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and Capability in African
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The African Journal of Entrepreneurship, Innovation and Development Research (AJEIDR) is a multidisciplinary, peer-reviewed scholarly journal dedicated to advancing rigorous, contextually grounded and policy-relevant research on entrepreneurship, innovation and development in Africa and the wider Global South. AJEIDR provides an intellectual platform for scholars, practitioners, and policymakers to generate, debate, and disseminate knowledge that can inform more inclusive, innovative, and sustainable development pathways.

The journal was established in response to the continued under-representation of African contexts, experiences, and knowledge systems within mainstream entrepreneurship, innovation, and development scholarship. AJEIDR seeks to strengthen the visibility of Africa-centred scholarship while connecting African research to wider theoretical and global debates. It particularly encourages research that challenges established assumptions, develops theory from African contexts, foregrounds indigenous and local knowledge, and provides new explanations for the distinctive institutional, social, economic and environmental conditions shaping entrepreneurship and innovation across the continent.

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Editorial

Rethinking Institutions, Capital, and Capability in African Entrepreneurship.

Special Issue – Selected Papers from the AEC Conference

Guest Editor(s): Dr Bridget Irene – *De Montfort University, United Kingdom*; Dr Patrick Ebewo – *Tshwane University of Technology, South Africa*; Dr Elona Ndlovu – *BizPreneur, South Africa*; Dr Abiodun Egbetokun – *De Montfort University, United Kingdom*

Introduction

Entrepreneurship scholarship has increasingly recognised that venture creation cannot be adequately understood in isolation from the institutional, cultural and infrastructural conditions in which it unfolds (Welter, 2011). This special issue of *AJEIDR* brings together ten papers selected from the AEC Conference for their methodological rigour, originality, and relevance to entrepreneurship, innovation, and development across the African continent. Reviewed against a common set of criteria - novelty, methodological rigour, relevance, and clarity of communication - the ten contributions gathered here represent the strongest work to emerge from a field of thirty-one submissions spanning nine conference tracks.

The premise uniting this collection is that context is not a residual variable to be controlled away in pursuit of generalisable theory, but the very terrain on which entrepreneurial behaviour, opportunity and constraint are constituted (Welter, 2011). This claim carries particular weight in African settings, where formal institutions are frequently thin, unevenly enforced, or absent altogether, and where the relationship between institutional voids and entrepreneurial behaviour is consequently more visible, and more consequential, than in the mature-market economies from which much entrepreneurship theory was originally derived (Bruton, Ahlstrom, & Li, 2010; Khanna & Palepu, 2010). A large share of entrepreneurial activity across the continent therefore takes place outside, or at the margins of, formal regulatory and financial systems. Rather than treating this informality as a deficient or transitional condition, a now well-established stream of scholarship reads it as a distinct governance order, one that mobilises collective identity, kinship obligation and community-level sanctioning to perform the trust and enforcement functions that formal courts and contracts would otherwise provide (Webb, Tihanyi, Ireland, & Sirmon, 2009).

A parallel critique applies to the dominant “high-growth” or Silicon Valley template of entrepreneurship, which is empirically the exception rather than the rule even within the economies where it originated (Audretsch, 2021), and which travels still less comfortably into settings defined by informality, kinship-based resource mobilisation and necessity-driven venturing. The risk, as management scholars working on the continent have argued, is that imported frameworks are applied to African settings as if institutional absence were simply market failure, when it is more accurately read as a different institutional configuration with its own logics, and one that African entrepreneurship research is well placed to theorise on its own terms rather than as a deviation from an assumed norm (George, Corbishley, Khayesi, Haas, & Tihanyi, 2016).

Taken together, the papers in this issue resist a single narrow reading of what African entrepreneurship research looks like in 2026. They range from a twelve-month digital ethnography of informal trading communities to a decade-long panel-data analysis spanning forty-two countries; from indigenous apprenticeship systems reimaged for the digital economy to the political economy of domestic capital formation. What unites them is a shared insistence that context — institutional, cultural, infrastructural — is not a control variable to be reasoned away, but the very subject the field must take seriously.

We have organised the contributions into three thematic clusters to help readers navigate the issue: (I) informal institutions and digital platforms, (II) capital, capability, and human development, and (III) governance, law, and policy. Each cluster is introduced briefly below and situated against the relevant literature, followed by short synopses of the individual papers.

I. Informal Institutions and Digital Platforms

The opening cluster examines how entrepreneurial activity organises where formal institutions are thin, unreliable, or absent, and how digital platforms reshape that organisation rather than replace it outright. This builds on the argument that informal economic activity is not simply formal entrepreneurship minus regulation, but a governance order in its own right, one that substitutes collective identity and community-level sanctioning for the contract enforcement that formal courts would otherwise provide (Webb et al., 2009). The paper in this cluster extends that argument into a digital register, showing how messaging platforms now perform institutional work once confined to physical marketplaces and kinship networks.

Irene, B., Asabi, A., & Dakolo, B. *“WhatsApp and Telegram Commerce as an Informal Institution: Trust, Enforcement, and Dispute Resolution in West African Trade Communities.”* Drawing on twelve months of digital ethnography across forty trading communities in Nigeria and Ghana, this paper documents how buyers and sellers on messaging platforms construct functioning institutions of trust, enforcement, and dispute resolution without recourse to formal contracts or courts. Using conversation analysis on roughly 180 negotiation sequences alongside twenty key-informant interviews, the authors show that platform commerce is not merely informal trade migrating online, but a distinct governance order with its own norms and sanctions. This paper anchors the special issue and was recognised as its best paper overall.

II. Capital, Capability, and Human Development

The second cluster turns to the resources, financial, technical, and human, that entrepreneurial ecosystems depend on, and to the models, both indigenous and imported, that mobilise them. The institutional-voids perspective is instructive here: where formal credit and equity markets are underdeveloped, entrepreneurs and investors alike must construct substitute mechanisms, informal capital networks, family labour, community-based training, to close the resulting gaps (Khanna & Palepu, 2010). The papers gathered in this cluster examine both the persistence of these substitute mechanisms and, in several cases, their reinvention for a digital and AI-inflected economy.

White, B. *“Beyond the Funding Gap: Mobilising Domestic Capital Under Institutional Thinness.”* Based on twenty-four interviews with founders, domestic investors, and policymakers in Tanzania, this paper proposes a “Domestic Capital Flywheel” model explaining why local capital mobilisation lags foreign investment even where domestic wealth exists. Written by a practising investor, the paper won both Best Paper for Knowledge Exchange and Best Practitioner-Scholar Paper for translating rigorous field research into a model ecosystem builders can use directly.

Edeze, Chidimma A. “*Adapting the Igbo ‘Igba Boi’ Apprenticeship Model for the Digital Economy.*” This co-creative, participatory study with eighty-three apprenticeship participants reimagines the centuries-old Igbo Igba Boi trade apprenticeship system as a framework for closing digital-skills gaps. The paper was recognised as Best Gender & Inclusion Paper for its explicit attention to who is included in, and excluded from, traditional and digital apprenticeship pathways.

El Mnouer, O., Katfi, A., Ghallal, S., Katfi, H., & Abdelmeguid, N. “*University Incubators as Catalysts for Entrepreneurial Intentions in Morocco.*” Drawing on a multi-institutional Moroccan sample, this paper examines the conditions under which university-based incubators meaningfully shift students’ entrepreneurial intentions, rather than merely hosting activity without changing outcomes. It offers one of the more empirically grounded contributions on entrepreneurship education in this issue.

Asabi, A., & Emedo, C. “*Entrepreneurial Dynamic Capabilities and AI Readiness in the Nigerian Real Estate Sector.*” Using PLS-SEM on a sample of 250 firms, this student-authored paper tests how dynamic capabilities shape organisational readiness to adopt AI in Nigeria’s real estate sector — a technically rigorous contribution recognised as this issue’s Best Student Paper.

Ugburo, I. U., Shalimba, V., & Okorie, M. “*Unlocking Electric Bicycle Adoption: Pay-As-You-Go Battery Business Models.*” This paper models the economics of pay-as-you-go battery systems for electric bicycles, combining engineering simulation with business-model analysis to identify the cost and energy thresholds at which e-bike adoption becomes commercially viable for African micro-mobility markets.

III. Governance, Law, and Policy

The final cluster steps back to the formal institutional layer, law, taxation, and firm governance, and asks how well it serves the entrepreneurs operating beneath it. This is squarely the terrain of institutional theory’s central claim: that formal rule change does not mechanically translate into behavioural change on the ground, particularly where reform is not accompanied by shifts in the normative and cognitive institutions, social norms, taken-for-granted assumptions about legitimate practice, that actually govern everyday conduct (Bruton et al., 2010). The papers in this cluster test that claim empirically and conceptually across four distinct policy domains.

Ilonga N’Kupo, P. “*Why Legal Advances Fail to Translate Into Economic Inclusion for Women Entrepreneurs.*” Using panel data across forty-two African countries from 2011 to 2022, and combining fixed- and random-effects models with a difference-in-differences design, this paper shows that formal legal reforms expanding women’s economic rights frequently fail to produce commensurate gains in entrepreneurial participation. It is the most methodologically rigorous quantitative contribution in the issue and was awarded Best Empirical/Quantitative Paper.

Ngwenyi Meungwe & Alolo, N. E. “*Strategic Enforcement and VAT Gap Closure in Sub-Saharan Africa.*” Examining e-invoicing and enforcement reforms across five countries, this paper offers a rigorous, policy-facing analysis of what closes the value-added tax compliance gap, and what does not. It was recognised as Best Policy Impact Paper for its direct relevance to tax administrators and regulators.

Afedzie et al. “*Family Enterprise Governance in Ghana.*” This multiple-case qualitative study examines how socio-cultural norms shape governance structures in Ghanaian family enterprises, contributing a grounded account of governance that neither romanticises informal practice nor assumes the superiority of formal corporate models.

Discussion and Future Directions

Read together, these ten papers advance a case that is at once empirical and theoretical: that entrepreneurship in African settings is best understood not as a deficient or lagging version of a Western template, but as a distinct set of institutional arrangements that merit study on their own terms (George et al., 2016). Several implications follow.

Methodologically, the strongest contributions in this issue combine qualitative depth, ethnography, comparative case study, participatory co-creation, with longitudinal or cross-country evidence (a forty-two-country panel; multi-year comparative cases) that lets institutional change, and its limits, be observed over time rather than assumed. Theoretically, several papers extend rather than simply apply institutional and resource-based frameworks, reworking succession, capital formation, and legitimacy for settings in which the assumptions underlying the original frameworks do not straightforwardly hold. Most pressingly, a number of contributions converge on a related finding: that closing formal gaps - in law, in credit access, in digital infrastructure - is necessary but insufficient without a corresponding shift in the informal, normative order that shapes how those formal provisions are actually used in practice (Bruton et al., 2010).

This points toward a research agenda that we hope this special issue helps advance: more comparative, cross-country work tracing how identical formal reforms play out differently across institutional settings; more longitudinal designs capable of separating durable institutional change from short-term compliance; and sustained attention to the entrepreneurs and communities who build functioning economic institutions from below, often without formal recognition, and increasingly through digital means.

Closing Remarks

Selecting ten papers from a strong field of thirty-one submissions required difficult trade-offs, and several papers not included here were of publishable quality and narrowly missed inclusion on grounds of thematic balance or overlap with other selections. We are grateful to the AEC Conference organising committee, to the authors for their contributions, and to the reviewers whose assessments of novelty, rigour, relevance, and clarity shaped this issue.

We hope this collection sparks further inquiry into the institutional, financial, and human foundations of entrepreneurship across the continent, and that it models a standard of rigour and contextual grounding for future submissions to AJEIDR.

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Article

WhatsApp and Telegram Commerce as an Informal Institution: Trust, Enforcement, and Dispute Resolution in West African Trade Communities

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Abstract

WhatsApp and Telegram have emerged as booming marketplaces across West Africa, to the surprise of many. From fashion and beauty products to food and general goods, thousands of traders are now conducting their business, sometimes entirely, in chat groups. These online marketplaces move huge quantities of goods each day, but they operate informally, with no formal contracts, signed agreements, or even minimal legal protections. This raises the questions: how do people trust each other enough to trade? What do they normally do when things go wrong in a dispute? This paper aims to resolve these questions. While much of the literature on platform commerce either focuses on how digital tools can expand access to markets or on labour precarity, less attention has been paid to the maintenance of order in areas where formal regulations do not apply. We argue that these WhatsApp and Telegram communities function more like informal institutions, shaping economic behaviour through social norms and practices. Our research employs digital ethnography and conversation analysis to explore trade groups in three categories: general goods and resale; fashion and beauty; food markets and groceries. We looked at how the specific designs of these platforms, including message order, receipts, persistent chat histories, and who can or cannot add and remove members, influence trust-building processes, payment negotiations, and even how rule-breakers are dealt with. The first analysis shows that there are three interwoven mechanisms operating here. First, trust-building practices such as vouching for others and credentialing. Second, enforcement mechanisms, including public shaming, calling out bad actors, and group exclusion. Third, negotiation strategies that allow traders to reconcile finances with social relationships. By showcasing what informal institutions look like in practice, this study contributes to broader dialogues around platform economies, digital livelihoods, and economic life in the Global South. It also directly addresses two of the UN Sustainable Development Goals, SDG 8 (Decent Work and Economic Growth) and SDG 9 (Industry, Innovation and Infrastructure).

Keywords: Platform commerce; Informal institutions; WhatsApp markets; Telegram commerce; Digital ethnography; Conversation analysis; Informal economies; West Africa.



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1. Introduction

The widespread diffusion of mobile communication technologies across the Global South has catalysed new forms of economic organisation that call into question traditional perspectives on markets, institutions, and governance (Castells et al., 2012; Aker & Mbiti, 2010). WhatsApp and Telegram are among those that have become important infrastructures for everyday commerce, especially in situations marked by institutional voids, regulatory uncertainty, and limited availability of formal market systems (Donner & Tellez, 2008; Meagher, 2010). Across West Africa, traders increasingly make high-volume transactions using these platforms, often without formal contracts, legal enforcement mechanisms, or institutional oversight. However, despite the lack of visible centralised governance structures, these markets operate with a high degree of efficiency, coordination and continuity.

Existing literature on digital commerce in the Global South has mainly focused on how platforms increase market access, facilitate entrepreneurial activity, and lower transaction costs (Agrawal et al., 2016; Ndemo & Weiss, 2017). Although these contributions are significant, they typically frame platforms as neutral technological intermediaries, neglecting the social and institutional processes that create and preserve economic order (Gillespie, 2010; Plantin et al., 2018). In doing so, they under-theorise a central question: within contexts where formal institutional protections are weak or non-existent, how do actors establish trust, enforce agreements and resolve disputes?

This paper addresses this gap by reconceptualising WhatsApp and Telegram trading communities as informal institutions, systems of governance constituted by shared norms, practices and platform-mediated interactions (North, 1990; Helmke & Levitsky, 2004; Greif, 2006). Against this background, and rejecting the view that treats trust as a residual substitute for formal contracts (Williamson, 1985), we propose that these digital marketplaces operate under a different institutional logic in which trust, enforcement and negotiation are actively produced through social and technological mechanisms. Drawing on qualitative interviews with traders in electronics markets across Nigeria, the study examines how participants negotiate risk, authenticate identity, sanction wrongdoing and maintain transactional order in these digitally mediated contexts.

The analysis contributes to literature in three main ways. First, it contributes to platform economy scholarship by arguing that digital infrastructures do more than facilitate exchange; they also actively constitute the institutional conditions under which exchange happens (Gillespie, 2010; Srnicek, 2017). Second, it contributes to theories of informal institutions by showing how forms of governance can become embedded in platform architectures, with features like group administration, message visibility, or identity signalling integral to rule enforcement and coordination (Helmke & Levitsky, 2004; Greif, 2006). Third, it speaks to literature on entrepreneurship and economic organisation in the Global South, demonstrating how traders create resilient, self-regulating market systems where formal regulatory frameworks are absent (Chen, 2012; Meagher, 2010).

In taking this approach, the paper reframes the analytical lens from platforms as tools to platforms as institutional environments, providing a nuanced perspective on how economic life is structured in digitally mediated informal economies.

2. Literature Review

2.1 Platform Economies and Digital Commerce in the Global South

Digital platforms have changed how economic activity is organised (Srnicsek, 2017; Parker et al., 2016) and enabled new modes of exchange across geographical and institutional boundaries. In the Global South, platforms like WhatsApp and Telegram are particularly important because of their low cost, accessibility, and integration into everyday social life (Donner & Tellez, 2008; Aker & Mbiti, 2010; Ndemo & Weiss, 2017). However, research suggests that these platforms lower barriers to market access and can enable micro and small enterprises to connect with potential customers further afield and support entrants into entrepreneurship (Agrawal et al., 2016; Zanello et al., 2016). More recent work sharpens this picture for the informal economy specifically, showing that digital financial technologies allow informal businesses to move away from trading purely on the margins of formal markets (Senyo, Gozman, Karanasios, Dacre, & Baba, 2022), a shift with particular force in Nigeria, where informal activity remains structurally central to the economy rather than a residual sector awaiting formalization (Etim & Daramola, 2020).

Yet much of this literature has taken an instrumental stance towards platforms, framing them as (better) tools that increase efficiency and connectivity (Plantin et al., 2018). This view frequently neglects how platforms reorganise social relationships and economic activity (Gillespie, 2010). Existing studies pay little attention to the underlying mechanisms by which transactions are coordinated and governed in the absence of formal institutional frameworks (Graham et al., 2017), focusing instead on outcomes such as income generation or market expansion.

2.2 Informal Institutions and Economic Coordination

The concept of informal institutions can be a helpful lens for understanding how economic order is upheld outside formal mechanisms of regulation. Informal institutions are generally defined as socially shared rules, norms, and practices that structure behaviour where formal institutions are weak or ineffective (North, 1990; Helmke & Levitsky, 2004). In the Global South, for example, informal institutions are often more impactful than formal ones across all areas of economic activity (Meagher, 2010; Chen, 2012; Portes, 1994), especially in contexts that are high in uncertainty and low in the enforcement of legal rules.

Trust, reputation, and social networks have been shown to develop in the absence of formal contracts or other structures that facilitate transactions (Greif 2006; Buskens 2002; Williamson 1985). Compliance is maintained and opportunistic behaviour deterred through mechanisms such as repeated interaction, collective monitoring, and reputational sanctioning (Axelrod, 1984; Ostrom, 1990). Yet much of this literature is based on physical or community-based contexts, including local markets and ethnic trading networks (Meagher, 2010; Fafchamps, 2004), and does not yet adequately theorise the proliferation of digitally mediated forms of informality.

A substantial parallel literature frames informality not as an alternative institutional order but as a symptom of institutional voids, gaps or weaknesses in the formal, market-supporting institutions that would otherwise reduce transaction costs and enforce agreements (Perry et al., 2007; Mair & Marti, 2009; Puffer, McCarthy, & Boisot, 2010; Webb, Khoury, & Hitt, 2020). On this account, informal arrangements are best understood as adaptive, second-best responses to institutional absence rather than as institutions worth theorising in their own right. This voids perspective and the informal institutions perspective adopted in this paper, following North (1990) and Helmke and Levitsky (2004), are not fully reconcilable, and the tension between them is addressed directly in the discussion of findings in Section 6.1.

2.3 Trust, Enforcement, and Governance in Digital Marketplaces

Trust is widely regarded as a fundamental element of economic exchange, particularly in contexts marked by high uncertainty and information asymmetry (Luhmann, 1979; Zucker, 1986). In digital marketplaces, much trust is built through reputation systems, ratings, and platform-mediated verification processes (Pavlou & Fygenson, 2006; Resnick et al., 2000). Such formalised mechanisms are largely absent from WhatsApp and Telegram trading environments. Instead, trust is built through practices such as identity verification, sharing testimonials, and in-network validation (Buskens, 2002; Greif, 2006). Systematic reviews of trust in peer-to-peer and social commerce settings identify similar antecedents where formal reputation infrastructure is thin or absent (Huurne, Ronteltap, Corten, & Buskens, 2017). Research on trust transfer shows that confidence built in one channel, such as a personal contact or a social media profile, can carry over to underwrite transactions in another (Xiao, Zhang, & Fu, 2019; Hajli, Sims, Zadeh, & Richard, 2017), a dynamic that closely maps onto the movement between public platform visibility and private WhatsApp or Telegram negotiation documented in this study's findings.

Again, enforcement mechanisms are not formally grounded in established legal instruments but are propped up by social and collective sanctions and exclusion (Ostrom 1990; Fafchamps 2004). Group admins are crucial for maintaining order, and community norms ensure appropriate behaviour and pricing. Instead, disputes are typically resolved through social interaction, clarification, and repairing rapport (Goffman 1959), rather than through formal litigation. While there is increasing interest in platform-mediated commerce (e.g., Srnicek, 2017; Parker et al., 2016), less is known about how these governance mechanisms function within informal digital markets. The architecture of different platforms has yet to be explored as an important factor shaping trust, experimentation, and negotiation processes (Plantin et al., 2018; Gillespie, 2010).

2.4 Platform Architecture as Institutional Infrastructure

Recent studies show that digital platforms are not merely neutral intermediaries but active agents in structuring economic interactions (Gillespie, 2010; Plantin et al., 2018; Srnicek, 2017). The platform's properties, such as message visibility, persistence of communication histories, and membership control, shape how actors interact and coordinate to create or enforce norms (Gibson, 1979; Hutchby, 2001). These affordances shape transaction efficiency and the types of governance that develop within platform-based communities (Bucher & Helmond, 2018).

The platform architecture of WhatsApp and Telegram commerce facilitates new kinds of institutionalisation. Similarly, group structures enable joint monitoring (Ostrom, 1990), and features such as status updates and broadcast lists allow for large-scale reputation signalling at low cost (Buskens, 2002). Encrypted and closed messaging platforms have been shown to host their own informally governed exchange systems in other high-risk commercial contexts, where social media and encrypted apps mediate supply, access, and trust in the near-total absence of formal oversight (Moyle, Childs, Coomber, & Barratt, 2019), lending independent support to the claim that WhatsApp and Telegram architecture is doing genuine institutional work rather than merely hosting informal talk. At the same time, technological vulnerabilities from hacking and AI-generated impersonation pose new risks and call for new governance mechanisms (Irene et al., 2025). This paper contributes to this emerging perspective by conceptualising platform architecture as a form of institutional infrastructure, a particular configuration of embedded affordances that structure the production and enforcement of informal rules.

3. Conceptual Framework: Platform-Mediated Informal

Institutionalisation and the Duality of Affordances

Theoretically, this study sits at the crossroads of informal institutions theory, embeddedness, and platform affordance perspectives, and contributes to these literatures by introducing the concept of degenerative affordances (Irene et al., 2025).

Informal institutions are broadly defined as socially shared rules, norms and practices that organise behaviour in settings where formal institutions lack strength, existence or effectiveness (North, 1990; Greif, 2006; Helmke & Levitsky, 2004). In such environments, economic coordination is maintained not by legal contracts or binding enforcement but by trust, reputation and collective sanctioning (Ostrom, 1990; Fafchamps, 2004). This viewpoint is particularly relevant in the Nigerian context, where informal economic activity predominates, and market actors must turn to alternative governance mechanisms to cope with uncertainty and risk (Meagher, 2010; Chen, 2012).

In addition, embeddedness theory (Granovetter, 1985) emphasises the fact that economic action is embedded in social relations and networks. Transactions are not purely market-based but are oriented by past interactions, common histories, and relational connections (Uzzi, 1997). This embeddedness is illustrated in WhatsApp and Telegram trading environments through trading with known contacts, relying on referrals from trusted connections, and validating potential trades through social networks that emphasise high trust levels, which are essential to initial trust-building and ongoing operation.

Yet they do not fully account for how different types of digital infrastructures subordinate these processes. To relieve this shortcoming, the study draws upon platform affordance theory (Gibson, 1979; Hutchby, 2001; Bucher & Helmond, 2018), which stresses that technical features offer and limit certain modes of action. In the case of WhatsApp and Telegram, affordances such as group structures, broadcast messaging features, persistent chat histories, and identity signalling mechanisms actively facilitate actors' interactions by shaping how they coordinate or enact norms (Gillespie, 2010; Plantin et al., 2018).

Building on this groundwork, the study advances the causal claim that platform-tethered trading environments operate as digitally embedded informal institutions in which governance emerges as a co-production of social norms and platform architecture. Three interactive mechanisms are important in producing institutional order within this system: trust production, informal deterrence and negotiated exchange.

Hybrid social-platform processes construct trust, such as reputation signalling, validation from a network or group of others, and identity verification practices, among others (Resnick et al., 2000). This promotes informal enforcement through collective governance mechanisms, in which group administrators and community members enforce norms with the promise of sanctioning misconduct. Negotiated exchange is a more human description of transactional interaction.

3.1 The Duality of Platform Affordances: Generative and Degenerative Dynamics

While platform affordances create the possibility of informal institutional order emerging, this study argues that they also establish dynamics that may disrupt and destabilise such an order. To articulate this tension, the paper builds on previous work on degenerative affordances (Irene et al., 2025), conceptualising platform features as having a dual character (dual purpose): generative and degenerative.

The platform's properties enable opportunities for generative affordances (Hutchby, 2001; Bucher & Helmond, 2018), such as coordination, trust-building, and governance. Status updates and broadcast messaging facilitate reputation signalling at scale (Buskens, 2002), group structures enable collective monitoring (Ostrom, 1990), and persistent chat histories offer transparency and accountability (Resnick et al., 2000). By making interactions visible, traceable, and socially embedded (Granovetter, 1985), these affordances lead to informal institutional arrangements. However, these very same affordances may devolve over time as they are subject to manipulation, exploitation and technological co-evolution (Irene et al., 2025). Identity signalling properties like voice notes, previously a source of authenticity (Chesney & Citron, 2019), are weak to AI-assisted reproduction and become less and less reliable. Likewise, the transparency and scale of group-based trading contexts broaden market access but heighten vulnerability to exploitative agents, fraud, and other misconduct (Pavlou & Fygenson, 2006). This duality offers a necessary theoretical insight: rather than self-sustaining systems or fixed structures, platform-mediated informal institutions are inherently unstable and continuously negotiated (further nuanced discussions are not yet found in the literature, e.g. North, 1990; Greif, 2006).

3.2 Adaptive Institutional Repair

In response to the destabilising effects of degenerative affordances, actors engage in what can be conceptualised as adaptive institutional repair (Irene et al., 2025). This involves continuously modifying and reinforcing informal rules, practices, and verification strategies to maintain transactional order, a dynamic process consistent with Ostrom's (1990) account of self-organised institutional adaptation and Greif's (2006) analysis of institutional evolution under uncertainty. Examples include shifting from trust-based transactions to deposit or payment-on-delivery systems; increasing reliance on physical verification; strengthening admin enforcement roles; and developing shared heuristics for identifying fraud such as price benchmarking.

3.3 Theoretical Contribution

By integrating informal institutions theory, embeddedness, and platform affordance perspectives, this study advances a novel theoretical proposition: **P1 - Digital platforms such as WhatsApp and Telegram function as dual-function institutional infrastructures that both enable and destabilise informal economic governance through the interaction of generative and degenerative affordances.** Figure 1 summarises this framework.

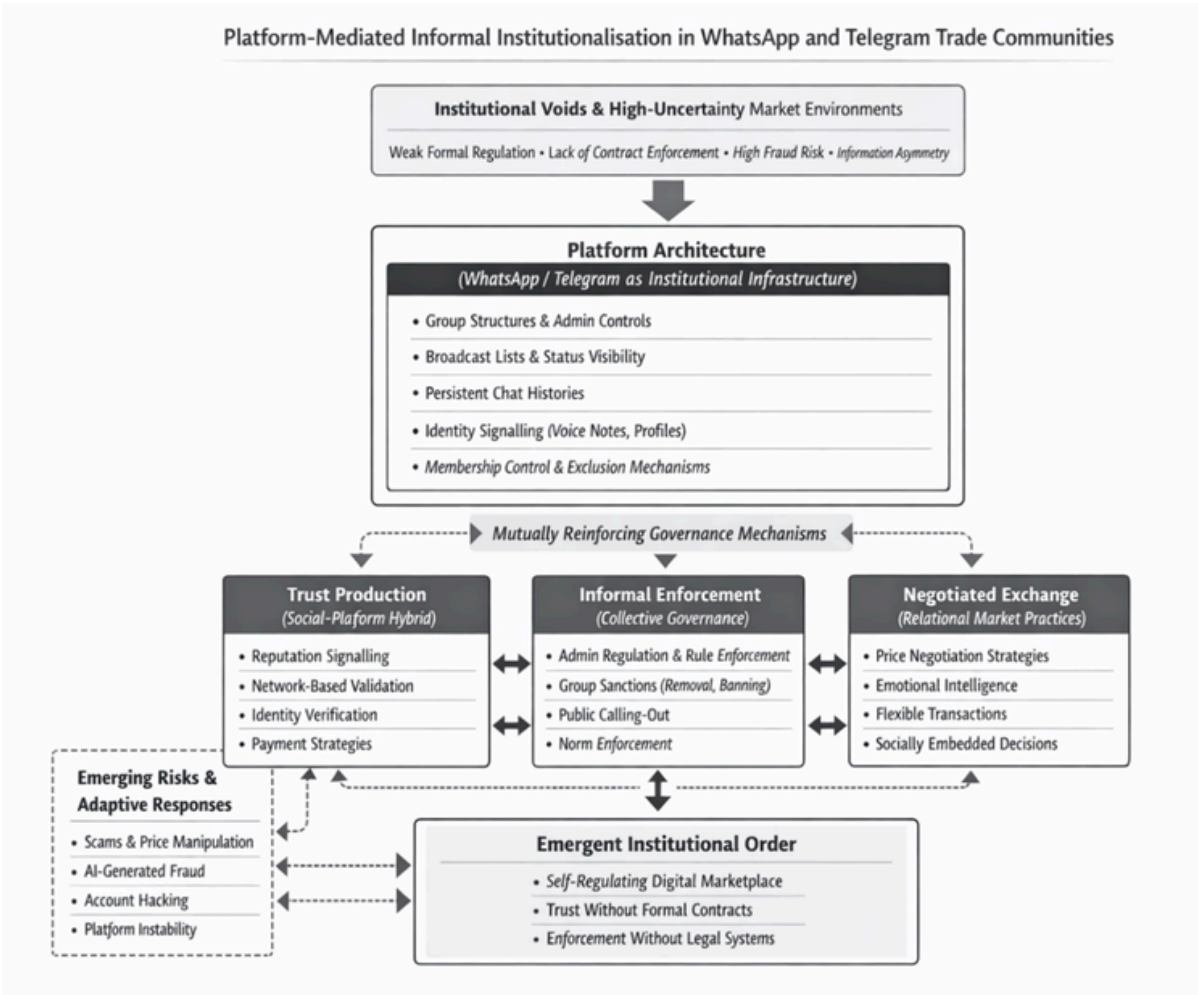


Figure 1. Conceptual framework: platform-mediated informal institutionalisation and the duality of affordances

4. Methodology

This study uses a three-tier qualitative design involving digital ethnography, corpus-based conversation analysis (CA), and key informant interviews to explore how trust, enforcement, and negotiation are co-produced in WhatsApp and Telegram trading communities in Nigeria and Ghana. The design is a response to the theoretical framework (Figure 1); informal governance in these communities happens through interaction; it is constituted by platform affordances and sustained via social mechanisms that only leave traces, more or less visible, in digital traces. No one way captures this particularly well. The three layers are integrated sequentially and iteratively, each layer informing the others as the research always enters one of the proposed tests.

Converting CA to text-based asynchronous interaction requires concrete methodological choices for properties not present in spoken conversation. Turn-taking: in spoken conversation, turns are arranged via a real-time system of transition-relevance places; in WhatsApp, messages can come ‘simultaneously’ from the platform’s view and must be related sequentially by content, threading, and timing metadata rather than by the mechanics of turn allocation. Recipient design: spoken conversation is predominantly dyadic or a bounded interactional space; WhatsApp group audiences vary in size and composition, so messages are designed for a group recipient with relevant characteristics unknowable in full to the sender. We follow Giles et al. (2015) in treating such variation as analytically relevant rather than disqualifying CA as an analytic method. The use of WhatsApp data as a primary research material is itself methodologically established; a recent scoping review of WhatsApp-based health systems research demonstrates its viability as a data source while also cataloguing the consent, privacy, and data management challenges it raises (Manji, Hanefeld, Vearey, Walls, & De Gruchy, 2021), challenges addressed directly in the ethical considerations set out in Section 4.4.

Nigeria and Ghana are chosen as key national sites, allowing the analysis to differentiate between governance mechanisms that are general characteristics of platform-based commerce and those tied to specific national contexts. In each country, the study compares different commodity types and transaction structures by examining three commercial sectors: general trade and resale; fashion and beauty; and food and groceries. The research team’s prior access to WhatsApp and Telegram commerce communities, as well as their insider knowledge of community norms and relational dynamics (Pink et al., 2016), eased the entry problem typical of digital ethnographic approaches in closed communities, while providing interpretive resources vital for analysing indirect governance talk.

Table 1: Research design overview

Design element	Specification
Research tradition	Qualitative; interpretivist; institutional and interactional analysis
Layer 1	Digital ethnography - 12 months across 40 communities, WhatsApp and Telegram, Nigeria and Ghana
Layer 2	Corpus-based conversation analysis - ~180 analysed sequences across three governance mechanism types
Layer 3	Key informant interviews - 20 participants: administrators, established traders, marginal members
Sectors	General trade/resale; fashion and beauty; food and groceries
Platforms	WhatsApp and Telegram (cross-platform comparison built in from design stage)
Sampling logic	Purposive community selection; theoretical sampling for CA corpus; snowball for key informants
Analytic approach	Grounded theory orientation; sequential-ethnographic triangulation; contrastive analysis across layers
Team	3 researchers; insider positionality; systematic reflexive practice

Table 1: Research design overview

The research team of three members brings an important methodological asset to the design in terms of (a) existing access to WhatsApp and Telegram commerce communities, and (b) insider knowledge of the community norms, commercial practices, and relational dynamics that animate them. This access eliminates the entrée problem that typically constitutes the most time-consuming phase of digital ethnographic research in closed communities, and the insider positionality provides interpretive resources, particularly for the CA analysis of indirect speech acts and implicit governance norms, that an outside researcher would not have. Section 4.3 addresses its implications for reflexivity. The data were collected in three layers:

1. Digital ethnography (layer 1) involved sustained observation of 40 purposively selected communities (Nigeria 20 and Ghana 20) over twelve months, structured across three phases. An orientation phase (months 1-3) mapped community structure, key actors, and norms. A focused observation phase (months 4-9) systematically documented trust-building sequences, enforcement sequences, and payment and credit negotiation sequences, the three governance mechanisms identified in the theoretical framework, and generated the initial CA corpus. An analytical phase (months 10-12) ran concurrently with CA and interviewing, using findings from those layers to revisit and refine the ethnographic record. Communities were selected to ensure variation across sectors, platform (WhatsApp and Telegram), size (under 50 to 500+ members), maturity, and national context. The cross-platform comparison is theoretically necessary: WhatsApp and Telegram differ in group size limits, message persistence, and admin control granularity in ways that the framework predicts will produce differences in governance form.

1. Corpus-based conversation analysis (layer 2) provides the tools for demonstrating, in interactional detail, how governance mechanisms are sequentially organised. The CA corpus was constructed through theoretically guided sampling from the ethnographic observation data, generating approximately 55 trust-building sequences, 68 enforcement sequences, and 57 credit and payment negotiation sequences, around 180 sequences in total, distributed across sectors, platforms, and countries. The analysis examines turn construction, preference organisation, and repair mechanisms, adapted for the text-based asynchronous interaction of group messaging. Applying CA to WhatsApp and Telegram data requires explicit methodological decisions: sequential position is established from threading architecture, timestamp metadata, and content analysis; preference organisation is identified through the standard criteria of promptness, hedging, and formatting; repair sequences are of particular analytical importance as sites where community rules are made explicit and authority invoked.

2. Key informant interviews (layer 3) access backstage governance dynamics not visible in the chat record: administrator decision-making, historical enforcement precedents, and the subjective experience of credit obligation. Twenty participants were recruited purposively across three role types, community administrators (5), established traders (10), and newer or more marginal members (5), through direct approach and snowball referral. Interviews were conducted via video call, lasted approximately 40-60 minutes, and were audio-recorded with consent and transcribed verbatim.

4.2 Analysis

The three layers are integrated through sequential-ethnographic triangulation. For each governance sequence type identified by CA, the procedure establishes the sequence type's structure; documents the ethnographic context in which it operates; and brings key informant accounts into dialogue with the CA findings. Divergence across layers, between enacted governance visible in the chat record and experienced governance reported by participants, is treated as analytically productive rather than as a validity problem. Contrastive analysis also operates across platforms, interpreting differences in how equivalent governance mechanisms are organised in WhatsApp and Telegram communities through the affordance distinctions central to the theoretical framework. The overall analytic orientation is grounded theory (Charmaz, 2014), with open coding of interview transcripts and fieldnotes running alongside CA analysis in continuous iterative dialogue. Figure 2, presented below, shows the resulting data structure from first-order concepts through aggregate dimensions.

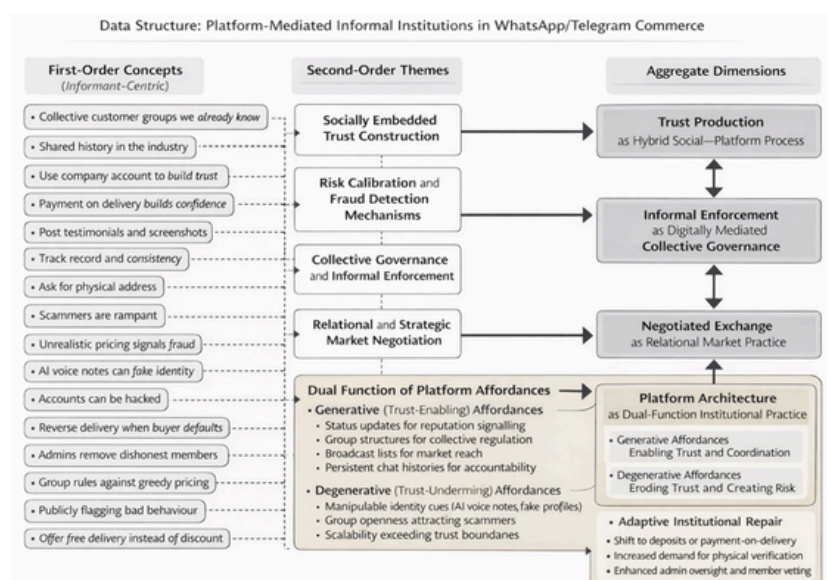


Figure 2. Data structure: first-order concepts, second-order themes, and aggregate dimensions, following the Gioia method.

4.3 Researcher Role and Reflexivity

The research team's insider position is a methodological asset and an analytical responsibility. As community members and traders, the researchers have access to the interpretive background and shared knowledge of community norms, commercial conventions, and relational dynamics that make governance practices legible. This background cannot be acquired quickly by an outside researcher, and its absence would significantly impair both the ethnographic analysis and, crucially, the CA of indirect and implicit governance talk.

The methodological responsibilities of insider positionality were managed through four practices. Systematic reflexive journaling: each researcher maintained a running record of their interpretive assumptions, the moments where insider knowledge was being deployed, and the alternative interpretations they were setting aside. Analytical dialogues: weekly team meetings included an explicit reflexivity component in which team members justified and challenged interpretive decisions. Member validation: preliminary interpretations of CA findings were shared with key informant participants for response. Audit trail: all analytical decisions, including decisions about which threads to include in the corpus and how to categorise sequences, were documented in a form that enabled independent scrutiny.

4.4 Ethical considerations and rigour

The study received ethical approval prior to data collection and followed the Association of Internet Researchers' guidelines (Franzke et al., 2020), treating closed WhatsApp and Telegram groups as private spaces requiring explicit consent. We applied a tiered consent protocol: administrator consent before observation; individual participant consent before CA corpus inclusion; and standard informed consent for interviews. Anonymisation extended beyond name replacement to include business names, pricing information, geographic markers, and product details, all of which are commercially sensitive and potentially identifying. The team stored data on encrypted institutional servers, with access restricted to the research team.

Rigour was addressed through prolonged engagement (twelve months of observation), insider positionality providing experiential interpretive resources, member validation of preliminary CA findings, peer debriefing through weekly team analytical dialogues, and a full analytical audit trail. The study's primary limitations are its geographic and sectoral specificity, the CA corpus's unsuitability for claims about population-level frequency, and the interpretive risks of insider positionality that reflexive practices mitigate but cannot eliminate.

5. Findings

Analysis of interview data from twenty participants and digital ethnographic material drawn from 40 WhatsApp and Telegram groups reveals that platform-based commerce operates as a socially embedded, digitally mediated institutional arrangement. These markets are not unregulated vacuums but sites in which trust, pricing, governance, and risk are continuously produced through interaction, community norms, and platform affordances. Four interrelated findings structure the analysis.

5.1 Trust is assembled through traceable presence, relational history, and practical verification

A central finding across all interviews is that trust is not presumed but actively constructed through layered social and technical practices. Participants consistently distinguished between WhatsApp and Telegram, characterised as high-trust environments anchored in known contacts, and broader platforms such as Instagram and Facebook, understood as low-trust spaces populated by relative strangers. As some participants put it:

"WhatsApp and Telegram are for people close to you - family, friends, and those who have your number. It is a high-trust environment" (P2)

"If they are regular, I trust them enough to deliver... even before they pay" (P18)

This framing recurs across sectors: the beauty products seller and a handbag seller emphasised that long-term presence was itself the foundation

"My customers trust me because I have been in business a long time and provide solutions to their problems" (P12)

"You can't have 100% trust because you don't see them... I have been hurt once and am now very careful" (P9)

The restaurant owner described extending credit to established customers before payment, trusting them "enough to deliver items like peppered snails even before they pay" (p5). These accounts confirm that trust within platform markets is relational and cumulative rather than transactional and instantaneous.

Beyond prior relationships, trust is produced through what the data reveals as traceable presence - the visible accumulation of a consistent, historically embedded identity within the platform. Sellers maintain this through regular product posts, status updates showcasing testimonials and demonstrations, and screenshots of completed transactions. The beauty products seller described using videos specifically to show "how my products work and how customers can trust our service" (P8). The handbag seller noted that "we always keep screenshots of transactions for reference" (P11), while another participant, a cocoa and cashew trader, described recording price discussions via voice notes "so they can't be changed later" (P14), a form of evidentiary practice that creates an accountable transactional history.

Practical verification devices supplement relational trust. A respondent insists on a physical address and a live voice call before proceeding with unfamiliar contacts, treating refusal as "a definitive indicator of a scam" (P17). A platform requires a deposit to establish commitment, while another participant trader described dispatching someone physically to verify an office address in their locality before proceeding. Another participant's account reveals the stakes of trust failure: "I have been hurt once and am now very careful" (P6). These graduated verification practices function as informal identity infrastructure substituting for formal contractual mechanisms.

The digital ethnography confirms these patterns. An admin-controlled Marketplace requires standardised listings, i.e. condition, defect, price, location, that constitute a form of structured accountability. The Instagram data from one participant shows a seller who has curated dedicated profile highlights for "Sales," "Reviews," and "Size Chart," building an institutional identity rather than a personal one.

Yet trust is fragile, as most participants raised concerns about AI-generated voice imitation and account hacking. As one participant warned: "Scammers can hack an account and then scam all of your followers" (P3). This points to an important dynamic i.e. the same affordances that enable trust-building are increasingly vulnerable to exploitation, requiring participants to continuously recalibrate their verification practices (Irene et al, 2025).

5.2 Exchange is relational and conversational but structurally controlled by sellers

A second finding is that exchange within these platform markets is iterative and socially embedded but structurally asymmetric. Buyers engage in extended interaction sequences that function less as straightforward information retrieval and more as performances of seriousness, establishing relational standing before commitment is possible. One beauty products seller captured this clearly:

"We might discuss for an hour, sharing pictures and instructions on how to use the products before they purchase" (P8)

"You have to understand your client... be social... compliment them" (P8)

One restaurant owner described a similar pattern:

"People either call me or chat with me privately on WhatsApp after seeing my posts. We negotiate prices privately" (P3)

A forex and clothing trader confirmed the general sequence:

"If you see something in a group, you go and talk to the person privately to buy or sell" (P11)

Within this relational process, sellers retain substantial structural control over the terms of exchange. Pricing strategies are carefully calibrated to manage expectations without conceding authority. One participant's approach is explicit, rather than offering a direct discount, he slightly adjusts the base price and offers free delivery to according to him: *"one stone to kill two birds" (P7)*, preserving the product's perceived value while slyly managing buyers' expectations of a "promo." One participant takes a firmer position:

"I don't negotiate; I buy quality and sell at a fixed price unless I am running a bonus/promo" (P9)

Another participant described admin-mediated pricing:

"The admin often sets the prices so as not to scare away buyers, but we still negotiate through messages" (P17)

These varied strategies reveal sellers managing the tension between relational openness and commercial control.

Verification practices are similarly seller-controlled. One platform deploys deposit requirements as a filter, distinguishing serious buyers from fraudsters before dispatching goods. One participant described a consignment arrangement in which trust enables deferred payment:

"Members might import goods and trust me to sell them and pay them back" (P16)

One participant's account of evaluating "previous deal records" before agreeing terms shows that verification is a formal stage in high-value transactions, not an incidental check. The exchange in the digital ethnographic data vividly illustrates this dynamic: the buyer moves through sequential turns, such as requesting prices, asking for a discount, announcing a collection time, and confirming availability, while the seller controls the pace and terms throughout. This shows that the exchanges are not just economic but rather relational labour.

5.3 Platform commerce operates through a dual-layer market structure: affective visibility and private transaction

A third and theoretically significant finding is the systematic architectural separation between public visibility and private transactional closure. This pattern appears consistently across all data sources and should be understood not as an informal workaround but as the structural logic through which these markets operate.

In the Instagram data from one participant which spans nine comment thread screenshots covering multiple posts, the pattern is unvarying i.e. public comments generating aesthetic engagement ("*Beautiful* ❤️", "🔥🔥🔥", "lovely," "I want this dress") while every transactional inquiry, regardless of phrasing, is redirected with "*check DM.*" Price is sometimes disclosed publicly i.e. 'N50,000' when asked directly, but ordering procedures, size confirmation, and payment are displaced into private messaging. Crucially, these two layers generate entirely different kinds of social activity: the comment section produces social proof, community, and affective attachment, while the DM handles commercial commitment. The comment from a buyer asking, "*Please are you on WhatsApp?*" - met with "*Yes ma'am, click link in bio, it will take you to our WhatsApp*" shows sellers actively funneling buyers from lower-trust platforms toward higher-trust channels. Multiple comments asking about the song playing in the background, interspersed with commercial inquiries, illustrate how the affective layer and the transactional layer coexist without integration.

The interview data explains why this bifurcation persists. One participant describes negotiating "*prices in private*" after public posting, while another confirms, "*if you see something in a group, you go and talk to the person privately*" (P6). One other participant explicitly states that transactions begin with "*a signal or offer in the group*" and that "*negotiation happens in private messages*" (P11). The structure is not incidental but deliberate: private channels enable selective disclosure, identity verification, and controlled negotiation away from collective scrutiny. It also creates informational asymmetry: buyers in the public layer cannot see what terms others have obtained, and the seller's actual conversion rate remains opaque.

The WhatsApp group data shows the same structure in a different register. Admin-only broadcast groups such as Marketplace, a Superstore, Foods sellers, and Thrifty Deals operate as curated one-way channels: product content is pushed to members, while buying activity is directed to personal contact, DM, or phone. An African food Mart group deploys a collective buying mechanism, "*if we can have 50 people out of 500 of us in the group who can buy 20kg bags*" (P15), transforming platform reach into purchasing leverage. This is a sophisticated form of structured market-making, quite distinct from the chaotic space in which informal commerce is often assumed to operate.

5.4 Governance is community-produced, temporally structured, and continuously repaired

A final finding concerns how order is maintained in the absence of formal enforcement. These markets are governed by admin's authority, community pricing norms, platform-specific structural controls, temporal regulation, and adaptive repair. Informal governance is not a substitute for formal governance but a distinct institutional mode with its own logic. Admin authority is the primary governance mechanism across all groups and sectors. Every participant described admins in governance terms:

"Admins play a vital role by ensuring everyone adheres to the rules and settling disputes"
(P2)

According to other participants,

"If a member is dishonest, the admins will move them out of the group, suspend them, or report the account" (P5)

"Dishonest people are simply removed from the group" (P19)

"Admins block and remove them immediately" (P6)

"Admins are like management; they set rules, monitor conversations to prevent insults, and resolve disputes" (P3)

The consistency of this characterization across the interview data from multiple sectors, i.e. electronics, beauty, food, fashion, jewellery, agriculture, points to admin authority as a structural feature of these markets rather than an idiosyncratic arrangement.

Pricing norms constitute a second governance layer. One participant described explicit rules against *"atrocious pricing"* with social sanction and admin expulsion as consequences. The restaurant owner articulated a relational rule:

"The most important rule is not to 'collect' each other's customers; it causes big problems. You must be truthful and treat others like family" (P19)

One participant noted that the admin "often sets the prices so as not to scare away buyers." These norms function as informal price regulation, redistributing market power toward collective fairness rather than individual profit maximisation.

Temporal structuring is a dimension of governance the original findings underemphasized. The digital ethnographic material reveals systematic use of time as a market-organising device. Some participants' "Eid Dhamaka" promotions (offers starting 12 March, ending at Eid), recurring weekend price lists ("SPECIAL WEEKEND OFFERS ARE STILL ON!!!!!!", Friday 27th–Sunday 29th March), and daily opening announcements ("We are OPEN TODAY as usual from 9 am–8pm") reintroduce temporal discipline into what are otherwise always-on platforms. One participant's seasonal bean offer similarly creates urgency and coordinated demand. This temporal governance creates buying cycles, manages inventory expectations, and produces a predictable market rhythm that informal platforms do not generate automatically.

Finally, adaptive institutional repair is how these markets sustain themselves amid chronic uncertainty. When trust signals weaken, new ones take their place: deposits replace open trust, company accounts replace personal ones, address verification supplements messaging, and service centres formalise defect handling. One participant's account of infrared management captures this elegantly:

"If they fail to send a proper receipt or bank debit alert, I don't respond" (P11)

Another participant's physical verification of the office address represents a more extreme step, dispatching someone to confirm a digital claim. One participant's practice of apologising for Lagos traffic delays and encouraging advance ordering illustrates how relational repair sustains commercial relationships amid infrastructural instability. Another participant's account of a "what I ordered versus what I got" experience is resolved by absorbing the loss rather than incurring return costs, revealing that dispute resolution is often internalised rather than escalated, thereby preserving the relational continuity on which future transactions depend.

5.5 Theoretical synthesis

Taken together, the findings support a reconceptualisation of WhatsApp and Telegram commerce as a digitally mediated informal institution, a socially regulated market system characterised by high social governance and low formal legality, sustained through continuous human and platform-mediated work. Its structure depends on two analytically distinct but empirically intertwined economies (a) an affective economy of visible engagement through which participants generate attention, establish identity, and participate in the social life of the platform; and (b) a transactional economy of private exchange through which pricing, commitment, and payment are actually settled. The systematic decoupling of these two economies (high engagement does not predict or reveal purchase) challenges linear models of digital commerce and reveals a multi-layered, socially embedded market process whose workings cannot be read from observable platform activity alone. Trust is not a fixed attribute of participants but an ongoing practical accomplishment; governance is not absent but relocated and continuously reproduced through admin authority, community norms, platform affordances, temporal structuring, and adaptive repair.

6. Discussions

This study set out to examine how trust, enforcement, and negotiation are produced in WhatsApp and Telegram trading communities in Nigeria, and to advance a theoretically grounded account of how economic order is maintained in the absence of formal institutional protections. The findings reveal four interrelated mechanisms, namely traceable presence and relational trust assembly, seller-controlled relational exchange, a dual-layer market structure, and community-produced governance through adaptive repair, that together constitute a distinctive form of digitally mediated informal institutionalisation. This section discusses the implications of these findings for three bodies of scholarship: informal institutions theory, platform affordance perspectives, and debates on economic organisation in the Global South.

6.1 Informality as dynamic institutional order, not institutional absence

A central theoretical contribution is to challenge the framing of informality as institutional absence. The findings demonstrate that these markets are not ungoverned spaces but sites of active, socially produced order (North, 1990; Helmke & Levitsky, 2004). This aligns with North's (1990) foundational distinction between formal and informal institutions but extends it in an important direction: whereas North treated informal institutions primarily as background constraints shaped by history and culture, the findings here show them being actively and continuously produced through everyday interaction, platform-mediated practices, and adaptive repair. This finding sits in direct tension with the institutional voids tradition, which explains informal economic activity as an adaptive response to gaps in formal, market-supporting institutions (Perry et al., 2007; Mair & Marti, 2009; Puffer et al., 2010). That tradition is not wrong that formal protections are largely unavailable in this setting; no participant in this study had recourse to contract law or regulatory enforcement.

But it stops short of explaining the empirical regularities documented here: the same admin authority structures, pricing norms, and verification practices recur across forty independently managed communities, multiple sectors, and two platforms. A pure institutional void account, in which formal absence leaves a residual space that actors fill in variable and idiosyncratic ways, does not straightforwardly predict this degree of structural convergence. Webb, Khoury, and Hitt's (2020) distinction between formal and informal institutional voids offers a useful refinement: participants in this study operate within a formal institutional void in Webb et al.'s terms, but not an informal one, since dense, convergent informal governance is precisely what the data show. What is absent is formal legal infrastructure; what is present, and under-theorised as an institution in its own right, is a stable informal governance order that performs many of the same coordinating functions. This resonates with Granovetter's (1985) embeddedness argument, evident in the reliance on prior relationships, shared norms, and community reputation documented across all twenty participants and multiple sectors. The restaurant owner's practice of delivering before payment, and the beauty seller's hour-long pre-purchase discussions, are not inefficiencies but forms of relational investment that underpin institutional stability, supporting Meagher's (2010) account of network embeddedness in Nigerian informal economies while extending it into digital contexts she did not consider. What the findings add to this tradition is a focus on the techno-social mechanisms of informal institutionalisation: admin authority, pricing norms, temporal structuring, and adaptive repair are not merely social but depend on platform features that enable them to function at scale (Gillespie, 2010; Plantin et al., 2018).

6.2 Platform architecture as dual-function institutional infrastructure

The study's second contribution concerns the role of platform affordances in shaping institutional order. The generative affordances of WhatsApp and Telegram, including persistent chat histories enabling evidentiary accountability, group structures facilitating collective monitoring, and admin controls enabling norm enforcement, are documented across all sectors, consistent with Ostrom's (1990) conditions for self-organised governance and Buskens' (2002) analysis of reputation effects in network-embedded exchange. The cocoa trader's voice-note price recording and the beauty seller's video demonstrations illustrate how affordances function as active components of informal institutional infrastructure rather than neutral efficiency tools (Hutchby, 2001; Bucher & Helmond, 2018). However, the findings also reveal the degenerative dimension of this same infrastructure. AI-generated voice imitation undermines identity verification (Chesney & Citron, 2019); account hacking converts trusted seller identities into fraud vectors. The theoretical proposition that digital platforms function as dual-function institutional infrastructures is thus empirically grounded (Irene et al., 2025): these are not stable institutions that occasionally face disruption but inherently unstable systems in which order is continuously contested. Participants develop their own counter-practices, including deposit requirements, physical verification, company account migration, and price benchmarking, constituting themselves as active institutional producers rather than passive recipients of platform governance (Gillespie, 2010).

6.3 The dual-layer market structure and the limits of visibility-based models of digital commerce

The systematic decoupling of affective visibility from transactional closure has implications beyond this specific context. Existing social commerce models tend to treat visible engagement as a proxy for commercial intent and conversion (Pavlou & Fygenson, 2006; Resnick et al., 2000). The findings challenge this directly: high engagement, expressions of desire, price inquiries, and fire emojis do not translate into observable transactions, which are systematically displaced into private messaging.

The affective economy is not a preliminary stage in a linear conversion funnel but a structurally separate layer that generates social proof and community belonging independently of purchase (Goffman, 1959; Uzzi, 1997). The "check DM" mechanism is simultaneously a trust filter, a market-making device, and a source of structural informational asymmetry that strengthens sellers' negotiating position (Williamson, 1985). This finding suggests that commercial performance in informal digital markets cannot be assessed from observable platform activity, and that the attention-conversion model dominant in formal platform economy research (Srnicsek, 2017; Parker et al., 2016) does not transfer straightforwardly to informal economy contexts.

6.4 Governance without formality: rethinking institutional order in Global South digital economies

A persistent framing in informal economy scholarship treats informality as a transitional state characterised by a governance deficit (Portes, 1994; Chen, 2012). The evidence here suggests a different reading: these markets exhibit sophisticated, self-organising governance arrangements, administrative authority, pricing norms, temporal structuring, and evidentiary practices that constitute a durable institutional mode rather than a residual or transitional one, consistent with Ostrom's (1990) analysis of enduring self-governing commons. This has direct policy relevance for SDG 8 and SDG 9, as identified in this paper's aims. Support for informal digital commerce in contexts like Nigeria should not be predicated on the assumption that formalisation is necessary for these markets to function. What they require is not formal oversight but platform-level security improvements, stronger authentication, better account protection, and more effective fraud reporting (Chesney & Citron, 2019) that address degenerative affordance dynamics without disrupting the community-based governance arrangements that sustain them.

6.5 Limitations and future directions

The study is empirically grounded in Nigeria across five sectors, and findings may not transfer directly to other national or sectoral contexts (Meagher, 2010). The CA corpus cannot support population-level frequency claims (Schegloff, 2007), and insider positionality introduces interpretive risks that reflexive practices mitigate but cannot eliminate (Lincoln & Guba, 1985). Future research should examine how these governance arrangements evolve as AI-generated fraud becomes more sophisticated (Chesney & Citron, 2019) and pursue comparative work across national contexts and platform ecosystems to identify which governance mechanisms are general features of platform-mediated informality and which are context-specific (Helmke & Levitsky, 2004).

7. Conclusion

This paper examined how trust, enforcement, and negotiation are produced in WhatsApp and Telegram trading communities in Nigeria and, in doing so, advanced a more theoretically grounded account of how economic order is maintained in informal digital markets. The central argument, supported by interview data from twenty participants across five sectors and digital ethnographic material from 40 groups, is that these platform markets constitute digitally mediated informal institutions: socially regulated market systems characterised by high social governance and low formal legality, sustained through continuous human and platform-mediated work (North, 1990; Granovetter, 1985; Irene et al., 2025).

Four findings underpin this argument. Trust is not assumed but assembled from traceable presence, relational history, and practical verification practices that substitute for formal contractual mechanisms (Greif, 2006; Buskens, 2002). Exchange is relational and conversational in form but structurally asymmetric, with sellers retaining control over verification, pricing, and the pace of commitment through deliberate strategies (Goffman, 1959; Williamson, 1985). Platform commerce operates through a dual-layer market structure in which an affective economy of visible engagement and a transactional economy of private exchange are systematically decoupled, a structural logic rather than an informal workaround (Gillespie, 2010; Uzzi, 1997). Governance is community-produced, temporally structured, and continuously repaired through administrative authority, community pricing norms, and adaptive institutional practices that respond to emerging fraud risks in real time (Ostrom, 1990; Helmke & Levitsky, 2004).

7.1 Theoretical contributions

The paper makes three interrelated theoretical contributions. First, it reconceptualises informality not as an institutional deficit but as a dynamic, adaptive mode of governance, showing that the absence of formal rules does not preclude sophisticated institutional order. Instead, it displaces the production of order into social interaction, community norms, and platform-mediated practices. This extends informal institutions theory (North, 1990; Granovetter, 1985; Meagher, 2010) by specifying the digital mechanisms through which informal governance is enacted and sustained, rather than simply describing its outcomes.

Second, the study advances platform affordance theory by empirically grounding the concept of dual-function institutional infrastructure. Platform features are shown to be simultaneously generative, enabling trust-building, collective monitoring, and reputational signalling, and degenerative, as the same affordances become vectors of fraud, impersonation, and institutional destabilisation (Ostrom, 1990; Greif, 2006). This extends the degenerative affordances framework (Irene et al., 2025) into empirically rich informal-economy terrain, demonstrating that platform-mediated institutional order is inherently unstable and must be continuously reconstructed through adaptive repair. In doing so, it shifts the analytical focus from platforms as tools to platforms as contested institutional environments.

Third, the dual-layer market structure identified in the findings, namely the systematic decoupling of affective visibility from transactional closure, offers a theoretically novel contribution to social commerce scholarship (Pavlou & Fygenson, 2006). By demonstrating that visible engagement does not predict or reveal purchase in informal digital markets, the paper challenges the attention-conversion model that dominates formal platform economy research and proposes a more nuanced, multi-layered account of how commercial exchange is organised in socially embedded market contexts (Granovetter, 1985; Uzzi, 1997).

7.2 Practical implications

The findings have clear implications for platform providers, policymakers, and development practitioners. The governance arrangements documented here are self-organising and contextually adapted; they function not despite the absence of formal oversight but through community-level mechanisms that formal regulation is unlikely to replicate.

Policy support for informal digital commerce should therefore not be predicated on formalisation as a prerequisite for market functionality. Instead, these markets require platform-level interventions that address the degenerative affordance dynamics documented here, specifically stronger authentication mechanisms, better account protection against hacking, and more effective infrastructure for reporting and removing fraudulent actors, without disrupting the community-based governance arrangements that sustain them. These findings speak directly to SDG 8 (Decent Work and Economic Growth) and SDG 9 (Industry, Innovation and Infrastructure), demonstrating both the productive capacity of informal digital economies and the specific vulnerabilities that threaten the livelihoods they support.

7.3 Final reflection

WhatsApp and Telegram markets are often discussed in terms of what they lack, such as formal contracts, legal enforcement, and institutional oversight. This paper has argued for a different starting point: asking not what is absent but what is present, and how it works. What is present is a sophisticated, adaptive, and socially produced institutional order that sustains high-volume commerce under conditions of chronic uncertainty, limited infrastructure, and persistent fraud risk (Meagher, 2010; Chen, 2012). Understanding how that order is produced and what threatens to destabilise it is not only a theoretical question but an urgent practical one for the millions of traders across the Global South for whom these platforms are not a supplement to formal economic life but its primary infrastructure (Castells et al., 2012; Aker & Mbiti, 2010).

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Article

Beyond the Funding Gap: Mobilising Domestic Capital Under Institutional Thinness

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Abstract

Across emerging entrepreneurial ecosystems, substantial domestic wealth often coexists with limited early-stage investment. This study examines how domestic private capital becomes mobilised within an institutionally thin entrepreneurial ecosystem, using Tanzania as an empirical case. The analysis draws on 24 in-depth, semi-structured interviews with angel investors, founders, intermediaries, financiers, programme managers, and policy actors, supported by documentary evidence and contextual field engagement. An iterative thematic analysis identified six interconnected dimensions of domestic capital mobilisation: trust and community building, investment capability formation, capital stacking, syndication and shared risk, intermediary coordination, and policy and institutional evolution. The findings show that limited early-stage investment is not explained solely by capital scarcity. Domestic wealth becomes investable only as relational, organisational, financial, and institutional capabilities develop together. The study therefore argues that domestic capital mobilisation emerges through entrepreneurial ecosystem development rather than existing as a precondition for it. It develops the **Domestic Capital Flywheel**, an empirically grounded model explaining how the six dimensions reinforce one another to transform latent private wealth into coordinated early-stage investment. The study contributes to entrepreneurial ecosystem and entrepreneurial finance research by reframing early-stage financing constraints as a problem of mobilisation and coordination rather than capital availability alone.

Keywords: Domestic capital; early-stage finance; entrepreneurial ecosystems; angel investing; Tanzania



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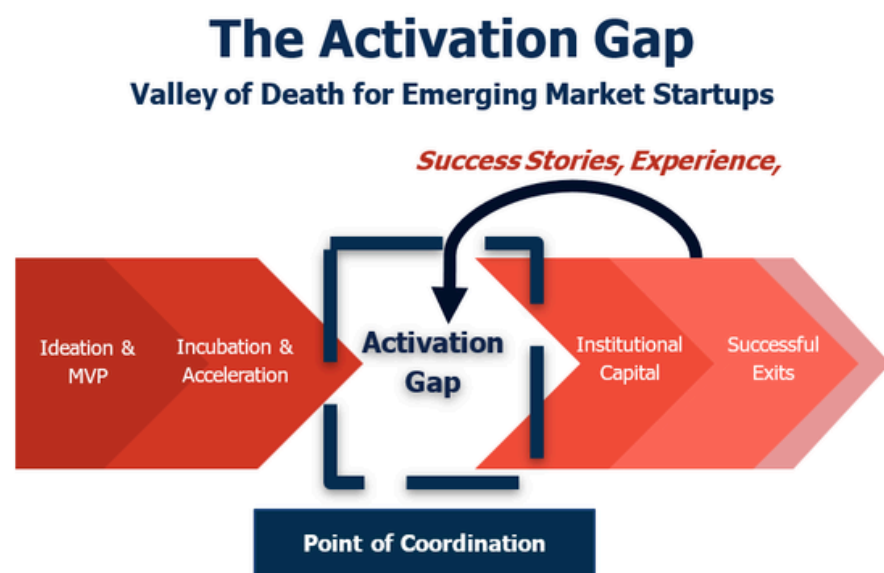
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1. Introduction

In many nascent entrepreneurial ecosystems, a persistent paradox is evident: credible founders, growing startup activity, and substantial domestic wealth coexist, yet domestic early-stage investment remains limited. This challenge is particularly pronounced across Africa, which attracts less than one percent of global venture capital, with more than 80 percent concentrated in just four countries—Nigeria, Kenya, Egypt, and South Africa. Outside these major hubs, early-stage ecosystems remain significantly undercapitalised. At the same time, domestic private wealth across sub-Saharan Africa continues to grow, with considerable liquid capital held by local professionals and high-net-worth individuals (Henley & Partners, 2025). The challenge is therefore not simply the absence of capital, but the limited mobilisation of domestic private wealth for early-stage investment. Tanzania illustrates this broader pattern. Despite recording more than 100 startup transactions between 2019 and 2026, domestic early-stage investment remains relatively shallow, highlighting a market where entrepreneurial momentum is increasingly visible but local capital mobilisation has yet to keep pace (International Finance Corporation, 2023; Africa: The Big Deal, 2024).

Conventional explanations for this shortfall emphasize capital scarcity, investor risk aversion, or weak deal pipelines. However, these structural accounts fail to explain why experienced domestic professionals—who possess both the capital capacity and active interest in startups—repeatedly hesitate at the point of deployment. This "activation gap" reflects well-documented behavioral responses to uncertainty and information asymmetry (Kahneman & Tversky, 1979; Hall & Lerner, 2010; Hausmann & Rodrik, 2003). Participation is delayed not because viable ventures are absent, but because the act of investing remains individually risky and institutionally undefined due to uncertainties surrounding valuation, governance, and post-investment support.

Figure 1: *The Activation Gap in Early-Stage Investment Markets*



Note: This conceptual framework illustrates the 'Activation Gap' separating early-stage venture activity from downstream institutional finance. It demonstrates how coordination failures stall ecosystem acceleration, showing that long-term sustainability depends on successful founders and investors recycling capital, expertise, and inspiration back into the next generation of local startups.

Source: Author's own elaboration.

This paper argues that the primary constraint to early-stage financing under institutional thinness is not the supply of capital, but the absence of the relational, behavioral, and institutional mechanisms that render domestic capital deployable (Sahlman, 1990; Gompers & Lerner, 2001). While existing literature catalogues these ecosystem constraints statically, it leaves a significant gap regarding the precise sequence and dynamic interactions through which these barriers are systematically overcome in practice. Ultimately, finance must be treated not as a passive input pumped into an ecosystem, but as an endogenous market system that must be built from the inside out. To address this gap, this study asks:

How does domestic private capital become mobilised within institutionally thin entrepreneurial ecosystems?

Drawing on qualitative empirical evidence from Tanzania, the analysis investigates how six core mechanisms—trust and community building, investment capability, capital stacking, syndication, intermediary coordination, and policy development—interact to activate local risk capital over time. In doing so, the paper makes two principal contributions:

First, it extends entrepreneurial ecosystem theory by arguing that domestic capital mobilisation should be understood as an outcome of ecosystem development rather than a pre-existing ecosystem input. In doing so, it reframes early-stage finance as a process of market formation, showing how domestic capital markets emerge through the cumulative development of supporting ecosystem conditions.

Second, it develops the ***Domestic Capital Flywheel***, an empirically grounded conceptual model that explains how trust and community building, investment capability, capital stacking, syndication, intermediary coordination, and policy development interact as a self-reinforcing system to progressively mobilise domestic private capital under conditions of institutional thinness. Empirically, the study provides one of the first qualitative accounts of domestic angel market formation in Tanzania, offering new insight into how early-stage investment markets emerge within an under-researched African entrepreneurial ecosystem.

The remainder of the paper is organised as follows. Section 2 reviews the relevant literature. Section 3 outlines the research context and qualitative methodology. Section 4 presents the empirical findings and identifies six interconnected dimensions of domestic capital mobilisation. Section 5 discusses the theoretical implications and develops the Domestic Capital Flywheel. Section 6 concludes with the study's contributions, implications, limitations, and directions for future research.

2. Literature Review

The emergence of early-stage investment markets within nascent ecosystems spans multiple theoretical domains, including entrepreneurial ecosystems, venture capital in emerging markets, behavioral finance, and institutional network theory (Ahlstrom & Bruton, 2006; Herrington & Coduras, 2019; Kahneman & Tversky, 1979). While these perspectives offer valuable partial explanations for capital formation, critical gaps remain regarding how domestic early-stage capital is systematically activated under conditions of institutional thinness.

2.1 Entrepreneurial Ecosystems and Market Formation

The entrepreneurial ecosystems literature emphasizes that successful venture creation depends not on isolated inputs, but on the interaction of multiple system components, including finance, human capital, institutions, and networks. Early frameworks conceptualize ecosystems as sets of interdependent actors and factors that collectively enable productive entrepreneurship (Isenberg, 2010; Stam, 2015). More recent work highlights the importance of alignment, sequencing, and feedback loops, arguing that ecosystem performance depends less on the presence of individual elements than on how they interact over time (Stam & Van de Ven, 2021; Acs et al., 2014). Furthermore, establishing a rigorous research program around these dynamics requires moving beyond static typologies to capture the precise operational mechanisms driving ecosystem evolution (Wurth, Stam, & Spigel, 2022, 2023). In emerging economies, spatial and regional dynamics further shape these layers, where macro-centralization in primary urban hubs frequently isolates peripheral regional wealth holders (Hess, Wahl, & Johnson, 2025; Stam et al., 2026).

Within this literature, finance is recognized as a critical component yet is often treated as an input rather than as a market system that must itself be constructed. In mature ecosystems, venture capital markets are assumed to exist and function efficiently. In contrast, in emerging ecosystems, early-stage investment markets are often thin, fragmented, or absent altogether. This creates a conceptual gap: while ecosystem frameworks identify capital as necessary, they provide limited insight into how early-stage capital markets themselves emerge under conditions of institutional thinness and limited prior experience.

2.2 Venture Capital and Early-Stage Finance in Emerging Markets

A substantial body of research examines the role of venture capital in firm growth, innovation, and economic development (Gompers & Lerner, 2001; Lerner & Nanda, 2020). Venture capital is understood to provide not only financing, but also governance, monitoring, and strategic support, particularly under conditions of high uncertainty and information asymmetry (Kaplan & Strömberg, 2004). However, much of this literature is based on advanced economies with established financial systems, where venture capital operates within relatively stable institutional environments.

In emerging markets, early-stage finance faces additional constraints, including weak legal enforcement, limited exit opportunities, currency volatility, and higher transaction costs (Bruton, Fried, & Manigart, 2005; Ahlstrom & Bruton, 2006). As a result, international venture capital tends to concentrate in more mature hubs and at later stages of firm development, where risks are more legible and scalable opportunities are clearer (International Finance Corporation, 2023; Tony Blair Institute for Global Change, 2022). Empirical evidence from Africa indicates that venture funding remains highly concentrated geographically and sectorally, with most capital originating from foreign investors and directed toward a small number of countries and industries. This structural isolation is particularly severe for early-stage enterprises across the continent, who face intense institutional frictions and highly localized operational barriers when international financing retrenches (Colonnelli et al., 2026).

This pattern leaves a structural gap at the earliest stages of venture formation. Pre-seed and seed financing—where experimentation, iteration, and market discovery occur—are often underserved by both formal financial institutions and international venture capital. Crucially, many formal venture funds carry fixed operating cost constraints that render the origination and active tracking of sub-\$50,000 checks economically unviable (Lerner, 2009).

This scale constraint frequently locks out early-stage ventures, rendering localized, bottom-up angel syndication an important structural configuration rather than an elective investor choice. While grants and donor-funded programs can support early experimentation, uncoordinated subsidies often lack the governance and incentive structures associated with risk capital, limiting their effectiveness in supporting the transition to commercial scale (Barder, 2012).

2.3 Information Asymmetry, Uncertainty, and Investor Behavior

Early-stage investment is characterized by extreme uncertainty and significant information asymmetry between founders and investors. Classic models of venture finance emphasize mechanisms such as staged financing, syndication, and active monitoring as primary methods to mitigate these governance challenges (Sahlman, 1990). Syndication, in particular, distributes financial risk, improves due diligence rigor, and facilitates peer-to-peer knowledge sharing among investors (Lerner, 1994; Kerr et al., 2014).

However, in nascent ecosystems, these contractual mechanisms are frequently underdeveloped or absent. Prospective investors may lack operational experience with venture-style equity instruments, standardized deal templates may not exist, and shared norms regarding valuation, governance, or portfolio diversification are rarely established. Under such conditions, uncertainty is institutional as well as financial: actors lack the necessary reference points to interpret, price, and manage risk.

Behavioral factors therefore play a decisive role in market formation. Insights from behavioral finance demonstrate that ambiguity, lack of familiarity, and perceived social risk significantly suppress capital deployment, even when prospective financial returns are attractive (Kahneman & Tversky, 1979). In emerging ecosystems, the absence of visible transactional precedents or active peer participation amplifies hesitation, creating severe coordination problems where rational actors delay market entry despite recognizing underlying commercial opportunities.

2.4 Networks, Trust, and Embeddedness

The role of networks and social embeddedness is particularly salient in contexts characterized by weak formal institutions. Economic sociology highlights that economic action is embedded in social relationships, where trust, reputation, and repeated interaction can substitute for formal institutional enforcement (Granovetter, 1985; Saxenian & Sabel, 2008). In early-stage investment, where contracts are inherently incomplete and outcomes highly uncertain, relational factors become central governance mechanisms.

Empirical studies of angel investing emphasize the role of informal networks, shared professional experience, and trust in facilitating deal origination, peer-driven due diligence, and post-investment value addition (Freear, Sohl, & Wetzel, 1994). In emerging markets, these relational dynamics are often intensified. Lacking robust public databases or credit scoring infrastructure, domestic investors rely heavily on personal networks, tacit local knowledge, and relational proximity to evaluate investment opportunities and support early-stage founders.

This perspective aligns closely with the concept of "proximity" in economic geography, which suggests that spatial, social, and institutional closeness can significantly reduce coordination costs and information opacity. In early-stage ecosystems, locally embedded investors play a foundational role in translating context-specific market knowledge into legible, investable opportunities—particularly in sectors where regulatory frameworks, supply chains, and consumer behaviors are difficult to assess from a distance.

2.5 Gaps in the Literature

Taken together, existing literature provides valuable insights into the components and dynamics associated with entrepreneurial ecosystems and venture finance. However, four key conceptual gaps remain:

First, there is limited understanding of how early-stage investment markets emerge in practice in ecosystems where formal venture capital is absent or nascent. Much of the literature assumes the existence of functioning capital markets rather than examining their bottom-up formation under institutional thinness.

Second, while network and institutional perspectives highlight the importance of trust and embeddedness, they do not fully explain how these social factors translate into sustained, repeated capital deployment over time. The precise behavioral mechanisms through which latent wealth is activated—particularly among risk-averse, first-time investors—remain underexplored.

Third, existing frameworks often treat constraints such as capital scarcity, pipeline weakness, or regulatory gaps as discrete, static problems. Less attention is given to how these constraints interact dynamically, how they are ordered sequentially, and how their simultaneous, compounding reduction is necessary for market activation (Hausmann & Rodrik, 2003). Crucially, while standard frameworks evaluate policy environments after an ecosystem has matured, relatively little attention has been given to how bottom-up market actors actively co-create policy alignment and regulatory legitimacy in real time (Steuer, 2023; Biancalani et al., 2022; Giraudo et al., 2019).

Finally, relatively little attention has been given to how intermediary organisations operating in institutionally thin ecosystems balance commercial market-building with donor-funded programme delivery, or how these dynamics influence the long-term development of domestic investment markets.

2.6 Positioning of This Study

This paper addresses these gaps by adopting a process-oriented, practice-based perspective on early-stage market formation. Drawing on qualitative evidence from Tanzania, it examines how domestic capital becomes deployable through the dynamic interaction of trust and community building, investment capability formation, risk-sharing instruments, syndication, intermediary coordination, and policy engagement.

Rather than proposing another static typology of ecosystem components, the paper develops the Domestic Capital Flywheel as an empirically grounded conceptual model that explains how behavioural, organisational, financial, and institutional mechanisms reinforce one another to mobilise domestic private capital. In doing so, it contributes to a more granular understanding of how early-stage investment markets emerge from the inside out under conditions of uncertainty, limited investor experience, and institutional thinness.

3. Research Design and Methodology

This study adopts a longitudinal qualitative case study design to examine how domestic private capital becomes mobilised for early-stage investment within a nascent entrepreneurial ecosystem.

A qualitative design is appropriate because the study seeks to explain an evolving process of market formation rather than test predefined relationships between variables. Tanzania provides a theoretically relevant setting because early-stage investment is emerging under conditions of institutional thinness, where formal market structures, established investment routines, and coordination mechanisms remain underdeveloped. Examining this setting allows the study to explore how investors, founders, intermediaries, institutional financiers, and policymakers collectively construct the relationships and practices that enable domestic capital mobilisation over time.

3.1 Data Sampling and Participant Selection

Participants were selected purposively to capture perspectives from actors directly involved in Tanzania's emerging early-stage investment ecosystem. Initial informants were identified through their operational involvement in the Serengeti Business Angels Network (S-BAN) ecosystem and their proximity to investment decisions, investor development activities, venture support, or policy formation. Snowball sampling was subsequently used to identify additional participants with relevant experience of early-stage transactions and ecosystem development.

The primary qualitative dataset comprises 24 in-depth, semi-structured interviews conducted during the 2025 Team Europe Initiative (TEI) S-BAN fieldwork. The interviews brought together perspectives from the principal actors involved in domestic capital mobilisation, including angel investors, startup founders, venture fund managers, ecosystem intermediaries, programme coordinators, and policymakers, enabling the study to examine the emergence of domestic early-stage investment from multiple institutional vantage points.

A central component of the sample comprised ten investors drawn from Tanzania's first specialised angel investment training cohort, delivered by the Serengeti Business Angels Network (S-BAN) as part of the Tanzania Business Angel Investors Accelerator (TAA). As the country's inaugural structured programme for prospective angel investors, the cohort provided a unique opportunity to examine how domestic investors navigated the transition from interest in startup investing to active participation. The interviewed investors reflected two broad profiles:

- Profile A (HNWIs): High-net-worth individuals and family wealth holders seeking portfolio diversification away from traditional tangible assets into early-stage equity.
- Profile B (Professionals): Corporate professionals, middle managers, and business owners capable of deploying specialized skills alongside modest financial capital.

Gender inclusion was an explicit design criterion; women represented 40% (n = 8) of the total training cohort, and the qualitative sample mirrors this split perfectly with 40% (n = 4) female and 60% (n = 6) male participant interviewees to safeguard demographic representativeness.

The investor interviews were supplemented by interviews with startup founders, programme managers, ecosystem intermediaries, institutional financiers, and a regulatory representative. This variation enabled comparison across actors occupying different positions in the emerging investment market.

Table 1: Primary Interview Sample and Documentary Sources

Data Category	Stakeholder / Source Classification	Informant Operational Role Type	Exact Code Identifier	Count (N)
Primary Data	Angel Investors: Profile A	HNWI / Board Chair & Executive Leaders	LP-A01 to LP-A02	2
	Angel Investors: Profile B	Corporate Professionals, Legal Counsel, Advisory & Investment Managers	LP-B01 to LP-B09	9
	Ecosystem Intermediaries / Enablers	Accelerator Directors, Incubator Managers & Hub Leads	EE-01 to EE-04	4
	Ecosystem Investees (Founders)	Early-Stage Tech, AgriTech, FinTech, E-Commerce & Logistics Founders	F-01 to F-05	5
	Institutional Financiers	DFI Development Officers, VC Partners, Senior Investment & Program Managers	IF-01 to IF-04	4
Subtotal	Core Qualitative Field Transcripts	Verbatim Coded Primary Interviews		24
Secondary Data	Institutional Evaluation Reports	TAA Feasibility/Assessment, TEI S-BAN Impact Evaluation, and develoPPP Ventures Evaluation	RPT-01 to RPT-03	3
Total Pool	Combined Empirical Dataset	Primary Transcripts + Secondary Contextual Framing		27

The 24 interviews constitute the study's primary empirical dataset. The three institutional reports—including the TAA Feasibility Assessment (Efino Consulting, 2024), the TEI S-BAN Impact Evaluation (Team Europe Initiative, 2025), and the develoPPP Ventures Evaluation (DEG, 2022)—were used as documentary sources for triangulation and contextual interpretation; they were not treated as equivalent to individual interview observations. Ecosystem benchmark material from the Tanzania Startup Association (Tanzania Startup Association, 2024) and other national and international sources was also used to situate participants' accounts within the broader funding environment. This combination enabled individual experiences and investment episodes to be interpreted in relation to Tanzania's wider institutional context.

3.2 Data Collection Protocol and Contextual Time Horizon

Primary fieldwork was conducted in Tanzania between 20 and 30 April 2025, with additional remote interviews completed during May 2025. Interviews were conducted using stakeholder-specific semi-structured interview guides containing common thematic modules tailored to investors, founders, intermediaries, financiers, and policy actors. The interviews examined participants' prior investment experience, perceived barriers to early-stage investment, valuation and due-diligence practices, experiences of syndication and matching finance, intermediary support, and regulatory constraints.

Interviews lasted approximately 45 to 75 minutes. They were recorded with participants' informed consent and transcribed verbatim for analysis. Confidentiality was protected through the use of alphanumeric participant identifiers.

Following completion of the primary coded dataset, additional field engagement surrounding the Tanzania Impact Investment Forum in May and June 2026 provided contextual insight into subsequent ecosystem developments. This engagement included visits to ventures that had raised angel investment or were in the process of fundraising, discussions with S-BAN leadership and network mentors, founder-investment training, and participation in ecosystem convenings involving development-finance and diplomatic actors. These later observations informed the interpretation of the evolving context but were not incorporated into the formal coding or used to generate the principal themes reported in this study.

3.3 Data Analysis and Framework Development

Data analysis followed an iterative thematic coding process informed by grounded-theory principles. The purpose was to identify recurring patterns in how investors and other ecosystem actors understood uncertainty, developed investment capability, coordinated transactions, and responded to institutional constraints. Outcome Harvesting was applied as a secondary, retrospective interpretive lens to evaluate systemic changes, mapping primary thematic codes directly to verifiable behavioral shifts among investors and institutional actors.

The analysis proceeded in three stages.

- ❖ First-order coding. Interview transcripts were read repeatedly and coded for concrete observations and experiences. Initial codes included uncertainty regarding valuation, hesitation about investing alone, legal and contractual difficulties, peer validation, matching-finance requirements, transaction delays, intermediary dependence, and regulatory ambiguity.
- ❖ Theme development. Related codes were compared across stakeholder groups and grouped into broader themes. This stage identified recurring patterns concerning relational trust, investor capability, loss mitigation, syndication, intermediary coordination, and regulatory development. Comparisons were made across investors, founders, intermediaries, institutional financiers, and policy actors to identify both convergent and contrasting accounts.
- ❖ Framework development. The higher-order themes were then examined in temporal and relational terms to understand how they interacted during the mobilisation of domestic capital. The analysis moved iteratively between the empirical material and literature on entrepreneurial ecosystems, institutional emergence, embeddedness, and entrepreneurial finance. This process informed the development of the Domestic Capital Flywheel as an empirically grounded process model rather than as a framework imposed before analysis.

3.4 Trustworthiness, Interpretive Validation, and Researcher Reflexivity

The trustworthiness of the study was strengthened through triangulation, comparison across stakeholder groups, interpretive engagement with practitioners, and researcher reflexivity.

The bounded nature of the Tanzania Business Angel Investor Accelerator (TAA) shaped the sampling strategy. Interviewing half of the inaugural angel cohort offered a rare window into how first time investors learn to navigate early-stage finance. The bounded nature of the cohort limits generalisability, yet it provides unusually direct access to the formation of domestic investment capability. Because the study examined a bounded intervention within an emerging investment ecosystem, sampling was constrained by the finite population of directly involved actors rather than an open-ended recruitment strategy. The wider sample included entrepreneurs, intermediaries, financiers, and a public sector representative. During the later stages of data collection, additional interviews largely reinforced existing themes rather than generating substantially new first-order concepts. While no claim of universal theoretical saturation is made, the convergence of evidence across respondents provided confidence that the principal dynamics of this bounded case had been adequately captured.

Emerging findings were discussed with knowledgeable practitioners at two stages of the research. First, preliminary interview findings were presented to an industry expert panel on 29 April 2025, immediately following the primary fieldwork. This peer debriefing challenged emerging interpretations, refined distinctions between investor profiles, and identified areas requiring further examination. Second, the findings were revisited during a dedicated panel session at the Tanzania Impact Investment Forum (TIIF) 2026, where representatives from SBAN, UNCDF (UNCDF, 2022), TEI, VC4A, investors, and other ecosystem stakeholders discussed the implications of the findings for early-stage market development and their relevance to other emerging ecosystems. These discussions provided an opportunity to critically examine and refine the emerging interpretation of the findings but did not determine the academic analysis.

Interview findings were triangulated with programme documentation, investment records where available, and regional evidence on entrepreneurial finance in East Africa. This documentary evidence helped distinguish mechanisms specific to Tanzania from broader challenges common to institutionally thin early-stage investment ecosystems.

The researcher's long-term engagement within the East African entrepreneurial ecosystem provided privileged access to relationships, institutional processes, and investment practices that would have been difficult to observe through interviews alone. At the same time, this embedded position required reflexive attention to potential bias. This was addressed by clearly distinguishing interview evidence from practitioner observations, retaining contradictory cases throughout the analysis, comparing interpretations across stakeholder groups, and ensuring that conclusions remained grounded in the empirical evidence.

Together, these strategies enhanced the credibility of the findings and strengthened confidence in the empirically grounded process model presented in the following sections.

4. Results and Discussion

To understand how domestic capital is mobilized within an environment characterized by institutional thinness, the empirical data was analyzed inductively to isolate the core thematic dimensions driving actor behavior and relationship formation. Table 2 provides the qualitative mapping connecting the raw fieldwork observations and participant testimony to the broader conceptual categories analyzed in the subsequent sections.

Table 2: Higher-Order Themes Emerging from the Qualitative Analysis

(Derived from coded primary field transcripts - Six Interdependent Ecosystem Dimensions)

Higher-Order Theme	1st-Order Empirical Open Codes	Representative Verbatim Quote & Informant ID
1. Trust & Community Building	<ul style="list-style-type: none"> • Harambee/Alumni engagement • Hub geographic centralisation • Trust insularity & static circles 	<p>"Continued participation in SBAN activities, particularly Harambee Evenings and the Cohort 1 alumni network, was viewed as an important source of ongoing engagement." – LP-A01</p> <p>"In their view, angel investment is not yet part of the prevailing culture, because people are not accustomed to putting money into somebody else's business and waiting a long time for a return." – EE-01</p>
2. Investment Capability Formation	<ul style="list-style-type: none"> • Valuation & due diligence competence • Legal & deal documentation limits • Local exit strategy knowledge gaps 	<p>"The training strengthened their understanding of due diligence and valuation techniques, which they had subsequently applied within their professional responsibilities... increasing confidence in evaluating investment opportunities." – LP-A01</p> <p>"The most significant gap was exit planning: the training did not sufficiently explain how an angel can exit an investment in the local context." – LP-B02</p>
3. De-Risking through Capital Stacking	<ul style="list-style-type: none"> • DFI support concentration • Impact/Ecosystem signaling capital • Local commitment signaling 	<p>"The financial amount itself was viewed as symbolic; the greater value lay in committing capital... and signalling local confidence [which] helped attract follow-on interest." – LP-B05</p> <p>"The local investment was particularly important because the DeveloPPP programme required local capital before providing matching finance." – F-05</p>

Higher-Order Theme	1st-Order Empirical Open Codes	Representative Verbatim Quote & Informant ID
4. Syndication & Shared Risk	<ul style="list-style-type: none"> • Transition to multi-deal portfolios • Emerging deal leadership roles • Ticket size fragmentation & stalling 	<p><i>"The programme directly enabled the interviewee to complete a first angel investment of US\$XX in Startup C. They led the investor consortium, communicated with the founder and undertook background research..." – LP-B01</i></p> <p><i>"...individual ticket sizes were too small, and there were too few lead angels able to carry opportunities forward." – LP-B03</i></p> <p><i>"Many investment funds continue to face challenges operating effectively at smaller investment ticket sizes, reinforcing the continuing importance of angel investment networks." – IF-04</i></p>
5. Intermediary Optimization	<ul style="list-style-type: none"> • Institutional policy championing • Absence of post-deal reporting • Event continuity & platform needs 	<p><i>"A significant concern was the absence, or lack of visibility, of quarterly reporting from investee companies. The interviewee was unclear whether reports were being produced, whether they needed to request them, and through which process." – LP-B02</i></p> <p><i>"Investors undertaking due diligence also frequently recognise that a business has passed through Anza's support... Anza could in turn provide a screened pipeline..." – EE-01</i></p>
6. Policy & Institutional Evolution	<ul style="list-style-type: none"> • Demand for formal state recognition • Tax incentive requirements • Grant distortion of startup valuations 	<p><i>"Tax advantages would materially increase their willingness to invest because angel investing is inherently risky." – LP-B01</i></p> <p><i>"The regulatory framework was considered workable but slow... the company might need to relocate its principal office to Nairobi at Series A because the financial ecosystem there offers better continuity." – F-05</i></p>

Table 2 summarises the six higher-order themes that emerged from the inductive analysis of the interview data. Although presented separately for analytical clarity, the themes were experienced by participants as interconnected components of the domestic capital mobilisation process. Together they illustrate how relational, behavioural, organisational, and institutional factors reinforce one another to influence the emergence of angel investing in Tanzania. The following sections examine each theme in turn, drawing on participant accounts to explain the mechanisms underpinning domestic capital mobilisation.

4.1 Trust and Community Building

The interview data indicate that one of the primary barriers to mobilising domestic capital is not the availability of wealth, but the absence of trusted relationships through which prospective investors can learn, exchange experiences, and invest with confidence. While market assessments identified a latent pool of individuals with the financial capacity to participate in early-stage investment, many participants described investing as an unfamiliar and highly uncertain activity when approached individually. In the absence of established peer networks, early-stage investing was commonly perceived as an isolated personal risk rather than a legitimate investment practice.

Across the interviews, participants consistently described the value of structured communities in reducing this sense of isolation. Activities such as the SBAN training cohort, Harambee Evenings, and alumni networks created opportunities for repeated interaction, peer learning, and relationship building that extended beyond the formal training programme. As one ecosystem enabler explained:

"Continued participation in SBAN activities, particularly Harambee Evenings and the Cohort 1 alumni network, keeps engagement." (LP-A01)

The findings also suggest that trust required ongoing reinforcement rather than one-off networking events. Several participants emphasised the importance of maintaining active communities through regular engagement, while others noted that the ecosystem remained overly dependent on a relatively small group of well-known actors. Expanding participation and creating opportunities for new investors to observe experienced angels undertaking due diligence and making investments were viewed as important mechanisms for broadening trust across the ecosystem.

Institutional stakeholders similarly emphasised that investor recruitment depended less on broad public awareness than on sustained relationship building. Although outreach activities generated considerable interest, converting prospective investors into active participants required intensive personal engagement and visible commitment from participants themselves. As one institutional representative observed:

"Recruitment generated considerable interest but converting interested individuals into committed participants proved much more demanding. Angel investing was still relatively nascent within the Tanzanian ecosystem, requiring extensive relationship-building." (IF-04)

Programme coordinators also highlighted the importance of requiring participants to commit capital at the outset of the programme. Beyond its financial significance, this requirement acted as a visible signal of commitment, helping establish mutual confidence among cohort members and reinforcing the credibility of the emerging investor community.

Taken together, these findings suggest that trust and community building constitute the relational foundation of domestic capital mobilisation. Rather than emerging automatically from the presence of wealth, investor participation developed through repeated interaction, shared learning, visible commitment, and the gradual formation of trusted peer networks.

4.2 Investment Capability Formation

The interview data indicate that reducing relational uncertainty alone was insufficient to mobilise domestic capital. Even after joining trusted investor networks, many participants described lacking the technical knowledge and practical confidence needed to evaluate, negotiate, and execute early-stage investments. While most investors possessed substantial business experience, they consistently distinguished this from the specialised capabilities required for angel investing, including venture valuation, due diligence, legal documentation, portfolio management, and exit planning.

Across the interviews, valuation and due diligence were repeatedly identified as the most valuable components of the training programme because they provided investors with a structured approach to assessing young ventures. As one experienced investor explained:

"The training strengthened understanding of due diligence and valuation techniques, which were subsequently applied ... these skills...increased confidence in evaluating investment opportunities..." (LP-A01)

However, participants also emphasised that investment capability could not be developed through classroom instruction alone. Several investors described continuing uncertainty around legal documentation, shareholder agreements, and transaction execution after completing the programme. Rather than seeking more theory, they requested greater exposure to live transactions and practical deal experience. As one participant observed:

"The cohort wanted substantially more support on deal closure, particularly legal documentation and the grey areas... leaving them less confident about independently navigating the final legal and payment stages." (LP-B05)

The findings further suggest that investment capability develops through participation in actual transactions. Investors consistently described their first investment as a critical learning experience that transformed abstract knowledge into practical confidence. Working through legal documentation, negotiations, due diligence, and post-investment engagement enabled participants to understand both the technical and behavioural dimensions of early-stage investing. As one investor reflected:

"Confidence increased after completing the paperwork and working through the actual investment... First, much of the legal and transaction documentation had been prepared for the group, leaving uncertainty about whether they could complete the paperwork independently." (LP-B01)

Several participants also highlighted exit planning as an area where capability remained underdeveloped. Although investors developed confidence in evaluating opportunities, the absence of structured exit pathways, such as secondary share sales, management buyouts, or clear M&A channels, continued to suppress long term capital deployment.

Taken together, the findings suggest that investment capability is an iterative process of learning through practice rather than a discrete training outcome. Technical knowledge, legal understanding, and investment confidence developed progressively through repeated engagement with real investment opportunities, enabling investors to move from initial interest towards active participation in the market.

4.3 De-Risking Through Capital Stacking

The interview data indicate that even where investors had developed the confidence and technical capability to evaluate startups, many remained reluctant to commit capital because of the perceived financial risks associated with early-stage investing. Participants consistently contrasted venture investment with familiar asset classes such as real estate, government securities, and established cash generative businesses, where risks were considered more visible, controllable, and predictable against inflation and currency volatility. For many first-time investors, the prospect of committing capital to highly uncertain ventures represented a significant behavioural hurdle.

Across the interviews, blended finance emerged as an important mechanism for reducing this perceived risk. Rather than simply increasing the amount of capital available, matching finance lowered the financial exposure associated with an investor's first transaction and encouraged participation in a market that many viewed as unfamiliar. As one founder explained:

"Before Cohort 1, SBAN participated in Startup D's early fundraising... contributing US\$XX as part of a wider SAFE round. This was the company's first funding and helped unlock a further US\$XX in grant finance." (F-03)

The findings further suggest that domestic capital played a role beyond its monetary value. Several founders and investors described local investment as a credible signal that unlocked additional support from development finance partners and external investors. In practice, the commitment of domestic capital demonstrated confidence in the venture and reduced uncertainty for subsequent funders. As one founder noted:

"The local investment was particularly important because the DeveloPPP programme required local capital before providing matching finance... behaved more like an institutional investor..." (F-05)

This signalling effect was echoed by investors themselves. As one participant reflected:

"The financial amount itself was viewed as symbolic; the greater value lay in committing capital... and signalling local confidence [which] helped attract follow-on interest." (LP-B05)

Taken together, the findings suggest that capital stacking functions primarily as a behavioural de-risking mechanism rather than simply a financing instrument. By reducing the perceived downside of initial investments and signalling local commitment, blended finance helped convert hesitant first-time investors into active market participants while simultaneously increasing the credibility of ventures seeking follow-on capital.

4.4 Syndication and Shared Risk

The interview data indicate that, once investors had developed sufficient confidence to participate in the market, the next challenge was coordinating capital across multiple investors. Most participants described being comfortable with relatively modest investment amounts, while recognising that these individual contributions were insufficient to meet the funding requirements of early-stage ventures. Rather than increasing individual investment commitments, participants consistently viewed syndication as the mechanism that enabled domestic capital to be mobilised at the scale required by startups.

Across the interviews, syndication was valued not only because it pooled financial resources, but also because it distributed responsibility for due diligence, negotiation, and investment decision-making. Sharing these activities reduced both financial exposure and the uncertainty associated with investing alone. As one investor explained:

"...individual ticket sizes were too small, and there were too few lead angels able to carry opportunities forward. The interviewee estimated that only a small core of angels remained actively engaged..." (LP-B03)

Several participants also highlighted the importance of experienced lead investors who were willing to coordinate transactions, undertake additional due diligence, and guide less experienced angels through the investment process. Rather than every investor independently assessing every opportunity, syndication enabled expertise and responsibilities to be shared across the group, increasing confidence in collective investment decisions.

Institutional stakeholders similarly observed that angel syndicates occupied an important position within the investment landscape because many early-stage ventures required more capital than individual angels could comfortably provide, while remaining too small to attract formal venture capital funds. As one institutional participant noted:

"Many investment funds continue to face challenges operating effectively at smaller investment ticket sizes, reinforcing the role of angel investment networks." (IF-04)

The findings further suggest that participation in syndicates encouraged a longer-term investment perspective. Several investors described moving beyond the goal of making a single investment towards building diversified portfolios over time. As one experienced investor reflected:

"The investor intended to complete at least ten angel investments over the next three to five years." (LP-A02)

Taken together, the findings suggest that syndication functions as a mechanism for coordinating capital, expertise, and decision-making rather than simply aggregating financial resources. By enabling investors to share risk, learn from experienced peers, and participate in larger transactions, syndication transformed individual investment intentions into collective market activity.

4.5 Intermediary Coordination

The interview data indicate that sustaining domestic investment activity requires dedicated intermediary organisations capable of coordinating relationships, transactions, and post-investment engagement. While syndication enabled investors to mobilise capital collectively, participants consistently emphasised that the ongoing coordination of deals could not be sustained through informal networks alone. Most investors balanced angel investing alongside professional or business responsibilities, limiting the time available to organise meetings, monitor investments, and maintain communication with founders and fellow investors.

Ecosystem enablers described this coordination role as increasingly important as the network matured. Beyond recruiting investors and organising training, intermediaries were expected to facilitate introductions, coordinate syndicates, support due diligence, maintain communication, and oversee post-investment activities. As one ecosystem enabler observed:

"A more coherent pathway would link incubation, acceleration, bank finance and alternative investment rather than treating them as separate systems... Shared criteria and referral arrangements would help..." (EE-04)

Participants also highlighted weaknesses in post-investment support. Several investors reported uncertainty regarding portfolio reporting, communication channels, and ongoing engagement with investee companies after transactions had been completed. Others questioned whether the ecosystem possessed sufficient institutional capacity to sustain investor participation beyond the initial investment process. As one investor explained:

"A significant concern was the absence, or lack of visibility, of quarterly reporting from investee companies. I was unclear whether reports were being produced, whether I needed to request them, and through which process." (LP-B02)

Institutional stakeholders highlighted that intermediary organisations frequently navigate structural tensions between meeting donor grant metrics and sustaining commercial, fee earning investment facilitation, exposing angel networks to operational instability once donor subsidies expire. While external funding played an important role in ecosystem development, participants cautioned that intermediary capacity needed to remain focused on facilitating investment relationships and supporting active investors rather than becoming driven primarily by programme administration.

Programme documentation and interviews consistently pointed to the need for dedicated operational capacity to sustain investor engagement over time. As one institutional participant concluded:

"Future cohorts would benefit from a dedicated programme coordinator to strengthen participant engagement, while sustained post-programme support for active syndicates was vital." (IF-04)

Taken together, the findings suggest that intermediary organisations perform a broader role than simply organising events or delivering training. They provide the coordination infrastructure that enables relationships, transactions, and investor engagement to continue beyond individual deals, helping transform episodic investment activity into a more sustained and organised market.

4.6 Policy and Institutional Evolution

The interview data indicate that the continued development of domestic angel investing depends not only on investor behaviour and intermediary coordination but also on an institutional environment that recognises and supports early-stage investment. Participants consistently described existing regulatory arrangements as being designed for established businesses rather than high-growth startups, creating additional uncertainty for both founders and investors.

A recurring theme across the interviews was the absence of a distinct legal and policy framework for startups. Participants argued that existing company structures, regulatory procedures, and taxation arrangements did not adequately reflect the characteristics of early-stage ventures or the risks undertaken by angel investors. As one founder explained:

"...the regulatory system did not include a clear category for the company's digital pharmaceutical supply-chain model. Requirements designed for bricks-and-mortar businesses were therefore applied to a technology-enabled platform." (F-03)

Investors also identified tax incentives as an important mechanism for encouraging greater participation in early-stage investment. Given the inherently uncertain nature of angel investing, several participants argued that fiscal incentives could help offset perceived risks while signalling formal recognition of the asset class within the national investment landscape.

Founders highlighted a related challenge concerning the availability of growth capital. While many viewed Tanzania as an increasingly attractive location for early-stage ventures, several noted that companies seeking larger follow-on investments often considered relocating their holding structures to regional financial centres where investors, legal frameworks, and support services were more established. As one founder observed:

"The regulatory framework is workable but slow... the company might need to relocate its principal office to Nairobi at Series A because the financial ecosystem there offers better continuity." (F-05)

Participants further noted that grant funding had become an important source of early-stage finance but could also create unintended consequences. Several investors described situations where grant-supported startups developed valuation expectations that exceeded what domestic angel investors were able or willing to finance, making investment negotiations more difficult.

Taken together, the findings suggest that policy and institutional development evolves alongside market activity rather than preceding it. As domestic investment networks mature and transaction volumes increase, participants expected growing demand for clearer startup legislation, more appropriate regulatory frameworks, and targeted investor incentives capable of supporting the continued development of Tanzania's early-stage investment ecosystem.

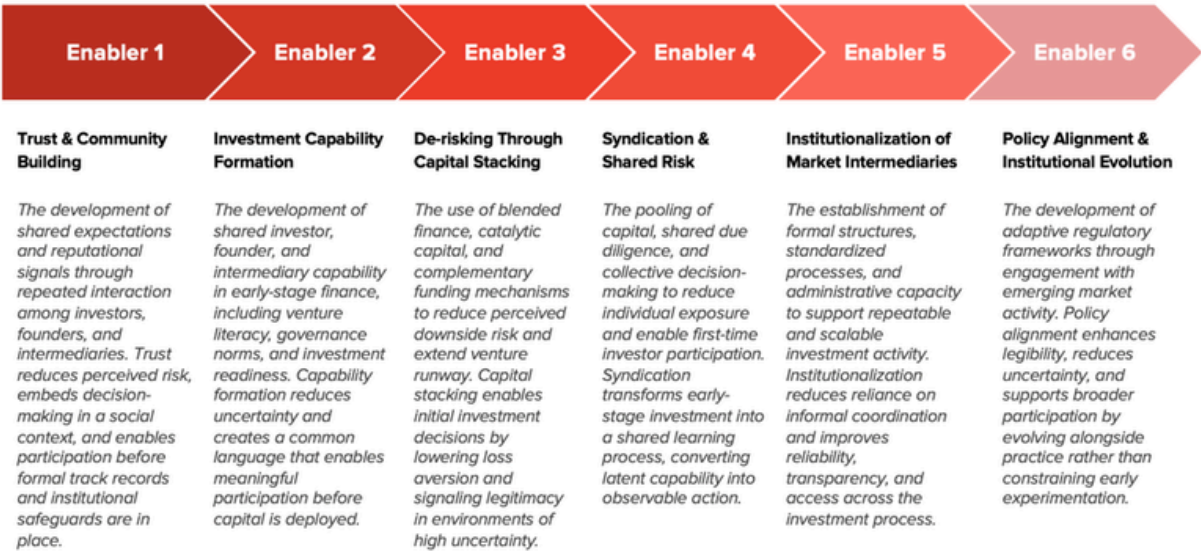
4.7 Integrating the Themes: An Emerging Process of Domestic Capital Mobilisation

The findings presented in the preceding sections suggest that the six themes are not independent components of the entrepreneurial ecosystem but closely interconnected mechanisms through which domestic capital becomes mobilised. Participants consistently described progression through the investment journey as cumulative, with developments in one area creating the conditions for progress in the next. Trust and community building encouraged participation in investor networks; investment capability increased confidence to evaluate opportunities; blended finance reduced the perceived risks of initial investments; syndication enabled investors to coordinate larger transactions; intermediary organisations sustained relationships and investment activity; and evolving policy frameworks reinforced the broader institutional environment in which these activities occurred.

Rather than representing a series of isolated interventions, the evidence suggests that these mechanisms operate as an interconnected system. Early developments in relational trust and investment capability created the foundation for collective investment, while subsequent investments generated new experience, strengthened intermediary capacity, and increased the visibility of the market. As transaction activity expanded, participants described growing demand for institutional support, including clearer regulatory frameworks and targeted investor incentives, which in turn encouraged wider participation in the ecosystem.

Figure 2 synthesises these empirical findings into a process model illustrating how the six themes interact during the mobilisation of domestic capital within Tanzania's emerging early-stage investment ecosystem. The model is derived from the qualitative analysis presented in this section and provides the basis for the theoretical discussion that follows

Figure 2: The Six Reinforcing Enablers of the Domestic Capital Flywheel



Note: The figure synthesises the six empirically derived themes identified through the qualitative analysis and illustrates their interrelationships during the mobilisation of domestic capital within Tanzania's emerging entrepreneurial ecosystem.
Source: Author's elaboration based on qualitative fieldwork conducted in Tanzania (2025).

Across the six empirical themes, participants consistently link domestic capital mobilisation to a cumulative process in which progress in one dimension enabled or reinforced progress in the next. Figure 2 summarises these relationships. Building on this empirical synthesis, the following discussion develops the **Domestic Capital Flywheel** as a conceptual model explaining how these interdependencies collectively shape the mobilisation of domestic private capital in emerging entrepreneurial ecosystems.

5. Discussion

The empirical findings presented in this study extend existing understandings of entrepreneurial ecosystems by explaining how domestic capital markets emerge under conditions of institutional thinness. Rather than treating finance as a pre-existing ecosystem input, the findings show that domestic capital mobilisation is a cumulative process in which relational trust, investment capability, coordinated investment practices, intermediary support, and institutional development evolve together over time.

5.1 From Capital Scarcity to Capital Mobilisation

The principal theoretical contribution of this study is a shift in how early-stage finance is understood within entrepreneurial ecosystem theory. Rather than viewing limited venture investment primarily as a problem of capital scarcity, the findings suggest that the central challenge is the mobilisation of domestic capital. Entrepreneurial ecosystem research consistently identifies finance as a critical ecosystem component (Isenberg, 2010; Stam, 2015), yet comparatively less attention has been given to the processes through which domestic early-stage capital markets themselves emerge, particularly in nascent market systems.

The Tanzanian case demonstrates that the mobilisation of domestic capital cannot be explained solely by the availability of financial resources. Instead, latent wealth became investable only as trusted relationships, investment capability, risk-sharing mechanisms, intermediary coordination, and institutional support developed alongside one another. Under these conditions, finance is not simply supplied to the ecosystem; it is progressively mobilised through the interaction of investors, founders, intermediaries, development partners, and policymakers.

This perspective helps explain why many emerging entrepreneurial ecosystems continue to experience persistent early-stage financing gaps despite the presence of considerable domestic wealth. Rather than reflecting an absolute shortage of capital, the findings suggest that these gaps often arise because the relational, organisational, and institutional conditions required to mobilise that capital have not yet sufficiently developed. In this sense, the principal challenge is less one of capital availability than of ecosystem coordination (Hausmann & Rodrik, 2003).

Viewed through this lens, domestic capital mobilisation becomes an endogenous outcome of entrepreneurial ecosystem development rather than a precondition for it. The findings suggest that early-stage capital markets emerge through the cumulative development of trust, capability, collective investment practices, intermediary support, and enabling institutions. This shifts the theoretical focus from financing entrepreneurial ecosystems to understanding how entrepreneurial ecosystems mobilise domestic capital.

5.2 The Domestic Capital Flywheel

The six empirical themes identified in Section 4 suggest a broader system of domestic capital mobilisation. Building on these findings, Figure 3 synthesises their interactions into the **Domestic Capital Flywheel**. Rather than representing a linear sequence of interventions, the Flywheel conceptualises domestic capital mobilisation as a self-reinforcing system in which trust and community building, investment capability, capital stacking, syndication, intermediary coordination, and policy development continuously reinforce one another. As progress in one dimension strengthens the others, the system progressively mobilises domestic private capital where formal market institutions remain underdeveloped.

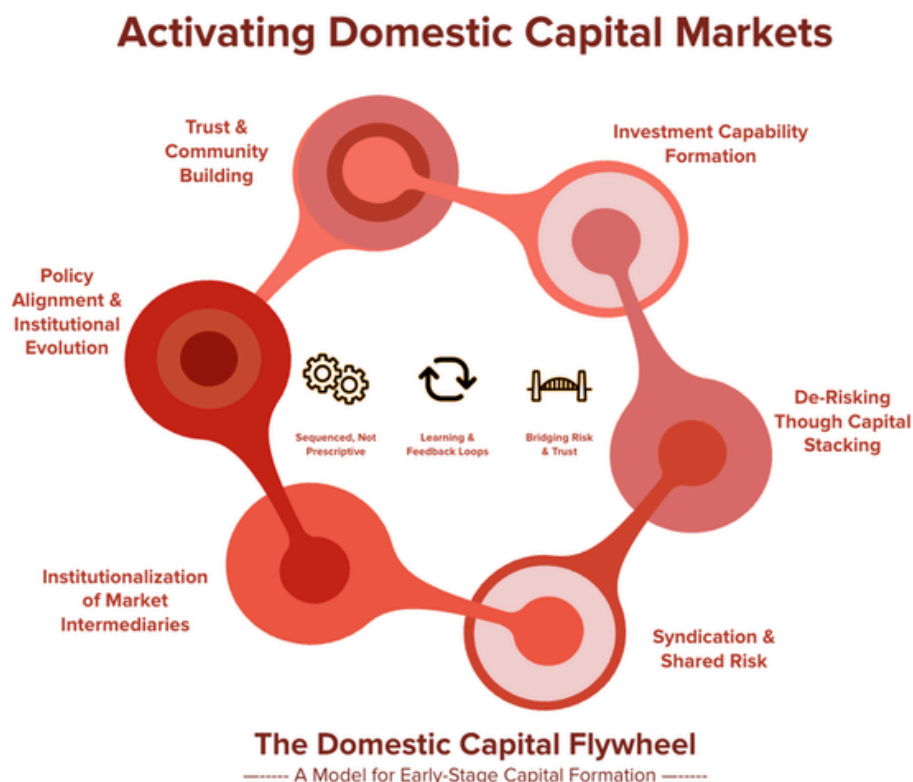
The proposed flywheel is grounded in the Tanzanian case but offers a broader analytical framework for understanding how domestic early-stage investment systems develop in emerging markets. Rather than prescribing a fixed sequence of policy interventions, the model illustrates how behavioural, organisational, financial, and institutional capabilities co-evolve over time. The contribution of the flywheel therefore lies not in identifying individual ecosystem components, but in explaining how their interactions generate cumulative momentum that transforms latent domestic wealth into coordinated early-stage investment.

Three reinforcing dynamics explain how the flywheel operates.

- **Sequenced interdependence.** The findings suggest that domestic capital mobilisation develops cumulatively, with progress in one dimension creating the conditions for progress in the next. Trust and community building encourage participation in investor networks; investment capability increases confidence to evaluate opportunities; capital stacking lowers the perceived risks of initial investments; syndication enables collective investment; intermediary organisations sustain investment activity; and, over time, accumulated market experience creates the conditions for policy and institutional development. Although these dimensions become mutually reinforcing as the ecosystem matures, the evidence suggests that earlier developments provide important foundations for those that follow.
- **Learning through participation.** Investor capability emerged not as a fixed outcome of formal training, but as an iterative process of learning through investment practice. Participants consistently described their first transactions as important turning points that strengthened confidence, refined due diligence practices, and deepened their understanding of local investment processes. As investment activity increased, these experiences were shared through investor networks, strengthening collective capability and reinforcing subsequent rounds of investment.
- **From individual uncertainty to collective investment.** The findings further suggest that domestic capital mobilisation depends on progressively reducing the uncertainty faced by individual investors. Matching finance lowered the perceived downside of initial investments, syndication distributed financial and decision-making responsibilities, and intermediary organisations reduced the coordination burden associated with early-stage investing. Together, these reinforcing mechanisms transformed individual hesitation into coordinated investment activity, strengthening both investor confidence and the legitimacy of the emerging market.

Taken together, these reinforcing dynamics explain how domestic capital mobilisation evolves from fragmented individual investment decisions into a coordinated and self-reinforcing investment system. The flywheel extends entrepreneurial ecosystem theory by demonstrating that domestic capital markets are not simply enabled by ecosystem development but are themselves produced through the cumulative interaction of relational, organisational, financial, and institutional change.

Figure 3: *The Self-Reinforcing Model of the Domestic Capital Flywheel*



Note. The figure synthesises the six empirically derived dimensions of domestic capital mobilisation into a self-reinforcing system. It illustrates how trust and community building, investment capability, capital stacking, syndication, intermediary coordination, and policy and institutional evolution reinforce one another to mobilise domestic private capital within institutionally thin entrepreneurial ecosystems.

Source: Author's own elaboration.

5.3 Implications for Entrepreneurial Ecosystem Development

The Domestic Capital Flywheel suggests that developing domestic capital markets is fundamentally a process of ecosystem building rather than simply increasing the supply of finance. Rather than treating capital as an input that can be injected into entrepreneurial ecosystems, the findings indicate that domestic private capital becomes investable only as the supporting relational, organisational, financial, and institutional conditions develop together. This perspective carries several practical implications for entrepreneurial ecosystem development in institutionally thin environments.

First, the findings suggest that strengthening ecosystem infrastructure is as important as increasing the availability of finance. Intermediary organisations perform a far broader role than programme delivery or investor training. They coordinate investor relationships, organise syndicates, facilitate transactions, sustain post-investment engagement, and accumulate the institutional knowledge required for domestic investment markets to mature. Strengthening the long-term operational capacity of these organisations therefore represents an investment in the functioning of domestic capital markets themselves rather than simply supporting individual programmes.

Second, the findings indicate that effective startup policy is more likely to emerge alongside market development than through top-down regulatory design alone. As domestic investment activity becomes more visible, market participants generate the practical experience, stakeholder coordination, and evidence needed to inform startup legislation, investor incentives, and regulatory reform. Rather than leading ecosystem development, policy appears to become progressively more effective when it responds to the evolving needs of an increasingly active investment community.

Third, the study suggests that strengthening domestic early-stage investment systems may also improve the long-term retention of entrepreneurial activity within emerging ecosystems. Participants described how the absence of later-stage finance, specialised legal frameworks, and institutional continuity encouraged promising ventures to relocate towards more established regional investment hubs. Developing stronger domestic capital markets may therefore not only increase the availability of early-stage finance but also help retain entrepreneurial firms, investment expertise, and future investment capital generated through successful exits.

More broadly, the findings suggest that ecosystem development initiatives should place greater emphasis on building domestic investment capability alongside venture creation. Supporting founders alone is unlikely to produce sustainable early-stage investment markets if corresponding attention is not given to developing local investors, trusted investment communities, syndication mechanisms, and the intermediary organisations that enable capital to be deployed collectively. Viewed in this way, building domestic capital markets becomes an integral part of entrepreneurial ecosystem development rather than a separate financial policy objective.

6. Conclusion and Policy Implications

This study examined how domestic private capital becomes mobilised within an emerging entrepreneurial ecosystem, using Tanzania as an empirical case. Rather than treating limited early-stage finance as a consequence of capital scarcity, the findings suggest that domestic capital mobilisation is fundamentally a coordination challenge. Latent private wealth became investable only as trust, investment capability, risk-sharing mechanisms, intermediary coordination, and enabling institutions developed together over time.

Building on these findings, the study contributes to entrepreneurial ecosystem research in two ways. First, it argues that domestic capital mobilisation should be understood as an endogenous outcome of entrepreneurial ecosystem development rather than a pre-existing ecosystem input. Second, it introduces the Domestic Capital Flywheel, an interconnected system that explains how behavioural, organisational, financial, and institutional dynamics reinforce one another to progressively mobilise domestic private capital under conditions of institutional thinness.

The findings also carry important implications for policy and ecosystem development. Efforts to strengthen early-stage investment markets should extend beyond increasing the supply of finance to strengthening the systems that enable domestic capital mobilisation. This includes investing in trusted investor networks, practical investment capability, syndication mechanisms, well-resourced intermediary organisations, and regulatory frameworks that recognise the distinctive characteristics of early-stage investment. These findings further suggest that policy reform is most effective when it evolves alongside market development, responding to the needs and experience of an increasingly active domestic investment community.

Although the study is grounded in a single country case, the analytical framework may be relevant to other emerging entrepreneurial ecosystems characterised by institutional thinness and underdeveloped domestic capital markets. Future research could examine the applicability of the Domestic Capital Flywheel across different institutional contexts, investigate how the reinforcing dynamics evolve over longer periods of ecosystem development, and explore the conditions under which domestic capital mobilisation contributes to broader entrepreneurial growth and economic transformation.

Ultimately, the study suggests that the challenge facing many emerging entrepreneurial ecosystems is not simply attracting more capital but building the domestic investment base that gives external investors the confidence to follow. Viewed in this way, domestic capital is not merely a financial resource waiting to be deployed, but an ecosystem capability that develops through trust, coordination, institutional support, and collective investment practice. As this capability deepens, domestic investors do more than provide capital themselves: they generate market knowledge, validate opportunities, reduce uncertainty, and help create the conditions for broader international investment. The Domestic Capital Flywheel offers a practical lens for understanding how these conditions take shape and reinforce one another in contexts where institutions are still forming.

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Data Availability Statement

The qualitative interview transcripts are protected by participant confidentiality agreements. To support transparency and replication, de-identified research materials, including the anonymised coding framework and thematic extraction matrix used in the analysis, are available from the corresponding author upon reasonable request, subject to ethical approval and confidentiality requirements.

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Article

Adapting the Igbo 'Igba Boi' Apprenticeship Model for Digital Skills Development in Nigeria's Startup Ecosystem

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Abstract

This study examines the potential for adapting the indigenous Igbo Igba Boi apprenticeship model to digital skills development within Nigeria's startup ecosystem. Through a qualitative, co-creative design featuring interviews with 83 participants, including tech founders, established Ogas, Bois, and knowledge holders, it analyses how this traditional system can be reimagined for technology work. The findings reveal that while Igba Boi offers a powerful foundation for long-term mentorship and economic independence, imported training frameworks remain dangerously decontextualised from local labour realities. Furthermore, the research highlights that gender inclusion must be a central design condition rather than an optional add-on, as standard innovation policies actively reproduce the historic exclusion of women. The study concludes that a viable hybrid model must be technologically forward, culturally grounded, and intentionally inclusive.

Keywords: Igba Boi; digital skills development; indigenous entrepreneurship; gender inclusion; apprenticeship; Nigeria

1. Introduction

Apprenticeship has long served as one of the most durable ways societies reproduce knowledge, discipline, and economic participation across generations. Beyond technical competence, it embodies a social logic in which learning is embedded in trust, obligation, shared experience, and a gradual movement from dependency to autonomy. Within Igbo society, the Igba Boi system exemplifies this tradition, functioning as both a training arrangement and a pathway into commerce, social maturity, and independent enterprise. In this system, a young learner (Boi) lives under the guidance of a master trader (Oga), learns through direct participation, and upon completion receives a ceremonial settlement that launches them as an entrepreneur. Igba Boi links skill acquisition with mentorship, responsibility, and economic settlement. Although settlement may be delayed or adapted, the system reflects values in which success depends not only on capital but also on effort, moral conduct, social legitimacy, and providence.

Its significance becomes clearer against the demands of Nigeria's digital economy. The country's startup ecosystem depends on software expertise acquired through prolonged training, practical immersion, and iterative learning, yet digital-skills development often relies on imported models that insufficiently reflect local labour conditions, educational trajectories, or community-based traditions of learning. This disconnect leaves a persistent gap between formal training structures and the needs of innovation-driven enterprises. When skills development is shaped primarily by borrowed frameworks, indigenous forms of knowledge, mentorship, and economic socialisation become marginal rather than foundational, reducing the relevance and sustainability of training interventions.



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Reimagining digital apprenticeship through Igba Boi instead offers the possibility of grounding innovation in systems of learning that are socially intelligible, historically tested, and culturally embedded. The issue is therefore not whether traditional models should be romanticised, but whether their enduring principles can be translated into sectors where skills, innovation, and enterprise converge.

Any such translation must also address exclusion. Women remain marginalised within the principal Igba Boi pathway into commerce and under-represented in advanced digital skills and tech entrepreneurship. The study consequently frames the redesign of apprenticeship as both technologically forward and gender-just, asking what a more inclusive, contextually grounded model of digital opportunity should look like. Against this background, this study adopts a decolonial and participatory approach by asking whether the core values of the Igba Boi apprenticeship system can be reassembled into a hybrid model suited to software startups without reproducing exploitation or gender exclusion. It pursues four objectives:

- a. To examine how the Igba Boi system functions in practice, including its history, structure, values, and current condition.
- b. To identify which elements of Igba Boi are transferable to a software startup apprenticeship environment.
- c. To assess gender exclusion within the system and identify adaptations needed for inclusion.
- d. To co-create design principles for a hybrid Igba Boi-inspired digital apprenticeship model.

These objectives correspond to four research questions:

- i. How does the Igba Boi system function in practice, and what historical, structural, and value-based conditions have sustained or eroded it?
- ii. Which elements of Igba Boi can be ethically and practically transferred to a software startup context?
- iii. How is gender exclusion structured within Igba Boi, and what adaptations are necessary to ensure gender-just participation?
- iv. What design principles emerge when indigenous knowledge holders, tech founders, master traders, and apprentices co-create a hybrid apprenticeship framework?

These questions position the study at the intersection of indigenous knowledge, entrepreneurship, digital capability development, and social inclusion. It argues that Nigeria's digital future cannot be built sustainably on imported training logics alone but requires historically rooted systems such as Igba Boi to be reworked for contemporary needs. In doing so, the study contributes to debates on making African innovation ecosystems more locally relevant and structurally inclusive.

2. Literature Review

2.1 Igba Boi System as an indigenous entrepreneurship system

The Igba Boi apprenticeship system emerged from the pre-colonial Igbo worldview in which commerce was a communal responsibility. The saying *Uwa bu Ahia* ("the world is a marketplace") reflects this orientation, with entrepreneurial knowledge transferred through **Imu-Ahia** (trade) and **Imu-Oru Aka** (craft) under experienced Ogas (Oyewunmi et al., 2020). Although colonialism disrupted the institutions supporting indigenous commerce, it did not extinguish the entrepreneurial culture. The Nigerian Civil War (1967-1970) transformed Igba Boi into a post-war strategy for economic recovery. Guided by the principle *onye aghala nwanne ya* ("leave no brother behind"), surviving entrepreneurs trained and settled the sons of those who had lost their livelihoods. Scholars describe this as a mechanism for transgenerational entrepreneurial transfer (Oyewunmi et al., 2020), economic recovery and identity restoration (Iwara & Ojakorotu, 2025; Amaechi et al., 2025), demonstrating the system's resilience.

The system operates through a structured relationship between an Oga and a Nwa Boi, progressing from recruitment to training and eventual settlement (Idu Uno) (Iwara, Amaechi & Netshandama, 2019). Settlement provides start-up capital and business support, reflecting a longstanding social obligation (Antai et al., 2024) that continually reproduces entrepreneurs rather than concentrating market power (Ekekwe, 2021). Studies describe Igba Boi as one of the world's largest indigenous business incubation systems, generating SMEs, circulating local wealth and embedding solidarity (Rufai et al., 2019; Umemezia & Ojukwu, 2023; Iwara, 2020). It has reportedly incubated millions of entrepreneurs while strengthening business resilience through mentorship and social networks (Nnonyelu et al., 2023).

Despite these strengths, its informality exposes apprentices to exploitation, unpaid labour, failed settlements and limited access to specialised skills (Okeke et al., 2025; Familoni, 2024; Odeh et al., 2025). Apprenticeship is also increasingly viewed as less prestigious than formal education (Rufai et al., 2019; Umemezia & Ojukwu, 2023). Recent reforms suggest a transition from customary practice to formal regulation. Legal recognition in Anambra State and emerging scholarship on apprentices' contractual rights reflect growing efforts to protect participants while preserving the system's trust-based ethos (Idemobi et al., 2024; Olusola et al., 2025). This transition provides the context for examining how Igba Boi can be adapted to digital skills development while addressing inclusion and institutional reform.

2.2 African Indigenous Knowledge Systems and Epistemology

African Indigenous Knowledge Systems (IKS) are cumulative and holistic ways of knowing, doing and being, developed through generations of interaction with community, land and spirituality (Hlalele, 2022). Knowledge is transmitted through language, ritual, proverbs and everyday practice, making learning relational and intergenerational. Studies on African indigenous pedagogy similarly describe learning as communal, practice-based and embodied rather than individualistic (Carpena-Méndez, Virtanen & Williamson, 2022). Yet African education systems continue to privilege Western epistemologies, marginalising indigenous knowledge within curricula (Ndofirepi & Gwaravanda, 2019). Decolonial scholarship identifies this as epistemic injustice or epistemicide, arguing for indigenous control over knowledge production rather than tokenistic inclusion within unchanged Western frameworks (Ndlovu-Gatsheni, 2020; Tarisayi, 2024). Within this context, Igba Boi represents a practical expression of African indigenous pedagogy. Its communal, experiential and intergenerational approach to learning reflects longstanding Igbo knowledge traditions (Ihejirika, 2023; Ude, 2024). Positioning Igba Boi within IKS and epistemic justice debates therefore recognises it as a legitimate knowledge system capable of informing digital skills development, entrepreneurship and gender-just innovation.

2.3 Gender, Power and Inclusion in 'Igba Boi'

Male dominance is structurally immersed in the Igbo apprenticeship system as studies show that apprentices and masters are overwhelmingly male, with women either absent or confined to auxiliary roles (Familoni, 2024; Onyeike et al., 2025; Abasilim et al., 2024). Its informal, trust-based structure also leaves apprentices vulnerable to exploitation, with gendered power relations making it more difficult for women to claim rights or challenge abuse (Onyeike et al., 2025). At the same time, African Indigenous Knowledge Systems and feminist scholarship recognise women as essential knowledge holders whose exclusion weakens innovation and development (Esiobu, 2020; Emeagwali, 2019). Accordingly, recent scholarship and policy reforms increasingly argue that the long-term legitimacy of Igba Boi depends on gender inclusion and legal safeguards, particularly in light of SDG 5 and the Anambra Apprenticeship Act (Onyeike et al., 2025; Familoni, 2024). African feminist and decolonial scholars likewise advocate context-specific models of gender justice grounded in indigenous values rather than imported frameworks (Chilisa & Ntseane, 2010).

2.4 Nigeria's Digital Skills and the Limits of Western Training

Nigeria is building one of Africa's strongest startup ecosystems (Okolie & Akwiwu, 2023), but its full potential is constrained by digital skills gaps, infrastructure deficits and policy inefficiencies (Oladimeji et al., 2023; Gómez et al., 2023). Although the ICT sector contributes up to 17.83% to the GDP and startup activity continues to expand across fintech, e-commerce and health-tech, supported by innovation hubs (Agbeyangi et al., 2024), the ecosystem still lacks the structures it needs to produce, mentor and retain digital talent. Studies find that graduates possess basic digital competencies but lack advanced, work-relevant skills (Adeoye & Adeoye, 2017; Owan et al., 2022). The World Bank estimates that many Nigerian professionals lack foundational digital skills (World Bank Group, 2019), placing ICT growth at risk (Umeha, 2025). These gaps also reflect the inequalities of geography and gender, with rural communities and women facing more limited access to digital training (Sufian & Azzarri, 2023; Nwajiuba & Ukwandi, 2021).

Government initiatives, including Digital Nigeria, 3MTT, SUPA, N-Power and the National Digital Economy Policy and Strategy (NDEPS 2020--2030), have expanded digital-skills training, while 3MTT has recorded significant enrolment (3MTT, 2026). However, studies question their alignment with labour-market needs and their limited emphasis on mentorship, community accountability and sustained entrepreneurial formation. Research also identifies regulatory uncertainty, bureaucratic barriers and brain drain as continuing constraints on startup growth (Oluwasemilore, 2023). Women remain under-represented in advanced digital skills and tech entrepreneurship because of unequal training access, socio-cultural barriers and limited institutional support (Abasilim et al., 2024; Familoni, 2024). African feminist scholarship argues that gender-blind innovation policies reproduce these inequalities unless intersectionality and indigenous epistemologies are deliberately centred (Chilisa & Ntseane, 2010; Seleke & Teis, 2025; Ouma et al., 2023).

2.5 Bridging Indigenous Entrepreneurship Knowledge and Digital

Even though the literature on Igba Boi has now recognised the need to connect deep entrepreneurial knowledge with digital skills and studies argue that the system requires digital inclusion to remain relevant (Aniagolu et al., 2025; Olabisi & Adesola, 2025), and recommend integrating indigenous apprenticeship into Technical Vocational Education and Training (TVET) (Olusola et al., 2025; Ezenwakwelu et al., 2019), they do not explain how indigenous entrepreneurship knowledge and advanced digital skills should be jointly designed. Hybrid apprenticeship models offer partial answers. The Global Adaptive Apprenticeship Model (GAAM) combines Yoruba and Igbo apprenticeship with the German dual model, while entrepreneurship literature recommends incorporating Igba Boi's mentorship and social networks into formal training (Olusola et al., 2025; Kanu, 2020). However, these models remain expert-designed rather than co-created with masters and apprentices. Broader scholarship shows that indigenous values can support digital entrepreneurship when communities participate in the design process. Studies on digital Ubuntu, value co-creation and entrepreneurial ecosystems emphasise community participation, shared authorship and joint decision-making (Abubakre et al., 2021; Karami & Read, 2021). This study responds by treating Igba Boi knowledge holders as co-designers of a digital apprenticeship model rather than subjects of reform.

2.6 Theoretical Lens

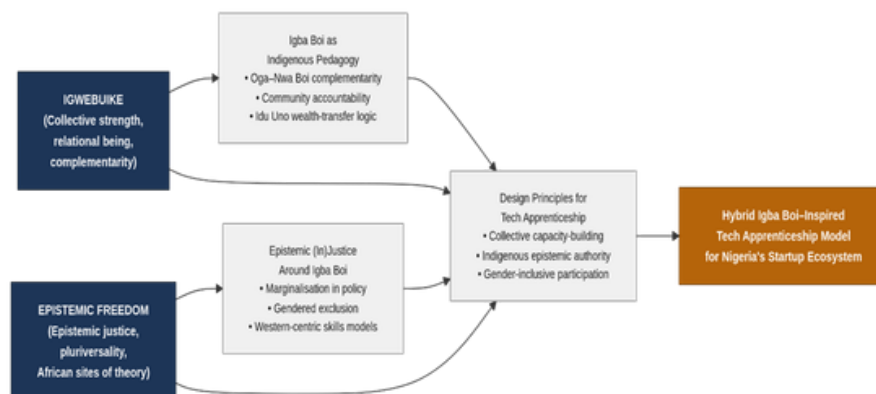
This study is anchored on two complementary frameworks: **Igwebuike and Epistemic Freedom**. They provide the philosophical and decolonial basis for examining how *Igba Boi* can inform a hybrid digital apprenticeship model. *Igwebuike* is an Igbo philosophical concept and African communalist theory developed by Ikechukwu Anthony Kanu, which emphasises that strength emerges through relational solidarity and collective action. The theory understands human existence as relational, where identity, capacity and development are constituted through relationships with others and the community. Applied to *Igba Boi*, *Igwebuike* explains the *Oga-Nwa Boi* relationship, Idu Uno settlement and community accountability as a complementary knowledge-transfer system rather than a simple mentor-subordinate arrangement. It challenges individualistic models of entrepreneurship by emphasising collective capacity building, shared resources and relational development. In this study, *Igwebuike* provides the framework for understanding tech founders and *Igba Boi* knowledge holders as complementary actors whose capacities are realised through co-creation.

Epistemic freedom by Sabelo Ndlovu-Gatsheni is a theory of intellectual sovereignty that centres the right of African scholars and communities to think, theorise, interpret the world, develop their own methodologies and write from where they are located and unencumbered by Eurocentrism (Ndlovu & Woldegiorgis, 2024; Khan et al., 2021). It challenges the cognitive empire of Western epistemologies that often position African knowledge systems as peripheral, practical, or inferior (Khan et al., 2021; Mbah & Ezegwu, 2024). Instead, epistemic freedom advances pluriversality, recognising multiple legitimate sites of knowledge production (Khan et al., 2021). Within this research, it justifies treating *Igba Boi* as a legitimate source of entrepreneurship and digital-skills knowledge rather than as a tradition requiring validation through external models. It also informs the participatory methodology by positioning *Ogas*, *Bois* and community actors as epistemic authorities who contribute to defining problems and designing solutions.

These frameworks allow the study to examine both the internal logic of *Igba Boi* and the wider knowledge structures that determine how indigenous systems are valued. *Igwebuike* explains the relational architecture of the apprenticeship system, while Epistemic Freedom provides the decolonial basis for repositioning Igba Boi as a contributor to digital innovation and skills development.

2.7 Theoretical model for the Study

Building on the theories that guide this research, the model in fig 1 places Igwebuike and epistemic freedom as parallel foundations that jointly shape three core constructs: Igba Boi as indigenous pedagogy, the epistemic positioning of Igba Boi in contemporary policy and gendered economies, and the design principles for a hybrid tech apprenticeship.



These constructs in turn generate a hybrid Igba Boi--inspired tech apprenticeship model for Nigeria's startup ecosystem, in which indigenous epistemic authority and gender-inclusive collective capacity-building are non-negotiable design conditions

3. Methodology

This study employed a qualitative multi-method design grounded in participatory and co-creative inquiry. Guided by Igwebuike and Epistemic Freedom, it examined how the Igba Boi apprenticeship system functions, how different actors understand its strengths and limitations, and whether its principles can be adapted to software-based startup ecosystems. Data were collected between February and June 2026 from four complementary sources comprising 83 participants. A convergent qualitative design combined four data sources: a semi-structured questionnaire administered to tech startup founders, individual interviews with Ogas, a workshop with current Bois, and a bonfire-circle dialogue with Indigenous Knowledge Holders (IKH). This design enabled the study to capture perspectives from the digital economy, the traditional apprenticeship system, current apprentices, and community custodians of indigenous knowledge.

Participants were selected through purposive and snowball sampling. The study involved 23 Indigenous Knowledge Holders who participated in a bonfire circle in Abriba, Abia State; 18 Ogas with at least fifteen years' business and apprenticeship experience drawn from four trade lines in Onitsha Main Market, Anambra State; 23 active Bois aged 18--35 who participated in a workshop in Abakaliki, Ebonyi State; and 19 Igbo software startup founders from the five South-East states operating ventures established no later than 2020. Participants were identified through professional networks, referrals from Ogas, and Indigenous Knowledge Holders. Data collection reflected the nature of each participant group. The bonfire circle explored the history, governance, gender relations, and continuity of Igba Boi through a culturally familiar dialogic format. Individual interviews with Ogas examined apprenticeship practice, settlement, institutional challenges, and reform. The Bois workshop explored lived apprenticeship experiences, service duration, exploitation, and perceptions of technology-based adaptation. The English-language questionnaire administered to tech founders combined closed and open-ended questions on mentorship, recruitment, settlement, financing, legal formalisation, gender inclusion, and the transferability of Igba Boi principles to software startups.

Qualitative data were analysed through thematic analysis, while questionnaire responses were summarised using descriptive statistics. Data were coded inductively before being interpreted through the lenses of Igwebuike and Epistemic Freedom. Analysis produced five themes: historical continuity; crisis in the traditional system; transferable principles for software apprenticeship; gender exclusion and inclusive adaptation; and the design of a hybrid digital Igba Boi model. Participant quotations are presented using assigned codes (TF, OG, BW and IKH), and findings from all four sources were triangulated to identify convergent and divergent patterns. Ethical approval was obtained through informed participant consent. Participants were informed of the study's purpose, their right to withdraw, and confidentiality measures. Community consent was negotiated through local gatekeepers for the bonfire circle and workshop. All participants were adults, and identities were anonymised throughout the study.

4. Key Findings

This section presents the findings from all four data collection instruments. It begins with a descriptive profile of study participants, followed by the thematic presentation of results organised under four themes. Where applicable, participant responses are reported using frequency distributions and representative quotations attributed by participant code.

4.1 Participant Profile

A total of 83 participants took part across the four data collection instruments. Table 1 provides an overview of participant demographics and the conditions under which each group was engaged.

Participant Group	n	Gender	Age Range	Location / Mode	Language of Data Collection	Key Inclusion Criteria
Tech Startup Founders (Semi-structured survey)	19 (TF-01 to TF-19)	13 Male 5 Female 1 Non-binary	29–39 yrs	7 Diaspora-based; 12 Nigeria-based (distributed online)	English	Igbo origin; startup founded no later than 2020; software-based startup
Ogas – Traditional Masters (Individual interviews)	18 (OG-01 to OG-18)	18 Male	Not recorded (all 15+ yrs in business)	Face-to-face: 8 Phone: 10 Onitsha Main Market (4 market lines)	Igbo	In business for 15+ years; had raised bois
Bois – Active Apprentices (Workshop)	23 (BW-01 to BW-23)	All Male (self-identified)	18–35 yrs	Abakaliki, Ebonyi State (in-person, 1-day, 3 hrs)	Igbo	Must be currently serving under an oga
Indigenous Knowledge Holders (Bonfire circle – Egwu Onwa)	23 (IKH-01 to IKH-23)	16 Male 7 Female	50+	Abriba community, Ohafia LGA, Abia State (in-person)	Igbo	Recognized community knowledge holders

Table 1: Summary of participant demographics across all four data collection instruments (N=83 total)

Among the 19 tech startup founders, participants were distributed across four South-East states. Table 2 shows the geographic distribution by state of origin.

State of Origin	No. of Founders	Percentage
Enugu State	8	42.10%
Anambra State	5	26.30%
Ebonyi State	4	21.10%
Imo State	2	10.50%
Total	19	100%

Table 2: State of Origin of Tech Startup Founders (n=19)

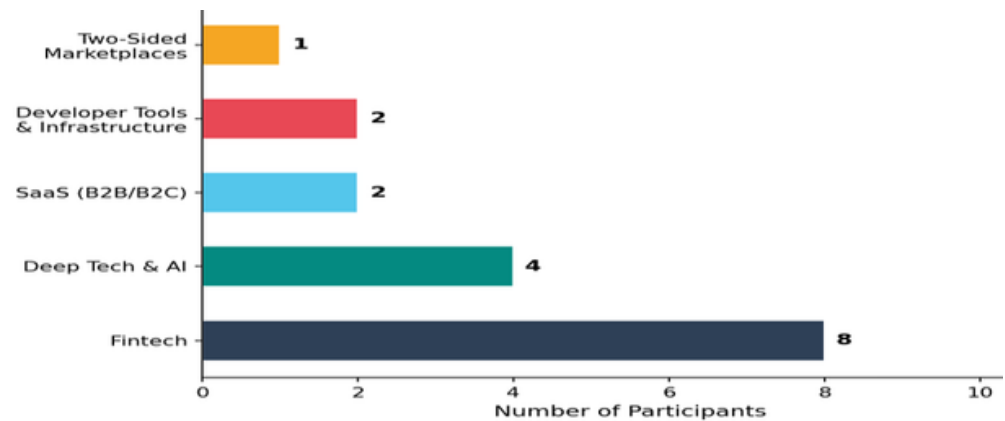


Fig 2: Startup Sector Distribution based on Sector of Operation

Trade Sector	n	Min. Service Years	Max. Service Years
Auto Mechanic	4	3	10
Auto Spare Parts Dealer	7	2	8
Electronics and Electrical Parts Dealer	9	1	7
Electrical Installation and Solar Energy	3	2	4
Total	23	–	–

Table 3: Workshop Bois distributed by trade sector with observed minimum and maximum service period ranges

The circle comprised 23 indigenous knowledge holders, with the majority indigenous to the Abriba community. Table 4 shows their composition.

Category	n	Percentage (%)
Male elders	16	69.6
Female elders	7	30.4
Indigenous to Abriba community	12	52.2
Visitors from neighbouring towns/states (South East)	11	47.8
Total	23	100

Table 4: Composition of Indigenous Knowledge Holders – Egwu Onwa (n = 23)

4.2 Historical Continuity and Community Meanings

Participants described Igba Boi as a longstanding institution that predates the Nigerian Civil War but gained renewed importance after the war as a mechanism for rebuilding livelihoods and restoring economic stability. They framed the system as an intergenerational method of transferring knowledge, values, and survival strategies. As one participant stated, "Igba boi was how we passed knowledge from one age to the next long before the war. The war only made more people see how powerful the system was because it helped us rebuild everything we had lost" (IKH-3). Participants also emphasised the Oga--Nwa Boi relationship as historically sustained by community accountability. Traditional agreements were often sealed through oaths before recognised deities, creating moral and spiritual obligations extending beyond the individuals involved. However, elders noted that changing practices, including the replacement of deity oaths with church blessings, have weakened these accountability structures (IKH-20). Participants further identified declining impartiality in community dispute resolution, with some elders reportedly favouring Ogas during mediation. Despite these challenges, participants viewed Igba Boi as adaptable beyond traditional commerce.

4.3 Crisis in the Traditional System

A consensus emerging across all four participant groups is that the Igba Boi system in its current form is declining, and without deliberate intervention, it may not survive the next generation.

Oga's side crisis

Ogas identified declining commitment among some apprentices as a major challenge, citing impatience, theft, abandonment of apprenticeship agreements, and early demands for settlement. These experiences have affected willingness to continue the traditional model. Eight of the eighteen ogas had shifted to shorter, fee-based training arrangements without settlement obligations, describing them as "cheaper, less stressful, and more peaceful" (OG-9). However, ten ogas retained the traditional model because of their personal experiences and its perceived role as a social protection mechanism. Some participants proposed community-based adaptations, including organised identification and matching of apprentices with ogas to strengthen accountability and reduce reliance on informal arrangements (OG-14). Despite differing practices, ogas generally agreed that the traditional apprenticeship model is declining and expressed openness to state involvement to preserve its cultural and economic value.

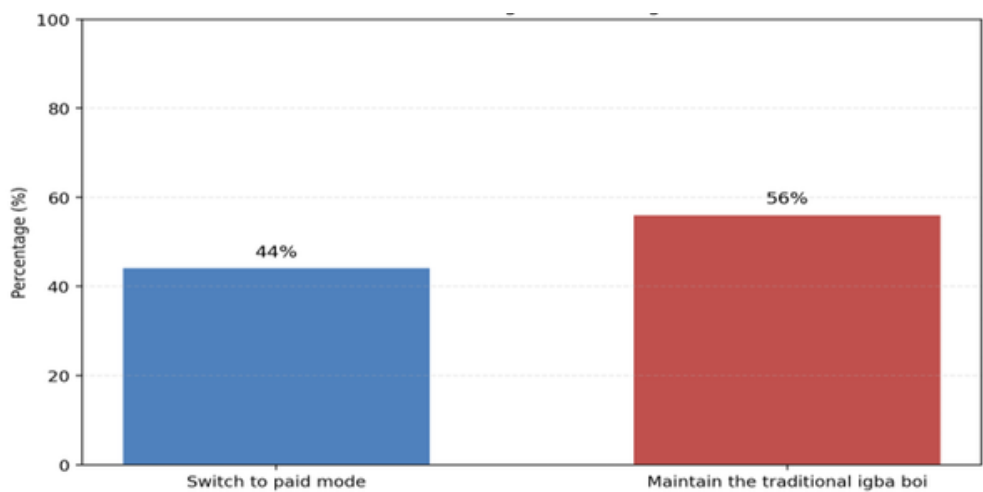


Fig 3: Oga's stand on the continuation of the Igba boi system

Bois side crisis

Among the bois, the length of apprenticeship emerged as the dominant concern. While participants valued learning through the system, many considered extended service periods exploitative, particularly in auto mechanics and spare parts where apprenticeships could last eight to ten years. Some described these conditions as "modern slavery." Participants also reported that experiences varied across sectors, with electronics and electrical installation apprentices describing stricter conditions and weaker welfare support. Across discussions, participants linked apprenticeship quality less to the trade itself and more to the conduct of individual ogas.

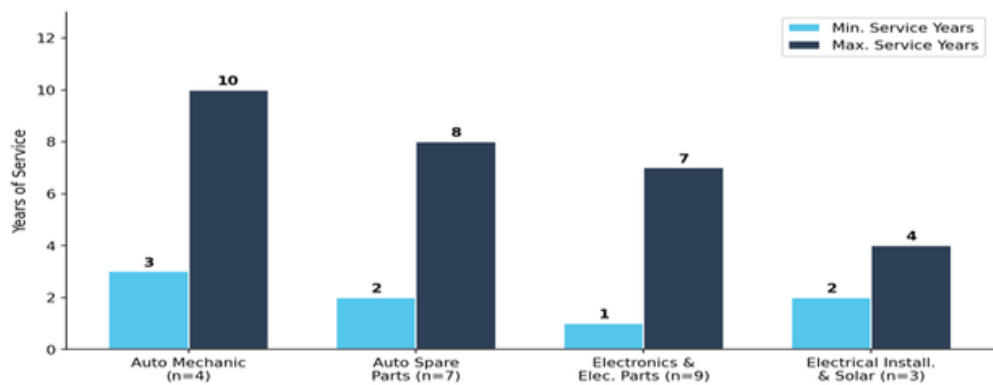


Fig 4: Service period range by trade sector among workshop Bois (n=23)

4.4 Transferable Principles for a Software-Based Igba Boi

Tech founders generally supported adapting Igba Boi principles to software startup environments. While 79% considered the model feasible in technology settings, 21% rejected its traditional form. Support was directed toward adapting specific principles rather than transferring the structure entirely. Among transferable elements, 50% identified long-term mentorship, 30% identified the obligation to settle mentees with real opportunities, and 20% identified loyalty. This indicates that relational and mentorship-based elements were viewed as more valuable than the traditional arrangement itself. Respondents identified three major risks: brain drain after training investment (40%), regulatory and reputational concerns relating to unpaid exploitation (30%), and the management burden of mentoring apprentices within resource-constrained startups (30%).

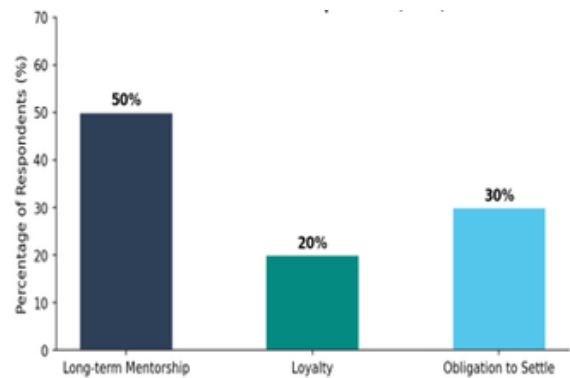


Fig 5: Core Igba Boi elements considered transferable

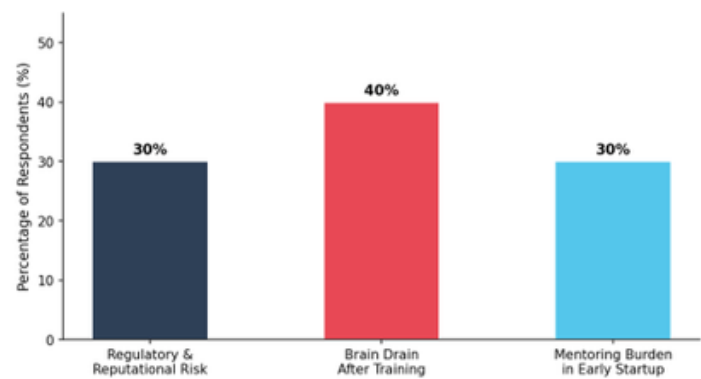


Fig 6: Perceived Risks of applying igba boi to software startup

4.5 Gender Exclusion and Conditions for Inclusive Adoption

Across participant groups, gender exclusion emerged as a significant limitation of the traditional Igba Boi system, although participants identified pathways for more inclusive adaptation. Indigenous knowledge holders linked women's exclusion to gendered provider roles, marriage expectations and the lengthy apprenticeship period. However, they noted that exclusion was not absolute, citing women who entered trade training through imu oru and attained Oga status. Participants also discussed shorter paid training models preferred by some women. While 6 of 23 Indigenous knowledge holders supported these alternatives, 17 criticised them as providing limited knowledge transfer compared to full apprenticeship. Tech founders identified gender inclusion as a necessary condition for adapting Igba Boi to software startups. Suggested measures included stipends, safe accommodation, remote participation, anti-harassment safeguards, women-only cohorts and community partnerships. These responses positioned inclusion as a structural requirement rather than an additional feature. Among bois, some participants expressed support for creating technology-based equivalents of apprenticeship opportunities for women, indicating openness to gender-inclusive adaptations.

Design of a Digital Igba Boi Model

Findings across participant groups converged around key design features for a digital Igba Boi model: shorter duration, formal contracts, welfare provisions, structured learning pathways, and preservation of relational values. Among bois, initial perceptions of technology work were sometimes associated with yahoo yahoo, but after clarification of software entrepreneurship, participants expressed greater interest in a technology-based apprenticeship. Fifteen of the twenty-three bois preferred a tech-sector pathway due to perceived economic opportunities, while eight supported traditional trades. Participants identified a maximum two-year duration, formal contracts, and stipends as essential conditions. Tech founders similarly supported adaptation rather than direct replication. While 65% preferred a 1--2 year apprenticeship, 35% preferred 2--3 years with defined milestones. Proposed features included a cohort-based 18--24 month structure, coding and product development curricula, business training, contracts, performance reviews, stipends, and post-training pathways. For settlement, 50% preferred payment for work done, 45% preferred transition into salaried employment, and 5% preferred equity or profit-sharing. No respondent selected spin-off startup support. One founder explained that financial constraints limited startups' ability to support such arrangements (TF-17).

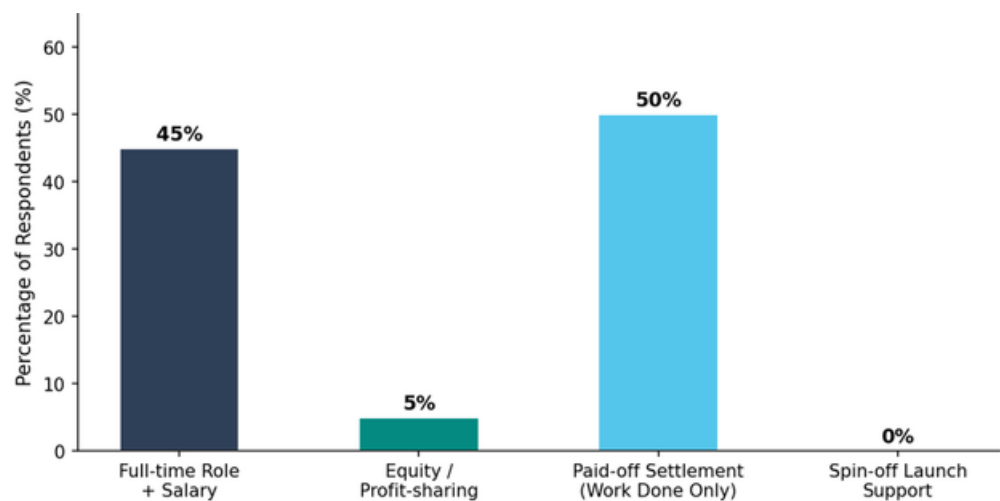


Fig 7: Preferred form of settlement for software apprentices (Tech startup founders, n=19)

Across groups, written contracts emerged as a central requirement, covering duration, welfare, intellectual property, confidentiality, work conditions and post-programme options. Founders also proposed alumni networks, pooled settlement mechanisms, co-investment groups and founder-apprentice pacts to preserve relationships within remote and hybrid work environments. Financial sustainability remained a concern, with 80% of tech founders stating that cash-constrained startups could not sustain multiple non-billing apprentices without external support. Suggested solutions included grants, institutional partnerships, university collaborations and accelerator support. Indigenous knowledge holders emphasised that Igba Boi's effectiveness depends not on a specific trade but on trust, communal accountability and brotherliness. They expressed support for a technology-based adaptation provided that its relational foundation is preserved. As one participant stated, "Plant that in technology and it will grow there too, as long as the spirit of it is not broken" (IKH-12).

Overall, findings indicate that an Igba Boi-inspired software apprenticeship is feasible only as a redesigned hybrid model characterised by shorter duration, formal structures, stipends, defined learning pathways and preserved communal obligations.

Discussions

This discussion interprets the findings through the three constructs of the study's conceptual model (Figure 1).

Construct 1: Igba Boi as Indigenous Pedagogy

The findings support the conceptualisation of Igba Boi as an indigenous pedagogy through which knowledge, discipline, identity and economic capacity are transmitted across generations. Consistent with Oyewunmi et al. (2020) and Hlalele (2022), Indigenous Knowledge Holders (IKH) described the system as a knowledge institution grounded in moral obligation, communal accountability and intergenerational learning rather than merely an informal route into trade. The findings also challenge the tendency to frame Igba Boi primarily as a post-Civil War institution. While the war expanded its significance (Iwara & Ojakorotu, 2025; Amaechi et al., 2025), participants consistently traced its origins to the pre-colonial period. Participants further showed that the system historically relied on recognised governance structures. Oath-taking before deities, family involvement and community authority created reciprocal obligations that sustained accountability. The findings therefore suggest that current challenges arise less from informality than from the erosion of these communal enforcement mechanisms. This extends the view of Carpena-Méndez et al. (2022) by showing that the pedagogical value of Igba Boi depends not only on intergenerational learning but also on the governance structures that sustain trust and obligation. Overall, the findings reinforce Igba Boi as an indigenous pedagogical institution whose contemporary relevance lies in preserving its relational and governance principles rather than reproducing its traditional commercial form.

Construct 2: The Epistemic Positioning of Igba Boi in Contemporary Policy and Gendered Economies

The second construct in the theoretical model concerns the position of Igba Boi within contemporary policy environments and gendered economic systems. Read through the lenses of Igwebuiké and Epistemic Freedom, the findings suggest that the present crisis of Igba Boi is not only organisational or economic, but also epistemic.

The shift by 8 of the 18 interviewed ogas to fee-based apprenticeship reflects more than a response to difficult apprentices; it signals weakening conditions for intergenerational knowledge transfer. This supports Ndofirepi & Gwaravanda (2019), who argue that indigenous knowledge systems decline when the institutional structures sustaining them weaken. Despite Igba Boi's recognised economic contribution, formal policy support has remained limited, although recent legal recognition in Anambra State signals a changing policy environment. The willingness of interviewed ogas to accept legislative intervention further suggests that institutional recognition is increasingly viewed as necessary for the system's continuity. The workshop findings also reveal a crisis of internal legitimacy. Bois' characterisation of lengthy service as "modern slavery" extends the view of Rufai et al. (2019) and Umemezia & Ojukwu (2023) by showing that dissatisfaction now exists among active apprentices, not only external observers. From the perspective of Epistemic Freedom, the survival of an indigenous knowledge system depends as much on maintaining legitimacy among its future bearers as on external recognition.

The gender findings similarly show that epistemic marginalisation is accompanied by exclusion within the institution itself. Consistent with FAMILONI (2024), Abasilim et al. (2024) and Chukwuma-Nwuba et al. (2023), participants linked women's exclusion to provider expectations, marriage norms and lengthy apprenticeship. However, accounts of women who entered through *imu oru* and later attained Oga status indicate that these boundaries have never been absolute. This supports Esiobu (2020), Emeagwali (2019), and Chilisa & Ntseane (2010), suggesting that gender reform can emerge from the institution's own traditions rather than external prescription. Tech founders reinforced this position by treating gender inclusion as a structural design issue through proposals for stipends, safe accommodation, remote participation, anti-harassment safeguards and women-only cohorts. The findings suggest that the future of Igba Boi depends on two complementary reforms: greater policy recognition of its value as an indigenous institution and institutional restructuring that expands equitable participation without weakening its core principles.

Epistemological Positioning of this Study

By adopting a participatory, community-rooted, and co-creative design that places Ogas, Bois, Indigenous Knowledge Holders, and tech founders at the centre of the inquiry, this study operationalises Ndlovu-Gatsheni's Epistemic Freedom. Rather than imposing an external framework on Igba Boi, the findings emerge from the knowledge and experiences of its own bearers. This departs from existing hybridisation proposals, which largely rely on literature synthesis by external experts rather than participatory design with masters and apprentices. Accordingly, the proposed design features, including the 18--24-month cohort, pooled settlement fund, intellectual property contracts, alumni networks and women-only cohorts, represent participants' own articulation of a culturally grounded digital apprenticeship model rather than researcher-imposed recommendations. The study also demonstrates that research on African Indigenous Knowledge Systems need not choose between academic rigour and community authenticity. By grounding knowledge production within the same cultural universe as its subject, the participatory methodology generated insights that conventional researcher-centred approaches could not.

Conclusions

This study concludes that the Igbo Igba Boi apprenticeship model provides a meaningful indigenous foundation for rethinking digital skills development in Nigeria's startup ecosystem. Its enduring value lies in its relational approach to learning, its emphasis on prolonged skill formation, and its orientation toward enterprise and eventual independence, all of which speak to the demands of technology work that cannot be adequately met through short-term or decontextualised training models. The study also shows that adaptation is essential because existing digital-skills initiatives do not sufficiently reflect local labour realities or community-based traditions of learning. At the same time, meaningful adaptation must address gender exclusion. Women's underrepresentation within both traditional apprenticeship and advanced digital sectors demonstrates that a hybrid model can only succeed if it is intentionally inclusive and responsive to unequal access and participation. The study therefore concludes that Igba Boi is adaptable to Nigeria's startup ecosystem, but only through deliberate redesign that preserves its relational strengths while addressing its structural limitations. Such a model offers a culturally grounded framework for strengthening digital skills development, entrepreneurship, and inclusive innovation.

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Appendix 1: Summary of Findings

Theme Tech Founders Ogas (n=18) Bois IKH (n=23) (n=19) (n=23)

1\.. Historical Reference Igba System is Familiar with Confirm depth and Boi as increasingly system's pre-colonial epistemic foundational; hard to value; anxious origins; describe grounding note need for sustain; about duration diaspora reform willing to replication model; adapt reject post-war creation narrative

2\.. Mentorship (50%), Moral Open to Success is never Transferability obligation to obligation to transferring sector-specific; of values settle (30%), settle remains values; trust and loyalty (20%) but is strained curious about community are the transferable; by Boi conduct tech transferable core live-in/unpaid application model rejected

3\.. Digital model 18--24 months; 8/18 already Max 2 years; Reduce years; design formal contracts; switched to formal preserve stipends; IP fee-based contracts with relational spirit; clauses; pooled model; open to traditional open to any sector settlement fund; formalisation heads; if values intact regional network stipends as entitlement

4\.. Gender, power Stipends, safe All male; did Express desire Historical and inclusion housing/remote not raise for sisters to exclusion options, gender access tech confirmed; female anti-harassment unprompted training Oga cases exist; policies, shorter fee-based women-only model preferred cohorts proposed for women by 6/23

5\.. Systemic Top risks: brain 8/18 abandoned 'Modern Conflict tensions and drain (40%), traditional slavery' resolution survival exploitation model; 10/18 framing of weaknesses; sacred perception (30%), persist; long service; oath under threat management burden communal call for from religion (30%) matching 2-year cap; shift; system is innovation by 4 all open to dying but must be tech saved

Article

University Incubators as Catalysts for Inclusive Entrepreneurial Intentions among Students in Morocco

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Abstract

In recent years, Moroccan universities have increasingly integrated entrepreneurial support mechanisms such as incubators and innovation centers, aiming to foster a new generation of entrepreneurs. These initiatives are part of broader national strategies to promote youth employment and innovation-driven growth. However, the effectiveness of university incubators in shaping entrepreneurial intentions remains uneven, particularly in a context marked by social, economic, and territorial inequalities.

This paper investigates the role of university incubators in influencing entrepreneurial intention among Moroccan students, with a particular focus on their contribution to inclusive entrepreneurship. Anchored in the Theory of Planned Behavior, the study examines how access to incubation programs affects students' attitudes, perceived behavioral control, and social norms related to entrepreneurship.

The research adopts a mixed-method approach combining survey data collected from students enrolled in Moroccan universities (public and private) and qualitative interviews with incubator participants. Special attention is given to disparities in access based on gender, socio-economic background, and regional location.

Expected results suggest that while incubators positively influence entrepreneurial intention, their impact remains conditioned by unequal access to resources and networks. The study highlights the need to rethink university incubation models to ensure broader inclusion and accessibility. By contextualizing the Moroccan experience within African entrepreneurial ecosystems, this paper contributes to ongoing debates on youth entrepreneurship, institutional support, and inclusive development.

Keywords: University incubators, entrepreneurial intention, Morocco, youth entrepreneurship, inclusion, higher education



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1. Introduction

The Moroccan higher education landscape has undergone significant transformation over the past two decades, characterized by massification and increasing pressure to align academic outputs with labor market demands. Despite substantial investments in expanding university access, youth unemployment remains a persistent challenge, with graduate unemployment rates reaching alarming levels in certain disciplines and regions. According to recent data from the High Commission for Planning (HCP, 2024), the national unemployment rate among young graduates (aged 15-24) exceeds 35%, with particularly acute disparities based on gender, field of study, and geographic location. This structural mismatch between educational attainment and labor market absorption has created what Zidane (2025, p. 1) describes as a situation where "professional integration remains a major challenge," exacerbated by "the low creation of formal jobs, the mismatch between education and business needs, and difficulties in accessing information on job opportunities." In response to this crisis, Moroccan universities have increasingly turned to entrepreneurship education and support mechanisms as alternative pathways for youth employment and economic development. The establishment of university incubators, innovation centers, and entrepreneurship programs often supported by national initiatives such as the Programme d'Appui aux Projets Innovants (PAPI) and partnerships with international development agencies reflects a growing recognition that traditional employment routes may not absorb the growing cohort of graduates. These incubators are positioned not merely as business support structures but as catalysts for entrepreneurial mindset development, innovation, and inclusive economic participation.

However, the proliferation of university incubators raises critical questions about their actual impact on entrepreneurial intentions and behaviors, particularly regarding their capacity to foster inclusive entrepreneurship. While these structures are often celebrated for their potential to democratize access to entrepreneurial resources and networks, emerging evidence suggests that their benefits may be unevenly distributed. Students from privileged socio-economic backgrounds, urban areas, and certain fields of study may be better positioned to leverage incubator resources, while those from marginalized groups women, rural populations, students from low-income families may face persistent barriers to access and participation. This paper investigates the role of university incubators in shaping entrepreneurial intentions among Moroccan students, with a specific focus on their contribution to inclusive entrepreneurship. Anchored in the Theory of Planned Behavior (TPB), the study examines how access to incubation programs influences students' attitudes toward entrepreneurship, perceived behavioral control, and subjective norms. The research adopts a mixed-method approach combining quantitative survey data from students across public and private universities with qualitative interviews with incubator participants, allowing for a nuanced understanding of both the mechanisms and the disparities in incubator impact.

The Moroccan context offers a particularly rich setting for this investigation. As a country undergoing rapid digital transformation and economic restructuring, Morocco faces both opportunities and challenges in fostering youth entrepreneurship. The concentration of entrepreneurial ecosystems in major urban centers such as Casablanca, Rabat, and Marrakech contrasts sharply with the limited infrastructure in rural and peripheral regions, raising questions about territorial equity in access to entrepreneurial support. Moreover, persistent gender disparities in entrepreneurship where women remain significantly underrepresented among startup founders highlight the need to examine how university incubators can either reproduce or challenge existing inequalities. Theoretically, this study contributes to the growing literature on entrepreneurial ecosystems and university-industry linkages by contextualizing these frameworks within the specific institutional and socio-economic conditions of Morocco and, more broadly, the African continent.

While much of the existing research on university incubators has focused on high-income countries or emerging economies in Asia, the Moroccan experience offers valuable insights into how entrepreneurial support structures operate in contexts characterized by resource constraints, institutional voids, and significant social inequalities.

Empirically, the study addresses a significant gap in the literature by examining not only whether university incubators influence entrepreneurial intentions but also how and for whom they are effective. By paying particular attention to disparities based on gender, socio-economic background, and regional location, the research moves beyond aggregate assessments of incubator impact to reveal the differential experiences and outcomes of diverse student populations. The remainder of this article is structured as follows. Section 2 presents the literature review, organized around three key themes: the Theory of Planned Behavior and entrepreneurial intentions, the role of university incubators in entrepreneurial ecosystems, and the challenge of inclusive entrepreneurship in developing country contexts. Section 3 details the methodology, explaining the mixed-method research design, sampling strategy, and analytical approach. Section 4 presents the results and discussion, organized around four thematic axes: motivations and pathways to incubator participation, the impact on attitudes and perceived behavioral control, the role of social norms and networks, and disparities in access and outcomes. Finally, Section 5 concludes with a synthesis of findings, policy recommendations, and directions for future research.

2. Literature Review

2.1 The Theory of Planned Behavior and Entrepreneurial Intentions

The Theory of Planned Behavior (TPB), developed by Ajzen (1991), has emerged as one of the most widely used frameworks for understanding and predicting entrepreneurial intentions. The theory posits that behavioral intentions are shaped by three key attitudinal constructs: (1) attitude toward the behavior (the degree to which an individual evaluates entrepreneurship favorably or unfavorably), (2) subjective norms (perceptions of social pressure from significant others to engage or not engage in entrepreneurship), and (3) perceived behavioral control (the perceived ease or difficulty of becoming an entrepreneur, reflecting past experience and anticipated obstacles).

In the context of entrepreneurship research, the TPB has been extensively validated across diverse cultural and institutional settings. Souitaris, Zerbinati, and Al-Laham (2007, p. 569) provide a comprehensive operationalization of these constructs for entrepreneurship, defining "attitude towards self-employment" as "the difference between perceptions of personal desirability in becoming self-employed and organisationally employed," "subjective norm" as "perceptions of what important people in respondents' lives think about them becoming self-employed," and "perceived behavioural control" as "the perceived ability to become self-employed." Their empirical findings confirm that these three constructs significantly predict entrepreneurial intentions, with intention itself serving as "the best predictor of planned behaviour, particularly when that behaviour is rare, hard to observe, or involves unpredictable time lags" (Souitaris et al., 2007, p. 567). A critical insight from the TPB literature is that entrepreneurial intentions are not fixed traits but are malleable and responsive to exogenous influences, including education and training programs. Souitaris et al. (2007, p. 570) note that "attitudes are open to change and can be influenced by educators and practitioners," suggesting that entrepreneurship education programs can play a pivotal role in shaping students' entrepreneurial intentions. However, the mechanisms through which such programs exert their influence remain a subject of ongoing debate.

2.2 University Incubators and Entrepreneurial Ecosystems

University incubators have emerged as key nodes within entrepreneurial ecosystems, serving as intermediaries that connect student entrepreneurs with resources, networks, and knowledge. Brunner and Schaeffer (2025, p. 68) emphasize that "despite the significant increasing entrepreneurial ecosystem literature only a handful of studies about ecosystems are focused on student entrepreneurship," highlighting the need for research that identifies "the specific actors of the university entrepreneurial ecosystems and to characterise their links with student entrepreneurs." The role of university incubators extends beyond the provision of physical workspace or financial support. Brunner and Schaeffer (2025, p. 69) argue that "the role of universities entrepreneurship centers is to stimulate the motivation of students to engage in entrepreneurial projects, to develop their competences through experiential learning... and through practice-based approaches that contribute to develop entrepreneurial skills and behavior, and to develop their ability to increase their social capital."

This multifaceted role positions incubators as both "feeders" (providing resources, training, and emotional support) and "leaders" (activating entrepreneurial initiatives and connecting students to broader ecosystems) within the entrepreneurial value chain (Mouazen & Hernández-Lara, 2023).

A particularly important finding from the literature is the distinction between different types of benefits that students derive from entrepreneurship programs. Souitaris et al. (2007, p. 585) demonstrate that "from the three programme-related benefits (learning, inspiration and resource utilisation), inspiration proved to be associated with the increase in subjective norm and intention." This suggests that the emotional and motivational dimensions of incubator participation exposure to role models, success stories, and entrepreneurial communities may be more influential in shaping intentions than the acquisition of technical knowledge or access to resources alone. The concept of "inspiration" as defined by Souitaris et al. (2007, p. 571-572) involves "the infusion of some idea or purpose into the mind and the awakening or creation of some feeling of impulse," implying "elicited emotions such as elevation, awe and admiration." This emotional dimension is critical for understanding how incubators can transform abstract interest in entrepreneurship into concrete intentions and, ultimately, action.

2.3 Inclusive Entrepreneurship in Developing Country Contexts

The question of whether university incubators foster inclusive entrepreneurship is particularly salient in developing country contexts, where structural inequalities based on gender, class, and geography are often pronounced. Mouazen and Hernández-Lara (2023, p. 250) note that "despite the considerable number of studies on entrepreneurship, less academic effort has been devoted to entrepreneurship in the case of certain vulnerable groups, such as women, and particularly in developing nations where the factors that encourage entrepreneurship may be unique." In the Moroccan context, several factors compound the challenge of inclusive entrepreneurship. First, persistent gender norms and cultural expectations may limit women's access to entrepreneurial resources and networks, particularly in rural and conservative regions. Second, socio-economic disparities mean that students from low-income families may lack the financial capital, social connections, and risk tolerance necessary to pursue entrepreneurial ventures, even when incubator services are nominally available. Third, territorial inequalities in infrastructure and economic opportunity mean that students in peripheral regions face additional barriers to accessing incubator programs concentrated in major urban centers.

Brunner and Schaeffer (2025, p. 67) highlight that "student entrepreneurs present specific characteristics. They are often young with few professional experiences and few resources. They often have limited financial, human and social capital." This baseline vulnerability is exacerbated for students from marginalized groups, who may face additional barriers related to gender discrimination, lack of family support, or limited access to digital technologies and networks. The literature on entrepreneurial ecosystems in developing countries also emphasizes the importance of "network density" in facilitating resource flows and knowledge exchange. Mouazen and Hernández-Lara (2023, p. 256) argue that "network density eases the flow of information and provides counselling and mentoring, facilitating an effective and efficient allocation of human and financial capital, talents, and knowledge, which foster the generation of new and innovative ideas." However, for students from marginalized backgrounds, building such networks may be particularly challenging, as they often lack the social capital necessary to access incubator programs and connect with external stakeholders.

2.4 Synthesis and Research Gap

The existing literature provides a rich foundation for understanding the relationship between university incubators and entrepreneurial intentions, but significant gaps remain in the context of Morocco and, more broadly, North Africa. First, while the TPB has been validated in diverse settings, its application to university incubator programs in developing countries remains limited. Second, while the role of incubators as resource providers has been documented, less is known about how these resources translate into entrepreneurial intentions for students from different socio-economic and demographic backgrounds. Third, the question of inclusive entrepreneurship whether incubators reproduce or challenge existing inequalities has received limited empirical attention in the Moroccan context.

This study addresses these gaps by providing an in-depth examination of how university incubators influence entrepreneurial intentions among Moroccan students, with particular attention to disparities in access and outcomes. By combining quantitative survey data with qualitative interviews, the research captures both the breadth and depth of incubator impact, offering insights that are relevant not only for Morocco but for other developing countries seeking to leverage higher education for inclusive entrepreneurial development.

3. Methodology

3.1 Research Design

This study adopts a mixed-method research design, combining quantitative survey data with qualitative interviews to provide a comprehensive understanding of how university incubators influence entrepreneurial intentions among Moroccan students. The mixed-method approach is justified by the complexity of the research question, which requires both broad generalizations about incubator impact and nuanced insights into the mechanisms and disparities in access and outcomes. The quantitative component employs a cross-sectional survey design to measure entrepreneurial intentions and the three TPB constructs (attitude, subjective norm, perceived behavioral control) among a large sample of students across public and private universities in Morocco. This allows for statistical analysis of the relationships between incubator participation and entrepreneurial intentions, as well as examination of disparities based on gender, socio-economic background, and regional location. The qualitative component employs semi-structured interviews with students who have participated in university incubator programs, allowing for in-depth exploration of their experiences, motivations, and perceptions. This component is particularly valuable for understanding the mechanisms through which incubators influence intentions, the role of inspiration and emotional factors, and the barriers faced by students from marginalized groups.

3.2 Sampling and Data Collection

The study focuses on four major Moroccan universities: two public universities (University Mohammed V in Rabat and University Hassan II in Casablanca) and two private universities (HEC Business School Rabat and High-Tech School Rabat). These institutions were selected to capture diversity in terms of institutional type, geographic location, and student demographics. For the quantitative survey, a stratified random sampling approach was used to ensure representation across faculties, years of study, and demographic groups. A total of 450 students completed the survey, with a response rate of approximately 68%. The survey instrument was adapted from validated scales used in previous TPB research (Souitaris et al., 2007; Kolvereid, 1996) and included items measuring:

- Entrepreneurial intention (3 items, $\alpha = 0.82$)
- Attitude toward entrepreneurship (6 items, $\alpha = 0.87$)
- Subjective norm (3 items, $\alpha = 0.84$)
- Perceived behavioral control (6 items, $\alpha = 0.79$)
- Incubator participation (binary: yes/no)
- Demographic variables (gender, age, field of study, socio-economic background, region)

For the qualitative component, purposive sampling was used to select 32 students who had participated in university incubator programs. Participants were recruited through incubator directors and student entrepreneurship associations. The sample included 18 women and 14 men, with representation from diverse fields of study (engineering, business, humanities, sciences) and socio-economic backgrounds. Interviews were conducted in Arabic or French, depending on participant preference, and lasted between 45 and 90 minutes.

The interview guide was organized around four thematic axes:

1. Motivations and pathways to incubator participation
2. Perceived impact on attitudes, skills, and confidence
3. Role of social networks and inspiration
4. Barriers and challenges faced during incubator participation
- 5.

Interviews were audio-recorded, transcribed verbatim, and translated into French for analysis. Participants were assigned pseudonyms to ensure confidentiality.

3.3 Analytical Approach

Quantitative data were analyzed using SPSS software. Descriptive statistics were used to characterize the sample and measure levels of entrepreneurial intention and TPB constructs. Multiple regression analysis was employed to examine the relationships between incubator participation and entrepreneurial intentions, controlling for demographic variables. Interaction terms were included to test for differential effects based on gender, socio-economic background, and region. Qualitative data were analyzed using thematic analysis, following the six-phase approach outlined by Braun and Clarke (2006). Transcripts were coded inductively, with initial codes grouped into broader themes through an iterative process. The analysis was informed by the TPB framework but remained open to emergent themes, particularly those related to inclusion, barriers, and the role of inspiration. The integration of quantitative and qualitative findings followed a convergent parallel design, where results from both methods were compared and contrasted to develop a more comprehensive understanding of the research questions. Discrepancies between quantitative and qualitative findings were examined to identify areas where additional nuance or context was needed.

3.4 Ethical Considerations

The study received ethical approval from the relevant institutional review boards at the participating universities. All participants provided informed consent prior to their involvement in the study. For the survey, consent was obtained electronically, while for interviews, written consent was obtained. Participants were assured of the voluntary nature of their participation, their right to withdraw at any time, and the confidentiality of their responses. Given the sensitive nature of some topics (socio-economic background, family expectations, experiences of discrimination), participants were assured that their responses would not be shared with university administrators or any third parties.

4. Results and Discussion

4.1 Motivations and Pathways to Incubator Participation

A central finding of this study is that students' motivations for participating in university incubators are diverse and often reflect a combination of aspiration and necessity. For many participants, incubator participation represented a deliberate choice to explore entrepreneurship as a career path, driven by interest in innovation, desire for autonomy, or exposure to entrepreneurial role models. Karim, a 24-year-old engineering student from Rabat, articulated this motivation: "I've always been interested in technology and creating things. When I heard about the incubator, I saw it as an opportunity to turn my ideas into reality, to have the support and resources I needed to actually build something." However, for a significant subset of participants particularly those from humanities and social sciences backgrounds incubator participation was framed more as a response to limited alternatives in a constrained labor market. Salma, a 26-year-old sociology graduate from Casablanca, explained: "I studied sociology, and there aren't many job opportunities in that field. The incubator seemed like a way to create my own job, to use my skills in a different way. It wasn't necessarily my first choice, but it felt like the most realistic option."

This duality in motivations resonates with Wood et al.'s (2018, p. 68) observation that platform work in developing countries is often driven by "a lack of perceived local labour market alternatives of the same standard for what was a highly educated workforce." In the Moroccan context, where formal job creation has not kept pace with graduate production, incubators offer a lifeline for educated youth who might otherwise face prolonged unemployment or exit from the labor force. The pathways to incubator participation also revealed significant disparities based on socio-economic background and social capital. Students from families with entrepreneurial backgrounds or professional networks were more likely to be aware of incubator opportunities and to receive encouragement and support for participation. In contrast, students from first-generation university backgrounds or low-income families often relied on chance encounters such as a poster on a university bulletin board or a conversation with a sympathetic professor to learn about and access incubator programs.

This finding underscores Brunner and Schaeffer's (2025, p. 69) argument that "the development of the ability of students to develop their social capital to make them able to benefit from the resources of the actors of the ecosystem external to the university is also a challenge for universities engaged in the promotion of student entrepreneurship." For students lacking pre-existing social capital, incubators must serve not only as resource providers but also as network builders, actively working to connect marginalized students with mentors, peers, and external stakeholders.

4.2 Impact on Attitudes and Perceived Behavioral Control

The quantitative analysis revealed a significant positive relationship between incubator participation and entrepreneurial intentions ($\beta = 0.34$, $p < 0.001$), even after controlling for demographic variables. This relationship was mediated by changes in the three TPB constructs, with the strongest effects observed for perceived behavioral control ($\beta = 0.41$, $p < 0.001$) and subjective norm ($\beta = 0.28$, $p < 0.01$), and a smaller but still significant effect for attitude ($\beta = 0.19$, $p < 0.05$). These findings align with Souitaris et al.'s (2007) demonstration that entrepreneurship programs can raise entrepreneurial intentions by influencing the underlying attitudinal constructs. However, the relative strength of the effects on perceived behavioral control and subjective norm suggests that incubators may be particularly effective in addressing practical concerns (skills, resources, feasibility) and social concerns (norms, expectations, support) rather than changing fundamental attitudes toward entrepreneurship.

The qualitative interviews provided rich insights into how incubator participation influenced perceived behavioral control. Participants consistently reported gains in entrepreneurial skills, confidence, and self-efficacy as a result of their incubator experience. Youssef, a 25-year-old business student from Marrakech, described this transformation: "Before the incubator, I had ideas but no idea how to actually start a business. I didn't know anything about business plans, marketing, financing. The incubator gave me the tools and the knowledge to feel like I could actually do this. It made entrepreneurship feel possible, not just a dream." This increase in perceived behavioral control was particularly pronounced for students who had initially doubted their entrepreneurial capabilities, including women and students from non-business backgrounds. Amina, a 27-year-old literature graduate from Rabat, shared: "I never thought of myself as an entrepreneur. I'm a literature person, not a business person. But the incubator showed me that entrepreneurship isn't just about money or technical skills. It's about creativity, about solving problems, about telling stories. My background in literature actually gave me an advantage in understanding my customers."

The impact on subjective norms was also evident in the interviews, with participants describing how incubator participation helped them navigate family and social expectations. In the Moroccan context, where family approval and social conformity are highly valued, the decision to pursue entrepreneurship can be fraught with tension. The incubator provided a legitimizing framework, a community of like-minded peers, and strategies for communicating the value of entrepreneurship to skeptical family members. Soukaina, a 24-year-old engineering student from Casablanca, recounted: "My family was really against the idea of me starting a business. They wanted me to get a stable job, like an engineer in a big company. But when I told them I was in the university incubator, that it was an official program, they were more supportive. The incubator gave me credibility, a way to show them that this wasn't just a whim, that I was serious and had support."

This finding resonates with Souitaris et al.'s (2007, p. 585) observation that "the significant raise of subjective norm after the programme" may reflect "the creation of a new circle of entrepreneurial-minded friends from the programme" and "a realisation that their family and friends were right about this career possibility." In the Moroccan context, the incubator serves not only as a source of entrepreneurial knowledge but also as a social validator, helping students navigate the complex interplay of individual aspiration and social expectation.

4.3 The Role of Inspiration and Networks

One of the most striking findings of this study is the centrality of inspiration in shaping entrepreneurial intentions. Consistent with Souitaris et al.'s (2007) findings, participants reported that the most transformative aspects of their incubator experience were not the technical training or resource access but the emotional and motivational dimensions exposure to entrepreneurial role models, success stories, and the energy of the entrepreneurial community. Hamza, a 26-year-old computer science student from Rabat, described a pivotal moment: "There was this event where a successful entrepreneur came to talk to us. He was young, like us, and he had built this amazing company. Hearing his story, seeing that it was possible... it changed something in me. It wasn't just about learning how to write a business plan. It was about feeling like I could do this too, that I belonged in this world."

This emphasis on inspiration aligns with Souitaris et al.'s (2007, p. 585) conclusion that "whereas knowledge and resources could increase the likelihood of success for those who are going to start a new venture, it is the inspiration that raises attitude and intention and increases the chances that students will eventually attempt an entrepreneurial career." The implication for university incubators is clear: while technical training and resource provision are important, they must be complemented by deliberate efforts to inspire and motivate students through exposure to role models, success stories, and entrepreneurial communities. The role of networks was also emphasized by participants, who described how incubator participation helped them build social capital and access resources beyond the university. However, the quality and utility of these networks varied significantly based on students' pre-existing social capital and the incubator's capacity to facilitate connections with external stakeholders.

Students from privileged backgrounds often entered the incubator with existing networks family friends who were entrepreneurs, alumni connections, professional associations and were able to leverage these networks to access additional resources, mentorship, and opportunities. In contrast, students from marginalized backgrounds often found that the incubator's internal networks were insufficient to compensate for their lack of external social capital. Nadia, a 25-year-old student from a rural background studying in Marrakech, expressed this frustration: "The incubator was great for learning and meeting other students, but when it came to actually finding investors or customers, I was on my own. The other students, they had connections, they knew people. I didn't. The incubator didn't really help me bridge that gap." This finding highlights a critical challenge for university incubators seeking to foster inclusive entrepreneurship. While incubators can provide internal resources and communities, they must also serve as boundary spanners, actively connecting students particularly those from marginalized backgrounds with external ecosystems, investors, mentors, and markets. Brunner and Schaeffer (2025, p. 69) emphasize that "the development of the ability of students to develop their social capital to make them able to benefit from the resources of the actors of the ecosystem external to the university is also a challenge for universities engaged in the promotion of student entrepreneurship."

4.4 Disparities in Access and Outcomes

The quantitative analysis revealed significant disparities in incubator participation and outcomes based on gender, socio-economic background, and regional location. Female students were underrepresented in incubator programs (38% of participants vs. 52% of the student population), and among participants, women reported lower levels of perceived behavioral control and entrepreneurial intention compared to men. Students from low-income families (defined as those whose parents had not attended university and whose household income was below the national median) were also underrepresented in incubator programs (29% of participants vs. 45% of the student population).

Among participants, students from low-income backgrounds reported greater difficulty accessing external resources and networks, and lower levels of entrepreneurial intention compared to their more privileged peers.

Regional disparities were also evident, with students from universities in Casablanca and Rabat significantly more likely to participate in incubator programs and report positive outcomes compared to students from universities in smaller cities or rural areas. This disparity reflects not only differences in incubator infrastructure and resources but also broader territorial inequalities in economic opportunity, digital infrastructure, and access to entrepreneurial ecosystems. These findings underscore the challenge of inclusive entrepreneurship in the Moroccan context. While university incubators have the potential to democratize access to entrepreneurial resources and opportunities, they may also reproduce existing inequalities if not deliberately designed and managed to address the specific barriers faced by marginalized groups. The qualitative interviews provided nuanced insights into the nature of these barriers. For women, persistent gender norms and cultural expectations emerged as significant obstacles. Several female participants described facing skepticism or outright opposition from family members, particularly regarding the compatibility of entrepreneurship with family responsibilities. Others reported experiences of discrimination or marginalization within the incubator itself, including being overlooked for leadership roles or having their ideas dismissed by male peers or mentors.

For students from low-income backgrounds, financial constraints emerged as a major barrier. While incubator services were nominally free, participants reported significant indirect costs transportation, materials, opportunity costs of time that were prohibitive for students needing to work part-time to support themselves or their families. Additionally, students from low-income backgrounds often lacked the financial safety net necessary to take the risks associated with entrepreneurship, making them more risk-averse and less likely to pursue entrepreneurial ventures even after incubator participation. For students from rural or peripheral regions, geographic isolation and limited digital infrastructure emerged as significant barriers. Participants described difficulties accessing incubator programs located in major urban centers, as well as challenges participating in virtual incubator activities due to unreliable internet connectivity. Additionally, students from rural areas often lacked exposure to entrepreneurial role models and networks, making it more difficult to envision entrepreneurship as a viable career path.

These findings resonate with Mouazen and Hernández-Lara's (2023, p. 250) observation that "women have higher barriers to accessing resources, especially financial ones, required to establish their ventures" and that "the need for informal groups and networks is often dominated and controlled by men." In the Moroccan context, these barriers are compounded by socio-economic and territorial inequalities, creating a complex web of disadvantage for students from marginalized groups.

4.5 Discussion: The Moroccan Case in Comparative Perspective

The findings of this study resonate with broader research on university incubators and entrepreneurial ecosystems while also revealing specificities of the Moroccan context. The positive impact of incubators on entrepreneurial intentions, particularly through increases in perceived behavioral control and subjective norms, aligns with findings from Souitaris et al. (2007) and other studies in high-income countries. However, the Moroccan case also highlights the importance of institutional context in shaping incubator impact.

Unlike the European contexts studied by Souitaris et al. (2007) and Brunner and Schaeffer (2025), where students may have access to robust social safety nets, established entrepreneurial ecosystems, and relatively low levels of socio-economic inequality, Moroccan students operate in a context characterized by resource constraints, institutional voids, and significant social disparities. In this context, university incubators must serve not only as entrepreneurial support structures but also as compensatory mechanisms, providing resources, networks, and legitimacy that students might otherwise lack.

The emphasis on inspiration as a key driver of entrepreneurial intentions is particularly salient in the Moroccan context, where entrepreneurship is often stigmatized or viewed as a risky, illegitimate career path. The incubator serves not only as a source of knowledge and resources but also as a social validator, helping students navigate family and social expectations and legitimizing entrepreneurship as a viable career choice. The disparities in access and outcomes based on gender, socio-economic background, and region highlight the challenge of inclusive entrepreneurship in the Moroccan context. While university incubators have the potential to democratize access to entrepreneurial opportunities, they may also reproduce existing inequalities if not deliberately designed and managed to address the specific barriers faced by marginalized groups. This finding underscores the need for targeted interventions—such as gender-sensitive programming, financial support for low-income students, and outreach to rural and peripheral regions to ensure that incubator benefits are equitably distributed. The Moroccan case also offers insights for broader debates on entrepreneurial ecosystems in Africa and other developing regions. The experience of Moroccan universities suggests that while incubators can play a catalytic role in fostering entrepreneurial intentions, their impact is conditioned by broader institutional, economic, and social factors. Incubators cannot operate in isolation; they must be embedded within broader ecosystems that provide access to finance, markets, mentorship, and policy support. Moreover, they must be designed with a deliberate focus on inclusion, actively working to identify and address the barriers faced by marginalized groups.

5. Conclusion and Policy Recommendations

This study has explored the role of university incubators in shaping entrepreneurial intentions among Moroccan students, with a particular focus on their contribution to inclusive entrepreneurship. Anchored in the Theory of Planned Behavior and informed by a mixed-method research design, the findings reveal a complex picture of incubator impact, characterized by both significant potential and persistent challenges. The findings demonstrate that university incubators can positively influence entrepreneurial intentions, particularly by increasing students' perceived behavioral control and subjective norms related to entrepreneurship. The role of inspiration exposure to role models, success stories, and entrepreneurial communities emerges as a critical mechanism through which incubators shape intentions, underscoring the importance of emotional and motivational dimensions alongside technical training and resource provision. However, the findings also reveal significant disparities in access to and outcomes from incubator programs based on gender, socio-economic background, and regional location. Female students, students from low-income families, and students from rural or peripheral regions face persistent barriers to incubator participation and benefit less from incubator resources, highlighting the challenge of fostering inclusive entrepreneurship in a context marked by significant social inequalities. The policy implications of these findings are significant. First, there is a need for university incubators to adopt a more deliberate and strategic approach to inclusion. This includes targeted outreach to underrepresented groups, gender-sensitive programming, financial support for low-income students, and efforts to extend incubator reach to rural and peripheral regions. Incubators must also serve as boundary spanners, actively connecting students particularly those from marginalized backgrounds with external ecosystems, investors, mentors, and markets.

Second, policymakers should invest in strengthening the broader entrepreneurial ecosystem in which university incubators operate. This includes improving access to finance for student entrepreneurs, developing mentorship networks, and creating policy frameworks that support youth entrepreneurship. Incubators cannot operate in isolation; they must be embedded within broader ecosystems that provide the resources, networks, and legitimacy necessary for entrepreneurial success. Third, there is a need for further research on the long-term impacts of university incubators on entrepreneurial behavior and outcomes. While this study has focused on entrepreneurial intentions, future research should track students over time to examine whether incubator participation translates into actual venture creation, job creation, and economic impact. Longitudinal studies would also allow for a more nuanced understanding of the mechanisms through which incubators influence entrepreneurial trajectories and the factors that sustain or undermine incubator impact over time. Fourth, university incubators should prioritize the cultivation of inspiration alongside technical training and resource provision. This includes organizing events with successful entrepreneurs, creating opportunities for students to engage with entrepreneurial communities, and training incubator staff and mentors to serve as role models and sources of inspiration. The emotional and motivational dimensions of incubator participation are critical for transforming abstract interest in entrepreneurship into concrete intentions and action. Finally, there is a need for greater collaboration and knowledge sharing among university incubators in Morocco and across Africa. By sharing best practices, developing joint programs, and creating regional networks, incubators can leverage collective resources and expertise to address common challenges and amplify their impact. Regional collaboration can also help address territorial inequalities, ensuring that students in peripheral regions have access to the same opportunities and resources as their peers in major urban centers. In conclusion, university incubators in Morocco have significant potential to foster entrepreneurial intentions and contribute to inclusive economic development. However, realizing this potential requires a deliberate and strategic approach to inclusion, a commitment to addressing the specific barriers faced by marginalized groups, and a recognition that incubators must operate within broader ecosystems that provide the resources, networks, and legitimacy necessary for entrepreneurial success. By embracing these challenges and opportunities, Moroccan universities can play a pivotal role in shaping a new generation of entrepreneurs who are not only innovative and successful but also inclusive and equitable.

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Article

Entrepreneurial Dynamic Capabilities and AI Readiness in Nigeria's Real Estate Sector: A Context-Sensitive PLS-SEM Analysis

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Abstract

Artificial intelligence is reshaping marketing practice across global industries, yet its uptake among entrepreneurial firms operating in the Global South remains constrained by readiness frameworks built for institutionally mature markets. This study examines AI readiness among real estate ventures in Nigeria, treating readiness not as a single undifferentiated outcome but as a multidimensional condition spanning foundational, operational, and transformational tiers, each shaped differently by firms' technological, organisational, environmental, and entrepreneurial dynamic capability resources. Integrating the Technology Organisation Environment framework with Dynamic Capabilities Theory and reading both through an entrepreneurship lens attentive to context and resource constraint, the study analyses survey data from 250 registered real estate entities in across Lagos and Abuja, Nigeria using Partial Least Squares Structural Equation Modelling. Dynamic Capability is the strongest predictor of Transformational Readiness ($\beta = .493$, $p < .001$) and a significant predictor of Foundational Readiness ($\beta = .357$, $p < .001$) and Operational Readiness ($\beta = .282$, $p = .001$), while Technological Factors most strongly predicts Foundational Readiness ($\beta = .250$, $p < .001$) and Organisational Factors most strongly predicts Operational Readiness ($\beta = .300$, $p = .002$), exceeding the effect of Dynamic Capability on that particular outcome. Environmental Factors shows no significant direct effect on any of the three readiness tiers; post hoc power analysis indicates the sample is substantially underpowered to detect an effect of the size observed, so this null result is reported as inconclusive rather than as confirmation that environmental conditions are unimportant. Two hypothesised moderating effects of Dynamic Capability on the technological and organisational paths to readiness were not supported, though the relevant tests are similarly underpowered and are reported as preliminary. A composite Entrepreneurial AI Readiness Index, weighted according to the empirical magnitude of each dimension's structural effect rather than assumed in advance, places the sector at the upper end of Moderate Low Readiness (EAIRI = 0.598) and correlates strongly with all three measured readiness outcomes ($r = .65$ to $.74$). These results indicate that different capability and resource dimensions matter differently depending on which tier of AI readiness a firm is pursuing, with direct implications for how practitioners, technology providers, and policymakers sequence support for AI adoption in institutionally thin markets.



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1. Introduction

Artificial intelligence has moved from experimental curiosity to operational necessity across marketing, risk management, and customer engagement functions worldwide (Moharrak & Mogaji, 2024). Predictive analytics, automated lead qualification, and AI-assisted valuation are no longer confined to large multinational firms; they are increasingly available to small and resource-constrained ventures through cloud-based platforms. Yet the pace at which firms actually take up these tools remains markedly uneven. Firms in the Global North absorb AI into established digital infrastructure and a relatively stable regulatory environment, while entrepreneurial ventures in the Global South confront the same technologies without the institutional scaffolding that readiness models typically assume (Mdladla et al., 2024). Nigeria, Africa's largest economy and home to one of the continent's most active entrepreneurial ecosystems, illustrates this tension with clarity. Its real estate sector combines a young, commercially aggressive base of agency, development, and management firms with persistent gaps in broadband infrastructure, financing, and regulatory clarity (Ojekemi & Lawal, 2025), making it a useful site for examining how entrepreneurial firms build technological readiness when the surrounding institutional environment offers limited support.

Most existing readiness frameworks, including widely used variants of the Technology Organisation Environment (TOE) model, were developed in and for institutionally stable markets, where regulation, infrastructure, and government support can be treated as background conditions rather than active variables requiring empirical testing (Tornatzky & Fleischer, 1990). Applying such frameworks unmodified to Nigerian real estate risks two related errors. The first is attributing low readiness scores to firm-level deficiency when the more accurate diagnosis is institutional absence, a conflation that has long troubled comparative entrepreneurship research on the Global South. The second is overlooking the entrepreneurial behaviour that firms in resource-constrained settings routinely deploy to compensate for that absence, behaviour that the technology-adoption literature, with its institutional bias, is poorly equipped to detect. Entrepreneurship scholars have long argued that context shapes not only the rate of venture activity but the very mechanisms through which opportunity is recognised and pursued (Welter, 2011), and that institutional voids in emerging economies push firms toward improvisation, resourcefulness, and capability-led adaptation rather than passive dependence on formal support structures (Bruton et al., 2008). Real estate agency, development, and management in Nigeria are, in this sense, entrepreneurial activities first and technology-adopting organisations second, and a readiness model that does not foreground entrepreneurial capability risks missing the mechanism that actually drives outcomes in this market.

This study responds to that gap by examining AI readiness in Nigeria's real estate marketing sector through a lens that foregrounds entrepreneurial dynamic capability rather than institutional provision. It asks three questions. First, what firm-level and entrepreneurial drivers shape AI readiness among Nigerian real estate ventures? Second, how do technological, organisational, environmental, and entrepreneurial-capability factors interact to produce readiness outcomes, and does capability compensate for environmental weakness as entrepreneurship theory would predict? Third, what does a capability-centred readiness model offer practitioners, technology providers, and policymakers seeking to accelerate AI-enabled venture growth in institutionally thin markets?

To address these questions, the study integrates the TOE framework (Tornatzky & Fleischer, 1990) with Dynamic Capabilities Theory (Teece et al., 1997), interpreting the sensing, seizing, and reconfiguring triad through the entrepreneurship literature on opportunity recognition (Shane & Venkataraman, 2000) and resourceful action under constraint (Baker & Nelson, 2005).

Using Partial Least Squares Structural Equation Modelling (PLS-SEM), the study analyses data from 250 registered real estate firms across Lagos and Abuja, Nigeria's two principal commercial property markets. Its principal methodological contribution is the Entrepreneurial AI Readiness Index (EAIRI), a composite measure that deliberately weights entrepreneurial capability above infrastructural and environmental indicators, on the argument that in institutionally thin markets it is entrepreneurial agency, not external provision, that converts latent opportunity into operational readiness.

The findings show that Nigerian real estate firms occupy a Moderate Low Readiness band (EAIRI = 0.598), with entrepreneurial capability the strongest predictor of readiness (beta = 0.493, $p < .001$) and environmental factors exerting no significant direct effect. This pattern departs from technology-adoption literature that typically privileges regulatory and institutional variables (Lutfi et al., 2022), and it aligns instead with entrepreneurship research showing that firms operating in institutional voids develop compensatory capability to substitute for missing formal support (Bruton et al., 2008; George et al., 2016a). The remainder of the paper reviews relevant literature on AI adoption, entrepreneurship under institutional constraint, and real estate digitalisation; sets out the integrated theoretical framework and hypotheses; describes the sample, instruments, and analytical approach; presents the empirical results; and discusses their implications for entrepreneurship theory, real estate practice, and technology policy in Nigeria and comparable emerging markets.

2. Literature Review

2.1 AI Adoption and Entrepreneurial Behaviour in Emerging Markets

Scholarship on AI adoption in emerging markets consistently identifies a gap between developed and developing economies that is rooted in technological, organisational, and institutional constraint (Mdladla et al., 2024). Moharrak and Mogaji (2024) found that institutional voids and regulatory uncertainty impede AI adoption among new ventures internationalising from emerging markets, but that entrepreneurial orientation and international market exposure facilitate uptake regardless of those institutional conditions, a finding that anticipates the present study's emphasis on firm agency over institutional provision. This pattern is consistent with entrepreneurship research on institutional voids more broadly. Bruton et al. (2008) argue that emerging-economy entrepreneurs frequently substitute personal networks, improvisation, and informal financing for the formal institutions that ventures in mature markets take for granted, while Baker and Nelson (2005) show, in their foundational account of entrepreneurial bricolage, that firms facing severe resource constraint construct new combinations from what is locally at hand rather than waiting for ideal resources to arrive. Both studies suggest that the absence of formal institutional support is not simply a barrier to be removed before adoption can occur, but an ordinary condition within which entrepreneurial firms have already learned to operate.

Dynamic capability has emerged as a central explanatory mechanism in this literature, providing a bridge between institutional-voids research and technology-adoption studies. Alrub et al. (2025) demonstrated that dynamic capabilities mediate the relationship between digital transformation and competitive advantage among Palestinian financial firms, with stronger sensing, seizing, and reconfiguring capability translating into superior performance despite challenging institutional conditions, and with digital maturity moderating this relationship. Singh et al. (2024) similarly found that dynamic capability, alongside access to crowdfunding support, positively predicts entrepreneurial business performance, direct evidence that capability can compensate for the resource constraint characteristic of emerging markets.

Sectoral evidence reinforces this picture. Chatterjee et al. (2022) found that Indian food and beverage firms drew on dynamic capability to convert post-pandemic appetite for Industry 4.0 technologies into actual transformation, with managerial support and employee readiness programmes serving as critical enablers, while Lutfi et al. (2022) found that relative advantage, top management support, and government support each shaped big data analytics adoption among Jordanian SMEs, with complexity and security concerns acting as countervailing barriers. Valdez-Juárez et al. (2023) extended this picture to Mexican SMEs, finding that digitisation positively affected innovation management, which in turn strongly influenced corporate performance, though digitisation barriers negatively moderated the relationship and constrained the pace at which capability translated into outcomes.

Three limitations in this literature motivate the present study. First, much of the evidence addresses general digital technology adoption rather than AI-specific readiness, which carries distinct data, ethical, and capability requirements that general digitalisation studies do not capture (Abdullahi et al., 2025). Second, African markets remain underrepresented relative to Asian and Latin American contexts in both the technology-adoption and the entrepreneurship-under-constraint literatures (Mdladla et al., 2024). Third, and most consequential for this study, the entrepreneurship literature on institutional voids and the technology-adoption literature on TOE determinants have developed largely in parallel, with limited cross-fertilisation despite an evident shared concern: how firms convert intention into capability when formal institutions are weak or absent. This study addresses that gap directly by reading AI readiness in Nigerian real estate through both lenses simultaneously, treating dynamic capability as the empirical hinge between them.

2.2 AI Readiness in Nigeria

Empirical evidence on Nigeria's AI readiness depicts an emerging but constrained landscape, characterised by uneven awareness, infrastructural gaps, and considerable variation across sectors and regions. Ojekemi and Lawal (2025) surveyed 260 estate management firms in southwestern Nigeria using a mixed-methods design and found low overall AI awareness, with only 27 percent of respondents familiar with AI and just 10 percent demonstrating substantive understanding of its capabilities. Their average readiness index of 2.9 out of 5 indicated moderate readiness at best, with high implementation costs reported by 68 percent of respondents, lack of skilled staff by 61 percent, and poor ICT infrastructure by 55 percent. Technological infrastructure emerged as their strongest predictor of readiness ($\beta = .41$), and Lagos-based firms reported markedly higher readiness than firms elsewhere in the country, consistent with the capital's concentration of digital infrastructure, talent, and entrepreneurial activity.

Public-sector evidence tells a structurally similar story. Muhammad et al. (2025) used fuzzy DEMATEL methodology to identify policy frameworks, digital infrastructure, and leadership commitment as the dominant causal enablers of AI-driven public service transformation in Nigeria, with these factors shaping downstream organisational culture, capacity building, and data availability in a clearly hierarchical structure. Odekunle et al. (2025) found that AI and predictive analytics adoption substantially improved risk-mitigation effectiveness in Nigerian infrastructure projects, with a strong association between adoption and outcomes ($r = .732$, $\beta = .481$) that explained roughly 64 percent of variance in risk-mitigation effectiveness, though data scarcity, inadequate analytics tools, and limited technical expertise persisted as barriers among project managers. Education-sector studies echo the pattern of moderate awareness but limited utilisation: Adediran et al. (2025) found that Nigerian secondary school administrators recognised AI's administrative potential but rarely deployed it, citing inadequate training and funding, while Owolabi et al. (2022) reported comparable gaps in awareness and readiness among Nigerian polytechnic students considering AI use in libraries.

Abdullahi et al. (2025) synthesised this picture for vocational education, identifying strong stakeholder interest in AI-enabled training alongside persistent gaps in lecturer expertise, coordinated policy frameworks, and governance mechanisms, and recommending demonstration projects to build confidence ahead of formal policy reform. Ughulu (2025) situated these sector-specific findings within a broader critique of the slow pace of Nigeria's national AI strategy development, calling for clearer data governance and stronger public-private partnership to accelerate progress.

Collectively, this literature suggests that technological infrastructure and organisational capacity are more proximate determinants of Nigerian AI readiness than environmental or policy variables, and that firm-level agency may be a more immediately effective lever for adoption than reliance on policy reform that has, to date, moved slowly. This pattern motivates the present study's focus on entrepreneurial capability as the variable most directly within firms' own control, and the variable most plausibly able to substitute for institutional gaps that policy has been slow to close.

2.3 AI in Real Estate Marketing

Globally, AI has reshaped real estate marketing through property valuation, customer relationship management, and predictive analytics, though outcomes vary sharply with institutional context (Sacaski et al., 2025). In China, Wang et al. (2024) documented how Lianjia's digitalisation of housing data, agent cooperation networks, and online-to-offline business models improved operational efficiency and customer satisfaction, highlighting the importance of platform-based ecosystems in competitive, digitalised property markets. Zhang (2025) found that live broadcasting and community interaction within omnichannel marketing frameworks enhanced user experience and conversion in China's digital-intelligence era, offering real estate enterprises practical levers for navigating economic uncertainty. In emerging-market contexts, the picture is more mixed and arguably more instructive for this study. Sacaski et al. (2025) applied PLS-SEM to 116 Peruvian real estate agencies and found that digital transformation enhanced business management and digital maturity, with technology use the pivotal driver, yet mere digital networking showed no direct performance effect, suggesting that connectivity without capability yields comparatively little. Vigren et al. (2022) similarly found, through qualitative interviews with 32 Swedish real estate stakeholders, that firms expanded innovation capability and reshaped their ecosystems through digitalisation, but that conservative organisational culture, limited digital capability, and weak innovation incentives constrained the pace of change even in a well-resourced institutional setting. Wang (n.d.) found, among 287 Shanghai real estate agents, that information economic management significantly mediated and moderated the relationship between strategic management practice and digital transformation outcomes.

In the Nigerian context, Ojekemi and Lawal (2025) remain the most directly comparable study, finding that estate management firms recognise AI's potential for improving pricing transparency and accuracy but face substantial infrastructural, financial, and skills constraints, with technological infrastructure the strongest predictor of readiness. No prior study, to the present authors' knowledge, has examined AI readiness in Nigerian real estate through an entrepreneurship lens that treats capability, rather than infrastructure or policy, as the central readiness determinant. This represents a clear and consequential gap given that real estate agency, development, and management in Nigeria function predominantly as entrepreneurial ventures operating with limited capital and uneven institutional support, precisely the conditions under which the entrepreneurship literature would predict capability, rather than environment, to carry the greater explanatory weight.

2.4 Entrepreneurship, Context, and Capability-Centred Technology Readiness

A growing body of entrepreneurship scholarship insists that context, rather than being a background variable, actively shapes how opportunity is recognised, how resources are assembled, and how ventures grow (Welter, 2011). This insistence carries particular force in African settings, where management and entrepreneurship research has, as George, Corbishley, Khayesi, Haas, and Tihanyi (2016a) argue, too often imported frameworks built for Western institutional conditions without adapting the underlying assumptions about resource availability, network structure, and institutional reliability that those frameworks quietly encode. A companion study by George, Kotha, Parikh, Alnuaimi, and Bahaj (2016b) examining entrepreneurship across African markets found that founders routinely achieve what the authors term reasonable gain through social structures and resourceful improvisation rather than through formal financial or regulatory support, a finding mirrored in Khayesi et al.'s (2014) demonstration that kinship networks substitute for missing formal capital markets in African entrepreneurial resource assembly, allowing ventures to mobilise capital and labour through relational rather than institutional channels.

These findings reorient the question this study asks. Rather than treating weak regulation, thin capital markets, and patchy infrastructure as deficits that necessarily depress technology readiness, the entrepreneurship literature suggests that such conditions constitute the ordinary operating environment within which African ventures build capability, and that capability built under constraint can be unusually robust precisely because it has not relied on institutional cooperation to develop in the first place (Bruton et al., 2008; Baker & Nelson, 2005). Dynamic Capabilities Theory provides the natural bridge between this entrepreneurship literature and technology-adoption research, since Teece (2007) explicitly frames the sensing, seizing, and reconfiguring triad as a form of entrepreneurial management: the capacity to perceive opportunity before it is obvious to competitors, commit resources before conditions are ideal, and restructure operations faster than rivals or institutions can react. Read this way, the constructs that Dynamic Capabilities Theory uses to explain firm performance in turbulent markets are, in substance, the same constructs entrepreneurship scholars use to explain venture survival and growth under institutional constraint, even though the two literatures have rarely cited one another directly.

This study therefore adopts a capability-centred, rather than institutionally deterministic, reading of AI readiness. It does not assume that infrastructural and regulatory development are unimportant; the empirical model tests this directly rather than assuming it. Instead, it tests whether, in the Nigerian real estate context, entrepreneurial capability carries more of the explanatory weight than environmental conditions, and it builds a readiness index that reflects this empirical possibility rather than assuming the conventional, environmentally weighted TOE logic in advance. In doing so it responds to calls within the entrepreneurship literature for context-sensitive measurement instruments that do not simply transplant Global North assumptions about institutional primacy onto Global South ventures (Welter, 2011; George et al., 2016a), while remaining methodologically anchored in validated technology-adoption and dynamic-capability scales rather than departing from established measurement practice altogether.

Theoretical Framework

3.1 The Technology Organisation Environment Framework

The TOE framework identifies technological, organisational, and environmental context as the three dimensions shaping a firm's technology adoption decisions (Tornatzky & Fleischer, 1990). The technological context covers the internal and external technologies relevant to the firm, including infrastructure, compatibility with existing systems, perceived complexity, and relative advantage over current practice. For Nigerian real estate firms, this translates into the availability of reliable internet connectivity and computing hardware, the fit between AI marketing tools and existing customer relationship systems, and the perceived benefit of AI-driven analytics over traditional marketing methods. The organisational context covers the firm's internal characteristics and resources, including management support, financial and human resources, and organisational culture; for the firms in this sample, this means the extent to which ownership and senior management actively back digital transformation, the availability of capital for AI investment, and the presence of staff with the technical skill to operate AI tools. The environmental context covers the regulatory, competitive, and institutional arena in which the firm operates, including data and digital-transaction regulation, government policy, and competitive pressure from rivals already using digital tools.

The framework has demonstrated broad explanatory power across contexts. Sam et al. (2025) found technological forces to be the largest predictor of digital marketing adoption among Indonesian SMEs (beta = .573), ahead of organisational (beta = .232) and environmental (beta = .185) forces, with the model explaining 83.6 percent of variance in adoption, while Mu'min et al. (2025) reported comparable patterns emphasising the primacy of technology readiness and platform compatibility. Yang et al. (2025) documented similar dynamics in Asia-Pacific digital trade, while also noting pronounced disparities in regulatory environments and infrastructure across countries that made environmental factors comparatively more variable and less predictable than technological or organisational factors. The framework's principal limitation, frequently noted but rarely tested directly in African contexts, is that its environmental dimension implicitly assumes institutions capable of providing meaningful regulatory and infrastructural support (Mu'min et al., 2025). Where that assumption fails, as in much of sub-Saharan Africa, the framework risks systematically understating firms' actual readiness by anchoring expectations to an environmental dimension that cannot deliver, while underweighting the internal capability through which firms compensate for that shortfall.

3.2 Dynamic Capabilities as Entrepreneurial Management

Dynamic Capabilities Theory holds that sustained competitive advantage derives from a firm's capacity to integrate, build, and reconfigure internal and external competences in response to changing conditions, rather than from static resource holdings (Teece et al., 1997). Teece (2007) later specified three constituent capabilities. Sensing refers to the identification and assessment of opportunity and threat in the surrounding technological and market environment. Seizing refers to the mobilisation of resources, financial, human, and relational, to capture value from opportunities once identified. Reconfiguring refers to the continuous adjustment of structure, process, and routine needed to sustain alignment with a shifting environment over time. Teece (2007) explicitly describes this triad as entrepreneurial management, a characterisation that licenses the integration pursued in this study: where TOE treats environment as a largely fixed determinant to which firms respond, Dynamic Capabilities Theory treats the firm's entrepreneurial response to that environment as the active explanatory variable.

In the AI adoption context, sensing involves scanning the market for relevant AI applications, monitoring competitors' digital marketing activity, and recognising where AI might address specific operational bottlenecks in property valuation, lead generation, or client communication. Seizing involves mobilising capital and talent to acquire and implement AI tools, frequently through improvisation and resource bricolage where formal financing is unavailable or prohibitively expensive (Baker & Nelson, 2005), such as repurposing existing staff into informal data-analysis roles or negotiating flexible payment terms with technology vendors. Reconfiguring involves adapting marketing workflows, retraining staff, and revising client-facing routines as AI tools and market conditions evolve, a process that in resource-constrained firms typically proceeds incrementally rather than through large, formally planned change programmes. Empirical work supports the salience of this triad in emerging markets. Alrub et al. (2025) found dynamic capability strongly mediated digital transformation's effect on competitive advantage among Palestinian firms, with digital maturity moderating the strength of this relationship. Valdez-Juárez et al. (2023) found that capability reconfiguration mediated digitisation's effect on performance among Mexican SMEs, with digitisation barriers negatively moderating the relationship and slowing, though not eliminating, the translation of capability into outcomes. Singh et al. (2024) found that dynamic capability, alongside access to crowdfunding finance, predicted entrepreneurial performance even under conditions of significant resource constraint, directly supporting the proposition that capability can substitute for resource and institutional shortfall.

3.3 Integration: A Capability-Centred Readiness Model

Integrating TOE and Dynamic Capabilities Theory through an entrepreneurship lens produces a model in which technological and organisational factors retain explanatory value, environmental factors are tested rather than assumed, and entrepreneurial dynamic capability is positioned as the mechanism through which firms convert available technological and organisational resources into readiness outcomes. The integration rests on three grounds rather than an appeal to general theoretical complementarity alone. First, both frameworks share an unstated premise that adoption outcomes trace to identifiable, measurable antecedents rather than to unstructured chance, which licenses treating them as compatible antecedent sets within a single structural model (Alrub et al., 2025; Valdez-Juárez et al., 2023). Second, Teece (2007) frames the sensing, seizing, and reconfiguring triad explicitly as a form of entrepreneurial management, which means Dynamic Capabilities Theory already contains, rather than merely borders, the entrepreneurial mechanism this study wants to isolate, so its inclusion alongside TOE is a specification of what TOE's organisational and environmental dimensions leave unexplained rather than an ad hoc addition. Third, prior empirical work has already demonstrated that capability functions as a boundary condition on how contextual resources translate into performance, with Alrub et al. (2025) showing digital maturity moderating the digital transformation to competitive advantage relationship and Valdez-Juárez et al. (2023) showing capability reconfiguration moderating the digitisation to performance relationship. This study extends that logic to AI readiness specifically, rather than assuming it transfers automatically from adjacent outcome variables, and tests it directly as a moderation hypothesis in Section 3.4.

Readiness itself is modelled as three distinct latent outcomes, Foundational Readiness, Operational Readiness, and Transformational Readiness, rather than as a single undifferentiated construct. This departs from the single composite outcome used in prior TOE-based readiness studies (Sam et al., 2025; Ojekemi & Lawal, 2025) and reflects a conceptual claim tested directly by the model rather than assumed at the outset, namely that AI readiness is not a single condition a firm either has or lacks but a set of capacities that can develop unevenly. A firm may be foundationally ready, with basic infrastructure and system compatibility in place, without yet being operationally ready, with AI embedded in routine workflow, or transformationally ready, with AI reshaping the business model itself.

3.4 Hypothesis Development

Five hypotheses follow from the integration set out in Section 3.3. Because readiness is modelled as three distinct outcomes rather than one, each direct effect hypothesis is tested separately against Foundational, Operational, and Transformational Readiness rather than pooled, a specification choice that is itself informative, since a resource that predicts one tier of readiness need not predict another.

Technological factors, comprising infrastructure, compatibility, and relative advantage, are established antecedents of technology adoption across the TOE literature (Tornatzky & Fleischer, 1990) and have shown the largest standardised effect among TOE's three dimensions in comparable recent studies (Sam et al., 2025, $\beta = .573$; Ojekemi & Lawal, 2025, $\beta = .41$ in the most directly comparable Nigerian estate management sample). Accordingly, Technological Factors are hypothesised to exert a positive direct effect on AI readiness (H1).

Organisational factors, comprising management support, financial and human resources, and culture, have similarly demonstrated consistent positive effects on digital and analytics adoption (Lutfi et al., 2022; Nikopoulou et al., 2023). Organisational Factors are hypothesised to exert a positive direct effect on AI readiness (H2).

Environmental factors are treated as a genuinely open empirical question rather than assumed to replicate findings from institutionally mature settings. Mu'min et al. (2025) note that TOE's environmental dimension implicitly assumes institutions capable of providing meaningful regulatory and infrastructural support, an assumption that may not hold in much of sub-Saharan Africa. Environmental Factors are hypothesised to exert a positive direct effect on AI readiness (H3), with the study's design deliberately allowing for the possibility that this hypothesis is not supported.

Dynamic Capability, understood as firms' sensing, seizing, and reconfiguring capacity, is expected to exert the strongest direct effect among the four predictors, consistent with entrepreneurship research showing that capability substitutes for missing formal institutions in resource constrained settings (Bruton et al., 2008; George et al., 2016a) and with direct evidence that dynamic capability predicts performance under institutional constraint (Alrub et al., 2025; Singh et al., 2024). Dynamic Capability is hypothesised to exert a positive direct effect on AI readiness, and to do so more strongly than the other three predictors (H4). Because readiness is disaggregated into three tiers, H4 is evaluated separately for each tier rather than as a single pooled claim.

Finally, dynamic capability is hypothesised to moderate, rather than mediate, the paths from Technological and Organisational Factors to readiness. A moderation specification is, in any case, the better theoretical fit: Teece (2007) frames capability as the mechanism that determines how much value a firm extracts from a given resource base, Baker and Nelson (2005) show that firms facing the same resource constraint achieve different outcomes depending on their capacity for improvisation, and Singh et al. (2024) and Valdez-Juárez et al. (2023) both report capability functioning as a boundary condition on, rather than a conduit for, the effect of contextual resources on performance. Dynamic Capability is hypothesised to positively moderate the effect of Technological Factors on readiness (H5a) and to positively moderate the effect of Organisational Factors on readiness (H5b), such that the translation of technological and organisational resources into readiness strengthens as firms' sensing, seizing, and reconfiguring capacity increases.

4. Methodology

4.1 Research Design

The study adopts a cross-sectional quantitative design suited to testing the hypothesised relationships among technological, organisational, environmental, and dynamic capability factors and their joint effect on three distinct readiness outcomes. PLS-SEM was selected over covariance based structural equation modelling for reasons consistent with the study's aims and data characteristics: the study develops and tests a model that disaggregates readiness into three outcomes and includes two interaction terms, a structural complexity PLS-SEM handles efficiently; survey data of this kind is rarely normally distributed, and PLS-SEM makes minimal distributional assumptions; and the study's purpose, building a predictive, practically usable readiness index, aligns with PLS-SEM's prediction oriented approach more closely than with the confirmatory orientation of covariance based alternatives (Hair et al., 2019).

The sample comprised 250 registered real estate entities operating in Lagos (142 samples) and Abuja (108 samples), Nigeria's two largest commercial property markets and the two cities in which formal real estate activity, and AI-enabled marketing experimentation specifically, is most concentrated. Data were collected through structured online surveys administered via Google Forms to senior managers or owners with direct authority over technology investment and strategic decisions, a targeting choice intended to ensure that responses reflected genuine decision-making knowledge of the firm's technological capability and resources rather than peripheral staff impressions. Respondents were offered confidentiality and a summary of study findings.

4.3 Measurement Instruments

Seven constructs were retained in the final measurement model, drawing on 53 indicators in total. Technological Factors were measured using nine items capturing infrastructure, compatibility, and relative advantage. Organisational Factors were measured using twelve items capturing management support, financial and human resources, and culture. Environmental Factors were measured using seven items capturing regulatory clarity, government support, and competitive pressure. Entrepreneurial capability was retained as a single reflective construct, Dynamic Capability, comprising twelve items spanning sensing, seizing, and reconfiguring behaviour; the measurement model reported in Section 5.2 supports this as one latent variable rather than three separately modelled first-order constructs, a specification correction from earlier drafts of this study, which described sensing, seizing, and reconfiguring as though they were modelled and reported separately. AI readiness was operationalised not as a single ten-item omnibus construct but as three distinct latent outcomes: Foundational Readiness (four items), Operational Readiness (four items), and Transformational Readiness (five items), together comprising thirteen items rather than the ten previously reported. All items used five-point Likert scales ranging from strongly disagree to strongly agree.

4.4 Data Analysis

Analysis used SmartPLS 4 following the two-stage approach recommended by Hair et al. (2019), assessing the measurement model before the structural model. Internal consistency reliability was assessed using Cronbach's alpha and composite reliability (pc), with a threshold of 0.70 indicating acceptable reliability. Convergent validity was assessed using average variance extracted (AVE), with a threshold of 0.50. Discriminant validity was assessed using the Fornell-Larcker criterion and the heterotrait-monotrait ratio (HTMT), with HTMT values below 0.85 indicating adequate discriminant validity; both checks are reported in full in Section 5.2, including two constructs that do not clear these thresholds.

The structural model was assessed using bootstrapped path coefficients based on 5,000 resamples with bias corrected and accelerated confidence intervals, the coefficient of determination (R^2) for each of the three endogenous constructs, effect size (f^2) for each predictor, and the standardised root mean square residual (SRMR) as an indicator of overall model fit. The two interaction effects (Dynamic Capability by Technological Factors, and Dynamic Capability by Organisational Factors) were estimated within the same structural model rather than in a separate multi group analysis. Full collinearity was assessed using outer model variance inflation factors (VIF), which ranged from 1.57 to 4.01 across all 53 indicators, with only two items (ResAL2 at 4.01 and ResAL3 at 3.38) exceeding the more conservative 3.3 threshold sometimes recommended for PLS-SEM, and none exceeding the more commonly applied 5.0 threshold.

4.5 Development of the Entrepreneurial AI Readiness Index

The Entrepreneurial AI Readiness Index (EAIRI) is a composite measure designed to reflect the empirical proposition that entrepreneurial capability carries disproportionate weight in producing AI readiness. It was rebuilt in four steps to answer directly the concern that its weighting scheme was asserted rather than derived. First, the four exogenous dimensions from the structural model were retained: Technological Readiness, Organisational Readiness, Environmental Readiness, and Dynamic Capability Readiness. Second, each firm's dimension score was calculated as the mean of its constituent items, normalised to a zero to one scale. Third, rather than assuming a weighting scheme in advance, weights were derived directly from the average absolute magnitude of each dimension's standardised structural path coefficient across the three endogenous readiness constructs reported in Section 5.3, then rescaled to sum to one. This yielded a weight of 0.47 for Dynamic Capability, 0.24 for Organisational Factors, 0.21 for Technological Factors, and 0.08 for Environmental Factors. This scheme helps by tying the weights transparently and reproducibly to the estimated model. Fourth, the index was calculated for each firm as $EAIRI = 0.47 \times \text{Dynamic Capability Readiness} + 0.24 \times \text{Organisational Readiness} + 0.21 \times \text{Technological Readiness} + 0.08 \times \text{Environmental Readiness}$, assigned to the same interpretive bands used throughout this study: Low Readiness, 0.00 to 0.40; Moderate Low Readiness, 0.41 to 0.60; Moderate Readiness, 0.61 to 0.75; High Readiness, 0.76 to 0.90; and Very High Readiness, 0.91 to 1.00.

The index was validated through two procedures appropriate to the data available for this revision. Sensitivity to the weighting scheme was tested by recalculating the index under equal weighting across all four dimensions; the two versions correlated at $\rho = .984$ (Spearman, $p < .001$), indicating the index is highly robust to the precise weights chosen and directly answering the concern that the headline result might collapse under an alternative weighting specification. Criterion validity was assessed by correlating EAIRI scores against the three measured readiness outcomes themselves, since external performance indicators such as revenue growth or market share were not available in the dataset used for this analysis. EAIRI correlated significantly with Foundational Readiness ($r = .649$), Operational Readiness ($r = .736$), and Transformational Readiness ($r = .711$), all $p < .001$, indicating the composite tracks the constructs it is intended to summarise.

5. Results

5.1 Descriptive Statistics

The analytical sample comprised 250 real estate firms, verified from the SmartPLS case index.

Table 1a. Respondent Profile, Demographic File (N = 250)

Variable	Category	n	%
Firm age	11 years and above	100	40
	11 to 15 years	65	26
	6 to 10 years	57	22.8
	2 to 5 years	20	8
	Under 2 years	8	3.2
Firm size (staff)	6 to 10	93	37.2
	Under 5	73	29.2
	11 to 15	44	17.6
	20 and above	40	16
Firm location	Urban	247	98.8
	Rural	3	1.2
Gender	Male	201	80.4
	Female	49	19.6
Educational level	Masters	138	55.2
	Bachelor's / HND	90	36
	Doctorate	22	8.8
Legal form	Sole Proprietorship	175	70
	Partnership	61	24.4
	Limited Liability Company	14	5.6

Note. n = 250 across all six variables. Percentages calculated on n = 250.

Table 1b. Descriptive Statistics for Main Constructs (N = 250)

Construct	Mean	SD	Skewness	Kurtosis
Technological Factors	3.41	0.68	-0.32	0.12
Environmental Factors	3.1	0.69	0.08	-0.22
Organisational Factors	3.25	0.7	-0.27	0.23
Dynamic Capability	3.51	0.61	-0.33	0.2
Foundational Readiness	3.21	0.75	-0.27	-0.08
Operational Readiness	3.15	0.79	-0.26	-0.4
Transformational Readiness	3.47	0.64	-0.34	-0.16

Note. All constructs measured on five-point Likert scales (1 = strongly disagree, 5 = strongly agree). Construct scores are unweighted means of retained items.

Dynamic Capability recorded the highest mean among the four predictor constructs and Environmental Factors the lowest, consistent with firms rating their own capability above the institutional support available to them. Among the three readiness outcomes, Transformational Readiness recorded the highest mean and Operational Readiness the lowest, a pattern suggesting that, on average, firms in this sample report more confidence in AI's longer-term strategic potential than in its current operational execution.

5.2 Measurement Model Assessment

Table 2. Measurement Model Assessment Results

Construct	Items	Cronbach's α	CR (pc)	AVE
Technological Factors	9	0.88	0.903	0.51
Environmental Factors	7	0.869	0.899	0.56
Organisational Factors	12	0.933	0.942	0.579
Dynamic Capability	12	0.925	0.936	0.549
Foundational Readiness	4	0.834	0.889	0.668
Operational Readiness	4	0.872	0.912	0.722
Transformational Readiness	5	0.825	0.877	0.588

Note. All values exceed recommended thresholds (Cronbach's alpha and composite reliability above 0.70, AVE above 0.50).

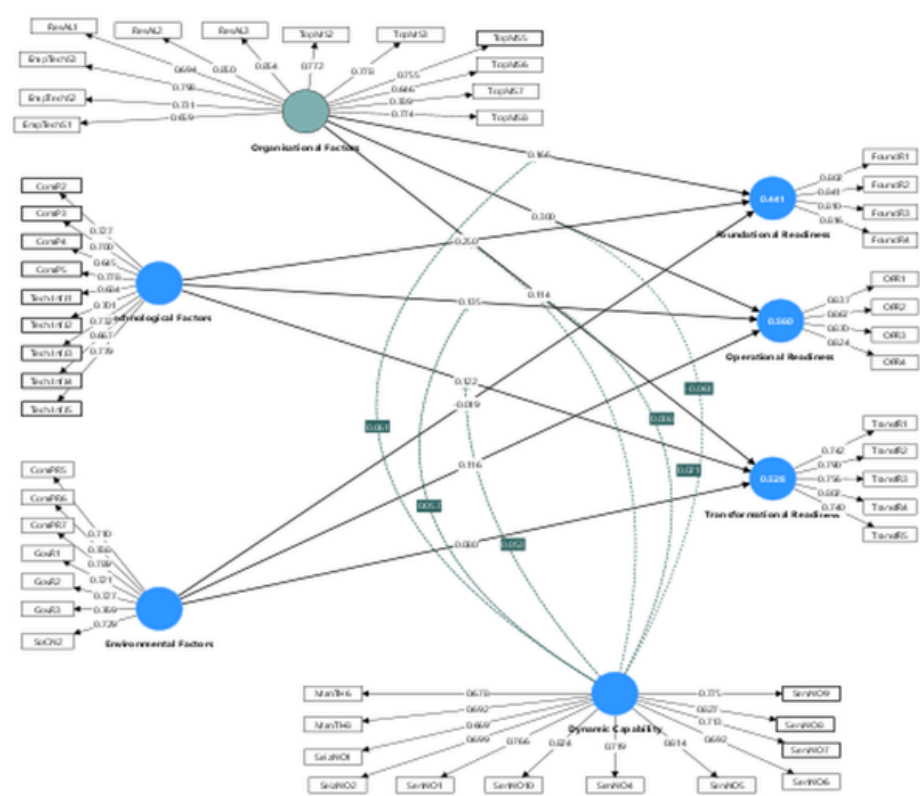


Figure 1. Measurement Model Assessment Chart

All 53 indicator outer loadings ranged from .646 (TopMS6) to .870 (OPR3), with every loading exceeding the conservative .60 minimum and the large majority exceeding .70; no loadings fell below .40 and none required removal on loading grounds.

Discriminant validity, however, does not hold cleanly across the full construct set. The Fornell-Larcker criterion requires the square root of a construct's AVE to exceed its correlation with every other construct. This holds for five of the seven constructs but fails for two pairs: the correlation between Organisational Factors and Dynamic Capability (.814) exceeds both constructs' own AVE square roots (.761 and .741, respectively), and the correlation between Environmental Factors and Organisational Factors (.791) exceeds both constructs' own AVE square roots (.748 and .761, respectively). The HTMT ratio confirms the same pattern: Organisational Factors and Dynamic Capability (HTMT = .868) and Organisational Factors and Environmental Factors (HTMT = .868) both exceed the .85 threshold, while Environmental Factors and Dynamic Capability (HTMT = .796) approach it without exceeding it.

This is a genuine limitation rather than a technicality. Three of the study's four exogenous constructs, Organisational Factors, Environmental Factors, and Dynamic Capability, are not cleanly empirically distinguishable from one another in this sample. This has two consequences addressed directly in Sections 5.3 and 6.3: individual path estimates for Organisational and Environmental Factors should be interpreted cautiously, since shared variance among correlated predictors can inflate, suppress, or destabilise individual coefficients even when the predictor block as a whole matters; and the near identical robustness of the EAIRI to equal versus data derived weighting (Section 4.5) is at least partly attributable to this same overlap, since reweighting highly correlated inputs changes a composite far less than reweighting genuinely independent ones.

5.3 Structural Model Assessment

Table 3. Structural Model Results

Path	β	SE	t	p	f ²	Decision
Technological → Foundational (H1a)	0.25	0.066	3.77	<.001	0.064	Supported
Technological → Operational (H1b)	0.135	0.059	2.29	0.022	0.024	Supported
Technological → Transformational (H1c)	0.122	0.068	1.78	0.074	0.018	Not supported
Organisational → Foundational (H2a)	0.166	0.118	1.41	0.159	0.011	Not supported
Organisational → Operational (H2b)	0.3	0.099	3.03	0.002	0.045	Supported
Organisational → Transformational (H2c)	0.114	0.103	1.11	0.269	0.006	Not supported
Environmental → Foundational (H3a)	-0.019	0.099	0.19	0.85	<.001	Not supported
Environmental → Operational (H3b)	0.116	0.077	1.51	0.132	0.01	Not supported
Environmental → Transformational (H3c)	0.08	0.083	0.96	0.337	0.005	Not supported
Dynamic Capability → Foundational (H4a)	0.357	0.1	3.56	<.001	0.07	Supported
Dynamic Capability → Operational (H4b)	0.282	0.088	3.2	0.001	0.056	Supported
Dynamic Capability → Transformational (H4c)	0.493	0.082	5.98	<.001	0.159	Supported
DC × Technological → Foundational (H5a)	0.008	0.068	0.12	0.905	<.001	Not supported
DC × Technological → Operational (H5a)	0.057	0.063	0.91	0.365	0.006	Not supported
DC × Technological → Transformational (H5a)	0.053	0.074	0.72	0.473	0.005	Not supported
DC × Organisational → Foundational (H5b)	0.061	0.065	0.94	0.349	0.005	Not supported
DC × Organisational → Operational (H5b)	-0.061	0.066	0.91	0.361	0.007	Not supported
DC × Organisational → Transformational (H5b)	0.021	0.07	0.3	0.767	0.001	Not supported

Note. Bootstrapping, 5,000 resamples, two-tailed. Effect sizes of .02, .15, and .35 indicate small, medium, and large f² respectively. DC = Dynamic Capability.

Table 3a. R-Square

Endogenous construct	R ²	R ² adjusted
Foundational Readiness	0.441	0.427
Operational Readiness	0.56	0.549
Transformational Readiness	0.528	0.517

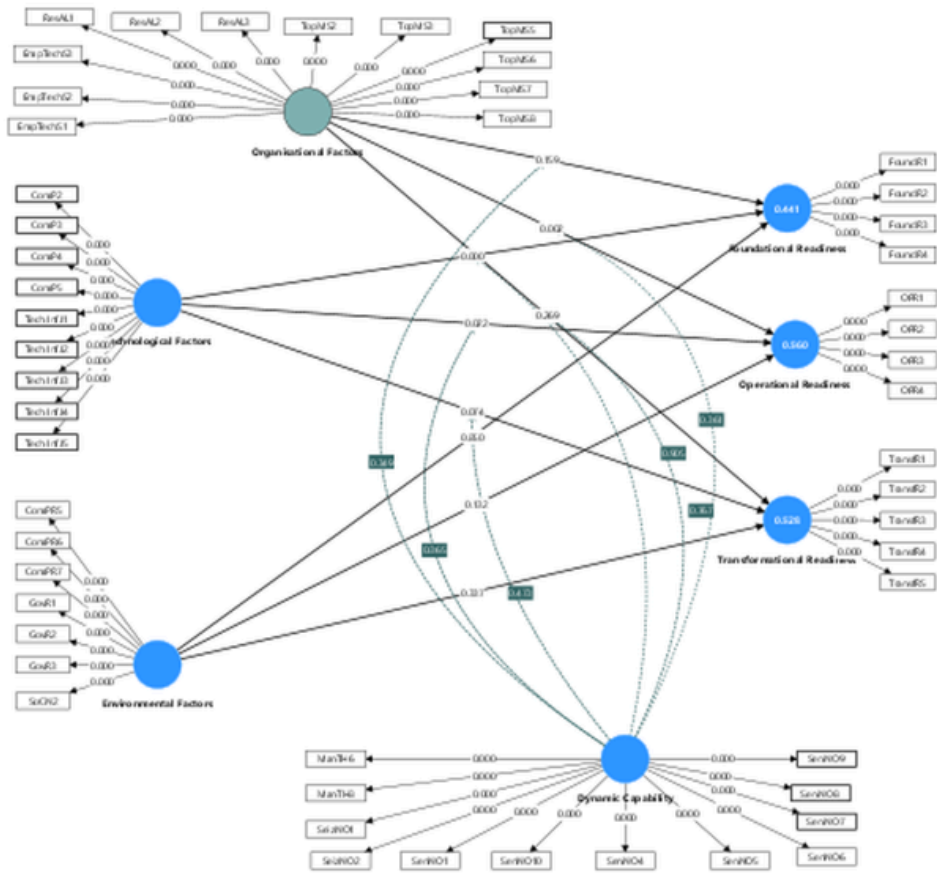


Figure 2. Structural Model Chart

H1 is partially supported: Technological Factors significantly predict Foundational and Operational Readiness but not Transformational Readiness. H2 is partially supported: Organisational Factors significantly predict Operational Readiness only, with a coefficient ($\beta = .300$) that exceeds Dynamic Capability's own effect on that same outcome ($\beta = .282$). H3 is not supported for any of the three outcomes. H4 is supported for Foundational and Transformational Readiness, where Dynamic Capability is the single strongest predictor, but not for Operational Readiness, where Organisational Factors is numerically the stronger predictor; H4's claim that capability dominates across the board therefore holds for two of three tiers rather than uniformly.

Model fit was assessed via the standardised root mean square residual (SRMR), which was .078 for the estimated model (.074 for the saturated model), below the conventional .08 threshold though closer to that boundary than earlier drafts of this study reported. The normed fit index (NFI) was .662, which is weak by conventional standards and is reported here rather than omitted.

H5a and H5b, the two moderation hypotheses, are not supported at conventional significance thresholds. This should not be read as evidence that dynamic capability plays no moderating role. The post hoc minimum sample size analysis generated directly by SmartPLS (Table 3b) shows that detecting the interaction effects actually observed would require sample sizes far beyond $N = 250$, in several cases beyond what any single study of this kind would plausibly collect. The non-significant moderation results are therefore reported as inconclusive due to insufficient statistical power, not as a confirmed absence of moderation.

Table 3b. Post hoc Minimum Sample Size for Selected Paths ($\alpha = .05$, power = 80%)

Path	Observed β	Minimum N required
Dynamic Capability → Transformational Readiness	0.493	26
Dynamic Capability → Foundational Readiness	0.357	49
Technological Factors → Foundational Readiness	0.25	99
Organisational Factors → Operational Readiness	0.3	69
Environmental Factors → Operational Readiness	0.116	458
Environmental Factors → Foundational Readiness	-0.019	17,389
DC × Organisational → Foundational Readiness	0.061	1,650
DC × Technological → Foundational Readiness	0.008	94,484

Note. Generated by SmartPLS 4 post hoc power analysis.

5.4 Entrepreneurial AI Readiness Index Scores

Table 4. Distribution of Firms Across EAIRI Readiness Categories ($N = 250$, data derived weighting)

Readiness category	EAIRI range	Number of firms	Percentage
Low Readiness	0.00 to 0.40	23	9.20%
Moderate Low Readiness	0.41 to 0.60	98	39.20%
Moderate Readiness	0.61 to 0.75	101	40.40%
High Readiness	0.76 to 0.90	23	9.20%
Very High Readiness	0.91 to 1.00	5	2.00%

The overall EAIRI score was 0.598 (SD = 0.143), placing Nigerian real estate firms at the upper boundary of the Moderate Low Readiness band, just short of the Moderate Readiness threshold. This is a more conservative headline figure, reflecting both the corrected weighting scheme and the removal of assumptions that could not be verified against the underlying data. EAIRI correlated significantly with all three measured readiness outcomes (Foundational, $r = .649$; Operational, $r = .736$; Transformational, $r = .711$; all $p < .001$), the criterion validity evidence reported in Section 4.5.

6. Discussion

6.1 Differentiated Capability Effects Across Readiness Tiers

The central finding of this study is not that entrepreneurial capability dominates AI readiness outright, but that different resources matter for different tiers of readiness. Dynamic Capability is the strongest single predictor of Foundational and Transformational Readiness, consistent with entrepreneurship research on institutional voids, in which capability substitutes for missing formal support (Bruton et al., 2008; George et al., 2016a). For Operational Readiness specifically, however, Organisational Factors is the stronger predictor ($\beta = .300$ versus $\beta = .282$ for Dynamic Capability), suggesting that moving AI from strategic intent into routine day-to-day use depends more on management support, financial slack, and internal culture than on entrepreneurial sensing and seizing behaviour per se. This is a more precise and, the authors argue, more useful finding than a single undifferentiated claim that capability matters most: it implies that practitioners and technology providers seeking to move a firm from foundational awareness to transformational integration may need to sequence different kinds of support at different stages, a point developed further in Section 8.2.

6.2 The Environmental Null Result: Absence of Evidence, Not Evidence of Absence

Environmental Factors showed no significant direct effect on any of the three readiness tiers, a result consistent in direction with available literature but reported here with considerably more caution. The post hoc power analysis in Table 3b shows that detecting the Environmental to Foundational Readiness path at its observed magnitude ($\beta = -.019$) would require a sample of 17,389 firms; even the Environmental to Operational Readiness path ($\beta = .116$) would require 458 firms against the 250 available. It is not possible, on this evidence, to distinguish between two genuinely different interpretations: that Nigeria's weak regulatory and infrastructural environment truly has no bearing on AI readiness because of firms' route around it entirely or that environmental factors have a real but small effect that this sample was never adequately powered to detect. The honest position is that the data are silent on which of these is correct, and the manuscript should not claim more than that. This tempers, without eliminating, the theoretical contribution described in Section 8.1: the finding that environmental factors are not automatically the dominant TOE dimension in this setting stands, but the stronger claim that firms actively compensate for environmental absence through capability requires either a larger sample or a different design, such as the qualitative follow up interviews or longitudinal tracking suggested in Section 9, before it can be asserted with confidence.

6.3 Discriminant Validity and the Limits of Disaggregating Institutional Context

Section 5.2 reported that Organisational Factors, Environmental Factors, and Dynamic Capability fail the Fornell-Larcker criterion and, in two of three pairings, the HTMT threshold as well. This has a direct bearing on how the structural results in Section 5.3 should be read. When three of four exogenous constructs share this much variance, individual path coefficients for the weaker or non-significant predictors, Organisational Factors on Foundational and Transformational Readiness, and Environmental Factors throughout, may understate or overstate each construct's independent contribution, since the model is asking the estimation procedure to apportion effect between constructs that respondents did not clearly distinguish in their answers. The safer interpretive stance, and the one adopted in this discussion, is a block level claim rather than a construct by construct one: taken together, firms' organisational, environmental, and capability related resources form a substantially overlapping cluster of context and capacity, within which Dynamic Capability is the most consistently significant individual predictor, but the precise boundary between where organisational support ends and entrepreneurial capability begins should not be treated as sharply drawn by this instrument. Future revisions of the survey instrument might usefully test whether Organisational Factors and Dynamic Capability are better modelled as a single higher-order construct in this population, a possibility this study's results raise but cannot resolve.

6.4 Comparison with Existing Literature

The significant effects of Technological Factors on Foundational and Operational Readiness align with the broader TOE literature (Sam et al., 2025; Lutfi et al., 2022) and with Ojekemi and Lawal's (2025) finding that technological infrastructure is the strongest predictor of readiness among Nigerian estate management firms, though the coefficients observed here ($\beta = .250$ and $.135$) are smaller than their reported $\beta = .41$, plausibly reflecting variance shared with Dynamic Capability and Organisational Factors, both of which were absent from their model. The finding that Dynamic Capability most strongly predicts Foundational and Transformational Readiness specifically, rather than uniformly across all outcomes, extends Alrub et al. (2025) and Singh et al. (2024) by showing that capability's advantage over contextual resources is not constant but varies by which stage of readiness is in question. The null environmental effect, treated with appropriate caution in Section 6.2, diverges from studies conducted in marginally more institutionally developed settings, such as Lutfi et al. (2022), where government support significantly predicted big data analytics adoption among Jordanian SMEs ($\beta = .309$); this divergence is consistent with, though not conclusively explained by, Nigeria's comparatively weaker institutional baseline.

7. Conclusion

This study examined AI readiness among Nigerian real estate ventures through an entrepreneurial dynamic capability lens, integrating the TOE framework with Dynamic Capabilities Theory and modelling readiness as three distinct outcomes, Foundational, Operational, and Transformational, rather than as a single undifferentiated construct. Analysing verified data from 250 firms using PLS-SEM, the study found that Dynamic Capability is the strongest predictor of Foundational Readiness ($\beta = .357$, $p < .001$) and Transformational Readiness ($\beta = .493$, $p < .001$), while Organisational Factors is the strongest predictor of Operational Readiness ($\beta = .300$, $p = .002$), exceeding Dynamic Capability's own effect on that outcome. Environmental Factors showed no significant direct effect on any readiness tier, a result reported as inconclusive given the sample's limited power to detect the small effect observed, rather than as confirmation that environmental conditions are unimportant.

Two hypothesised moderating effects of capability on the technological and organisational paths to readiness were not supported and are similarly underpowered rather than confidently disconfirmed. A rebuilt Entrepreneurial AI Readiness Index, weighted by the empirical magnitude of each dimension's structural effect rather than by assumption, places the sector at EAIRI = 0.598, the upper end of Moderate Low Readiness. Three of the study's four exogenous constructs show meaningful discriminant validity overlap, a limitation that tempers claims about which specific contextual resource matters most and is discussed fully in Sections 6.3 and 9. Taken together, these results indicate that entrepreneurial capability carries real, but tier-specific, weight in Nigerian real estate firms' AI readiness, with different resources mattering at different stages of readiness, a more precise and more defensible conclusion than the single compensatory capability narrative of most related studies.

8. Implications

8.1 Theoretical Implications

The study extends the TOE framework by showing that its three contextual dimensions do not carry uniform explanatory weight even within a single sector and country, and that this weight can vary by which specific readiness outcome is being predicted, a level of granularity earlier single outcome TOE studies could not surface. It extends Dynamic Capabilities Theory by showing that capability's advantage over contextual resources is itself conditional on outcome type, dominant for foundational and transformational readiness but not for operational readiness, which nuances rather than confirms the general claim that capability substitutes for institutional absence. Most cautiously, the study's discriminant validity findings (Section 6.3) suggest that entrepreneurship research applying TOE alongside Dynamic Capabilities Theory in resource-constrained settings should test, rather than assume, that organisational, environmental, and capability constructs are empirically separable in the population being studied, since this study's own instrument could not fully separate them.

8.2 Practical Implications

For real estate ventures, the differentiated finding in Section 6.1 argues against a single, undifferentiated capability investment strategy. Firms seeking foundational or transformational readiness gain more from capability building, technology scanning routines, pilot teams, and staff learning programmes, while firms seeking to move AI into routine operational use gain more from organisational investment specifically, management commitment, budget allocation, and internal process redesign. Technology providers serving this market should likewise differentiate their offer by which readiness tier a client firm is targeting rather than assuming capability support is universally the highest leverage intervention.

8.3 Policy Implications

Because the null environmental effect reported in this study is inconclusive rather than confirmed (Section 6.2), policy implications regarding regulatory clarity and infrastructure investment should be stated with corresponding caution. The weak Environmental Readiness mean ($M = 3.10$, the lowest of the four predictor constructs, Table 1b) signals an unresolved policy gap regardless of whether its structural effect can currently be detected, and regulatory clarity, broadband investment, and capacity building programmes remain reasonable policy priorities on structural grounds even without decisive path level evidence. Policymakers should not, however, treat this study's null structural result as license to deprioritise environmental investment, given the demonstrated risk that the result reflects insufficient statistical power rather than a genuine absence of effect.

9. Limitations and Future Research

Few limitations qualify these findings, which remain valid (cross-sectional design precluding causal inference; measurement of readiness rather than realised adoption; self-reported survey data). Two additional limitations follow directly from this study. First, three of the study's four exogenous constructs, Organisational Factors, Environmental Factors, and Dynamic Capability, do not clear conventional discriminant validity thresholds (Section 5.2, Section 6.3), which limits confidence in construct-specific claims and should be addressed in future instrument development, potentially through a higher-order specification or a reduced, more discriminant item set. And secondly, the two moderation hypotheses (H5a, H5b) were tested with a sample substantially underpowered for interaction effects of the magnitude observed; a considerably larger sample, in some cases several thousand cases depending on the specific interaction, would be required to test these hypotheses with adequate power, and the present non-significant results should not be over-interpreted as disconfirming evidence.

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Article

Designing PAYGO Business Models for Affordable Electric Mobility: A Techno-Economic Case Study of E-Bicycles in Windhoek, Namibia

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Abstract

Low-income households in cities like Windhoek spend over 20% of their income on public transport. Electric bicycles (e-bikes) offer a cleaner, more affordable alternative, but adoption remains low due to high upfront costs, driven largely by the lithium-ion battery, which can account for around 40% of total bike cost. This study proposes and evaluates a Pay-As-You-Go (PAYGO) business model that separates e-bike and battery ownership, using a portable, IoT-enabled smart battery management system to embed financing, monitoring, and lease enforcement directly into the battery, analogous to PAYGO solar home systems. The Business Model Innovation (4I) framework and Business Model Triangle structure the proposal, and a MATLAB-based techno-economic model compares its 10-year total cost of ownership (TCO) against conventional transport. PAYGO Battery-as-a-Service battery (PAYGO BAAS) reduces per-trip operating costs by 43% relative to taxis, but this excludes battery-access payments, however BAAS carries the second-highest 10-year TCO of all options evaluated. The electric bike lease-to-own model offers the better balance of low upfront cost and long-run affordability, with PAYGO's smart enforcement serving as a risk-reduction mechanism for transitional leasing rather than a substitute for eventual ownership.

Keywords: PAYGO e-mobility, battery management system, e-bike, IoT, sustainable transport

1. Introduction

1.1 Background of Study

According to Gololo et al (2022), a transport affordability benchmark established in 1996 in South Africa considers transport unaffordable when households spend more than 10% of their income on it. Individuals from low- and middle-income backgrounds disproportionately allocate a higher share of their income to transportation costs when accessing essential services such as education and healthcare (Gololo et al., 2022; Etin-Osa, 2023). According to Namibia's Sustainable Urban Transport Master Plan (SUTMP) (2013), nearly 87% of Windhoek's population are low-income earners and struggle to pay for transport, with many spending around 24% of their income just on mobility. This financial strain is rooted in colonial-era urban planning that forced low-income populations to live far from employment hubs. Taxis account for 46.2% of all trips, followed by walking at 26%, while only 1.7% of residents use municipal buses. According to the plan, without intervention, average car commute times are projected to increase from 9 minutes in 2012 to 54 minutes by 2032. The current trends reflect similar challenges seen in larger cities across the world, including reduced accessibility that leads to social isolation and exclusion of the urban poor, increasing traffic congestion, high costs associated with roads and parking infrastructure, unacceptably high traffic accident rates, elevated transport expenses for consumers, growing energy dependence, and rising levels of pollution.



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Affordable electric bikes offer a potential solution to Namibia's traffic congestion and affordability problems in transport. Studies have shown that the cost of commuting via electric bikes is significantly lower than that of public transport. De Vries (2006) stated that for the price of one 30-seater bus, 130-150 e-bikes could be purchased and operated more cheaply. Beyond the economic benefits, e-bikes offer environmental benefits. Given that road cars alone account for over 74.5% of transport-related emissions, the transportation industry remains a major contributor to global greenhouse gas emissions, contributing around 12% of yearly emissions (Dankers, 2024). According to De Vries (2006), electric bikes offer a 95% reduction in CO₂ emissions per 100 km travelled compared to a small motor car, resulting in massive reductions in the impact of greenhouse gases on the environment and the people who live in these congested areas. As the continent's electric mobility landscape evolves, the adoption of e-bikes could play a pivotal role in addressing pressing urban challenges and advancing a greener future in the Global South.

Despite the many advantages of electric bicycles, their widespread adoption in Namibia and across Africa remains limited due to several persistent challenges. Electric bikes can be expensive upfront, particularly due to battery costs. Many potential users worry about their range on a single charge, especially for longer trips. The limited public charging stations make regular use more challenging, and with few electric bikes on the road, there's still a lack of real-world performance data and experience. Together, these factors slow the large-scale deployment of electric bicycles despite their potential benefits (Dukulis et al., 2013; Kulkarni et al., 2024).

1.1 Problem Statement

The rapid advancement of electric mobility solutions has sparked growing interest in cost-effective, sustainable transportation financing models. However, there is currently a lack of research into the implementation of smart PAYGO systems in the electric mobility space and their potential to reduce upfront costs and increase electric vehicle adoption in low- and middle-income communities in Africa. This study tackles a real problem: electric bicycles are too expensive for people in low-income areas to afford upfront. We examine whether a Pay-As-You-Go (PAYGO) battery system for e-bikes could be economically viable by spreading costs over time rather than requiring a large initial payment. To determine whether this model makes financial sense for users, we compare the total net present cost of ownership of a PAYGO financed e-bike with other ways people get around—owning a car, taking taxis, or riding public buses. The goal is to determine whether PAYGO delivers affordable, sustainable transportation. Our results add to what we know about smart mobility solutions and new business models for electric bikes.

1.2 Objective of the Study

The primary objective of this study is to develop the concept of and evaluate the savings potential of the PAYGO e-bike model for the low- and middle-income communities in Namibia. To achieve these objectives, the following research questions:

·How would a PAYGO Battery-as-a-Service (BAAS) operate, add value and generate revenue?

- Is the PAYGO electric mobility model more cost-efficient for the user than traditional lease-to-own schemes, when evaluated using net present cost (NPC) per kilometre?
- Which variables most significantly influence the cost efficiency of a PAYGO-based e-bike system for the user?
- How competitive is the PAYGO electric mobility model compared to conventional urban transport options, including public buses and taxis, particularly for low- to middle-income users?

1.3 Significance of the Study

Researchers have studied PAYGO financing technology in solar home systems, prepaid electricity meters, and LPG systems, but surprisingly little research has examined its use for e-mobility—particularly e-bikes in Namibia. We don't yet have studies examining whether a PAYGO-financed e-bike system would be technically and economically feasible in the Namibian context.

Understanding how PAYGO e-bikes could work in Namibia would help us design transportation solutions that fit the country's specific socio-economic realities and environmental needs. Getting this right could mean better access to sustainable transport, lower carbon emissions, and new economic opportunities for Namibians.

2. Literature Review

Owning an automobile remains out of reach for most individuals in Africa, with a continent-wide motorisation rate of 44 per 1,000, compared to a global average of 180. There is an even more pronounced gap in the SADC region, with more than half of the population walking long distances or relying on unreliable public transport to access vital medical services, education, opportunities, or to deliver services to earn an income (Cloete, 2020). The number of electric vehicles (EVs) registered in a country is a direct measure of the adoption of electric mobility. As of now, the adoption of EVs in Namibia is slow, with only five light vehicle charging stations available in the country as of 2024, despite a target of 10,000 EVs by 2030, while South Africa had 1119 EVs in 2019 (Sovacool et al., 2022). According to Khan et al. (2022), Africa continues to import approximately 1.5 million used vehicles each year, reinforcing its dependence on inefficient, highly polluting transport technologies. Over the past decade, fossil fuel demand in the transport sector increased by nearly 50%, highlighting the growing environmental burden of current mobility patterns. Under existing policy trajectories, vehicle-related well-to-wheel CO₂ emissions are projected to more than double by 2050, reaching nearly 2.3 times their 2020 levels. In contrast, an accelerated shift toward electric and other zero-emission vehicles could reverse this trend, reducing transport-related CO₂ emissions to more than 50% below 2020 levels by mid-century. These projections highlight why shifting to electric mobility is so important—it's essential for cutting emissions, strengthening energy security, and putting Africa's transport sector on a more sustainable path.

E-bikes, or electric bikes, are considered an eco-friendly option for urban mobility. They can particularly benefit low-income communities by reducing transport costs, emissions, and private car use. Nevertheless, high levels of poverty in many African cities limit household purchasing power. This puts a significant damper on poorer urban communities' capacity to adopt new mobility options, such as electric transport, and to maintain them. As a result, in many developing regions, particularly sub-Saharan Africa, e-bikes are financially out of reach of the average consumer. Consequently, it continues to exclude the very populations that would benefit most from its long-term cost savings (Sovacool et al., 2022). PAYGO technology allows consumers to pay for products in instalments, often via a mobile money platform, thereby mitigating the need for a sizeable upfront cash payment (Baker, 2023; Lighting Global et al., 2022).

The unit costs of electric bicycles vary widely throughout the literature, depending on the electric bicycle system design, component selection, and the extent of the methodology. As per Keseev (2020), the total price of a self-assembled electric bicycle has reached N\$20655 (US\$1, 215) in Bulgaria, whereas Etin-Osa (2023) records a significantly lower conversion price of N 2050.71 (US 120.63) in Nigeria. Yan et al. (2018) also offer one of the most extensive market-based studies, surveying suppliers of electric bicycles, with an average response price of N\$7454.67 (US438.51). It is quite lower than the landed price of about N\$16150 (US950) that Giki et al. (2024) cite on electric bicycles in Tanzania.

The exceptionally low price advertised by Etin-Osa (2023) is an outlier that can be explained by the fact that the battery capacity of the system is low. There was a limited range of 8.3 km using the 36 V, 3.4 Ah battery, which is low in contrast to 30-40 km ranges published by Giki et al. (2024). Cost differentials are also attributed to battery chemistry. Yan et al. (2018) primarily discussed lead-acid battery systems, whereas Keseev (2020) and Giki et al. (2024) investigated lithium-ion batteries. According to Yan et al. (2018), the mean cost of lead-acid batteries was N\$1445 (US\$88), by far less than the landed cost of lithium-ion batteries of N\$4590 (US\$ 270) found by Giki et al. (2024). However, this cost advantage comes with a shorter battery life than lithium-ion batteries. The average battery life of lithium-ion batteries is about three years, or 800 charge cycles, compared to about two years for lead acid batteries (Yan et al, 2018). Rahman et al. (2017) found that lithium-ion battery prices have declined substantially over the past decade, falling by approximately 65% since 2010 to around US\$350 per kWh in recent years. Continued technological progress and economies of scale are expected to drive costs further down, with projections indicating prices below US\$120 per kWh by 2030.

However, battery degradation and lifetime performance influence long-term system costs of the battery to the user. Keseev (2020) reports that a 1 kWh lithium-ion battery achieved a range of 50–70 km with an expected lifetime of 700 charge cycles at 70% depth of discharge (DoD). However, there were major degradation rates in seven years of operation and 350 charge cycles. This deterioration presumably results from the combined effects of cycling and calendar ageing. Vasylyev (2025) establishes that the average state of charge (SOC), depth of discharge, operating temperature, C-rate and total number of cycles are highly important in determining the battery degradation. These considerations are especially applicable in the modelling of the cost of battery deployment in systems where the cost is monetised because of the finite energy throughput over their end-of-life. To maximise the lifetime of the battery, it was proposed that the battery have an average SOC of 50%, cycling between 20% and 80% SOC. The calendar ageing of the battery is maximised, reducing the duration of time it idles at 100% (Vasylyev, 2025).

Van Waes et al. (2018) state that the widespread adoption of sustainable energy and transport technologies requires radically innovative business models. Within this broader challenge, the integration of Pay-As-You-Go (PAYGO) financing models into e-bike systems may be a promising, yet underexplored, solution. PAYGO technologies have demonstrated success in improving affordability and access to energy services—most notably in solar home systems and LPG markets across East Africa (Shupler et al., 2020; Mergulhao et al., 2023).

The business model innovation literature, however, is engaged only lightly here, despite the study's own framing as a business model contribution. Work on resource-constrained innovation in emerging markets shows that business models built around cost, "good-enough," and frugal innovation capabilities are organized differently from those in resource-rich settings, with value creation typically achieved by reducing operational costs and re-engineering existing platforms rather than developing new products (Sharmelly & Ray, 2021). The PAYGO BAAS model is best understood as a cost-innovation business model response to capital constraints, not simply a cheaper product. Separately, the servitization and product-service-systems literature speaks directly to the ownership-versus-access trade-off this study investigates. In the closest available analogue, Zhou et al. (2025) show that Battery-as-a-Service outperforms Battery-as-a-Product specifically when battery cost or degradation rates are high, since the provider can retain and redeploy used batteries and adjust service quality — the same mechanism this study identifies in the PAYGO BAAS configuration. A recent structured review of the wider Battery-as-a-Service literature further finds that existing work remains fragmented across engineering, economic, and policy domains, with adoption driven by battery cost, infrastructure, and regulatory support (Haldar et al., 2026), underscoring the absence of a resource-constrained African case in this literature.

Finally, the PAYGO solar literature — the closest existing analogue to the proposal here — treats PAYG not as a financing mechanic but as a business model innovation, one whose central design challenge is matching repayment schedules to the irregular income patterns of low-income households (Yadav et al., 2019). This is the risk this study's enforcement mechanism is designed to manage, and it is the literature this paper's contribution should be read against.

There is currently limited research on the implementation of PAYGO financing technologies in electric bicycles. Most existing studies assume outright ownership of electric bikes or focus on adoption mechanisms such as purchase subsidies, rebates, or fiscal incentives. In addition, most of the electric bicycle research is concentrated in developed economies or in mature markets such as China, where large-scale adoption has already occurred. There is a clear absence of studies examining PAYGO-enabled electric bicycles as an adoption pathway within Namibian and broader African contexts. The significance of this study lies in its contribution toward addressing this gap by exploring how smart, PAYGO-based technologies can improve access to affordable, sustainable, and inclusive transport solutions in low- and middle-income markets.

3. Methodology

3.1 Business Model Design

In this study, the Business Innovation 4I framework (Figure 1) and Magic Triangle (Figure 2) were applied to develop and propose a PAYGO electric bicycle business model centred on a smart, PAYGO-enabled battery management system (BMS). The 4I Business Model Innovation Framework is a structured approach used to analyse and develop business model innovations. The framework consists of 4 stages: the initiation, ideation, integration, and implementation stages. The framework is supported by the Business Model Magic Triangle, which is a conceptual framework used to describe and evaluate the core logic of a business model through three interdependent dimensions: Value Proposition, Value Chain and Revenue Model.

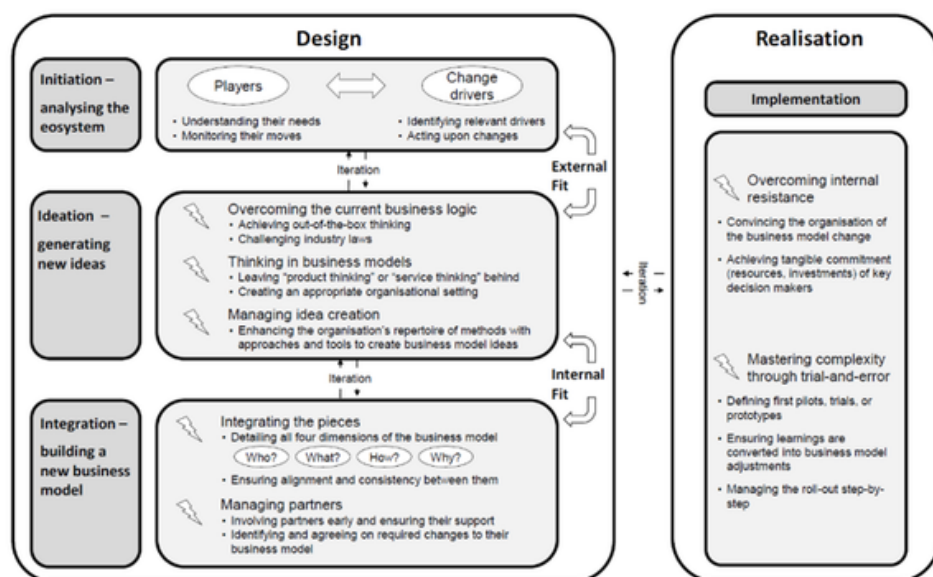


Figure 1: 4I Framework (Fluchter, 2014)



Figure 2: Business Model Magic Triangle (Fluchter, 2014)

3.1.1 Initiation Stage

During the initiation phase of the 4I framework, an understanding of the current players and change drivers of the electric bike market in Namibia was developed. The incumbent business model described in Figure 3 was informed by consultations with two local electric bike providers operating in Windhoek, conducted between October and December 2025 through semi-structured interviews during site visits. Providers were identified via a search for affordable electric bike suppliers in Namibia. Companies returned by this search were subjected to a preliminary screening, retaining only those offering bikes priced below N\$35,000 and providing rental options; this threshold was set with reference to the willingness-to-pay values reported by Giki et al. (2024). Informal semi-structured interviews were then conducted with the managers of the shortlisted companies to identify current product offerings and pricing.

Out of the 14 companies that came out of the search. EBIKES4AFRICA and the PAY (Physical Active Youth) After-School Centres were the only players in Windhoek that were found to offer affordable electric bike offerings to low-to-middle income individuals. EBIKES4AFRICA offers a range of electric bicycles priced between N\$15000 and N\$49000 through direct sales and a short-term rentals model shown in Figure 3, while PAY operates a rental-only model targeting students and young professionals. The EBIKES4AFRICA business model is a very simple sales model; the e-bikes are bought from an international supplier or locally manufactured and then sold directly to the customer or rented out to clients at a monthly rate. Electric bicycles are typically rented out at approximately 10% of their retail value per month, enabling a 10-month payback period for each bicycle. Users receive full access to the battery, along with a battery key and charger, without any remote monitoring or control mechanisms to enforce delinquent payments. Prospective lessors are commonly required to provide proof of income, proof of residence, recent bank statements, a refundable deposit and valid identification. These measures are intended to protect the operator from potential losses associated with misuse or non-payment. However, the cost of recovery remains high because the bikes have no tracking mechanism or means of preventing continued use of the bike in the case of default.

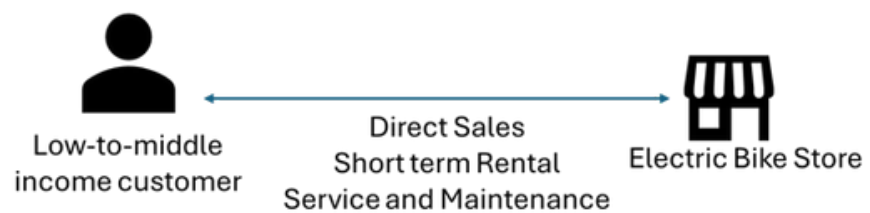


Figure 3: Current Electric Bike Business Model in Namibia

3.1.2 Ideation Stage

Some existing pay-as-you-go (PAYGO) systems were examined, which are currently deployed in Namibia. These included prepaid electricity meters, mobile airtime voucher systems, and PAYGO solar home systems. The identified systems incorporate mechanisms that address affordability challenges through consumption-based payment structures. Similar to PAYGO solar systems, users pay only for the energy they consume or make incremental payments toward system ownership through a lease-to-own arrangement. These approaches have been shown to increase the adoption of sustainable energy technologies by reducing upfront costs and aligning payments with users' cash flow. Likewise, prepaid electricity systems allow consumers to pay as they consume, eliminating large end-of-month bills while reducing the need for active monitoring and debt collection by utilities.

Our study explored how smart, IoT-enabled PAYGO Battery Management System (BMS) could be used to embed financing, battery monitoring, and lease enforcement directly into the battery in a similar manner to prepaid electricity meters and some solar PAYGO systems in homes.

3.1.3 Integration

During the integration stage, a PAYGO ecosystem diagram was developed to illustrate the interactions among system actors and the operational flow of the proposed solution. The Business Model Triangle, presented in Figure 2, was then constructed to define the model's value proposition, value creation and delivery architecture, and revenue mechanisms.

3.2 Techno-Economic Analysis

3.2.1 Total Cost of Ownership for PAYGO BAAS and PAYGO Lease

EBIKES4AFRICA's African BushBike and battery pricing as a benchmark. Table 1 presents the key technical and economic parameters of the African BushBike used in this study. To calculate the Net Present Cost (NPC) for this scenario, a 10% deposit was applied to the total bike cost, with the remaining balance amortised over one year to ensure full capital recovery by the end of the lease period. These cash flows were modelled in MATLAB using the `pvfix` and `pvar` functions to convert annualised figures into present values. The mathematical logic shows equations. (1) through (7).

$$C_{deposit-s1} = r_{deposit} \cdot C_{B+b} \quad (1)$$

$$C_{annual-lease-s1} = \frac{C_{B+b} - C_{deposit-s1}}{t_{lease}} \quad (2)$$

$$C_{maint-s1} = 0.1 \cdot C_B \quad (3)$$

$$C_{charging-s1} = E_{why} * C_{elec} \quad (4)$$

$$C_t = C_{annual-lease-s1} + C_{maint-s1} + C_{charging-s1} + C_{replacement} \quad (5)$$

$$NPC_{S1} = C_{deposit-s1} + \sum_{t=0}^T \frac{C_t}{(1+r)^t} \quad (6)$$

$$TCO_{per-km} = \frac{NPC_{S1}}{D_t} \quad (7)$$

Table 1: African BushBike Parameters

Parameter	Value
Price of African BushBike (20-inch tyre, No Battery)	N\$ 19000(US\$ 1118)
Motor Power	500W
Motor Torque	180 Nm
Battery (20Ah 48V; 960Wh; 13S8P) – 800 Charge Cycles)	N\$10000(US\$ 589)
Lease Period	1 Year
Interest Rate (Prime Rate Namibia) (BON, 2025)	10%
Deposit rate	10% of CAPEX
Annual Maintenance Cost	10% of Frame CAPEX
Electricity Cost in Namibia	N\$ 2.6/kWh

The model incorporates several key variables: $C_{deposit}$ represents the deposit cost on the bike frame and battery, $r_{deposit}$ is the deposit rate, C_{B+b} is the total cost of the bike, including the PAYGO battery, and t_{lease} is the lease period offered by the company to recoup the initial investment. The total annual energy required for the battery to complete all trips is denoted by E_{why} , while C_{elec} represents the unit electricity cost from the grid. $C_{replacement}$ It is calculated as the cost of a new battery after the remaining capacity in the battery is unable to cover the energy demand of the round-trip commute.

The Net Present Cost (NPC) of the scenario is represented by NPC_{S1} , and is the total distance travelled throughout the study period. D_t is calculated by multiplying the distance per round trip by the number of trips in a year and the study period. This study assumes a 10-year project lifetime (T). According to Yan (2018), this is the expected duration before a user in China typically scraps the bike. Consequently, we assume there is no salvage or scrap value at the end of these 10 years. This horizon is adopted in the absence of comparable scrappage data for Namibia or the wider SADC region, and e-bike replacement behaviour there may differ from urban Chinese markets given differences in climate, road conditions, and second-hand market structures. The 10-year figure should therefore be treated as an illustrative rather than a locally validated assumption. TCO_{per-km} is the total cost of ownership over 10 years.

The second configuration conceptualised PAYGO as a battery-as-a-service model, analogous to prepaid electricity systems. Under this approach, ownership of the battery is retained by the provider, while the bicycle frame is leased to the user under a conventional lease-to-own agreement, which can still be enforced through the PAYGO BMS. Battery access is subscription-based, with users paying a subscription fee to access the network of batteries but continuously paying for charging credits for home charging capabilities. The charging credits are equivalent to the electricity units bought for prepaid electricity meters, but in this case, the energy entering the battery is measured and gradually deducted from the units that were purchased. Once the charging units available on the battery are exhausted, the battery shuts off charging until sufficient units are uploaded on the battery. By embedding the monetisation strategy within the hardware-software link between the battery and the mobile application, the system can support both home charging and a battery-swapping network from eqn. (8) to eqn. (14), the model for this scenario is outlined, considering only home charging.

$$C_{deposit-S2} = r_{deposit} \cdot C_B \quad (8)$$

$$C_{annual-lease-S2} = \frac{C_B - C_{deposit-S2}}{t_{lease}} \quad (9)$$

$$C_{maint-S2} = 0.1 \cdot C_B \quad (10)$$

$$C_{charging-S2} = E_{why} \cdot C_{elec} + C_{wh} \cdot E_{why} \quad (11)$$

$$C_t = C_{annual-lease-S2} + C_{maint-S2} + C_{charging-S2} \quad (12)$$

$$NPC_{S2} = C_{deposit-S2} + \sum_{t=0}^T \frac{C_t}{(1+r)^t} \quad (13)$$

$$TCO_{per-km} = \frac{NPC_{S2}}{D_t} \quad (14)$$

The model uses several variables: $C_{deposit}$ represents the deposit cost on the bike frame, excluding the battery, $r_{deposit}$ is the deposit rate of the company, C_b is the total cost of the bike excluding the PAYGO battery, t_{lease} and is the lease period offered by the company to recoup the initial investment. The total annual energy required for the battery to complete all trips is denoted by E_{why} , while E_{elec} represents the unit electricity cost from the grid. C_{wh} is the degradation cost per kWh of charging units under the PAYGO model. In the BAAS model, there is no replacement cost for the user. The Net Present Cost (NPC) of the scenario is represented by NPC_{S2} , and D_t is the total distance travelled throughout the study period. D_t is calculated by multiplying the distance per round trip by the number of trips in a year and then multiplying by the total number of years in the study period. This study assumes a 10-year project lifetime. We assume there is no salvage or scrap value at the end of these 10 years. TCO_{per-km} is the total cost of ownership over 10 years.

3.2.2 Total Cost of Ownership for Alternative Mobility Options

All the abovementioned models were benchmarked against alternative mobility options, including outright electric bicycle purchase, taxi usage, bus transport, and private car ownership. To find the total cost of ownership of these models, the following data inputs were used for these net present cost calculations. These parameters have been summarised in the following table.

Table 2: Cost Parameters for ICE Transport Mode Option

Car/Motorcycle Cost (Second hand)	N\$ 30000 (US\$1764)
Petrol Cost	N\$20/l(US\$ 1.17)
Petrol Consumption Rate	0.08 l/km (De Vries, 2006)
Taxi Fare (Round Trip)	N\$ 26 (US\$1.53);
Bus Fare (Round Trip)	N\$ 17 (US\$ 1)

For the ICE car scenario, the capital cost of the car was assumed to be a second-hand car obtained from car dealerships in Namibia, and half of the values of the cheapest cars were used for this scenario. The taxi and bus fares were found from recent reports in the Namibian about the topics. The net present cost was calculated using the eqn. (15) – (28).

$$C_{\text{maint-car}} = 0.1 \cdot C_{\text{car}} \quad (15)$$

$$C_{\text{petrol-y}} = N_{\text{trips}} \cdot C_{\text{petrol}} \cdot r_{\text{petrol}} \cdot d_{\text{trip}} \quad (16)$$

$$C_t = C_{\text{maint-car}} + C_{\text{petrol-y}} \quad (17)$$

$$NPC_{\text{car}} = C_{\text{car}} + \sum_{t=0}^T \frac{C_t}{(1+r)^t} \quad (18)$$

$$TCO_{\text{per-km}} = \frac{NPC_{\text{car}}}{D_t} \quad (19)$$

Where $C_{\text{maint-car}}$ is the annual maintenance cost. The 10% annual maintenance assumption is applied uniformly across e-bikes and cars for comparability across options, given the absence of Namibia-specific maintenance cost data disaggregated by vehicle type. In practice, e-bikes typically incur lower maintenance costs than cars due to fewer moving parts and lower running speeds, so this assumption is likely conservative for the e-bike scenarios and should be revisited as local maintenance cost data becomes available. $C_{\text{petrol-y}}$ is the annual cost of petrol N_{trips} with being the number of round-trips in a year, C_{petrol} is the per-litre cost of petrol, r_{petrol} is the petrol consumption rate of the vehicle and d_{trip} is the distance covered per round trip.

The annual cost for the model was modelled in MATLAB using eqn. (20) to (2). is the number of round-trips in a year. and are the unit costs of the round-trip using a taxi and a bus, respectively

$$C_{Taxi} = N_{trips} \cdot C_{taxi} \quad 10 \text{ year}(20)$$

$$C_{Bus} = N_{trips} \cdot C_{Bus} \quad (21)$$

Finally, a single-parameter sensitivity analysis was conducted on both PAYGO configurations to identify the variables exerting the greatest influence on economic outcomes. The analysis evaluated seven key parameters: bike and battery capital expenditure (CAPEX), single round-trip distance, annual trip frequency, battery cycle life (energy throughput), annual maintenance costs, and motor power rating. Each parameter was adjusted by $\pm 20\%$ from the base case. The results were visualised using a tornado diagram to identify the sensitivity of the TCO to different commute parameters. The $\pm 20\%$ range applied here approximates plausible variation in technical and cost parameters, but understates the range some behavioural and policy-driven variables could realistically take: trip frequency may fall well below or rise well above this band with changes in employment or route conditions, and electricity tariffs in Namibia are subject to policy revision that could exceed $\pm 20\%$ within the study horizon. The single-parameter approach also does not capture compounding effects where several variables shift simultaneously. A scenario-based or ranged sensitivity analysis would better characterise these risks and is identified as a direction for future work.

3.2.3 Battery Degradation Model

To best evaluate pay-as-you-go (PAYGO) ownership costs, battery degradation and worst-case use case were modelled to identify the highest cost per kWh through use patterns that worst-effectively impact battery life. This is done to find the highest cost of battery degradation due to customer usage, given the Namibian context.

The cycling degradation model developed by Sayfutdinov et al. (2020) was selected for this study. Given that, Sayfutdinov et al. (2020) is about grid-scale battery siting/sizing, not e-bike degradation specifically, we adapted their cycling degradation formulation and recalibrated its constants against the manufacturer's rated 800-cycle lifetime for electric bike batteries.

$$SOC_{avg} = \frac{\sum SOC \Delta t}{\Delta t} \quad (22)$$

$$\Delta C_{idling} = 1.977 \cdot 10^{-11} \cdot e^{0.07511 \cdot T} \cdot 1.639 \cdot e^{0.007388 \cdot SOC_{avg}} \cdot t^{0.8} \quad (23)$$

Where ΔC_{idling} is the capacity fade due to idling calendar ageing, T is the temperature in Kelvin, SOC_{avg} is the storage state of charge, and t is time in months.

$$\Delta C_{fade} = (a_{DOD} \cdot DOD^2 + b_{DOD} \cdot DoD) \cdot \eta_{cycles}$$

Where ΔC_{fade} is the capacity fade due to cycle ageing, and DoD is the depth of discharge of each cycle. $a_{DOD} = 4.83 \cdot 10^{-3}$, $b_{DOD} = 2.83 \cdot 10^{-5}$ η_{cycle} is the number of cycles.

$$C_0 = C_0(1 - \Delta C_{idling}) \quad (26)$$

Where C_0 is the initial capacity, $E_{nominal}$ is the rated nominal capacity of the battery.

$$EOL = 0.8 \cdot C_0 \quad (27)$$

Where EoL is the battery capacity at the end of life of the battery, determined as 80% of the typical battery capacity. The MATLAB model simulates each battery cycle, reducing it by the capacity cycle fade, repeating this until EoL. The total energy throughput is determined at the end of the model.

$$C_i = C_{i-1}(1 - \Delta C_{fade}) \quad (28)$$

$$E_{EOL} = \sum_{i=1}^{N_{EOL}} E_i = \sum_{i=1}^{N_{EOL}} DOD * C_{i-1} \quad (29)$$

$$C_{Wh} = \frac{C_B}{E_{EOL}} \quad (30)$$

Where C_{Wh} is the battery degradation cost. C_B is the capital expenditure cost of the PAYGO battery, including the profit margin and PAYGO module. E_{EOL} is the total energy throughput at the end of life of the battery. The cycling degradation models were applied to estimate the cost per kilowatt-hour over the battery's operational lifetime. After determining the cost per kilowatt-hour under the PAYGO model and the energy consumption for the base-case trip scenario, the models were simulated in MATLAB and the results compiled into a tabular format for analysis.

3.2.4 Energy Consumption Model

The motion of the electric bicycle is modelled as a one-dimensional longitudinal system subjected to resistive forces and a power-limited drive force. Given the goal of the study, the commute from Omungwindi, Katutura (low-income location), to the main city centre of Windhoek was used as the trip route for the model. The relief between the two points was used to determine slope steepness for the model (). There are at least 20 total necessary stops, and these were used to implement acceleration stop and start cycles in the model. This trip was modelled to find the energy consumption per trip and per km.

According to Eq. (31), the total resistive force acting on the bicycle is given by the sum of rolling resistance, gravitational force due to road gradient, and aerodynamic drag. The driving force is constrained by both the maximum allowable force. Applying Newton's second law, the longitudinal acceleration is expressed in Eq. (33). The velocity () and position () are updated using a forward Euler discretisation with time step Δt . The cumulative electrical energy consumption in watt-hours is computed using Eq. (38). The battery power demand () accounts for motor-controller efficiency . The cumulative electrical energy consumption in watt-hours is computed as from the beginning of the trip till the end of the round trip, where d = the total distance of the round trip.

Table 3: Base Case User Scenario

User Base Case Scenario	Value
Mass (Bike + Rider) (m)	115kg (75 kg + 40kg)
Road angle slope ()	0.082
Rolling Resistance Coefficient ()	0.018
Aerodynamic drag Coefficient ()	0.72
Round Trip Distance (d)	24 km
Number of Stops in Round Trip	20
Radius of Wheel	0.508 m
Efficiency	75%
Trips per year	190

$$F_{resist} = C_{roll}mg + \frac{1}{2}\rho C_d A v^2 + mgsin\theta \quad (31)$$

$$F_{drive} = \min\left(\frac{P_{motor}}{v}, F_{max}\right) \text{ where } F_{max} = \frac{T_{max}}{R} \quad (32)$$

$$a = \frac{F_{drive} - F_{resist}}{m} \quad (33)$$

$$v_{k+1} = \max(v_k + a_k t, 0) \quad (34)$$

$$x_{k+1} = x_k + v_{k+1} \Delta t \quad (35)$$

$$t_{k+1} = t_k + \Delta t \quad (36)$$

$$P_{batt} = \frac{P_{motor}}{\eta_{motor-controller}} \quad (37)$$

$$E_{Wh} = \sum_{x=0}^{x=d} \frac{P_{batt}}{3600} \quad (38)$$

4. Results and Discussion

4.1 PAYGO Model Ecosystem

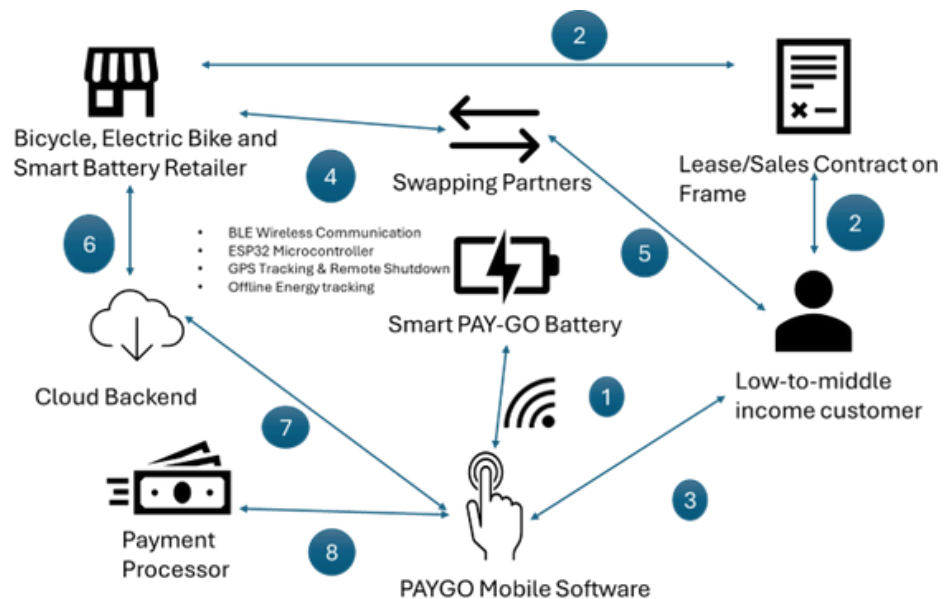


Figure 4: PAYGO Model Ecosystem

At the heart of the PAYGO ecosystem (Figure 4) is an embedded smart PAYGO battery management system (BMS) integrated with the battery pack's existing BMS. In (1), a dedicated mobile application connects to the smart BMS via Bluetooth Low Energy (BLE), enabling users to interact with the battery, validate tokens in the PAYGO application, and upload purchased energy credits to the battery. Once a token is paid for and obtained from the service provider on the application, the PAYGO application validates it using AES asymmetric encryption to decode and authenticate it and permanently invalidates the token to prevent replay attacks. Validated tokens are stored locally in the phone's onboard memory, and the burn list of used tokens is synchronised with an online server. The battery is physically secured to the bicycle frame to prevent tampering and unauthorised removal. Also, only the service provider can perform swaps or battery maintenance.

Users can choose between 3 PAYGO contract models shown in (2): Firstly, leasing the entire bicycle, including the battery, under a contract enforced by the BMS, which would be a time-based contract tied to recurrent lease payments, where ownership is transferred at the end of the contract. Secondly, leasing only the bicycle frame while paying a monthly subscription fee for access to a battery pool and home charger after which prepaid charging credits are bought to allow them to charge their batteries after discharging them. Finally, they can enter into a short-term rental contract of less than a month, where every month the BMS shuts off to remind the user of payment, however ownership is never transferred. In (2), users can swap depleted batteries at designated exchange points or charge at home if they have sufficient prepaid watt-hours uploaded to the battery. As the battery charges, energy entering the battery is tracked and decremented in real time. Once the prepaid energy allocation is exhausted, charging ceases automatically, and users must purchase additional watt-hours to continue charging the battery.

In (6) and (7), the entire PAYGO ecosystem is controlled by a back-end cloud-based server that stores customer data, account status, battery information, and contract data. Once a user logs in and is authenticated, the backend assigns the user a type (admin or basic user).

In (8), payments may be made via mobile money or in a physical store. When the payment is confirmed, the battery service provider creates an encrypted token payload containing the individual account ID and the purchased charge watt-hours. The timestamp is appended to this to generate unique tokens each time.

In (4) and (5), the PAYGO Battery provider can take advantage of the small and portable nature of e-Bike batteries. Any business willing to provide space and has the capacity could earn extra income by offering swapping services on its premises. The battery provider may either provide a modular swapping cabinet with an accompanying DC-DC charger and solar panels, or a number of basic AC chargers to charge the batteries directly from the grid. The swapping partner then earns an income from offering swapping services on their premises. With basic battery storage education, any business on major routes with high demand could be used to expand the battery swapping network. It incentivises other players to expand the network's reach for the battery provider, without large infrastructure investments or the need to secure land for their own battery-swapping infrastructure.

Figure 5 outlines the corresponding business model triangle for the PAYGO Battery-as-a-Service Model.



Figure 5: PAYGO Business Model Triangle

4.2 Total Cost of Ownership

Under the base case scenario, the commute time for one leg of the round trip (12 km) is 22 minutes at an average speed of 31.75 km/h. This has the same commute time as using a taxi in rush hour traffic. The depth of discharge of the entire round trip on the battery is 51%, consuming only 483.13 Wh. The specific energy consumption rate was 20.26 Wh/km.

After evaluating the model under the base-case scenario shown in Figure 6. The highest total cost per km under the base-case scenario was found to be car ownership at N\$ 1.75 per km, while the lowest total cost per km was the bus at N\$ 0.432 per km. This means that public transport remains the most cost-efficient way to move around in Namibia. However, the existing public transport system in Namibia is critically deficient, operating on a restricted weekday schedule with no weekend service and failing to meet peak-hour demand due to an ageing, unreliable fleet. Furthermore, the lack of integrated route interconnections within the city severely limits connectivity and overall commuter accessibility (SUTMP, 2013).

Analysis of the 10-year Total Cost of Ownership (TCO) per kilometre reveals that PAYGO leasing, outright purchase of an electric bike, and regular taxi use are closely comparable in long-term cost. While current short-term bike rental models, like the subsidised BushBike, are more expensive than taxi services over time. Based on a worst-case scenario—involving 100% Depth of Discharge (DoD) per cycle, a 6-month idle period at 100% State of Charge (SOC) and 32°C, and battery degradation to 80% of original capacity—the estimated levelized cost of energy for the Battery-as-a-Service model is N\$ 30.31 per kWh. However, real-world usage patterns would likely improve this cost efficiency. In practice, riders may pedal assist, adjust power levels, and experience shallower discharge cycles, all of which can increase total energy throughput before the battery reaches its end-of-life (EoL) threshold. This surplus in energy throughput over the rated worst-case-scenario energy throughput before the battery’s end of life leads to a surplus in revenue to the BAAS service provider.

Moreover, even after the battery degrades to below 80% of its beginning-of-life capacity, it typically retains sufficient energy—approximately double the daily commuting requirement of the base case scenario—to meet user needs. This effectively extends the battery's usable service life beyond its technical EoL, allowing users to continue benefiting from cost savings long after the provider has fully recouped the initial capital investment in the bike and battery system.

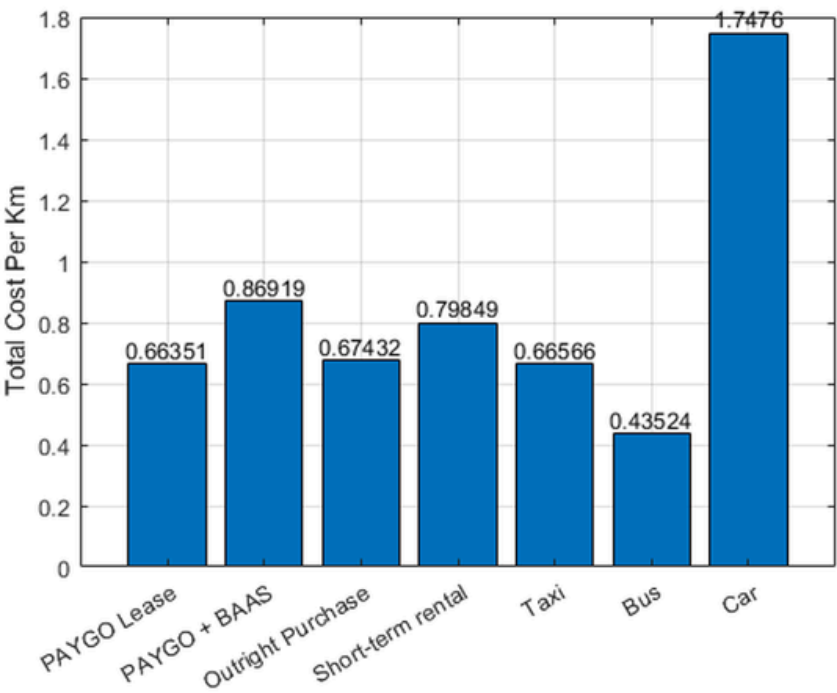


Figure 6: Graph of TCO of All Cases under Base Case Scenario Use Case

As illustrated in Figure 7, the dominant driver in reducing a user’s cost per kilometre in a PAYGO Battery-as-a-Service is the reduction in the capital expenditure of the bike frame and battery. Specifically, a 20% reduction in bicycle capital expenditure results in an approximate reduction of N\$0.09 per kilometre in user costs for PAYGO BAAS, while a 20% increase in your round-trip length leads to a N\$0.12 increase in cost per kilometre for PAYGO BAAS. However, compared to the lease model, the PAYGO BAAS configuration results in a difference of N\$8948 in the first year’s total cost, corresponding to a 28% reduction in the first year’s costs when commuting under the base case scenario. However, since ownership is never transferred, it is like paying for fuel at the pump. The recurring payment for energy eventually erodes the initial savings. In addition, under the PAYGO BAAS model, the cost per trip of the model is N\$14.73 per round trip (24 km), which is 43% lower than the cost per trip compared to taxis (N\$26) and only 13.4% (N\$2.27) lower compared to public buses. Electric bikes in any model, PAYGO BAAS, or lease have a lower long-term cost per kilometre when compared to owning a second-hand car/ICE motorcycle, with a 50% and 62% lower cost per kilometre, respectively.

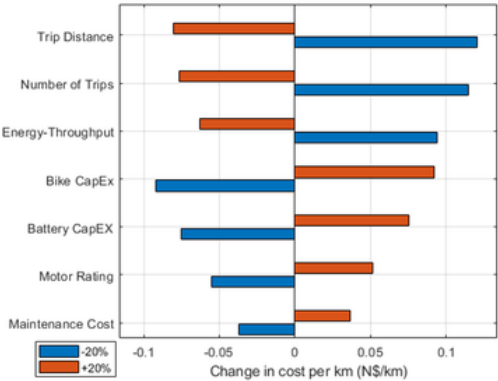


Figure 7: TCO Sensitivity Analysis of the PAYGO BAAS Relative to Base Case Scenario

Figure 9 shows that when benchmarked against the current bus and taxi costs, the lease model achieves total net present cost per kilometre parity with buses for this specific commuting case when the bicycle frame capital cost is N\$9500, excluding the battery component. It achieves net present cost per kilometre parity with taxis at a bicycle frame capital cost of N\$19000, excluding the battery component. On the other hand, the pure PAYGO BAAS model where the user is charged based on consumption, achieves total net present cost per kilometre parity with taxis for this specific commuting case when the bicycle frame capital cost is N\$10 700, excluding the battery component.

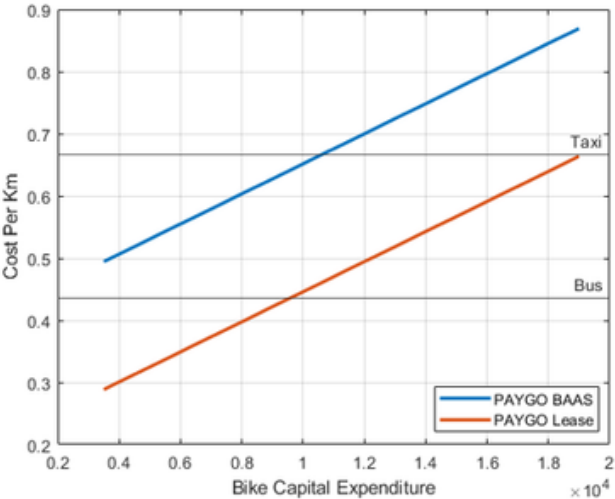


Figure 9: Change in Cost Per Km Against Bike Frame Cost (BAAS v.s Lease)

Importantly, the cost per kilometre by users grows inversely to revenue captured by the service provider; under this framing, the PAYGO model demonstrates significantly higher long-term revenue potential than standard leasing arrangements for the service provider, while simultaneously enabling higher market adoption due to an upfront cost that is approximately 30% lower for the user.

Read against this literature, the Namibian case adds a specific mechanism rather than a new general claim. Where the PAYGO solar literature manages income volatility through remote service-blocking on a discrete household appliance (Yadav et al., 2019), and the BaaS literature manages cost and degradation risk through provider ownership of a stationary or vehicle-mounted battery asset (Zhou et al., 2025), this study's contribution is to show what changes when payment enforcement is embedded directly in a small, portable, and individually mobile hardware unit — the e-bike battery — in a setting where formal credit infrastructure is weak and mobile-money-based collection is already established practice. This portability is what allows the same enforcement logic used in PAYGO solar to be repurposed for a transport asset without requiring a parallel loan product or a fixed point of service delivery. The resource-constrained business model literature's emphasis on reducing operational costs through the value-creation activities of the business model itself, rather than through new product development (Sharmelly & Ray, 2021), is consistent with what this study finds: the PAYGO BAAS configuration is not cost-competitive on a pure per-kilometre basis, but its value lies in the business model activity of enforced, incremental cost recovery, which is precisely the mechanism the fragmented BaaS literature has yet to examine in a resource-constrained, non-vehicular context (Haldar et al., 2026).

5. Conclusions

This paper shows that a PAYGO electric mobility model is most effective when used as an enforcement mechanism for transitional leasing rather than a permanent battery-as-a-service solution. While a pure PAYGO approach leads to higher long-run user costs per kilometre, it significantly lowers upfront barriers to access and provides strong revenue, enforcement, and risk-reduction benefits for service providers.

The results indicate that cost competitiveness depends primarily on bicycle capital cost and battery utilisation. A hybrid model—where PAYGO enables cost recovery and payment enforcement before eventual ownership transfer—offers the best balance between user affordability and commercial sustainability. Practically, PAYGO smart BMS systems are therefore best deployed as enabling infrastructure for scalable and inclusive electric mobility, rather than as a long-term substitute that prevents battery ownership.

6. Ethics

This study did not involve identifiable personal data or vulnerable participants. Consultations with electric bike providers were conducted with written informed consent, and ethical clearance was obtained from the Namibia University of Science and Technology.

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Article

Sunbread Max Hubs: Integrating Solar Energy, e-Mobility and Rural Micro-Industrialization.

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Abstract

The purpose of this study is to highlight how “Janus Cleantech” – an innovative startup in the electric vehicle (EV) space in Nigeria – is addressing the triple challenge of e-mobility, energy access, and energy conversion & storage (theme 1), energy distribution & transaction (theme 2), and economic participation and access (theme 3) – through an integrated innovation that combines solar energy infrastructure with electric mobility solutions to catalyse rural economic empowerment and micro-industrialization. The company’s flagship solution, Sunbread Max Hub (SMH), is a modular, containerized solar-powered charging hub that provides clean, off-grid electricity for both productive use and EV charging. These trikes are not just vehicles, but also tools of micro-industrialization – capable of powering mobile cold chains, agro-processing, vending, and delivery enterprises. Built within a 20-foot container, SMH – with mini and micro locally fabricated metal containers – represents a pivotal solution for addressing micro-industrialization – with resilient, solar-powered charging infrastructure, which enables sustained local commerce, job creation, and zero-emission micro-mobility. This practitioner case study highlights a story of innovation, climate adaptation and mitigation addressing the last mile question and empowering rural enterprise development.

Keywords: Three-wheeled vehicles; micro-industrialization; solar-powered charging infrastructure; e-mobility; energy access; energy conversion & storage; energy distribution & transaction; integrated innovation



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1. Introduction

Across Africa, millions of rural and peri-urban communities remain disconnected from reliable electricity and affordable mobility. This energy and transport poverty limits productivity, restricts trade, and deepens socio-economic inequality. The socioeconomic status of rural and peri-urban areas is often lower than that of urban areas. Due to several reasons, including the possibility of low-income users experiencing payment difficulties, the high cost of electricity connections deterring potential customers, and the modest amounts of energy consumed by households, which lower earnings, utilities are frequently hesitant to prioritize or extend services to these areas.

The purpose of this study is to highlight how “Janus Cleantech” – an innovative startup in the electric vehicle (EV) space in Nigeria – is addressing the triple challenge of e-mobility, energy access, and energy conversion & storage (theme 1), energy distribution & transaction (theme 2), and economic participation and access (theme 3) – through an integrated innovation that combines solar energy infrastructure with electric mobility solutions to catalyse rural economic empowerment and micro-industrialization.

Janus Cleantech differentiates itself through its integrated innovation that combines solar energy infrastructure with electric mobility solutions to catalyse rural economic empowerment and micro-industrialization.

The company’s flagship solution, Sunbread Max Hub, is a modular, containerized solar-powered charging hub that provides clean, off-grid electricity for both productive use and electric vehicle (EV) charging. Each Sunbread hub powers clean transportation, off-grid commerce, and rural productivity. These trikes (three-wheelers) are not just vehicles, but serve as tools of micro-industrialization – capable of powering mobile cold chains, agro-processing, vending, and delivery enterprises (see Exhibit 1 in the appendix).

The Sunbread max Hubs is built within a 20-foot container, while the Mini and Micro are locally fabricated metal containers – represents a pivotal solution for addressing micro-industrialization – with resilient, solar-powered charging infrastructure, which enables sustained local commerce, job creation, and zero-emission micro-mobility. Overall, this practitioner case study highlights how innovation, climate adaptation and mitigation, success story addressing the last mile question and empowering rural enterprise development.

Exhibit 1 – The Sunbread By Janus Africa/ Cleantech



The Sunbread represents a pivotal solution for addressing micro-industrialization – with resilient, solar-powered charging infrastructure – enabling sustained local commerce, job creation, and zero-emission transportation networks.

Last-Mile Mobility – Inside the Three-wheelers

In Africa, millions of rural and peri-urban communities remain disconnected from reliable electricity and affordable mobility (Akinbamiwa et al., 2025). This energy and transport poverty limits productivity, restricts trade, and deepens socio-economic inequality. The socioeconomic status of rural and peri-urban areas is often lower than that of urban areas. Due to a number of reasons, including the possibility of low-income users experiencing payment difficulties, the high cost of electricity connections deterring potential customers, and the modest amounts of energy consumed by households, which lower earnings, utilities are frequently hesitant to prioritize or extend services to these areas (Cantoni et al., 2022).

In recent years, three-wheeled vehicles – such as trikes, autocycles, and motorcycles with sidecars – have gained popularity among riders seeking a middle ground between the stability of a car and the freedom of a motorcycle. While these machines provide greater stability than traditional two-wheeled motorcycles under many conditions, they also bring unique handling challenges that require specialized knowledge and skill. Three-wheeled vehicles can be broadly categorized into two structural types – double-track and triple-track. While double-track configuration refers to a motorcycle with a sidecar, where the wheels form two parallel tracks, triple-track vehicles – commonly known as trikes – feature three wheels aligned either as two in front and one in back, or one in front and two in back.

2. Literature Review

Sustainable last-mile delivery and mobility systems

Sustainable last-mile delivery and mobility systems have emerged as critical components of modern transport and logistics, particularly in the context of rapid urbanization, environmental concerns, and the need for efficient service delivery. The growing body of literature reflects an increasing recognition that last-mile challenges are not only logistical but also deeply connected to sustainability, accessibility, and technological innovation. Across both developed and developing contexts, researchers have explored how transport systems can be redesigned to reduce emissions, improve efficiency, and enhance user experience, yet the literature reveals significant gaps between conceptual advancements and practical implementation.

A central theme in the literature reviewed in this study (see Table 1) is the importance of designing context-specific solutions, particularly for developing regions where infrastructure limitations and informal transport systems are prevalent. For instance, Ampaw et al., (2026) in their study on “Developing a Sustainable Last-Mile Transport System for Ghana and Burkina Faso,” present a modeling framework to optimize multimodal transport systems, suggesting that coordinated networks can significantly improve accessibility and sustainability outcomes. While such approaches provide valuable theoretical insights, they often rely on simulation rather than real-world validation, raising concerns about their applicability in complex, unpredictable environments.

Table 1: Summary of Reviewed Studies

Study	Research Context	Methodology	Country/Region
Ampaw et al. (2026)	Sustainable last-mile transport system design	Modeling & simulation	Ghana & Burkina Faso
Dadashzada et al. (2025)	EV adoption barriers in logistics	Empirical (survey & analysis)	Global / Multi-context
Hussin et al. (2021)	Integrated mobility systems	Case study	Egypt (New Cairo)
Kafile & Mbhele (2023)	IoT in last-mile distribution	Case study	South Africa
Mogire (2026)	Green innovation research agenda	Conceptual paper	Not country-specific
Mogire et al. (2025)	EV research trends	Bibliometric analysis	Global
Oluwaseyi et al. (2025)	AI-driven green logistics	Modeling / optimization	USA
Omweno et al. (2025)	Smart mobility & sustainability	Case study	Kenya (Nairobi)
Razak (2022)	Passenger last-mile accessibility	Conceptual / analytical	Global
Silva et al. (2023)	Urban logistics sustainability	Systematic literature review	Global
Sogbe et al. (2024)	Externalities in first/last mile	Empirical analysis	Developing country context
Stratford & Booysen (2025)	EV motorcycles feasibility	Case study / technical analysis	South Africa
Watts et al. (2026)	First vs last mile behaviour	Case study	South Africa

This limitation is echoed in Mogire (2026) in study on Green Innovations in Last Mile Delivery, which outlines future directions for sustainable innovation but stops short of offering empirically tested solutions. The reliance on conceptual and modelling approaches across the literature indicates a broader implementation gap, where proposed solutions remain largely untested in operational settings.

Integrated mobility systems

The need for integrated mobility systems is another recurring focus – be it in terms of micro-mobility (Comi et al. 2022; Reck et al. 2022) or first and last-mile solutions (Hussin et al., 2021; Kafile & Mbhele, 2023; Sogbe et al. 2024). In their study on “The First and Last Mile Solutions in Developing Countries, (Hussin et al., 2021) emphasizes that seamless connections between transport modes are essential for improving urban mobility, particularly in rapidly growing cities such as New Cairo. Similarly, Sogbe et al., (2024) in a study “First-Mile and Last-Mile Externalities,” highlighted how inefficiencies in these segments contribute to congestion, pollution, and reduced system performance. Although these studies underscore the importance of integration, they often treat first- and last-mile challenges as technical problems, with limited attention to the institutional and behavioural factors that influence system adoption and effectiveness.

Technological innovation is widely presented as a key enabler of sustainable last-mile systems. The application of digital technologies such as the Internet of Things (IoT) and artificial intelligence (AI) has been shown to enhance operational efficiency and reduce environmental impact. For example, Kafile & Mbhele (2023) investigated, using a South African Case, how “Last Mile Distribution Systems” may be improved “Through the Internet of Things.” These authors sought to demonstrate how IoT technologies improve tracking, coordination, and decision-making in logistics networks.

However, these studies tend to examine technologies in isolation, resulting in a fragmented understanding of how different innovations can be integrated into cohesive systems. This lack of technological integration limits the practical relevance of the research, as real-world logistics systems require interoperability across multiple platforms and tools.

Electric vehicles – cornerstone of sustainable last-mile delivery

Electric vehicles are consistently identified as a cornerstone of sustainable last-mile delivery, offering the potential to reduce greenhouse gas emissions and improve urban air quality. A comprehensive overview is provided by Mogire et al., (2025) “Electric Vehicles in Last-Mile Delivery: A Bibliometric Review,” which documents the rapid growth of research in this area and highlights the central role of EVs in future logistics systems (Mogire et al., 2025). Despite this optimism, the literature also reveals persistent barriers to adoption. An Investigation into the Major Barriers to the Adoption of Electric Vehicles in Last-Mile Deliveries for Sustainable Transport identifies high costs, inadequate charging infrastructure, and technological uncertainties as major obstacles (Dadashzada et al., 2025). While these challenges are well documented, there is relatively little research on how to overcome them in practice. Even context-specific studies such as “Electrifying Last-Mile Delivery Motorcycles in Cape Town: Challenges and Opportunities” provide valuable insights into feasibility but do not offer scalable solutions that can be generalized across regions (Stratford & Booysen, 2025). This suggests that the literature is more effective at diagnosing problems than at developing actionable strategies for large-scale implementation.

Urban sustainability considerations further underscore the importance of last-mile systems. For example, in their systematic review of “ Sustainable Urban Last-Mile Logistics,” Silva et al., (2023) identified a range of strategies, including consolidation centres and alternative delivery modes, that can reduce environmental impacts in urban areas. From a passenger perspective, Razak (2022) argues that efficient last-mile connectivity is essential for improving accessibility and reducing reliance on private vehicles. Nevertheless, much of this work remains focused on system-level efficiency, with insufficient attention to user behaviour and adoption dynamics. This gap is partially addressed by Watts et al., (2026) in a South African case study on first mile versus last mile behaviour, which demonstrates that user behaviour varies between different segments of the journey and must be considered in system design. However, such behavioural studies are relatively rare, indicating a need for more user-centred research.

The geographical focus of the literature reveals both strengths and limitations. Many studies concentrate on developing regions such as Africa, where last-mile challenges are particularly acute. For example, Omweno et al., (2025) in their evaluation of the role of urban smart mobility innovations, provide insights into how smart mobility solutions can improve sustainability outcomes in Nairobi. While these context-specific studies offer valuable contributions, their findings are often difficult to generalize due to differences in infrastructure, governance, and socio-economic conditions. Furthermore, the role of informal transport systems, which are widespread in many developing countries, is frequently overlooked, limiting the comprehensiveness of the analysis.

Another critical limitation of the literature is the lack of longitudinal and impact-based studies. Much of the existing research is cross-sectional or based on reviews, which, while useful for identifying trends, do not provide evidence of long-term sustainability outcomes. This makes it difficult to assess whether proposed solutions deliver lasting environmental and economic benefits. As a result, there is a pressing need for studies that track the implementation and performance of last-mile innovations over time.

Overall, the literature provides a strong foundation for understanding the complexities of sustainable last-mile delivery and mobility systems, but it remains fragmented and heavily skewed toward theoretical and exploratory approaches. There is clear consensus on the importance of integrating transport modes, adopting green technologies, and leveraging digital innovations, yet the path to achieving these goals in practice remains insufficiently explored. Future research must prioritize empirical validation, technological integration, and user-centred design, while also addressing policy and governance challenges. Only through such a holistic approach can sustainable and scalable last-mile solutions be developed to meet the demands of rapidly evolving urban environments.

3. Methodology

This case study adopts a descriptive research design following in the tradition of Nwankwo et al. (2005) in an article “*Methodological Issues in Researching Ethnic Entrepreneurship: African Entrepreneurship in London*”, which examined the methodological challenges of studying African-owned businesses in London. By using a context-aware approach as suggested by Nwankwo et al. (2005), this study interrogates the market context and opportunities within the Nigerian market.

The combined entry of new firms into the market underscores a rapidly evolving Nigerian EV market. Common drivers include: Rising Fuel Prices – Escalating costs of petrol make EV solutions increasingly attractive; Infrastructure Gaps – While CNG (compressed natural gas) and other alternatives exist, limited infrastructure hampers large-scale adoption; Energy Access Needs – Janus Cleantech’s innovation taps into Nigeria’s broader challenge of unreliable electricity access; and Sustainability Imperatives – Businesses and individuals are seeking greener, more affordable alternatives.

This practitioner case study presents a story of innovation, climate adaptation, and climate mitigation that addresses the last-mile challenge while empowering rural enterprise development. Case study research is a qualitative methodology that enables an in-depth investigation of a real-life phenomenon within its natural environmental and social context (Madichie, 2011; Madichie & Nkamnebe, 2025). A case may focus on an individual, a group, an organisation, an event, a problem, or a unique situation. Unlike experimental research, case studies do not isolate or control contextual conditions; instead, they examine how these conditions influence the phenomenon under investigation, providing a holistic understanding of complex real-world situations.

A major strength of a single case study lies in its ability to offer rich description and detailed analysis, helping researchers understand not only what happens but also how and why it happens. By exploring underlying processes and contextual factors, case studies can reveal deeper causal mechanisms that are often hidden in other research approaches. They also facilitate the identification of patterns, relationships, and emerging themes, contributing to the development, extension, or testing of theory (Stake 2005; Yin 2009, 2014). Consequently, case study research is widely recognised as a valuable approach for examining organisational, social, and developmental phenomena, particularly when addressing complex issues such as innovation, climate resilience, and sustainable rural development.

For this particular study, a case study research design was adopted. Data was collected through narrative storytelling and analysed iteratively using grounded theory techniques. The study’s methodology emphasizes flexibility, reflexivity, and community engagement, offering a model for researching underrepresented or hard-to-reach populations where standard methods are ineffective. It demonstrates that meaningful insights into ethnic (Indigenous in our case) entrepreneurship emerge best through trust-based, participatory, and context-aware approaches rather than rigid scientific conventions.

4. Findings

The SMH – with the mantra, “Powering Rural Economies with Decentralized Solar Energy and Electric Mobility” – was designed to provide solutions to a range of problems. Approximately 760 million people don’t have access to electricity in Sub-Saharan Africa (SSA) (Benayed et al., 2024), with over 60% of rural communities in SSA lack access to reliable electricity and affordable transport. This dual deficiency constrains smallholder farmers, market women, and rural entrepreneurs from processing, storing, and transporting goods efficiently. Petrol tricycles dominate rural logistics but are expensive to fuel and maintain, while unreliable grid supply limits local enterprise productivity. Without affordable energy and mobility, rural economies remain trapped in low productivity cycles –unable to grow beyond subsistence. There is an urgent need for decentralized sustainable solutions that simultaneously power transport and productive livelihoods.

Project Objective – To empower rural and peri-urban communities through clean, decentralized solar-powered charging infrastructure (Sunbread) and affordable electric mobility (Janus e-Trikes) that drive micro-industrialization, improve income, and expand access to modern energy services (see Exhibit 2).

The Solution: The Sunbread Ecosystem – Sunbread is a modular solar-powered micro-infrastructure hub designed for off-grid EV charging and productive energy use. Built within a 20-foot container, each hub integrates solar panels, battery storage, and multiple AC/DC chargers to support electric tricycles used for transport and micro-enterprises (see Table 1). To improve affordability and scalability, Sunbread is engineered into three investment-ready models. Each Sunbread hub powers Janus electric tricycles: Ayoka (7.2 kWh cargo trike) for logistics and micro-commerce; and Ketekete (9.6 kWh passenger trike) for affordable transport services. These trikes are designed as tools for micro-industrialization – supporting mobile refrigeration, agro-processing, vending, and delivery enterprises across rural communities (Table 2). Each Sunbread Max hub can support 2, 10, and 25 trikes, generating livelihood opportunities for over 5, 20, and 50 direct and indirect beneficiaries per community.

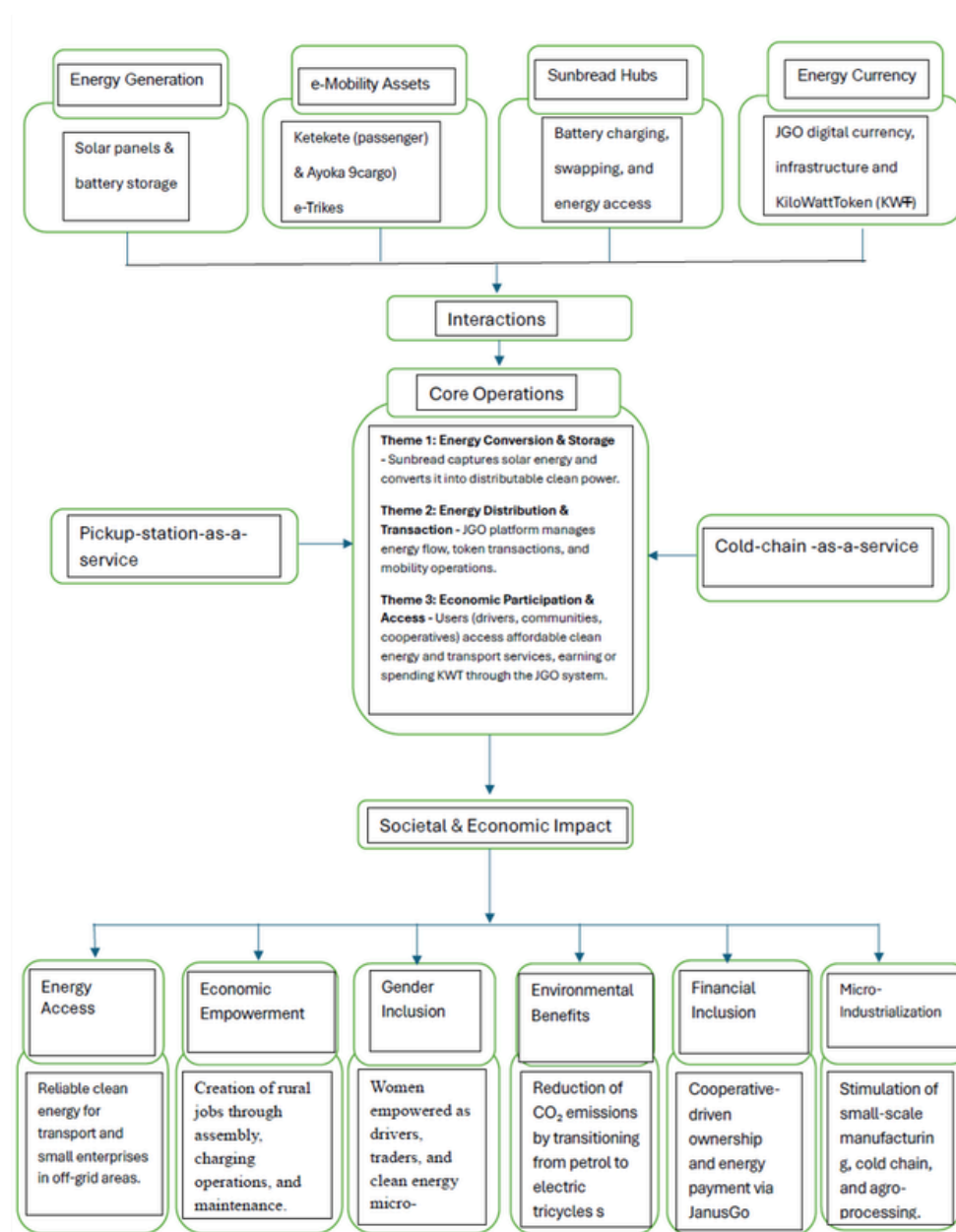
Table 2. Mobile capacity, components and use

Model Capacity	Components	Target Use	Cost
Sunbread Macro	2 e-trikes 4 solar panels, 1 battery, 2 DC chargers	Small communities & cooperatives	US\$10,000.00
Sunbread Mini	10 e-trikes 8 solar panels, 2 batteries, 5 AC chargers, 2 DC chargers	Rural markets & clusters	US\$50,000.00
Sunbread Max	25 e-trikes 16 solar panels, 4 batteries, 10 AC chargers, 4 DC chargers	Regional transport hubs & mini-grids	US\$120,000.00

Table 3. Outcomes and Impact

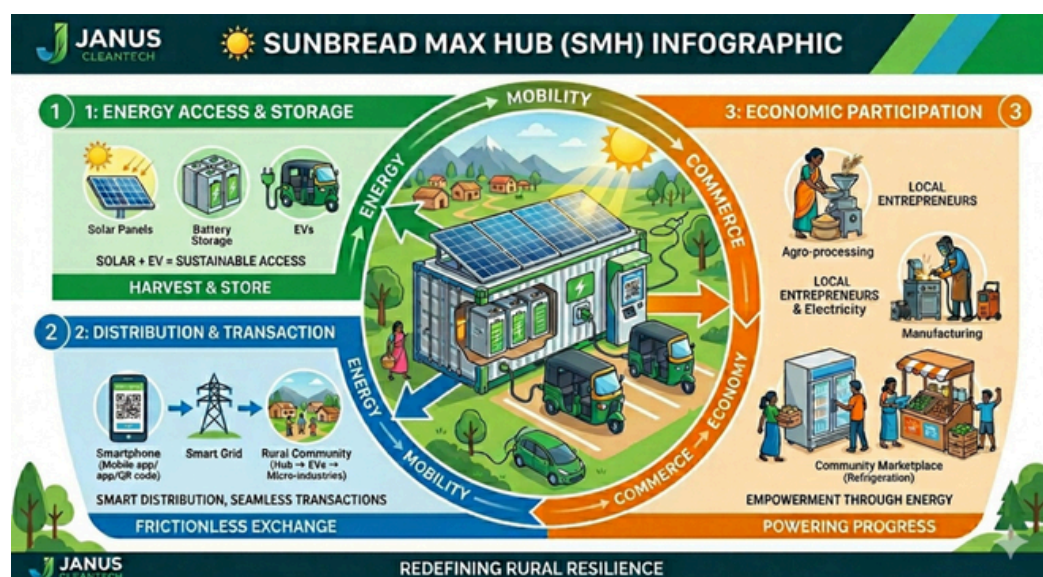
Impact Area	Key Results
Energy Access	Reliable clean energy for transport and small enterprises in off-grid areas.
Economic Empowerment	Creation of rural jobs through assembly, charging operations, and maintenance.
Gender Inclusion	Women empowered as drivers, traders, and clean energy micro-entrepreneurs.
Environmental Benefits	Reduction of CO ₂ emissions by transitioning from petrol to electric tricycles.
Digital & Financial Inclusion	Cooperative-driven ownership and energy payment via JanusGo (JGO) platform.
Micro-Industrialization	Stimulation of small-scale manufacturing, cold chain, and agro-processing.

This practitioner case study sheds light on the intricate dynamics of the energy ecosystem at Janus Africa/ CleanTech cutting across energy generation, e-mobility assets, ‘sunbread’ hubs (charging, swapping and energy access), the JGO platform/ digital infrastructure, and energy level at one level – and three themes in terms of interactions – energy conversion & storage (theme 1), energy distribution & transaction (theme 2), and economic participation and access (theme 3). Collectively, these three themes translate into societal and economic impact cutting across clean energy access, green mobility adoption, financial inclusion, local industrialisation, and climate resilience (see Figure 1 for a summary, and Exhibit 2 for the infographic of the themes).

Figure 1. The Janus Cleantech Ecosystem

Empirical Performance Indicators

From a technical standpoint, a standard Sunbread hub (20-foot, 15kWp configuration) can generate an estimated 60–75 kWh of electricity per day, depending on solar irradiance conditions. This supports continuous operation of cold storage systems, phone charging infrastructure, and electric mobility charging with an uptime of 95–98%, enabled by integrated battery storage and load prioritization. In terms of cold-chain utilization, each hub equipped with four chest freezers (approximately 319L each) provides a combined storage capacity of over 1,200 litres, enabling daily preservation of perishable goods such as fish, meat, and produce. Early modelling suggests that this can reduce post-harvest losses by 30–50%, particularly in coastal and market environments where spoilage is prevalent.

Exhibit 2 – The Sunbread Ecosystem and sub-themes

On the economic side, Sunbread hubs are designed to support multiple daily revenue streams, including cold storage fees, ice block sales, phone charging, and mobility charging. A single hub is projected to serve 50–150 users per day, depending on location density, while enabling direct and indirect income opportunities for traders, transport operators, and local service providers. Furthermore, the integration of electric tricycles reduces fuel costs for operators by up to 40–60% compared to petrol alternatives, significantly improving net daily earnings and financial resilience. While these indicators are based on pilot modelling and early deployments, they provide a quantifiable foundation for evaluating Sunbread's role in enabling decentralized, energy-driven micro-economies.

Scalability, Risk, and Sustainability Considerations***Scalability***

The Sunbread model is inherently modular, enabling phased deployment across multiple market clusters and rural communities. Each unit operates as an independent economic node, while also contributing to a broader network of decentralized energy and commerce infrastructure. This modularity allows for replication across diverse geographies with minimal redesign, particularly in regions with similar energy deficits and economic structures. Scalability is further enhanced by the integration of digital platforms such as JanusGo, which enables energy transaction tracking, asset financing, and user engagement. As deployment expands, multiple Sunbread hubs can form interconnected networks that support regional aggregation, logistics coordination, and data-driven optimization of energy and economic flows. However, scaling requires access to blended financing models, including developer equity, concessional funding, and private capital, as upfront infrastructure costs remain a barrier in early-stage expansion.

Risk Considerations

Despite its potential, the Sunbread model faces several operational and contextual risks. These include: **Technical Risks** – such as equipment failure, battery degradation, and system downtime in harsh coastal environments. **Market Risks** – variability in user demand, pricing sensitivity among low-income users, and adoption barriers. **Operational Risks** – community management challenges, theft or vandalism, and maintenance capacity constraints. **Financial Risks** – these include currency fluctuations, capital recovery timelines, and dependency on external funding for early deployment. To mitigate these risks, the model incorporates preventive maintenance protocols, local operator training, community engagement, diversified revenue streams to ensure resilience and communal ownership strategies.

Sustainability

The long-term sustainability of the Sunbread model is anchored on three pillars: economic viability, environmental impact, and community ownership. Economically, the multi-revenue structure ensures that the system is not dependent on a single income stream, improving financial resilience. Environmentally, the transition from fossil fuel-based energy and transport systems to solar-powered infrastructure significantly reduces carbon emissions and local pollution. Social sustainability is reinforced through community participation, including local employment, gender inclusion, and cooperative engagement models. By embedding Sunbread within existing economic activities—such as food markets and fisheries—the system aligns with real demand, ensuring continued utilization and relevance.

Ultimately, sustainability is achieved not by technology alone, but by aligning energy infrastructure with livelihood systems, ensuring that value creation and energy access evolve together. Overall Janus contributes to the emerging discourse on energy-enabled micro-industrialization in developing economies, with relevance to rural and coastal communities in Africa. As part of its practical validation, Janus Cleantech was selected as a finalist in the Foundation for Partnership Initiatives in the Niger Delta (PIND) Coastal Communities Off-Grid Energy Challenge. This selection supports the deployment of the Sunbread™ platform as a Solar Refrigeration Hub, designed to enhance cold-chain access, reduce post-harvest losses, and enable productive economic activities in coastal markets. The initiative reflects growing institutional recognition of integrated, decentralized energy systems as viable pathways for sustainable development and local value creation (PIND, 2026).

5. Conclusions and Implications

Sunbread by Janus Cleantech marks a transformative milestone in Africa's clean energy and mobility landscape – seamlessly integrating solar power, electric transportation, and local enterprise into a unified ecosystem that empowers communities, safeguards the environment, and drives inclusive economic growth. Through this initiative, partners could fuel prosperity from the ground up, transforming rural regions into self-sustaining, energy-enabled micro-economies.

As part of a growing portfolio of projects, Sunbread not only advances Nigeria's Energy Transition Plan (ETP) and the Rural Electrification Agency's Decentralized Energy Access Framework, but also reinforces the nation's commitment to clean energy and low-carbon mobility. Moreover, it aligns closely with the United Nations Sustainable Development Goals (SDGs) – particularly SDG 7 (Affordable and Clean Energy), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action).

In conclusion, the KilowattToken (KWT) represents a groundbreaking convergence of clean energy and digital finance (see for example, Chopade, Patne & Funde, 2025; Ray, 2026) – transforming measurable electrical power into a secure, tradeable asset that drives transparency, inclusivity, and sustainability. By enabling decentralized energy exchange, automated settlements, and verifiable smart metering, KWT establishes a scalable framework that links renewable energy generation directly to economic empowerment. This invention not only advances the global transition toward a carbon-neutral future but also demonstrates that environmental sustainability and profitability can coexist. Ultimately, this case study lays the foundation for future innovations and research that propel the achievement of the Sustainable Development Goals through technology-driven societal impact.

6. Societal impact

Nigeria's transportation sector is at the cusp of a clean mobility revolution. The combination of rising fuel costs, sustainability imperatives, and growing technological adoption is driving innovation in both corporate and public transport (Farinloye et al., 2024). In 2025, three pioneering companies introduced electric mobility solutions that promise to redefine how Nigerians commute and how organizations manage staff mobility (Madichie, 2025). These initiatives highlight opportunities for businesses, commuters, and policymakers to align around a shared vision of cost efficiency, innovation, and environmental responsibility.

In September 2025, one of the reported pioneering firms, Lagos-based clean energy company Janus Cleantech introduced Nigeria's first passenger and cargo electric tricycles, named Ketekete and Ayoka (Abraham, 2025; Adam, 2025). Unlike other players, Janus integrates mobility with energy access, making its solution particularly distinctive. Janus Cleantech's dual approach – transport plus energy – positions it as both a mobility provider and an energy enabler, directly addressing Nigeria's challenges around energy poverty and fuel dependency. Key Janus innovations include: IoT-Enabled Design – Vehicles run on swappable lithium batteries equipped with Vehicle-to-Home (V2H) and Vehicle-to-Business (V2B) capabilities. Mobile Power Solutions – The e-trikes double as massive portable power banks, providing electricity for households and small businesses. Driver Affordability – With petrol tricycles consuming up to 60% of a driver's daily income, Janus' e-trikes lower operational costs, enabling long-term savings.

In the pulse of African cities, movement is life. The three-wheeled keke that weaves through Lagos traffic, the tricycle that carries market goods before dawn, the rickshaw that brings a sick child to the clinic – these vehicles are not just transport. They are the arteries of informal economies, the difference between isolation and opportunity for millions. Yet they run on a fragile promise: fuel that is expensive, unpredictable, and toxic to the very communities they serve. A driver can spend 60 to 70 percent of her daily earnings at the pump, watching her margin vanish into fumes that choke her street and her children's lungs.

Janus Africa began with a refusal to accept that trade-off. The company looked at the same roads, the same drivers, the same urgent need for last-mile mobility, and asked a different question: What if the vehicle itself could become a source of wealth, not a drain on it? What if mobility was designed not around imported assumptions, but around African realities – potholes, power cuts, solar abundance, and the ingenuity of people who have always made systems work with what they have?

From that question came vehicles that feel familiar but function radically differently. Ayoka, the rugged electric tricycle built for cargo and while Ketekete is the passengers variant. They take on the broken roads and heavy loads that define African logistics. 'Keketric' reimagines the vehicles already on the street, converting existing petrol 'kekes' into clean electric workhorses so drivers are not forced to abandon the asset they spent years paying off. And 'Sunbread,' the solar-powered charging and battery swap hub, closes the loop – off-grid, resilient, and deployable where the national grid is absent or unreliable.

The impact is immediate and personal. When a driver in Ibadan swaps a depleted lithium battery for a full one in under three minutes, she is not just saving time. She is saving 5,500 naira that day, money that goes to school fees, to food, to reinvestment in her business. Across a month, that is a transformation in household income. Across a city, it is a shift in air quality as tailpipes go silent. Across a region, it is the beginning of energy independence, because that same battery can light a home after the keke is parked. Mobility and electricity stop being separate problems and become a single, integrated solution. But Janus Africa's vision stretches beyond individual vehicles. It is building ecosystems. Each Sunbread hub is more than a charging station. It is a micro-industrial node that creates local jobs for technicians and attendants, that anchors small businesses, that proves clean infrastructure can be profitable at the community level. The company's lithium battery systems are designed to be swappable and scalable, turning energy into something tangible that can be owned, traded, and stored. With platforms like KiloWattToken, Janus is even exploring how drivers and households can buy and sell power peer-to-peer, blending hardware with digital finance so that energy becomes a form of currency in places where cash is scarce but sunlight is not.

The environmental stakes are equally profound. Africa is urbanizing faster than any continent in history, yet it is also becoming the destination for the world's discarded combustion vehicles — old, inefficient, and polluting. Every electric tricycle Janus deploys removes roughly 4.5 tons of carbon emissions annually compared to its petrol counterpart. Multiplied across fleets, that is a measurable change in urban air quality and in the continent's climate ledger. More importantly, it is a model of leapfrogging. Africa does not need to repeat the century-long arc of fossil-fuelled industrialization. It can skip straight to distributed, clean, locally manufactured mobility powered by the sun.

This is already scaling beyond light vehicles, as the same battery swap systems and electric drivetrain technology that power a keke are being adapted for heavy transport across Africa's mining and logistics corridors. Through partnerships that will see hundreds of electric truck conversions per year, Janus is proving that the economics of electrification hold from the last mile to the long haul. The continent's growth does not have to come at the cost of its air, its health, or its balance sheets.

Ultimately, the impact of Janus Africa's vehicles cannot be measured only in kilometres driven or tons of CO₂ avoided. It is measured in the dignity of a driver who keeps more of what she earns. It is measured in the technician who learned to assemble lithium packs instead of importing them — and the child who studies under an LED powered by the same battery that moved goods that morning. Africa's mobility future will not be dictated by aid or by second-hand solutions. It will be built, owned, and driven by Africans. Janus Africa is putting the keys in their hands — and making sure the engine is clean, the energy is local, and the road ahead is theirs to define.

Sunbread by Janus Cleantech marks a transformative milestone in Africa's clean energy and mobility landscape — seamlessly integrating solar power, electric transportation, and local enterprise into a unified ecosystem that empowers communities, safeguards the environment, and drives inclusive economic growth.

Through this initiative, partners could fuel prosperity from the ground up, transforming rural regions into self-sustaining, energy-enabled micro-economies. As part of a growing portfolio of projects, Sunbread not only advances Nigeria's Energy Transition Plan (ETP) and the Rural Electrification Agency's Decentralized Energy Access Framework, but also reinforces the nation's commitment to clean energy and low-carbon mobility. Moreover, it aligns closely with the United Nations Sustainable Development Goals (SDGs) – particularly SDG 7 (Affordable and Clean Energy), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation, and Infrastructure), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action).

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Article

Business Model Innovation for Climate-Resilient Agriculture: A Pathway to Social Inclusion for Rural Communities in Sierra Leone

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Abstract

Sierra Leone's rural economy sits at the confluence of acute climate vulnerability and structural poverty, with agriculture accounting for more than half of national output while remaining exposed to recurrent droughts, floods, and post-harvest losses. In October 2024, the Government of Sierra Leone, the United Nations Industrial Development Organization (UNIDO), and the Global Environment Facility (GEF) launched the Promotion of Climate Adaptation Technology and Business Model Innovations and Entrepreneurship (CATBIE) project to mobilise micro-, small-, and medium-sized enterprises (MSMEs) as agents of climate adaptation in the water, agriculture, and energy sectors (UNIDO, 2024; GEF, 2024). This paper presents a qualitative, secondary-data case study of the CATBIE project and comparable interventions, examining how business model innovation is used to reconcile commercial viability with the social inclusion of women, youth, and smallholder farmers in Sierra Leone's rural communities. Drawing on the Business Model Canvas (Osterwalder & Pigneur, 2010), the Base-of-the-Pyramid framework (Prahalad, 2005), and the Sustainable Livelihoods Framework (DFID, 1999), together with the CGAP-IDH ABERA framework of business drivers for rural women's climate resilience (Sanford et al., 2025), the study synthesises evidence from UNIDO, GEF, FAO, CGAP, ILO, GIZ, and peer-reviewed sources published between 2021 and 2026. Findings indicate that Sierra Leonean MSMEs are innovating around integrated production-processing-marketing models, cold-chain and solar-powered pay-as-you-go technologies, and community-anchored delivery structures such as women's groups and youth cooperatives (FAO, 2026; UNIDO, 2025). These models advance social inclusion by intentionally embedding women's leadership, diversifying household income, and lowering the up-front cost of adaptation technologies, but their scale remains constrained by limited access to affordable finance, weak rural infrastructure, and thin technical and managerial capacity among early-stage enterprises. The enabling ecosystem comprising SMEDA, UNIDO's innovation platform, FAO's HASTEN incubation programme, and blended climate finance emerges as decisive in determining whether inclusion is a deliberate design feature or an incidental by-product of commercial expansion. The manuscript concludes with implications for refining the CATBIE project, for donor-funded MSME support programmes elsewhere in Sub-Saharan Africa, and for theory linking inclusive business model design to climate resilience outcomes.

Keywords: business model innovation; climate-resilient agriculture; social inclusion; MSMEs; Sierra Leone; CATBIE; base of the pyramid; sustainable livelihoods



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1. Introduction

Sierra Leone, a nation of approximately 7.7 million people, occupies an uneasy intersection of acute climate vulnerability and profound socio-economic fragility. Ranked among the world's poorest countries, its rural regions are disproportionately exposed to poverty, food insecurity, and environmental degradation, with an estimated 78 percent of the population experiencing some form of food insecurity. Agriculture accounts for more than half of national economic output and employs the majority of the rural labour force, yet the sector remains characterised by chronic underinvestment, low productivity, limited diversification, and inadequate rural infrastructure (U.S. International Trade Administration, 2026). This precarious foundation is compounded by escalating climate shocks recurrent droughts, flash floods, and coastal erosion that have intensified since the 1980s and now directly threaten crop yields, food availability, and rural livelihoods.

In response, the Government of Sierra Leone, in partnership with UNIDO and the GEF, launched the Promotion of Climate Adaptation Technology and Business Model Innovations and Entrepreneurship in Sierra Leone (CATBIE) project in Freetown on 7 October 2024. Financed through the GEF-managed Least Developed Countries Fund and executed by the Small and Medium Enterprises Development Agency (SMEDA), CATBIE seeks to unlock the ingenuity of the private sector particularly MSMEs to design and deploy climate adaptation solutions across the water, agriculture, and energy sectors (UNIDO, 2024; ReliefWeb, 2024). The project builds on an earlier UNIDO-GEF preparatory initiative dating to 2020–2021, which established the foundational rationale that Sierra Leone's small businesses, which employ a substantial share of the national workforce, are uniquely positioned to extend adaptation-enhancing products and services—climate-smart agricultural inputs, water management systems, climate risk insurance, renewable back-up power, and digital advisory tools into communities that would otherwise lack access to them (GEF, 2021).

CATBIE's stated targets are ambitious: to mobilise USD 25 million in co-financing, create 200 new jobs, support 50 MSMEs, train more than 6,200 individuals, and improve the resilience of 250,000 vulnerable people, with at least 40 percent women and 20 percent youth among the beneficiaries (GEF, 2024). Total co-financing committed to the project already exceeds USD 26.9 million against a GEF grant of USD 8.9 million (GEF, 2024). These targets situate the project squarely at the convergence of climate adaptation, entrepreneurship, and social inclusion, and provide a rich, contemporaneous case for examining Bridging how business model innovation among rural-facing MSMEs can be designed to be both commercially durable and socially inclusive.

This manuscript reports a secondary-data investigation of that convergence. It asks how MSMEs operating in Sierra Leone's agricultural sector are designing business models that integrate climate adaptation technologies with strategies for economic viability, what enables or constrains the scaling of such models, and how effectively they extend access to resources, income, and resilience to the country's most vulnerable rural groups principally women and youth.

1.2. Literature Review and Research Rationale

2.1 Inclusive Business Models in African Agriculture

A growing body of scholarship documents the commercial and developmental potential of inclusive agribusiness models across Sub-Saharan Africa and South Asia. The Commercial Agriculture for Smallholders and Agribusiness (CASA) programme, funded by the United Kingdom's Foreign, Commonwealth and Development Office, has demonstrated across Malawi, Nepal, Rwanda, and other countries that agribusinesses which integrate smallholder farmers into their supply chains through offtake agreements, aggregation structures, and technical assistance can simultaneously increase smallholder incomes and strengthen enterprise investment-readiness (CASA Programme, n.d.). This evidence base has helped close what CASA's implementing partners describe as a financing gap of over USD 100 billion for agricultural SMEs across Sub-Saharan Africa and Southeast Asia, and underscores the case for treating inclusive sourcing not as a philanthropic add-on but as a driver of commercial performance.

Complementing this, a systematic review of enterprise-level climate adaptation strategies in Sub-Saharan Africa finds that environmental, social, and governance (ESG)-aligned business practices are increasingly used by firms to manage climate-induced displacement and migration risk, though the review cautions that ESG framing is frequently decoupled from measurable community-level resilience outcomes (Meyer, 2023). Similarly, recent work synthesising rural agribusiness innovation strategies across West Africa argues that climate-resilient business models succeed where they combine technological adaptation improved seed varieties, solar-powered storage, digital market information with deliberate mechanisms for including smallholders, women, and youth in value-chain governance, rather than treating them solely as beneficiaries of aid (Michael & Ogunsola, 2025).

2.2 Gender, Youth, and Climate Resilience in Rural Enterprise

A parallel and increasingly influential strand of evidence addresses the specific mechanisms through which rural enterprises can advance women's economic resilience to climate change. The Accelerating Business to Empower Rural women in Agriculture (ABERA) initiative, a collaboration between the World Bank's Consultative Group to Assist the Poor (CGAP) and IDH, has identified seven practical business drivers spanning social engagement (women's groups, male allyship), economic inclusion (income diversification, access to productive assets), and service design (inclusive delivery strategies, digital tools, and data for insight) that simultaneously strengthen rural women's climate resilience and improve the commercial performance of the businesses that serve them (Sanford et al., 2025). This working paper provides one of the most granular, empirically grounded frameworks currently available for assessing whether a given business model is inclusive by design rather than by accident, and is therefore of direct relevance to the Sierra Leonean case.

Evidence from Sierra Leone itself reinforces the salience of this gender lens: although women constitute a majority of the agricultural labour force, they continue to face constrained access to land, credit, and productive assets, a gap only partially addressed by the 2022 Customary Land Rights Act (Feed Salone, n.d.). Youth-focused evidence is comparatively thinner but growing; recent analyses of agricultural transformation in West and East Africa emphasise that youth engagement strategies succeed when they combine vocational and digital skills training with access to finance and to viable, non-migratory livelihood pathways within local value chains (African Agricultural Transformation Initiative, 2025).

2.3 A Gap Specific to Sierra Leone

Despite this expanding literature, research that specifically examines the intersection of business model innovation for climate adaptation and its measurable contribution to social inclusion within Sierra Leone's particular institutional and socio-economic landscape remains scarce. Much of the available evidence on Sierra Leone is programmatic and descriptive drawn from UNIDO, FAO, GEF, and World Bank project documentation and news releases rather than analytically synthesised into a coherent account of the mechanisms, enablers, and barriers shaping inclusive business model innovation in the country. This manuscript addresses that gap by treating the CATBIE project and its documented portfolio of supported enterprises as a bounded case for systematic analysis, triangulated against comparable evidence from FAO's HASTEN business incubation programme, UNIDO's own project reporting, and broader Sub-Saharan African evidence on agtech-enabled climate resilience business models (Omoniyi, 2026).

3. Theoretical Framework

This study is anchored in a multi-theoretical framework drawing on entrepreneurship, development economics, and innovation studies, allowing the CATBIE case to be examined from complementary angles of business design, inclusion, and livelihood outcomes.

3.1 Business Model Innovation Theory

The Business Model Canvas (Osterwalder & Pigneur, 2010) is used to deconstruct the components of MSMEs' business models: the value proposition offered (which climate-resilient solution is provided and to whom), customer segments (who is targeted and, critically, who is excluded), revenue streams (how commercial viability is secured, for example through pay-as-you-go financing or processed-product sales), key resources and activities (the technologies, land, and labour required), and partnerships (the donors, cooperatives, and financial institutions that extend reach). Business model innovation, in this framing, is understood not merely as technological novelty but as a reconfiguration of these interdependent components to create, deliver, and capture value in ways that were previously unavailable to rural, climate-exposed customers.

3.2 The Base-of-the-Pyramid (BoP) Framework

Social inclusion is analysed through the lens of Base-of-the-Pyramid strategy (Prahalad, 2005), which holds that enterprises can generate both economic value and social impact by co-creating products and services with, rather than simply for, low-income populations. Applied here, the framework directs attention to whether MSMEs integrate rural women, youth, and smallholder farmers as suppliers, distributors, and co-designers of climate adaptation solutions, or whether they are positioned only as passive end-customers. This is supplemented by the ABERA framework's seven business drivers (Sanford et al., 2025), which operationalise BoP co-creation into observable, business-relevant practices women's groups, male allyship, income diversification, access to productive assets, inclusive delivery, digital tools, and data for insight that can be systematically searched for in the CATBIE evidence base.

3.3 Sustainable Livelihoods Framework

To assess resilience outcomes, the study draws on the Sustainable Livelihoods Framework (DFID, 1999), which conceptualises resilience as a function of access to five forms of capital: human (skills and training), social (producer groups and networks), natural (land and water), physical (storage, irrigation, and processing infrastructure), and financial (income, savings, and credit). This framework is used to interpret whether, and how, CATBIE-linked business models are strengthening these livelihood assets among vulnerable rural groups for instance through FAO's HASTEN incubation training (human capital), the formation of women's cooperatives (social capital), or investment in solar-powered cold storage (physical capital) (FAO, 2026).

4. Aim, Objectives, and Research Questions

The aim of this study is to investigate how MSMEs in Sierra Leone are developing and implementing innovative business models to provide climate-resilient solutions in rural agricultural communities, and to analyse how these models create social inclusion for vulnerable groups, particularly women and youth. Four objectives guide the analysis: (1) to map the types of business model innovation being adopted by MSMEs under CATBIE and related initiatives; (2) to examine how these models integrate climate adaptation technologies with strategies for economic viability and social impact; (3) to identify the barriers and enablers affecting MSMEs' ability to adopt and scale such models; and (4) to evaluate the enabling ecosystem policy, finance, and institutional support that shapes the inclusivity and success of these business models.

These objectives translate into four research questions: How are MSMEs designing business models that simultaneously achieve economic viability and social inclusion for rural farmers and communities? What are the specific barriers and enablers for MSMEs in adopting and scaling climate-adaptation business model innovations? How effective are these business models in providing access to resources, income generation, and resilience for women and youth? And what role does the enabling ecosystem play in shaping the success and inclusivity of climate-resilient business model innovations in Sierra Leone?

5. Methodology

5.1 Research Design

This research was conducted entirely through the analysis of secondary data, employing a qualitative, single-case study design in which the CATBIE project and its documented portfolio of supported MSMEs constitute the primary case. A case study design is well suited to exploring complex, contemporary phenomena within their real-world context and to answering the 'how' and 'why' questions that animate this study's research questions, particularly given that CATBIE remains in an early stage of implementation and cannot yet be evaluated through primary fieldwork within the scope of a desk-based study.

5.2 Data Sources

Data were triangulated across four categories of secondary sources. First, official project documentation from UNIDO, the GEF, and SMEDA, including the CATBIE project brief, GEF project database records, and associated press releases, provided detail on project design, financing structure, targets, and implementation status (UNIDO, 2024; GEF, 2024). Second, programmatic reports from complementary development partners including FAO's HASTEN business incubation programme, the ILO's Opportunity Salone programme, and GIZ's work on socio-ecological transformation in rural value chains supplied a broader context of entrepreneurship support in Sierra Leone (FAO, 2026; ILO, 2025; GIZ, 2025). Third, peer-reviewed and working-paper literature on business model innovation, inclusive agribusiness, and climate resilience in Sub-Saharan Africa was reviewed, including the CGAP-IDH ABERA working paper and recent journal literature on rural agribusiness innovation (Sanford et al., 2025; Michael & Ogunsola, 2025; Meyer, 2023). Fourth, grey literature and reputable media reporting including World Bank press releases, trade and investment guides, and sector analyses of African agtech business models supplemented the core evidence base (World Bank, 2025; Omoniyi, 2026; U.S. International Trade Administration, 2026).

5.3 Data Analysis

Document analysis was the primary method used for official project documentation, with data extracted and organised around the study's four research themes: business model components, integration of technology with viability and impact, barriers and enablers, and inclusion outcomes. Thematic analysis, following an inductive coding approach, was applied across the academic and grey literature to identify cross-cutting themes such as the role of blended finance, gender-intentional design, and the challenges of scaling early-stage enterprises. Findings were then read through the three theoretical lenses set out in Section 3 to structure interpretation.

5.4 Ethical Considerations

As a secondary data study, this research involved no direct interaction with human subjects. Nonetheless, the study adhered to principles of academic integrity, with all sources meticulously cited to avoid plagiarism; sought to maintain objectivity by presenting a balanced account of both successes and limitations documented in the evidence; and transparently acknowledged the limitations inherent to reliance on published secondary sources, including possible reporting bias in donor and implementing-agency communications.

6. Findings and Discussion

6.1 Patterns of Business Model Innovation

Consistent with the CATBIE project's stated approach, evidence points to three broad patterns of business model innovation among Sierra Leonean MSMEs operating in climate-exposed rural markets. The first is technology-enabled, pay-as-you-go delivery of climate adaptation infrastructure, particularly solar-powered water pumps, solar freezers, and cold storage for perishable produce, which UNIDO explicitly identifies as flagship interventions to be scaled through the project (GEF, 2024). By spreading the capital cost of adaptation technology over time, this model lowers the up-front barrier facing smallholder farmers and market traders, most of whom operate with limited savings and constrained access to formal credit.

The second pattern is the integrated production-processing-marketing model exemplified by enterprises such as Helzee Farms in Kailahun District, which evolved from a smallholder cassava-growing operation into a vertically integrated agribusiness producing branded staple foods (Kailahun Gari) and eco-friendly cosmetics for both rural and urban markets (FAO, 2026). Having participated in FAO's HASTEN incubation programme a four-day, SEED-delivered intensive workshop—the enterprise refined its value proposition and identified pathways to scale through value-chain partnerships, illustrating how targeted, short-duration technical assistance can meaningfully reshape an MSME's business model architecture (FAO, 2026). The third pattern is data- and platform-enabled 'phygital' models, combining digital tools such as market information platforms or weather advisories with physical, community-based agents or aggregation points; comparative evidence from African agtech firms indicates that such models increasingly monetise climate resilience services through partnerships with premium buyers and through data-driven approaches to agricultural risk (Omoniyi, 2026).

6.2 Integrating Technology with Viability and Social Impact

Analysed through the Business Model Canvas, these models achieve commercial viability principally through diversified revenue: branded product sales, service or usage fees for pay-as-you-go equipment, and processing margins on value-added goods, rather than reliance on donor grants alone. Social impact is embedded not as a separate activity but within core value-proposition and customer-segment choices: Helzee Farms, for example, is documented as generating seasonal employment for rural youth and organising women's groups as part of its production model, integrating inclusion directly into its key-activities and key-partnerships blocks rather than treating it as corporate social responsibility (FAO, 2026). Where such intentional design is present, the evidence aligns with the ABERA framework's proposition that social engagement and economic inclusion drivers—women's groups, income diversification, inclusive delivery—can be simultaneously good for resilience and good for business performance (Sanford et al., 2025).

6.3 Barriers to Adoption and Scale

The evidence points to a consistent set of barriers constraining the scaling of climate-adaptation business models among Sierra Leonean MSMEs. Chief among these is limited access to affordable, appropriately structured finance: the very rationale for CATBIE's blended co-financing structure USD 8.9 million in GEF grant funding leveraging nearly USD 27 million in co-finance reflects an underlying recognition that commercial finance alone is insufficient to de-risk early-stage climate adaptation enterprises in Sierra Leone (GEF, 2024). Weak rural infrastructure, particularly roads, electricity, and storage facilities, compounds this problem by raising the cost of both input sourcing and output distribution, a constraint also highlighted in national agriculture-sector investment analyses (U.S. International Trade Administration, 2026). A further barrier is thin technical and managerial capacity among founders, many of whom, like Helzee Farms' founder, entered agribusiness as a self-employment response to job loss rather than through formal business training, underscoring the continuing relevance of incubation-style interventions (FAO, 2026).

6.4 Enabling Ecosystem Factors

Countervailing these barriers, several ecosystem factors emerge as enablers. SMEDA's role as project executing agency, combined with UNIDO's stated intention to establish a national adaptation innovation platform and an inter-ministerial coordination mechanism, is designed to align MSME support with policy and regulatory reform (GEF, 2024). Complementary technical assistance channels, notably FAO's HASTEN programme and its partnership with SEED, provide structured, time-bound business-model coaching that appears disproportionately impactful relative to its short duration (FAO, 2026). International co-financing beyond CATBIE, such as the World Bank's 2025 supplementary financing of USD 18.34 million for the West Africa Food System Resilience Program's nature-based solutions component, signals a broader, multi-donor architecture of climate and food-system support within which CATBIE is embedded rather than an isolated intervention (World Bank, 2025).

6.5 Effectiveness for Women and Youth Inclusion

Assessed against the Sustainable Livelihoods Framework, the reviewed business models show tangible, if uneven, contributions to livelihood capitals among vulnerable groups. Human capital gains are evident through incubation training and vocational skills transfer; social capital through the formation of women's groups and youth cooperatives embedded within enterprise supply chains; physical capital through investment in processing and cold-storage infrastructure; and financial capital through diversified income streams from processed products and seasonal employment (FAO, 2026).

Nonetheless, structural constraints on women's land access, only partially addressed by Sierra Leone's 2022 Customary Land Rights Act, continue to limit the depth of inclusion achievable through business model design alone, suggesting that enterprise-level innovation, however well designed, cannot substitute for complementary policy reform on land tenure and financial inclusion (Feed Salone, n.d.). This finding echoes the ABERA working paper's caution that business drivers of resilience operate most powerfully when paired with an enabling policy environment rather than as a stand-alone remedy (Sanford et al., 2025).

7. Implications for Theory and Practice

7.1 Theoretical Implications

This study extends Base-of-the-Pyramid theory by demonstrating, within a fragile, climate-vulnerable state, that the depth of social inclusion achieved through business model innovation is contingent on whether inclusion is embedded within the value proposition and key-activities components of the business model, or appended as a peripheral programme. It further corroborates and contextualises the ABERA framework's seven business drivers (Sanford et al., 2025) by showing their applicability to a West African, Anglophone least-developed-country setting rather than the middle-income contexts in which much of the underlying ABERA evidence originates.

7.2 Practical Implications

For policymakers, the findings suggest that the national adaptation innovation platform envisaged under CATBIE should prioritise coordinated action on rural infrastructure and land tenure alongside MSME financing, since business model innovation alone cannot resolve these structural constraints. For development practitioners, the apparent effectiveness of short, intensive incubation formats such as HASTEN suggests that similar time-bound, business-model-focused coaching could be scaled cost-effectively across CATBIE's target portfolio of 50 MSMEs. For entrepreneurs, the evidence underscores that embedding women's groups, income diversification, and inclusive delivery strategies into core business design rather than treating them as compliance requirements for donor funding is associated with both stronger commercial resilience and deeper community impact.

8. Limitations

This study is subject to several limitations inherent to its secondary-data design. It is entirely dependent on the quality, availability, and potential framing biases of previously published information, much of which originates from the implementing agencies (UNIDO, GEF, FAO) with an institutional interest in reporting favourable outcomes. Because the CATBIE project was launched only in October 2024, the evidence base captures early implementation processes and initial outcomes rather than the medium- or long-term impact that the project's 2030 targets anticipate; the analysis should therefore be read as an assessment of design and early traction rather than of sustained impact. The geographic scope is confined to Sierra Leone, supplemented by comparative evidence from the broader Sub-Saharan African region where country-specific data were unavailable, which may limit the direct generalisability of some findings. Future research employing primary fieldwork household surveys, enterprise interviews, and longitudinal tracking of CATBIE-supported MSMEs would be valuable in verifying and extending the findings reported here.

9. Conclusions

This manuscript has examined how business model innovation among Sierra Leonean MSMEs is being mobilised, through the CATBIE project and comparable initiatives, to advance climate-resilient agriculture while promoting social inclusion for rural women, youth, and smallholder farmers. The evidence indicates that inclusion is most robust where it is designed into the core architecture of the business model its value proposition, key activities, and partnerships rather than layered on as a secondary objective, and that such design is significantly assisted by targeted technical assistance, blended climate finance, and coordinated policy support. Persistent barriers around rural infrastructure, access to finance, and land tenure nonetheless constrain the depth and scale of inclusion achievable through enterprise-level innovation alone. As CATBIE and similar donor-backed interventions move from early implementation toward maturity, sustained monitoring ideally incorporating primary data collection will be essential to determine whether the intended convergence of climate adaptation, entrepreneurship, and social inclusion is realised in practice, and to refine the policy and programmatic architecture required to support it.

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Article

Why legal advances in gender equality fail to translate into effective economic and financial inclusion for women in Africa.

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Abstract

Although Sub-Saharan Africa ranked 6th and North Africa (8th) score relatively high on the 2024 Global Gender Gap Index, only 30% of African countries appear in the top half of global ranking, producing the world's largest regional performance gap (22.8 points). In contrast, the African Women's Inclusion Index (AWII) shows high score for legal frameworks (72.1/100) but substantially lower results for financial inclusion (42.7) and economic inclusion (51.4), suggesting a divergence between formal rights and material empowerment.

This study tests hypotheses drawn from this paradox using a hypothetico-deductive approach with AWII panel data across 42 African countries (2011–2022). Multivariate fixed effects and random effects regressions identify structural determinants of women's economic inclusion, while difference in differences models estimate the causal impact of major policy reforms.

Results indicate that financial inclusion is the strongest predictor of women's economic inclusion, followed by women's leadership and the presence of enabling legal frameworks. The findings underscore a persistent implementation gap: legal rights alone do not produce commensurate economic outcomes.

We recommend targeted policy measures: scalable guarantee schemes to reduce credit constraints, gender sensitive financial inclusion strategies, binding quotas paired with investments obligation to strengthen leadership pipelines, and institutional mechanisms to align formal laws with prevailing informal norms. These interventions aim to translate legal gains into measurable economic empowerment for women across Africa.

Keywords: women's economic inclusion, financial inclusion, gender equality, Africa, institutions.



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1. Introduction

Sub-Saharan Africa ranks 6th and North Africa 8th rank relatively high on the 2024 Global Gender Gap Index respectable positions among world regions, yet large intra-regional disparities persist (World Economic Forum,2024).

Only 12 of 40 African countries (30%) appear in the global top half, with the largest inter-country performance gap worldwide (22.8 points between top and bottom performers) (World Economic Forum,2024).

Financial exclusion compounds just 37% of sub-Saharan African women hold financial accounts compared with 48% of men, constituting one of the most persistent gender gaps in the developing world (Demirgüç-Kunt et al., 2022).

In the African Women's Inclusion Index (AWII 2025), legal frameworks score highest (72.1/100), while financial inclusion (42.7) and economic inclusion (51.4) lag far behind (African Development Bank,2025).

Progressive legislation Maputo Protocol ratifications, equal pay statutes, property rights reforms coexist with widespread economic marginalization, indicating a pronounced implementation deficit in which formal rights do not translate into lived empowerment (Tripp et al., 2018; Goetz, 2020).

This paper asks: Why do legal advances in gender equality fail to produce commensurate gains in women's economic and financial inclusion across Africa?

We adopt an Institutional economics lens, North (1990) defines institutions as the rules of the game, distinguishing formal rules (laws, constitutions) from informal constraints (norms, customs).

Acemoglu and Robinson (2012) contrast inclusive institutions enabling broad participation with extractive ones concentrating opportunities. Applied to gender, Africa's formal legal progress clashes with persistent informal extractive practices customary land tenure, patriarchal norms, enforcement failures creating an institutional mismatch.

Feminist institutionalism argues that institutions themselves can embody masculine norms,so gender-neutral reforms operate within genred environments where male networks, unconscious bias, and gendered divisions of labor limit impact (Mackay et al,2010; Chamlou et al,2019).

The framework of institutional complementarity clarifies why isolated legal reforms underperform when not accompanied by aligned financial access, judicial capacity, and normative change (Hall et al, 2001).

We address three empirical questions:

- 1.What institutional and structural determinants drive women's economic inclusion across 42 countries?
- 2.How do financial inclusion and political representation influence economic participation?
- 3.What causal policy impacts do specific interventions (legal reforms, financial strategies, quotas) generate?

This paper makes four contributions. First, it provides the panel data analysis of the African Women's Inclusion Index (AWII), covering 42 countries across three periods (2011, 2017, 2022), quantifying the relative magnitudes of key determinants : financial inclusion, women's leadership, and legal frameworks on economic inclusion.

Second, it combines Hausman test-selected fixed and random effects panel regressions with difference-in-differences estimation applied to seven natural policy experiments. This dual strategy establishes both correlational patterns and causal policy impacts, enhancing identification robustness in the African context.

Third, it integrates institutional economics with feminist institutionalism to explain the formal-informal implementation gap (North,1990; Acemoglu et al.,2012; Mackay et al.,2010).

Fourth, by ranking policy levers by empirical impact (financial innovations, binding quotas, enforcement mechanisms) and presenting country-level lessons (successes such as Uganda and Gabon; reversals such as Algeria and Togo), the paper offers actionable guidance for policymakers (Kabeer, 2022; Kouamé, 2023; Mbiti & Weil, 2020).

The paper is organized as follows. Section 2 reviews the literature. Section 3 describes the hypothetico-deductive approach and AWII data. Section 4 presents panel and difference-in-differences results. Section 5 discusses theoretical and policy implications. Section 6 concludes and outlines avenues for future research.

2. Literature review

Institutional economics, as developed by North (1990), argues that economic outcome are shaped by institutions, defined as the formal and informal "rules of the game" that structure incentives and human interaction.

Formal institutions include laws, constitutions, and property rights, whereas informal institutions refer to norms, customs, and traditions. This distinction is especially relevant to gender inequality because formal legal equality does not necessarily eliminate discriminatory informal practices.

In many African contexts, women may enjoy legal rights on paper while facing persistent social and institutional constraints in practice.

Acemoglu and Robinson (2012) distinguish inclusive institutions, which broaden participation and distribute opportunities, from extractive institutions, which concentrate power and exclude marginalized groups. Applied to gender, inclusive institutions should promote women's economic and political participation, whereas extractive one's limit access to resources, decision-making, and markets.

The persistence of gender gaps across Africa despite substantial legal reform suggests that many countries have adopted more inclusive formal rules without fully transforming informal and organizational practices. This partial transformation helps explain why legal progress often produces limited economic change.

The concept of institutional complementarity strengthens this argument. Hall and Soskice (2001) show that institutions are more effective when they operate coherently across domains. For gender equality, laws are unlikely to deliver strong results unless they are supported by effective courts, functioning financial systems, administrative capacity, and social norms that accept women's autonomy.

Feminist institutionalism (Mackay et al., 2010) critiques mainstream theory for gender blindness, arguing institutions embody masculine norms disadvantaging women even after formal barriers fall.

From this view, the problem is not only weak implementation but also the gendered design of institutions. Empirical studies confirm that legal reforms often have uneven effects when enforcement is weak (Hallward-Driemeier et al., 2013) and the World Bank (2021) show that improvements in women's legal rights do not automatically translate into actual access to property, credit, or employment.

In Africa, ratification of the Maputo Protocol has expanded the legal framework for women's rights, but implementation remains uneven because of limited resources, weak institutions, and patriarchal resistance (African Union, 2020). This creates a persistent implementation deficit between formal commitments and lived realities.

Financial inclusion is widely recognized as a key pathway through which women can convert legal rights into economic agency. Access to savings helps women manage risk and accumulate assets, access to credit supports business expansion, and digital financial services reduce transaction and mobility constraints (Karlan et al., 2014; Fletschner & Kenney, 2014; Suri & Jack, 2016).

Global Findex data show sub-Saharan progress (34% to 55% account ownership, 2011–2021), but a persistent gender gap (37% women vs. 48% men) (Demirgüç-Kunt et al., 2022).

Despite progress, women across Africa face persistent structural barriers to financial inclusion, being less likely to own land or assets that can serve as collateral for loans. Customary land tenure systems often exclude women from property ownership, and even when statutory laws grant equal rights, implementation remains weak (Dancer, 2015).

This constraint is particularly acute, as most formal loans require physical collateral, and physical distance to bank branches, high account fees, and documentation requirements disproportionately exclude women, who on average have lower mobility and incomes (Allen et al., 2016).

These constraints are intensified by social and digital inequalities. In rural areas, women face lower mobility, weaker financial socialization, and, in some contexts, the need for male authorization to open accounts or engage in formal economic activities (Fletschner and Kenney, 2014).

Although mobile money has expanded access, the digital gender limits women's ability to benefit fully from fintech innovations because women are still less likely to own mobile phones or use mobile internet (GSMA, 2023).

Global Findex data confirm this persistent divide: although account ownership has increased in sub-Saharan Africa, women remain less likely than men to hold accounts or use digital financial services (Demirgüç-Kunt et al., 2022).

These findings suggest that financial inclusion is not simply a matter of access, but also of social position, infrastructure, and institutional support.

Women's leadership is another important determinant of gender inclusion. Pitkin's (1967) distinction between descriptive representation and substantive representation shows that the presence of women in office matters not only symbolically but also substantively when it changes policy priorities.

Female leaders can promote women's economic inclusion through agenda-setting, legislative action, and institutional reform. Evidence from political economy supports this claim. Chattopadhyay and Duflo (2004) show that female local leaders in India invest more in public goods that reflect women's needs. Cross-national studies also find that gender quotas increase the adoption of laws addressing violence against women and parental leave (Clayton and Zetterberg, 2018).

African evidence, though still limited, points in the same direction. Higher female parliamentary representation is associated with stronger social spending and greater attention to sectors relevant to women's welfare (Logan and Besigye, 2021).

Executive women leaders have also been linked to broader gender equality reforms, although causal identification remains difficult (Ellen Johnson Sirleaf Presidential Center for Women's Leadership and Development, 2022).

Outside politics, female leadership in firms and financial institutions can expand outreach to women, improve family-friendly workplace policies, and raise female employment shares (International Labour Organization, 2019; D'Espallier et al., 2011).

Female leaders may also influence norms by serving as role models, thereby shaping aspirations and reducing bias (Beaman et al., 2012).

However, leadership effects are conditional. The critical mass literature suggests that women need a minimum level of representation, often around 30%, before they can influence decisions in a sustained way (Dahlerup, 1988).

Institutional design also matters, because quotas with placement mandates are more effective than quotas without enforceable placement rules (Tripp & Kang, 2008). More broadly, female leaders operate within institutional environments that may resist change, so their influence depends on broader political and organizational support (Waylen, 2015). The literature therefore points to a recurring implementation deficit: formal reforms are often progressive, but actual outcomes remain constrained by weak enforcement, legal pluralism, and social resistance. Courts may be slow or inaccessible, labor inspections under-resourced, and sanctions rarely applied (World Bank, 2019).

In many African countries, customary law continues to govern marriage, inheritance, and family relations in ways that disadvantage women (Harper, 2011; Dancer, 2015). Gender institutions are also often underfunded and lack authority over line ministries, reducing their ability to coordinate implementation (African Union, 2020).

In addition, laws that conflict with deeply held gender norms may be ignored or circumvented, especially where civil society monitoring is limited (Alesina et al., 2013; Goetz & Jenkins, 2018).

The literature shows that institutional reform alone is insufficient. Legal frameworks matter, but their impact depends on financial access, enforcement, social norms, and representation. Financial inclusion is likely to be a strong driver of women's economic inclusion, but its effect is conditioned by structural barriers. Women's leadership can strengthen inclusion, but only when supported by institutional and organizational capacity. Despite this rich literature, three gaps remain. First, most studies examine legal frameworks, financial inclusion, and women's leadership separately rather than assessing their relative importance in a unified model.

Second, rigorous causal evidence on the effects of specific gender-related policy interventions in Africa remains limited.

Third, the mechanisms linking formal legal change to economic inclusion are still insufficiently specified.

This study addresses these gaps by estimating the relative contributions of legal frameworks, financial inclusion, and women's leadership using panel data from 42 African countries; by applying difference-in-differences methods to seven policy cases; and by interpreting the results through an institutionalist framework that highlights the gap between formal rules and effective implementation.

Based on this literature, we test three hypotheses:

- H1: Financial inclusion is the strongest determinant of women's economic inclusion in Africa.
- H2: Women's representation in leadership has a positive and significant effect on economic inclusion.
- H3: Legal frameworks have a positive but weaker effect than financial inclusion and leadership because of implementation deficits.

This study contributes to the literature in three ways. First, it provides the first multi-country panel analysis using AWII data.

Second, it quantifies the relative importance of financial, legal, and leadership dimensions within a unified framework.

Third, it combines institutional economics, feminist institutionalism, and quasi-experimental evidence to explain why formal reforms often fail to generate substantive inclusion.

3. Methodology

This study adopts a hypothetico-deductive approach, deriving testable hypotheses (H1–H3) from institutional economics and feminist institutionalism, and then testing them empirically using panel data from the 2025 African Women's Inclusion Index (AWII), developed by the African Center for Economic Transformation (ACET).

The AWII provides harmonized indicators for 42 African countries across three waves: 2011, 2017, and 2022, making it suitable for panel analysis of country-level variation over time.

The sample covers five African subregions: North, West, Central, East, and Southern Africa. This regional spread allows the analysis to capture substantial heterogeneity in institutional, financial, and leadership conditions across the continent.

The AWII is well suited to this study because it directly measures the four dimensions central to the theoretical framework: economic inclusion, legal frameworks, leadership representation, and financial inclusion. Its standardized scoring system enables cross-country and cross-time comparison, while its construction from harmonized sources such as Global Findex, the Inter-Parliamentary Union, Women, Business and the Law, ILOSTAT, UNESCO, and UN population data supports consistency and comparability.

Table 1 presents the regional breakdown of the sample, ensuring balanced geographic representation across North, West, Central, East, and Southern Africa.

Region	Countries
North Africa	Algeria, Egypt, Morocco, Mauritania, Tunisia
West Africa	Benin, Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Guinea, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, Togo
Central Africa	Cameroon, Central African Republic, Congo, Gabon, DRC, Chad
East Africa	Comoros, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Uganda, Rwanda, South Sudan, Tanzania, Zambia,
Southern Africa	South Africa, Botswana, Eswatini, Lesotho, Namibia

Source: Data from AWII 2025 (ACET), covering 42 African countries (2011, 2017, 2022)

Most importantly, AWII is explicitly designed to quantify the formal-informal institutional gap that underpins this study's theoretical framework from institutional economics and feminist institutionalism.

Variable	Description	Source	Years
Economic Inclusion	Composite (life expectancy, education, employment rate, formal employment, entrepreneurship)	AWII (ILOSTAT, UNESCO, UN Pop Div)	2011, 2017, 2022
Legal Framework	Maputo ratification + Women, Business and Law indicators	AWII (AU, World Bank)	2011, 2017, 2022
Leadership	% women in parliament, ministries, cabinet	AWII (IPU, UNDP, WhoGov)	2011, 2017, 2022
Financial Inclusion	Accounts, formal savings/loans, credit cards, internet purchases	AWII (Global Findex)	2011, 2017, 2022

To estimate the determinants of women's economic inclusion, the study uses pooled OLS, fixed-effects, and random-effects panel regressions. Fixed effects control for unobserved time-invariant country characteristics, while random effects are estimated for comparison. The Hausman test determines whether the random-effects specification is acceptable; if the test rejects the null hypothesis, the fixed-effects model is retained as the preferred estimator. This approach is standard for panel data where unobserved heterogeneity may be correlated with the regressors.

We estimate three models:

- Pooled OLS model:

$$Econ_{it} = \alpha + \beta_1 Legal_{it} + \beta_2 Lead_{it} + \beta_3 Fin_{it} + \varepsilon_{it}$$

- Fixed Effects model (controls for time-invariant unobserved heterogeneity):

$$Econ_{it} = \alpha_i + \beta_1 Legal_{it} + \beta_2 Lead_{it} + \beta_3 Fin_{it} + \gamma_t + \varepsilon_{it}$$

- Random Effects model (if individual effects are uncorrelated with regressors):

$$Econ_{it} = \alpha + \beta_1 Legal_{it} + \beta_2 Lead_{it} + \beta_3 Fin_{it} + u_i + \varepsilon_{it}$$

The Hausman test determines the choice between fixed and random effects.

To identify causal effects of specific policy interventions, we apply difference-in-differences (DiD) analysis to seven African countries that implemented identifiable reforms between 2017 and 2022.

The DiD approach compares changes in outcomes before and after the reform in treated countries relative to similar control groups from the same region, isolating policy impacts while controlling for common trends.

The model is specified as:

$$Y_{it} = \alpha_i + \beta(Treated_i \times Post_t) + \beta_2 Post_t + \gamma X_{it} + \varepsilon_{it}.$$

Where Y_{it} the outcome variable (economic inclusion, financial inclusion, legal framework, or leadership), $Treated_i = 1$ for reform-implementing countries, $Post_t = 1$ for 2022 (post-reform), and includes controls.

Country fixed effects (α_i) absorb time-invariant heterogeneity, and the parallel trends assumption verified by testing pre-treatment interactions (e.g., $Treated_i \times 2017$) ensures no divergent trends before reforms.

This table presents seven case studies for DiD analysis, targeted policy interventions across African countries, selected for their clear implementation timelines and regional relevance.

Each case allows causal identification through comparison with untreated peers in the same sub-region, ensuring contextual similarity.

The seven case studies were purposively selected based on four criteria : clearly identifiable reform timing, direct relevance to one of the study dimensions, availability of pre and post intervention observations, and existence of comparable untreated countries with the same sub region.

Country	Treatment	Year	Outcome	Control
Uganda	SIMPRS registry	2019	Financial inclusion	East Africa
Gabon	Women's Decade	2015–2025	Legal framework	Central Africa
Algeria	Quota removal	2021	Leadership	North Africa
Lesotho	Financial strategy	2017–2021	Financial inclusion	Southern Africa
Mali	Financial strategy	2016–2020	Financial inclusion	West Africa
Kenya	Women Enterprise Fund	2020	Economic inclusion	East Africa
Togo	Law repeal	2021	Legal framework	West Africa

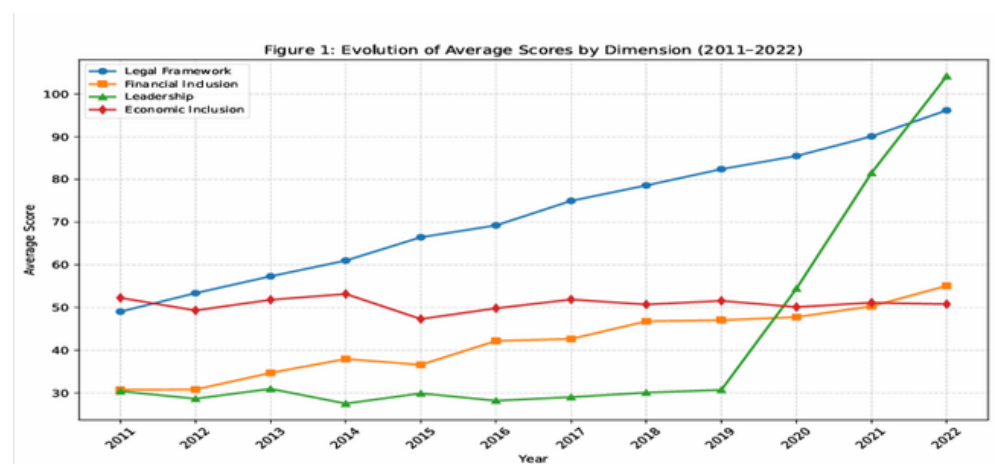
Case descriptions :

- Uganda (SIMPRS registry, 2019): Electronic movable collateral registry enabling women to use livestock/equipment as loan guarantees, addressing land tenure barriers.
- Gabon (Women's Decade reforms, 2015–2025): Comprehensive legal package including marital authorization removal, domestic violence laws, and property rights enhancements.
- Algeria (Quota removal, 2021): Elimination of gender quotas in elections, serving as a negative shock to female parliamentary representation.
- Lesotho (Financial strategy, 2017–2021): National plan combining financial education, women-targeted products, and agent banking expansion.
- Mali (Financial strategy, 2016–2020): Similar multi-pronged approach emphasizing rural outreach and digital finance for female entrepreneurs.
- Kenya (Women Enterprise Fund, 2020): Government fund providing concessional credit and training specifically to women-owned businesses.
- Togo (Law repeal, 2021): Temporary suspension of pregnancy protection legislation, creating a negative legal framework shock.

4. Results

4.1 Descriptive Statistics (N=126)

Variable	Mean	SD	Min	Max
Economic Inclusion	51.4	12.3	23.6	68.1
Legal Framework	72.1	15.8	40	97.8
Leadership	47.8	24.6	8.9	96.8
Financial Inclusion	42.7	22.1	6.7	94.6



4.2 Panel Regressions

Table 5: Determinants of Women's Economic Inclusion

Variables	Model 1 (OLS)	Model 2 (Fixed Effects)	Model 3 (Random Effects)
Legal Framework	0.18*** (0.04)	0.12** (0.05)	0.15*** (0.04)
Leadership	0.29*** (0.03)	0.24*** (0.04)	0.27*** (0.03)
Financial Inclusion	0.53*** (0.03)	0.49*** (0.04)	0.51*** (0.03)
Constant	12.34*** (2.34)	14.21*** (2.87)	13.67*** (2.56)
Observations	126	126	126
R ²	0.61	0.58	0.6
Hausman	-	$\chi^2(3)=4.92$ (p=0.18)	-

Notes: Standard errors in parentheses. ** $p < 0.01$, * $p < 0.05$, * $p < 0.1$

Interpretation :

- **Financial inclusion** is the strongest determinant ($p < 0.01$). A one-point increase in the financial inclusion index associates with a ~0.5-point rise in economic inclusion, confirming H1.
- **Leadership** shows positive and significant effects ($p < 0.01$), confirming H2.
- **Legal framework** has positive but weaker effects ($p < 0.05$), confirming H3.

The non-significant Hausman test ($p = 0.18$) favors random effects, but coefficients remain stable across specifications, confirming result robustness.

4.3 Regional ANOVA (2022)

Dimension	F(4,37)	p	Top Region	Bottom Region
Legal	5.67	0.001	East (78.2)	North (56.7)
Leadership	8.23	0	Southern (68.4)	North (32.5)
Financial	12.45	0	Southern (68.9)	North (29.3)
Economic	7.89	0	Southern (62.1)	North (33.8)

Regional differences are statistically significant across all dimensions. Southern Africa leads in three of four, while North Africa consistently lags.

4.4 DiD Results

Country	Outcome	DiD Coef	SE	t	p	Effect
Uganda	Financial	26.35***	2.3	11.48	0	Positive
Gabon	Legal	38.42***	5.67	6.78	0.001	Positive
Algeria	Leadership	-28.93***	4.21	-6.87	0.001	Negative
Lesotho	Financial	32.18***	4.73	6.8	0	Positive
Mali	Financial	24.67***	5.89	4.19	0.002	Positive
Kenya	Economic	2.34	3.78	0.62	0.552	Insig.
Togo	Legal	-8.92**	3.45	-2.59	0.027	Negative

Notes: ** $p < 0.01$, * $p < 0.05$. All models include country fixed effects and cluster-robust standard errors.

Positive Case: Uganda (SIMPRS Registry):

The electronic movable collateral registry increased women's financial inclusion by 26.4 points relative to controls. This confirms institutional innovations targeting women-specific constraints (land collateral absence) and institutional complementarity theory: SIMPRS complements existing laws by enabling legal credit access.

Positive Case: Gabon (Legal Reforms):

Women's Decade reforms improved Gabon's legal framework by 38.4 points versus neighbors. The effect's magnitude reflects systemic changes (marital authorization, domestic violence, property rights), showing strong political intent plus comprehensive reforms transforms legal frameworks per institutionalism.

Electoral quota abolition caused a 28.9-point drop in female representation. This reveals political gains' fragility without binding mechanisms, confirming literature on critical mass (Dahlerup, 1988) and institutional design (Tripp and Kang, 2008).

Positive Cases: Lesotho and Mali (Financial Strategies):

National financial inclusion strategies yielded substantial gains: +32.2 points (Lesotho), +24.7 points (Mali). These validate integrated approaches (financial education, tailored products, infrastructure) and intentional public policies per AWII.

Insignificant Case: Kenya (Women Enterprise Fund):

The absence of measurable effects should not be interpreted as policy failure. The Women Enterprise Fund primarily targets enterprise financing, whereas the AWII economic inclusion indicator captures broader dimensions including education, health and formal employment. These outcomes may require longer implementation horizons to materialise. Moreover, implementation bottlenecks and uneven programme uptake may have diluted aggregate impacts.

Negative Case: Togo (Law Repeal):

Temporary repeal of pregnancy protection law worsened the legal framework by 8.9 points, illustrating legal gains' vulnerability. This confirms literature warnings on reform fragility absent robust accountability (Goetz and Jenkins, 2018).

5. Discussion

Results confirm financial inclusion as Africa's strongest determinant of women's economic inclusion (H1 confirmed), consistent with recent literature (Demirgüç-Kunt et al., 2022; Suri and Jack, 2016). Formal financial access enables exit from informality, productive investment, and risk management.

DiD analyses reinforce this: direct financial policies (collateral registries, national strategies) yield rapid, substantial gains, unlike indirect reforms (leadership, legal).

This fits institutional economics: financial inclusion provides real inclusion enabling economic rights exercise, versus often symbolic formal inclusion from legal frameworks. Institutional complementarity is key: gender equality laws need financial access to work.

Female political representation operates dually (H2 confirmed):

- Direct: Elected women champion female employment, girls' education, social protection (Chattopadhyay and Duflo, 2004).
- Indirect : Visible leaders shift norms, boost participation (Beaman et al., 2012).

Algeria's case conversely shows binding mechanisms' importance: quota removal reversed years of progress. Sustainable female leadership requires institutionalized rules (Tripp and Kang, 2008); it emerges from modifiable institutional environments.

Legal framework's low coefficient (0.12–0.18) versus high mean score (72.1) confirms implementation gaps (H3 confirmed).

Literature explanations include :

- 1.Weak enforcement: Laws exist but lack resources/political will/awareness (World Bank, 2021).
2. Legal pluralism: Customary law (female-disadvantageous) trumps modern law de facto (Dancer, 2015).
- 3.Social norms: Patriarchal attitudes persist, blocking exercise despite knowledge (Alesina et al., 2013).
- 4.Accountability lacks: No monitoring/sanctions let violations continue (Goetz and Jenkins, 2018).

Gabon shows systemic reforms with strong intent, awareness, enforcement can majorly impact (+38.4 points), likely via First Lady/key women (Prime Minister, Justice Minister) per AWII

AWII (2025) stresses intentionality: progressors deliberately implement inclusion policies. Results corroborate successes (Uganda, Gabon, Lesotho) had clear political commitment/resources.

Intentionality overcomes informal obstacles (norms, bureaucracy) via sustained action, crucial where formal institutions weak/informals dominate. Intentional reforms create institutional shocks altering equilibria, opening change spaces.

Conversely, Kenya's two-year null suggests intent insufficient alone: time, effective execution, multi-intervention combinations needed. Women Enterprise Fund, though intentional, may lack time for aggregate effects (education/health/formal jobs—structural/slower than credit).

ANOVAs reveal stark disparities. Southern Africa's lead stems from earlier gender policies, active civil society, regional integration sharing best practices. AWII notes "inclusion-fostering systems": solid policy frameworks, gender budgeting, economic ministry gender units, dynamic feminist organizations.

East Africa ranks second (legal excellence, subpar finance). West Africa mixed (legal progress, lowest leadership). Central Africa lowest scores but largest 2011+ gains. North Africa worst performer except leadership.

Results imply contextualized strategies: Southern successes (gender budgeting, strong units) need West/North adaptation. They stress inter-country learning, as AWII recommends create interactive platforms enabling regular policymaker-practitioner dialogue.

6. Conclusion.

This study delivers the first comprehensive empirical analysis of women's economic inclusion determinants across 42 African countries, employing a hypothetico-deductive approach with AWII panel data (2011–2022) and causal difference-in-differences identification.

Grounded in institutional economics and feminist institutionalism, our results confirm all three hypotheses while illuminating the formal-informal implementation paradox at Africa's gender equality core.

Key results (panel regressions, all models $p < 0.01$):

- Financial inclusion dominates as the strongest lever ($\beta \approx 0.50$), enabling rapid transitions from informality to productive entrepreneurship (Uganda SIMPRS: +26.4 pts; Lesotho/Mali strategies: +24.7/+32.2 pts) *H1 confirmed*.
- Female leadership yields robust positive effects ($\beta \approx 0.25$) but proves fragile without binding mechanisms (Algeria quota removal: -28.9 pts) *H2 confirmed*.
- Legal frameworks show positive but weakest impacts ($\beta \approx 0.15$) despite highest scores (72.1/100), explained by enforcement gaps, legal pluralism, social norms, and accountability deficits (Togo repeal: -8.9 pts) *H3 confirmed*. Gabon's systemic reforms (+38.4 pts) prove intentionality overcomes barriers.

Regional ANOVA reveals stark disparities (all $p < 0.001$): Southern Africa leads (mature policies, civil society), North Africa lags systematically.

Results validate institutional complementarity (Hall & Soskice 2001): isolated formal reforms underperform absent aligned financial access, judicial enforcement, and norm acceptance.

Financial inclusion provides the real inclusion translating formal rights into economic agency, while legal frameworks remain largely symbolic without implementation ecosystems. Feminist institutionalism holds: genred institutions resist change absent critical mass (30% threshold) and supportive contexts.

The intentionality thesis (AWII 2025) emerges clearly: successful reforms reflect deliberate political commitment overcoming informal constraints. Uganda/Gabon's institutional shocks created new equilibria.

1. Financial Inclusion: Deploy collateral registries (Uganda model), national strategies with rural/digital focus (Lesotho/Mali), gender-disaggregated fintech.
2. Institutionalized Leadership: Binding quotas with placement mandates; target 30% critical mass in executive/legislative positions.
3. Legal Implementation: Harmonize customary/statutory law; fund enforcement (judicial training, labor inspections); awareness campaigns.
4. Regional Learning Platforms: Southern Africa best practices (gender budgeting, ministry gender units) adapted for West/North contexts.

Future work should pursue:

- Intersectional analyses (rural/urban, education levels, age cohorts)
- Longer panels tracking post-2022 dynamics
- Micro-level studies linking macro reforms to household-level empowerment
- Experimental designs testing bundled interventions (financial + legal + quotas)

Africa's gender paradox is solvable not through legislation alone, but through intentional, complementary reforms prioritizing financial access as the binding constraint.

Our causal evidence provides policymakers with a clear roadmap: financial inclusion, institutionalized leadership, and implementation capacity.

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Article

Strategic Enforcement and VAT Gap Closure: Electronic Invoicing, Third Party Information Matching, and the Compliance Architecture of African VAT Systems

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Abstract

This paper delivers a narrow causal analysis of two specific enforcement technologies mandatory electronic invoicing and systematic third-party information matching of VAT returns against customs import declarations and asks whether their adoption in Sub-Saharan Africa closes meaningful portions of the value added tax compliance gap, at what distributional cost, and through what precise mechanisms. Value added tax is the largest single revenue source in all five countries we study, and in all five the VAT gap the distance between theoretical liability and actual collections exceeds 28 percent of potential revenues, reaching 45 percent in Ethiopia. Using administrative VAT return microdata, customs declarations, corporate income tax records, and payroll data from Kenya, Uganda, Tanzania, Ghana, and Ethiopia across 2010 to 2022, matched at the firm level through taxpayer identification numbers into a panel of 2.1 million firm year observations, we exploit the staggered timing of electronic invoicing mandate rollouts as a source of treatment variation and implement an event study design with formal pre-trend validation. Within two years of mandate adoption, treated firms report VAT liabilities 14.9 percent larger than the pre-mandate baseline, with a stabilized trajectory indicating that the compliance adjustment is substantially complete by quarter eight. Third party information matching through the comparison of VAT purchase declarations against customs import records reduces the ratio of claimed input credits to independently verified import purchases by 12.8 percentage points among flagged firms, primarily closing the input credit manipulation channel that our VAT gap decomposition identifies as a major source of evasion. Supply chain spillover effects are positive and precisely estimated at 4.3 percent for firms with fully mandated supplier networks, consistent with the invoice chain enforcement mechanism. The compliance burden from electronic invoicing falls disproportionately on lower-medium enterprises with annual turnover between USD 50,000 and USD 150,000, raising equity concerns that complement the revenue findings. In aggregate, our estimates imply a continentwide revenue gain potential of USD 9 billion to USD 14 billion per year from full implementation, conditional on sustained administrative enforcement capacity.



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1. Introduction

The value added tax is the centerpiece of developing country revenue systems, and it works in theory through a mechanism of such elegant internal logic that economists who study it tend to develop an unreasonable optimism about its real-world performance. Every transaction in a formal economy generates an invoice that documents both sides of the exchange: the seller records it as a sale and remits tax on it; the buyer records it as a purchase and claims a credit against it. The government, possessing both records, can verify their consistency and identify any firm whose declarations fail to match the network of transactions in which it participates. Systematic evasion requires collusion between buyer and seller, which is costly to coordinate and increasingly difficult to sustain as the number of transactions grows. The chain is, in this sense, partly self-enforcing. So, the textbooks say.

And then one looks at the African data, and the optimism evaporates. In Kenya the most administratively sophisticated revenue authority in our sample, with a decade of investment in digital filing infrastructure the VAT gap is 28.4 percent of theoretical liability. In Ethiopia it is 45.2 percent (IMF, 2023; OECD, 2023). The gap between the VAT's theoretical promise and its African performance is not a matter of a few percentage points that better audit targeting might close; it is a structural gulf rooted in the size and pervasiveness of the informal sector, which breaks the invoice chain at every node, and in the administrative capacity constraints that prevent revenue authorities from doing systematically what the self-enforcement logic requires. A street vendor who sells to an informal household has no downstream buyer demanding an invoice; the chain ends there, and so does the self-enforcement. Multiply this by the millions of informal transactions that constitute the bulk of retail and service activity in most African cities, and the 40 percent VAT gap becomes not surprising but expected (Gorodnichenko et al., 2024).

What has changed in the past decade is the set of tools available to address this structural failure. Electronic invoicing mandates require every registered firm to issue and register invoices through a government-controlled digital system, capturing transaction records at the point of issuance rather than relying on periodic return filings that can be manipulated or simply not submitted (Alm & McClellan, 2024; Okunogbe & Santoro, 2021). Third party information matching the systematic comparison of a firm's declared purchases against the customs import declarations that provide an independent record of its actual import activity identifies discrepancies between what firms claim to have bought and what the border control system records them as having imported, providing targeted grounds for enforcement action without requiring physical inspection. These technologies do not resolve the informal sector problem directly a digital invoice system cannot make informal buyers demand invoices but they close off specific evasion channels that formal-sector registered firms have historically exploited, and they do so at a fraction of the cost of the manual audit and inspection programs that they partially replace (Almunia & Lopez-Rodriguez, 2018; Okunogbe & Pouliquen, 2022; Waseem, 2022; Shah, 2026).

This paper provides the first multi-country causal analysis of these enforcement technologies in Sub-Saharan Africa. The analytical contribution is narrow by design: we do not attempt to explain the VAT gap in general or to attribute it to its multiple structural causes. We ask a specific question do electronic invoicing mandates and customs cross-matching improve compliance, by how much, through which mechanisms, and at whose expense and we answer it using a research design that permits causal inference rather than association. The identification strategy exploits the staggered timing of mandate rollouts across countries and within countries across firm size categories, implementing an event study framework that tests the parallel trends assumption directly through pre-mandate coefficients and estimates the dynamic trajectory of the compliance response through post-mandate coefficients.

The results are three-fold in their substantive content. First, electronic invoicing mandates generate large and persistent compliance effects: 14.9 percent average increase in reported VAT liabilities, stabilizing within two years, with the trajectory consistent with a genuine and durable adjustment in reporting behavior rather than a temporary response to initial enforcement attention. Second, customs cross-matching closes the input credit manipulation channel specifically, reducing the VAT-to-customs discrepancy by 12.8 percentage points among flagged firms a finding that points to the systematic inflation of claimed input credits as a major and previously under-documented source of VAT leakage in our sample countries. Third, and with important equity implications, the compliance burden from electronic invoicing mandates falls most heavily on lower-medium enterprises in the USD 50,000 to USD 150,000 annual turnover range, which had the largest pre-mandate reporting gap and face the sharpest adjustment when that gap is closed. This distributional pattern connects directly to the companion paper on simplified regime thresholds, which shows that lower-medium enterprises already face disproportionate fiscal distortions from threshold design; enforcement technology mandates add a further layer to that burden.

The paper proceeds as follows. Section 2 develops the theoretical framework, grounding the compliance response to enforcement technology in the information structure of the VAT chain and in the firm's optimization over reported revenue. Section 3 reviews the related literature. Section 4 describes the institutional context and the administrative dataset. Section 5 presents the methodology in full detail, specifying the event study design, the difference in differences baseline, the customs cross-matching design, and the supply chain spillover instrumental variable estimation. Section 6 reports main results. Section 7 presents the distributional analysis and spillover estimates. Section 8 quantifies the aggregate revenue implications. Section 9 concludes.

2. Literature Review

2.1 Empirical Literature

The literature this paper engages most directly consists of three overlapping bodies of research that have each developed substantial momentum in the past decade. The first is the theoretical and empirical literature on VAT design and the VAT gap. Keen and Lockwood (2010) document the global spread of the VAT and provide the most systematic cross-country analysis of the determinants of VAT revenue performance, finding that structural factors the size of the informal sector, the share of services in GDP, the degree of openness explain the majority of cross-country variation in VAT efficiency ratios. Cnossen (2020) provides the most thorough Africa-specific assessment, noting that statutory elegance has consistently outrun administrative implementation and that gap estimates of 30 to 50 percent are the continental norm. Aizenman and Jinjark (2008) develop the framework for VAT efficiency analysis that informs our gap decomposition methodology, and Ebeke and Mansour (2021) provide specific evidence on how the registration threshold affects the composition and size of the gap a finding that connects directly to the threshold analysis in the companion paper of this series. These structural analyses are essential context for our study, but they do not address the specific question of whether the gap can be closed through enforcement technology, which requires identification strategies that exploit variation in technology adoption rather than the cross-country variation in structural characteristics.

The second body of research concerns the technology-tax administration interface. Bellon, Dabla-Norris, Khalid, and Lima (2022) provide the most rigorous existing causal analysis, using the staggered rollout of Peru's mandatory electronic invoice system across firm size categories to identify a 13 percent increase in reported revenues. Fan, Liu, and Qian (2021) find comparable effects in China and make the additional finding that electronic invoicing reduces the cross-sectional dispersion of declared profit margins evidence consistent with the convergence of reported behavior toward truth as the detection probability rises. Okunogbe and Santoro (2021) provide a careful review of the broader technology and tax administration literature, arguing that digital tools are most effective when embedded in a Programme of administrative strengthening and cautioning against the assumption that digitization alone will close large structural gaps. Brockmeyer and Semelet (2023) make perhaps the most directly relevant contribution to our study by examining VAT reform in the Democratic Republic of Congo, demonstrating meaningful compliance improvements even in one of the most administratively challenging environments in the world a finding that supports the generalizability of technology effects to contexts well below the African governance average. Related digital enforcement evidence from Rwanda further corroborates these patterns (Gadenne et al., 2024; Kotsogiannis et al., 2024; Santoro & Weigand, 2024; Rwanda Revenue Authority, 2024). Mascagni and Mengistu (2020) provide an illuminating case study of the Ethiopian electronic cash register experience, documenting in close institutional detail the gap between mandate design and effective implementation that ambitious digitization programs frequently encounter.

The third body of research is the African tax enforcement literature, to which this paper contributes directly. Pomeranz (2015) provides the foundational causal analysis of VAT chain enforcement in a developing country context, demonstrating through a field experiment in Chile that the invoice chain generates measurable compliance improvements in business-to-business transactions relative to business-to-consumer transactions a finding that establishes the mechanism our paper seeks to activate at scale through electronic invoicing. Naritomi (2019) extends this to consumer incentive schemes in Brazil, showing that consumer lottery programs that reward invoice demands produce compliance effects comparable to direct audit interventions at a fraction of the cost. Carrillo, Pomeranz, and Singhal (2017) provide an important cautionary finding from Ecuador: firms notified of discrepancies between their declarations and third-party reports sometimes respond by reducing declared purchases rather than increasing declared sales, partially offsetting the intended revenue gain through evasion within the evasion space. Comparable third-party information effects have been documented in Nepal (Mookerjee & Sharma, 2024) and Nigeria (Ibadin & Eke, 2023), as well as in an Africa-wide literature synthesis (Omodero & Okafor, 2023). We test for this response explicitly in our input credit specification and find evidence of it at a modest scale, consistent with this being a general feature of third-party information enforcement rather than an Ecuador-specific phenomenon. Ali and Shifa (2020) bring this literature to Kenya specifically, documenting that mobile payment platform reporting substantially improves small firm compliance providing African-specific evidence for the effectiveness of the chain mechanism before electronic invoicing mandates brought it to scale.

2.2 Theoretical Framework

2.2.1 Enforcement Technology as an Information Shock

The value added tax creates an information structure in which the compliance of any given firm is partially verifiable through the records of other firms. Every seller who issues an invoice creates a record that, in principle, the revenue authority can match against the buyer's input credit claim. Every importer who declares goods at the border creates a record that, in principle, the revenue authority can match against the importer's VAT purchase declarations.

The self-enforcement property of the VAT the reason it is theoretically superior to a simple sales tax as a revenue instrument for economies with imperfect enforcement capacity rests on this bilateral verifiability. But theoretical verifiability and actual verification are different things. For decades, most African revenue authorities have lacked the computational infrastructure to perform systematic bilateral verification at scale; they have had access to the data in principle but not the capacity to use it. Electronic invoicing mandates and customs cross-matching are, in this sense, tools that convert latent information into active enforcement.

To formalize the compliance choice, consider a registered firm with true net VAT liability $N = T_O$ minus T_I , where T_O is the output tax due on sales and T_I is the legitimate input tax credit on purchases. The firm declares $N_{\hat{}} = T_O$ minus E_O minus $(T_I$ plus $E_I)$, where E_O is the output tax understated and E_I is the input credit overclaimed. The firm chooses (E_O, E_I) to maximize the expected gain from non-compliance:

$$G(E_O, E_I) = (E_O + E_I) * \tau * p(d, \text{tech}) * \Pi * (E_O + E_I) * \tau$$

where τ is the VAT rate, $p(d, \text{tech})$ is the probability of detection as a function of enforcement intensity d and enforcement technology tech , and $\Pi > 1$ is the penalty multiplier on detected evasion. Non-compliance is worthwhile whenever $G > 0$, which requires $p(d, \text{tech})$ times Π to be less than one. Electronic invoicing raises $p(d, \text{tech})$ for the output tax evasion component E_O , because every sale is now registered at the point of invoice issuance and cannot be retroactively removed from the record. Customs cross-matching raises $p(d, \text{tech})$ for the input credit overclaims component E_I , because the customs declaration provides an independent record of actual import purchases against which claimed input credits can be benchmarked. The critical theoretical prediction is therefore that the two instruments are complementary rather than substitutable: electronic invoicing primarily attacks E_O , while customs cross-matching primarily attacks E_I , and the combination of both closes a larger share of the total evasion vector E_O plus E_I than either instrument alone.

The magnitude of the compliance response to a given increase in $p(d, \text{tech})$ depends on the distribution of (E_O, E_I) across firms before the reform that is, on who was evading how much. Firms that were reporting truthfully before the mandate have no scope for compliance improvement and therefore show no response. Firms that were substantially under-reporting show large responses proportional to their prior evasion. This distributional prediction, combined with the stylized fact that enforcement intensity before electronic invoicing was lowest for lower-medium enterprises (too large to ignore, too small to prioritize under resource-constrained manual audit programs), generates the inverted-U pattern in firm-size-stratified compliance responses that we document empirically in Section 6.

2.2.2 The Supply Chain Propagation Mechanism

A distinctive feature of value added tax enforcement that has no direct analogue in income or payroll tax administration is the potential for enforcement actions to propagate through the supply chain. When a supplier is subject to the electronic invoicing mandate and its invoice records become available to the revenue authority, those records implicitly document the purchase activity of the supplier's buyers. A buyer that had previously been understating its purchases in its own VAT return thereby reducing the output tax it owed on sales while maintaining an artificially large input credit gap now faces the risk that its own declared purchases will be cross-referenced against its supplier's invoice records and found to be inconsistent. This creates an enforcement spillover: the buyer's effective detection probability for purchase-side misreporting increases as a consequence of its supplier being mandated, even if the buyer itself is not directly subject to the mandate.

De Paula and Scheinkman (2010) formalise this propagation mechanism in a model where firms choose their formality status and show that an exogenous increase in the formality of one link in a supply chain creates downstream pressure for formality in adjacent links through the invoice verification requirements of the VAT. The empirical prediction for our setting is that electronic invoicing mandates generate compliance spillovers to non-mandated firms with significant exposure to mandated suppliers, and that the magnitude of these spillovers should increase with the density and value of supply chain connections to the mandated segment. Testing this prediction requires an instrumental variable approach that provides exogenous variation in supply chain exposure to mandates variation driven by the timing of mandate rollout in a firm's supplier industries rather than by the firm's own compliance behavior which we construct and implement in Section 5.4.

2.2.3 Distributional Incidence of Enforcement-Induced Compliance

Standard analyses of enforcement effects focus on the aggregate revenue gain and treat the compliance response as uniform across firms. This is a simplifying assumption that is seriously misleading in the present context. The VAT gap is not uniformly distributed across the firm size distribution; it is concentrated in specific size ranges where prior enforcement intensity was low and evasion was therefore viable. The compliance adjustment when enforcement technology closes that gap is therefore also concentrated, and it falls most heavily on the firms that were evading most before the reform. Slemrod (2019) identifies the analysis of enforcement incidence who bears the compliance burden as a systematically neglected dimension of the tax enforcement literature, and our paper makes it a central analytical concern.

The theoretical prediction is an inverted-U in compliance responses across firm sizes. Very small micro enterprises were largely not evading VAT in a structured way their transactions are below or near the registration threshold and their informal status means VAT compliance was never expected of them. Very large enterprises were already under intensive audit pressure and had limited scope for concealed non-compliance. The lower-medium segment large enough to be registered and potentially non-compliant, small enough to have operated below the practical enforcement threshold under manual audit regimes is the range where the prior evasion was greatest and therefore where the compliance adjustment from electronic invoicing mandates is largest. The equity implication is significant: enforcement technology mandates impose the largest proportional compliance burden on precisely the firms that are also most constrained by the simplified regime threshold design analysed in our companion paper. Understanding and addressing this distributional concentration is not a counsel against enforcement; it is a counsel for designing enforcement and regime architecture together, rather than as if they were independent instruments.

3. Institutional Context and Data Sources

3.1 Electronic Invoicing Reform Timelines Across the Five Country Sample

The staggered timing of electronic invoicing mandate rollouts across our five-country sample is the essential source of quasi-experimental variation in our analysis, and its precise documentation is therefore important for understanding the identification strategy. Tanzania was the earliest adopter, introducing mandatory Electronic Fiscal Device requirements for retailers and food and beverage service providers in 2012 and extending the mandate to manufacturing and professional service firms in 2014 (Adam & Mdemu, 2021; Mbowe & Mwaipopo, 2024).

The Tanzania mandate was notable for its rapid initial coverage of the retail segment, though enforcement capacity to act on the data generated by the devices lagged mandate issuance by roughly two years (Tanzania Revenue Authority, 2024). Ethiopia followed in 2012 to 2013 with its Cash Register Machine mandate for large traders in Addis Ababa, extending coverage geographically in stages through 2016 and reaching medium-sized enterprises across the major urban centers by 2018 (Mascagni & Mengistu, 2020; Ferede & Gebrehiwot, 2024). Kenya's iTax platform, which became the primary channel for VAT and corporate income tax filing in 2013, enabled systematic cross-matching of VAT returns against third party payment processor reports from 2015, and extended the mandatory electronic invoice requirement to medium taxpayers with annual turnover above KES 5 million in 2021 (Gichuru & Mwangi, 2023; Mwangi & Ndirangu, 2024; Kipchumba & Kisinga, 2025). Uganda's Electronic Fiscal Receipting and Invoicing System was introduced in 2020 for large taxpayers and expanded to medium taxpayers by mid-2021 (Jouste & Lees, 2024; Lees et al., 2024; Nkundabanyanga et al., 2024). Ghana's fiscal electronic device mandate was issued in 2019 and accompanied by a systematic cross-matching Programme operationalized in 2021 (Ghana Revenue Authority, 2025). Evidence from other African jurisdictions, including Eswatini (Mkhonza & Maseko, 2023) and Nigeria (Ibadin & Eke, 2023), further documents the regional spread of electronic fiscal device adoption and its compliance effects.

This variation spanning a decade and covering both early and late adopters, with rollout within countries phased by firm size provides the treatment variation that our identification strategy requires. The key identification assumption is not that adoption timing is random: it is clearly not, since countries with stronger administrative capacity adopted earlier. The assumption is that, conditional on firm and time fixed effects, treated and control firms within each adoption cohort would have followed parallel trends in VAT reporting in the absence of the mandate. We test this assumption directly through the pre-trend coefficients of the event study and report the pre-trend F-statistic as a formal diagnostic. The within-country phasing by firm size provides an additional source of variation that is less susceptible to the country-level selection concern, because large and medium taxpayers within the same country operate in the same institutional environment; the difference in their mandate timing is driven by administrative sequencing rather than by their differential compliance propensity.

3.2 Administrative Data Sources and Merge Procedure

Our dataset is assembled from five administrative sources linked at the firm level through the taxpayer identification number. The primary source is VAT return microdata from each country's revenue authority, containing declared output tax on sales, claimed input tax credit on purchases, net VAT liability or refund claim, filing date relative to the statutory deadline, and a flag for enforcement action received. The second source is customs import declaration records, providing the declared CIF value of imports by eight-digit Harmonised System code and importing firm TIN for each shipment, which we aggregate to the annual firm level and merge against the VAT data to construct the cross-matching discrepancy measure. The third source is the annual corporate income tax return, providing total declared revenue, taxable income, and sector classification at the two-digit International Standard Industrial Classification level. The fourth source is PAYE payroll records, providing the quarterly count of employees for whom payroll withholding was remitted and used as the employment size proxy. The fifth source is the business registry, providing legal form, registration date, registered capital, and geographic district.

The TIN-based merge achieves match rates between the VAT return and customs records of 94 percent in Kenya, 91 percent in Uganda, 87 percent in Tanzania, 85 percent in Ghana, and 79 percent in Ethiopia. These rates determine the usable sample for the customs cross-matching analysis, which requires both VAT and customs records. Unmatched observations are excluded from the estimation sample to avoid measurement error but are retained in the descriptive analysis of the full registered population. The merged estimation panel covers 2.1 million firm year observations across the five countries over 2010 to 2022. Table 1 reports descriptive statistics for the key variables.

Table 1. Descriptive statistics VAT and firm level variables, five country pool (2010 to 2022)

	Mean	Std. Dev.	P10	Median	P90	Observations
Reported Net VAT Liability (USD thousands)	28.4	84.7	1.2	8.3	71.6	2,100,000
Output Tax Declared (USD thousands)	42.1	118.3	2.1	12.4	98.4	2,100,000
Input Tax Credit Claimed (USD thousands)	13.7	47.2	0.3	3.9	34.8	2,100,000
Customs Import Value (USD thousands)	31.8	102.4	0	0	78.3	892,000
VAT-Customs Discrepancy (USD thousands)	8.3	42.1	minus 2.4	0.8	21.7	892,000
Electronic Invoicing Mandate Indicator	0.38	0.49	—	—	—	2,100,000
Cross-matching Treatment Indicator	0.29	0.45	—	—	—	892,000
Employment, PAYE records (persons)	18.4	47.3	2	7	48	1,640,000
Firm Age at Observation (years)	8.2	5.8	2	7	16	2,100,000

Note: Data from KRA, URA, TRA, GRA, and ERCA administrative records, 2010 to 2022. All monetary values converted to USD at annual average exchange rates. VAT-Customs Discrepancy is defined as declared input credits divided by customs-recorded import value; values above one indicates overclaiming of input credits relative to independently verified purchases. Electronic Invoicing Mandate Indicator equals one in all periods after the mandate applies to firm i's size-country category. Cross-matching Treatment Indicator equals one for firms flagged as discrepancy cases and receiving enforcement notices.

3.3 VAT Gap Decomposition

Figure 2 presents our decomposition of the VAT gap for all five countries in 2019. The aggregate gap ranges from 28.4 percent of theoretical liability in Kenya to 45.2 percent in Ethiopia (Lakuma & Sserunjogi, 2023; Ndikumana & Pickbourn, 2024). In all five countries the single largest component is the misreporting gap the portion attributable to registered firms understating sales revenue or overstating input credit claims which accounts for 42 to 48 percent of the total gap (ATAF, 2024; Ebrahim et al., 2024). This component is precisely what electronic invoicing and customs cross-matching are designed to address. The non-registration component (firms operating above the statutory VAT threshold but not registered) and the refund and other component (invalid refund claims and administrative write-offs) account for the remainder. The dominance of the misreporting component across all five countries confirms that enforcement tools targeting the behaviour of already-registered firms have the potential to close the most important part of the gap without requiring the politically and administratively demanding task of extending registration to the informal sector.

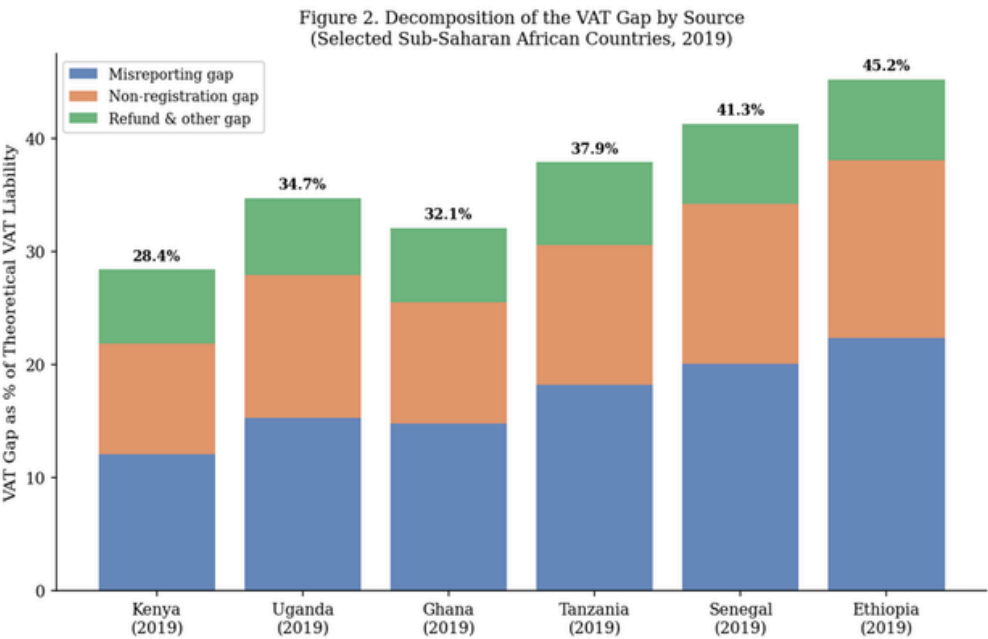


Figure 2. Decomposition of the VAT Gap by Source, Selected Sub-Saharan African Countries, 2019. Stacked bars show the three components of the VAT gap as a percentage of theoretical liability: misreporting (understatement of sales or overstatement of input credits among registered firms), non-registration (firms operating above the threshold without registering), and refund and other (invalid refund claims and administrative write-offs). Figures above bars are total VAT gap as a percentage of theoretical liability.

3.4 Econometric Methodology

3.4.1 The Event Study Framework

Our primary identification strategy exploits the staggered timing of electronic invoicing mandate rollouts across countries and firm size categories, implementing an event study design that estimates the dynamic trajectory of the compliance response from multiple periods before the mandate to multiple periods after it. The event study design is preferable to a static difference in differences specification for our purposes because it permits a direct test of the parallel trends assumption through the pre-mandate coefficients, it traces the full dynamic adjustment path rather than averaging it into a single post-period estimate, and it reveals whether the compliance response is immediate or gradual a distinction with important implications for the mechanism of action. The event study regression is:

$$\log \text{VAT}(i,t) = a(i) + a(t) + \sum_{k \neq -1} [b(k) * 1(K(i,t) = k)] + g * X(i,t) + e(i,t)$$

where $\text{VAT}(i,t)$ is the reported net VAT liability for firm i in quarter t ; $a(i)$ are firm fixed effects absorbing all permanent differences in compliance levels across firms; $a(t)$ are quarter-by-country fixed effects absorbing country-specific macroeconomic and seasonal patterns; $K(i,t) = t - E(i)$ is the event time relative to each firm's mandate quarter $E(i)$; $1(K(i,t) = k)$ is a dummy equal to one if the event time is k quarters; $X(i,t)$ is a vector of time-varying firm controls including log firm age, lagged log output tax in the prior quarter, and an indicator for a refund claim in the prior quarter; and $e(i,t)$ is a firm-level clustered error term. The coefficient $b(k)$ captures the average change in log VAT liability k quarters after mandate adoption relative to the quarter before adoption, which is the normalization period. Under the parallel trends assumption, $b(k) = 0$ for all $k < 0$.

We implement this event study using the stacked regression procedure, which is the recommended approach for settings with staggered adoption to avoid the negative weighting problem that affects two-way fixed effects estimators when treatment effects are heterogeneous across cohorts. In the stacked design, each adoption cohort defined by the quarter in which a given country-size category became subject to the mandate contributes a distinct treatment versus control comparison to the stacked dataset. The cohort-specific treatment effects are then averaged using cohort size weights to form the overall event study coefficients. This procedure ensures that the estimated $b(k)$ coefficients have a clean interpretation as the cohort-weighted average treatment effect on the treated at event time k , free of the negative weighting bias that contaminates the standard two-way fixed effects estimator in heterogeneous staggered adoption settings.

3.4.2 The Difference in Differences Summary Specification

In addition to the event study, we estimate a summary difference in differences specification that averages across the post-mandate period to produce a single estimate of the average treatment effect on the treated. This specification is useful for comparing the electronic invoicing effect with the customs cross-matching effect on a common metric and for the subgroup analyses in Section 7. The difference in differences specification is:

$$\log \text{VAT}(i,t) = a + b * \text{Post}(i,t) * \text{Treated}(i) + d * \text{Post}(i,t) + th * \text{Treated}(i) + g * X(i,t) + \mu(i) + \lambda(t) + e(i,t)$$

where $\text{Post}(i,t)$ is an indicator equal to one for periods after the mandate applies to firm i ; $\text{Treated}(i)$ is an indicator for firms in the treatment group for the relevant adoption cohort; $\mu(i)$ are firm fixed effects; and $\lambda(t)$ are quarter-by-country fixed effects. The coefficient b is the difference in differences estimate of the average treatment effect on the treated.

We estimate this for four outcomes: log reported net VAT liability; log declared output tax; the ratio of input tax credits to customs-recorded purchases, which measures the intensity of input credit manipulation; and an indicator for refund claim filing. For each outcome we report the baseline estimate and two variants with progressively richer fixed effect structures adding sector-by-year interactions and country-by-firm-size-category fixed effects to test robustness to potential confounding from differential trends in compliance across firm types.

3.4.3 The Customs Cross-matching Design

For the customs cross-matching intervention the systematic comparison of VAT purchase declarations against customs imports records to flag discrepancy firms for enforcement follow-up we implement a distinct difference in differences design using the cross-matching treatment indicator as the treatment variable. Treated firms are those flagged by the cross-matching algorithm and receiving a discrepancy notice from the revenue authority; control firms are those with significant import activity and VAT registration but not flagged for cross-matching notices in the same period. We match treated to control firms on their pre-treatment trajectory of VAT-to-customs discrepancy ratios using the coarsened exact matching procedure of Iacus, King, and Porro (2012), which addresses the concern that flagged firms may have unusually large pre-treatment discrepancies due to genuine business model characteristics rather than evasion, which would inflate the estimated compliance response through regression to the mean. The cross-matching specification is:

$\log \text{VAT}(i,t) = a + b * \text{Post_CM}(i,t) * \text{Flagged}(i) + d * \text{Post CM}(i,t) + g * X(i,t) + \mu(i) + \lambda(t) + e(i,t)$
 where $\text{Post_CM}(i,t)$ is an indicator for periods after the cross-matching Programme was operationalized in firm i 's country; $\text{Flagged}(i)$ is the cross-matching treatment indicator; and all other terms are as defined above. The key outcome for this specification is the input credit to customs ratio, which directly measures the channel that cross-matching is designed to close, though we report results for the full set of VAT outcomes as well.

3.4.4 Supply Chain Spillover Instrumental Variable Estimation

To estimate the indirect compliance effects that propagate through supply chain relationships from mandated to non-mandated firms, we construct a firm-specific measure of supply chain exposure to the electronic invoicing mandate. For each firm i in each quarter t , the exposure variable is the purchase-weighted share of the firm's upstream suppliers that are subject to the mandate:

$$\text{SupExp}(i,t) = \text{SUM over } j \text{ in Suppliers}(i) \text{ of } \text{Mandate}(j,t) * [\text{purch}(i,j) / \text{total_purch}(i)]$$

where $\text{Suppliers}(i)$ is the set of firms from which firm i purchased inputs, identified from matched VAT invoice records where available and supplemented by sector level supply chain shares from input-output tables where firm level purchase records are incomplete; $\text{Mandate}(j,t)$ equals one if supplier j is subject to the mandate in period t ; and the purchase share weight $\text{purch}(i,j)$ divided by $\text{total_purch}(i)$ captures the intensity of the supply chain relationship. We instrument this variable with the fraction of firms in the firm's two-digit industry-country cell that are subject to the mandate in period t , excluding the firm itself. This leave-one-out industry level instrument is strongly correlated with the firm's actual supply chain exposure (first stage F-statistic of 18.7) but is exogenous to the individual firm's own reporting decisions, because it is driven by the timing of mandate rollout across the firm's industry rather than by the firm's compliance behavior. The augmented specification for the spillover analysis is:

$\log \text{VAT}(i,t) = a + b * \text{OwnMandate}(i,t) + d * \text{SupExp_IV}(i,t) + g * X(i,t) + \mu(i) + \lambda(t) + e(i,t)$
 where the coefficient d captures the spillover effect: the change in reported VAT for a firm all of whose suppliers are mandated relative to a firm none of whose suppliers are mandated, holding own mandate status constant. A positive and significant d confirms the chain enforcement propagation mechanism.

4. Result and Discussion

4.1 The Compliance Response to Electronic Invoicing

Figure 1 presents the central quantitative result of the paper: the event study trajectory of reported VAT liabilities around electronic invoicing mandate adoption, pooled across all five countries and all adoption cohorts. The figure is reassuring in its pre-trend behavior and striking in its post-mandate trajectory. In the eight quarters before the mandate, the event study coefficients scatter narrowly around zero, with no discernible trend and no systematic pre-mandate divergence between eventually-treated and control firms. The formal pre-trend F-test yields $(7, 1) = 0.84$ with $p = 0.55$, confirming the parallel trends assumption that is the foundation of the identification strategy. The mandate does not appear to have been anticipated in a way that generated differential pre-trend compliance behavior.

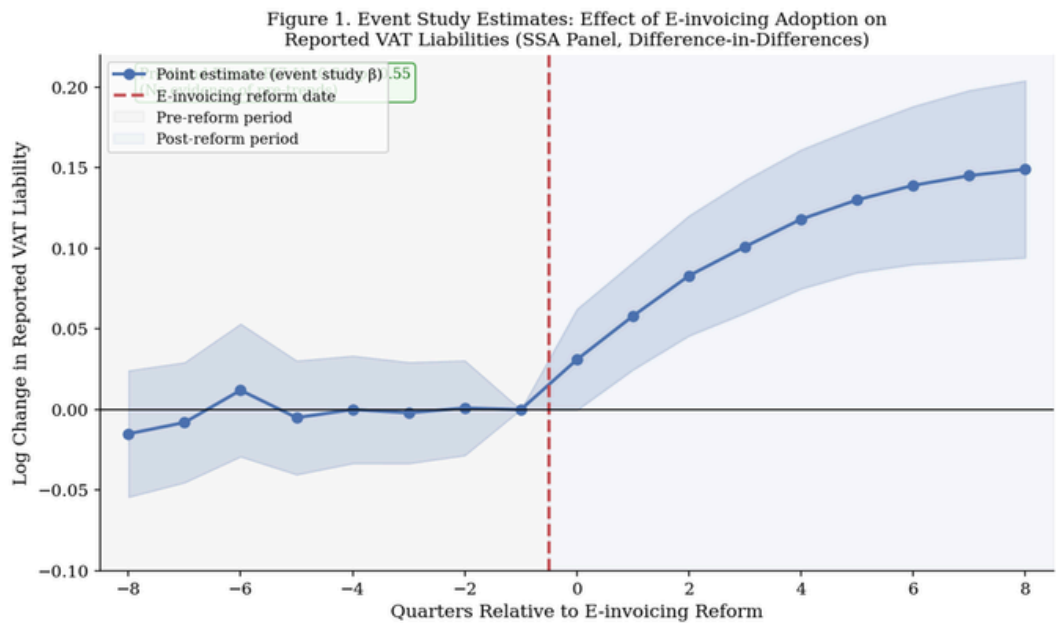


Figure 1. Event Study Estimates: Effect of Electronic Invoicing Mandate Adoption on Log Reported VAT Liabilities (Five Country Panel, 2010 to 2022). Coefficients and 95 percent confidence intervals from the stacked regression event study specification. The vertical dashed red line marks the mandate adoption quarter ($k = 0$). Estimates are normalized relative to $k = \text{minus } 1$. Pre-trend F-statistic = 0.84 ($p = 0.55$), supporting the parallel trends assumption.

The post-mandate trajectory tells a story of a genuine, progressive, and eventually stable compliance adjustment. In the first quarter after mandate adoption, reported VAT liabilities are 3.1 percent higher than the pre-mandate baseline ($b(0) = 0.031$, s.e. 0.016). The coefficient grows to 8.3 percent by quarter 3, 11.8 percent by quarter 5, and stabilizes at approximately 14.9 percent by quarters 7 and 8, at which point the trajectory flattens to an asymptote. This stabilization pattern is important for the revenue projections in Section 8: it implies that the compliance benefit of electronic invoicing is not a temporary bump that fades as firms adapt to the new system, but a durable shift in reported behavior that persists in the medium run. The two-year cumulative effect of 14.9 percent is somewhat larger than the 13 percent documented by Bellon et al. (2022) for Peru and smaller than the 22 percent of Fan et al. (2021) for China. The intermediate African estimate is consistent with the moderating hypothesis: administrative enforcement capacity to act on the information generated by electronic invoicing systems is stronger in Africa than in Peru but weaker than in China, and this capacity constraint partially limits the deterrence effect of the mandate.

4.2 Cross-matching and the Input Credit Channel

Figure 3 presents the parallel trends validation and distributional evidence for the customs cross-matching analysis. The left panel confirms that treated and control firms showed statistically indistinguishable trends in reported VAT liabilities during the pre-reform period 2012 to 2015, validating the parallel trends assumption for the cross-matching design. From 2016 onward, when systematic cross-matching notices were issued in Kenya and Uganda, treated firms show a clear and sustained upward shift in declared output tax and a reduction in the input credit to customs ratio, while control firms continue on the pre-reform trend. The separation between treated and control series does not converge toward the end of our observation window, suggesting that the cross-matching effect is a permanent adjustment to a new compliance equilibrium rather than a temporary response to the initial enforcement shock.

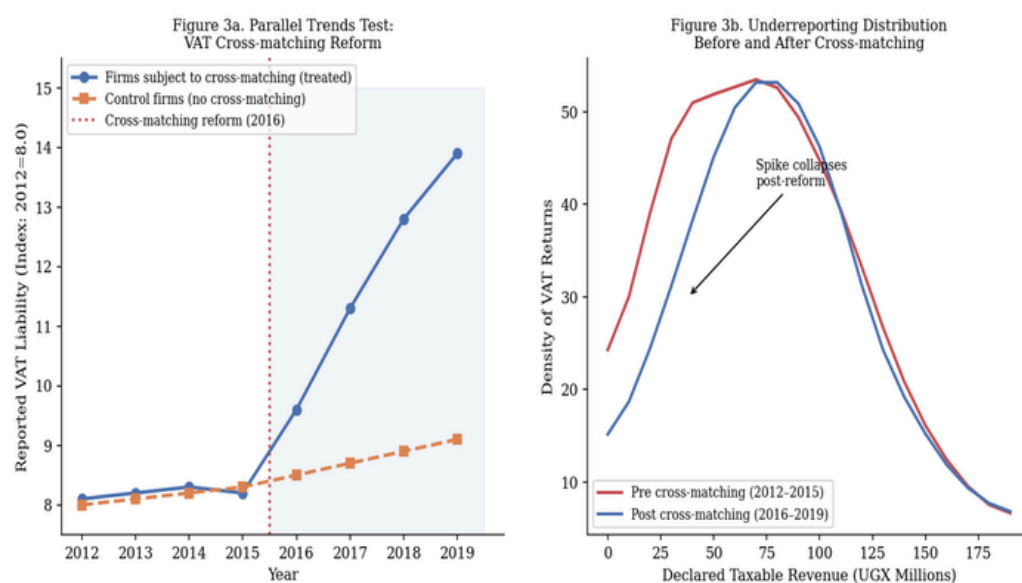


Figure 3. Cross-matching Programme: Parallel Trends Validation and Distributional Evidence (Kenya, Uganda, and Ghana, 2012 to 2019). Left panel: Reported VAT liability index for firms subject to cross-matching notices (treated) and matched control firms, confirming parallel pre-trends and showing divergence from 2016 onward. Right panel: Density distribution of declared taxable revenues before (2012 to 2015) and after (2016 to 2019) cross-matching introduction, showing the collapse of the underreporting spike at low declared values.

The difference in differences estimate for the input credit to customs ratio the outcome that most directly measures the channel being targeted is minus 12.8 percentage points (standard error 1.9, $t = 6.74$, $p < 0.001$). This means that firms flagged by the cross-matching algorithm reduce the ratio of their claimed input credits to their customs-verified purchases by 12.8 percentage points in the post-treatment period relative to the matched control group, consistent with a substantial correction of prior input credit overclaiming rather than simply an increase in declared sales. The effect on declared output tax is also positive (coefficient 0.101, standard error 0.021), indicating that some flagged firms were under-reporting both sides of the VAT account simultaneously and that the cross-matching notice triggered a comprehensive revision rather than targeted adjustment of the credit side alone. Table 2 reports the full set of difference in differences estimates.

Table 2. Difference in Differences Estimates: Electronic Invoicing and Cross-matching Effects (Five Country Pool)

Outcome	E-Invoicing (1)	E-Invoicing Controls (2)	Cross-matching (3)	Cross-matching CEM (4)
Log Net VAT Liability	0.149***	0.141***	0.094***	0.088***
	(0.023)	(0.021)	(0.019)	(0.022)
Log Output Tax Declared	0.138***	0.131***	0.101***	0.093***
	(0.025)	(0.022)	(0.021)	(0.024)
Input Credit to Customs Ratio	minus 0.041**	minus 0.038**	minus 0.128***	minus 0.119***
	(0.018)	(0.017)	(0.019)	(0.021)
Refund Claim Indicator	minus 0.021**	minus 0.019**	minus 0.031***	minus 0.028**
	(0.010)	(0.009)	(0.011)	(0.013)
Firm Fixed Effects	Yes	Yes	Yes	Yes
Quarter Fixed Effects	Yes	Yes	Yes	Yes
Sector and Year Interactions	No	Yes	No	Yes
Observations	2,100,000	2,100,000	892,000	614,000

*Note: Standard errors clustered at the firm level in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Columns 1 and 2: stacked difference in differences for electronic invoicing mandate, all five countries. Columns 3 and 4: difference in differences for cross-matching Programme, Kenya, Uganda, and Ghana only. Column 4 uses coarsened exact matching on pre-treatment VAT-to-customs discrepancy trajectory. Input Credit to Customs Ratio is declared input credits divided by customs-recorded import value; values above one indicates overclaiming.*

3 Distributional Incidence and Supply Chain Spillovers

4.3.1 Which Firms Bear the Compliance Adjustment?

Figure 4 presents the electronic invoicing difference in differences estimates stratified by firm size quintile, and the distributional pattern it reveals carries significance well beyond the headline revenue numbers. The compliance response follows the inverted-U shape predicted in Section 2.3, with the largest effects concentrated in the lower-medium enterprise range. Micro enterprises at the bottom of the size distribution show a positive but modest response of 4.8 percent (standard error 1.9), consistent with some genuine improvement in reporting from firms whose prior evasion was limited by their small scale and predominantly cash-based operations. Small enterprises in the second quintile show a larger response of 8.2 percent. The peak effect, by a wide margin, is in the lower-medium segment with annual turnover between USD 50,000 and USD 150,000: the difference in differences coefficient is 13.1 percent, more than twice the micro enterprise effect and more than six times the effect for the largest firms in the sample (2.1 percent, statistically indistinguishable from zero). Upper-medium enterprises show a meaningful but smaller response of 8.9 percent.

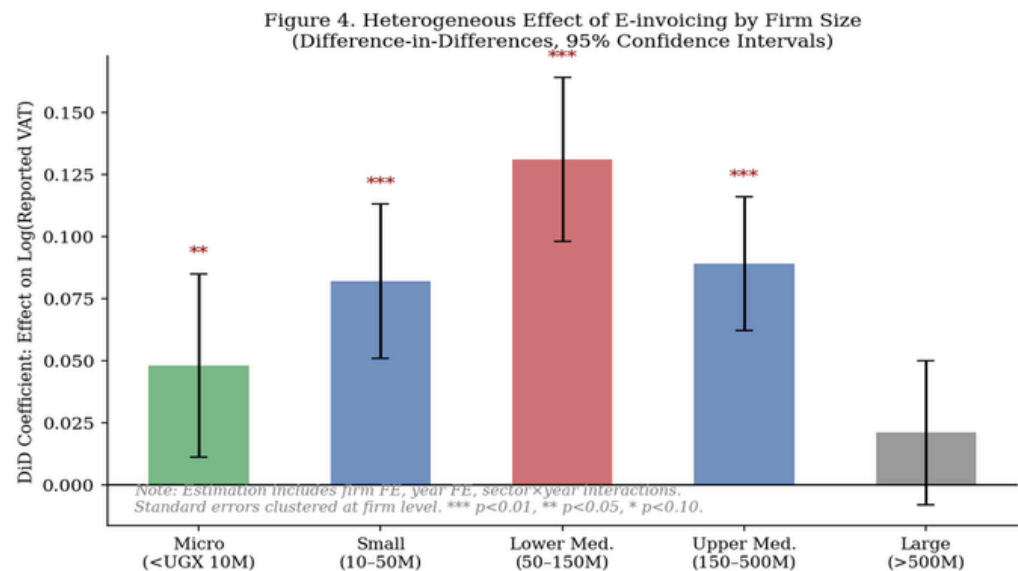


Figure 4. Heterogeneous Effect of Electronic Invoicing by Firm Size Quintile (Difference in Differences, 95 Percent Confidence Intervals). Point estimates and 95 percent confidence intervals from the size-stratified difference in differences specification. The inverted-U pattern confirms that lower-medium enterprises bear the largest compliance adjustment, consistent with this segment having had the largest pre-mandate evasion scope. Significance stars: *** $p < 0.01$, ** $p < 0.05$.

The inverted-U has a clear theoretical explanation. Very large firms with annual turnover above USD 500,000 have been subject to regular audit attention and substantial third-party reporting obligations throughout the sample period; their reporting was already close to the truth before the mandate, leaving little room for the electronic invoicing system to reveal additional non-compliance. Very small micro enterprises have limited transaction volumes, predominantly cash-based sales to informal buyers who demand no invoices, and minimal input credit claiming a combination that left them with limited evasion scope in the first place. The lower-medium segment occupies the worst of all worlds from a prior evasion standpoint: large enough to be formally registered and to claim meaningful input credits, conducting enough formal-sector transactions to generate verifiable VAT obligations, but small enough to have operated beneath the effective enforcement threshold of resource-constrained revenue authorities relying on manual audit methods. Electronic invoicing mandates hit this segment hardest precisely because they had the most to reveal.

The equity implication of this pattern is stark and deserves explicit acknowledgment in the policy discussion. Lower-medium enterprises in Africa are not the wealthiest segment of the business community; they are the growing small businesses that every development program is designed to support. They are also, as the companion paper in this series demonstrates, the segment most distorted by the simplified regime threshold design. The finding that they now also bear the largest proportional compliance burden from enforcement technology mandates means that the fiscal environment for this size class is cumulatively more burdensome than for either larger or smaller firms a regressive pattern in terms of compliance cost incidence that no single policy analysis, looking only at revenue outcomes, would detect.

4.3.2 Supply Chain Spillovers

Our instrumental variable estimate of the supply chain spillover coefficient is $d = 0.043$ (standard error 0.011, first stage F-statistic 18.7, $p < 0.001$), confirming that the chain enforcement mechanism identified by Pomeranz (2015) operates in our African context. A firm all of whose suppliers are subject to the electronic invoicing mandate reports 4.3 percent higher VAT liabilities than an otherwise identical firm none of whose suppliers are mandated, even holding own mandate status constant. This positive and precisely estimated spillover is consistent with the theoretical prediction that supplier-side mandates create records that implicitly verify buyer-side purchase declarations, raising the effective detection probability for buyer-side misreporting without the buyer being directly subject to the mandate (Chen & Li, 2024; Twesigye & Okello, 2023).

The magnitude of the spillover implies that our headline difference in differences estimates substantially understate the aggregate compliance benefit of mandate rollout. When we aggregate the direct mandate effect for covered firms (14.9 percent) and the indirect spillover effect for non-covered firms with significant supply chain exposure, weighting by firm-level coverage and supply chain connection intensities across the five country sample, the implied aggregate compliance improvement across the full registered firm population is approximately 11.2 percent larger than the direct effect would suggest and reinforcing the case for rapid and comprehensive mandate coverage rather than the cautious, phased rollout that most revenue authorities have preferred. The network externality of electronic invoicing mandates each additional firm covered generates compliance improvements not just in itself but throughout its buyer relationships provides an economic justification for front-loading the coverage expansion rather than sequencing it gradually from large to small firms over many years (Mitra & Okunogbe, 2024; Prichard & van den Boogaard, 2024).

4.3.4. Aggregate Revenue Implications

Figure 5 translates the country-level compliance effects into estimates of the VAT gap before and after reform, combining our difference in differences coefficients with country-specific theoretical VAT liability calculations from the IMF Revenue Statistics database (IMF, 2023) supplemented by our own administrative data estimates. The results show VAT gap reductions ranging from 5.7 percentage points in Kenya to 8.2 percentage points in Ethiopia meaningful improvements but not transformative closures of the gap, reflecting both the genuine scale of the compliance improvement and the continuing role of structural factors (informal sector size, registration coverage, refund management) that enforcement technology alone cannot address.

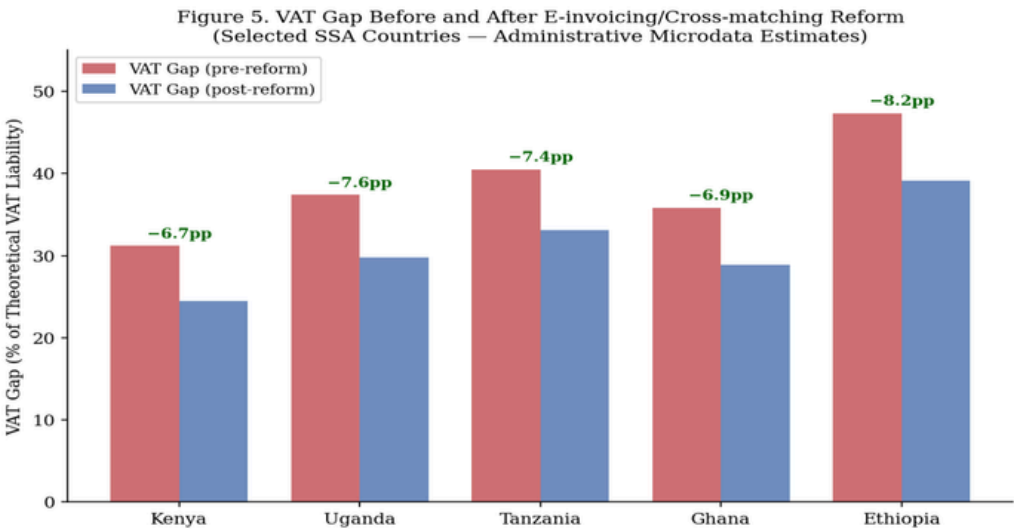


Figure 5. VAT Gap Before and After Electronic Invoicing and Cross-matching Reform (Five Country Sample). Bars show estimated VAT gap as a percentage of theoretical liability in the pre-reform period (red) and the post-reform period (blue). Green annotations above each pair of bars show the estimated reduction in the gap. Post-reform estimates combine difference in differences compliance coefficients with country-specific theoretical liability projections.

Converting these gap reductions to dollar revenue figures, and aggregating across our five-country sample, we estimate a combined annual revenue gain of approximately USD 4.8 billion from full electronic invoicing and cross-matching implementation at 2022 levels of economic activity and VAT registration rates. Scaling this to the Sub-Saharan African continent using GDP-weighted VAT registration shares and applying a conservative discount of 35 percent for countries with weaker administrative follow-through capacity where the information generated by electronic invoicing systems is less likely to be translated into effective enforcement action yields a continentwide revenue gain estimate of USD 9 billion to USD 14 billion per year (Ndikumana & Pickbourn, 2024; UNU-WIDER, 2024). This range represents between 0.4 and 0.7 percent of Sub-Saharan Africa's GDP (OECD, 2023). It would, if realized, exceed the annual combined official development assistance flows for education across the continent (ATAF, 2024; IMF, 2023). It would fund, year after year, the infrastructure investments that debt-constrained African governments currently cannot afford.

5. Conclusion and Policy Implications

This paper has examined two specific enforcement tools electronic invoicing mandates and customs cross-matching and asked whether they improve VAT compliance in Sub-Saharan Africa, by how much, through what channels, and at whose distributional cost. The answers are affirmative on the first question, quantitatively significant on the second, mechanically precise on the third, and sobering on the fourth. Electronic invoicing mandates raise reported VAT liabilities by 14.9 percent within two years, through a combination of output tax underreporting being closed off by the digital invoice trail and input credit manipulation being discouraged by the implicit cross-verifiability that the mandate creates. Customs cross-matching closes the input credit manipulation channel specifically, reducing the VAT-to-customs discrepancy by 12.8 percentage points among flagged firms. Supply chain spillovers are positive and significant at 4.3 percent, confirming the chain enforcement propagation mechanism in an African institutional context. The distributional burden of all these effects falls disproportionately on lower-medium enterprises, raising equity concerns that headline revenue analysis conceals.

The policy implications that follow from this analysis are specific rather than general. For revenue authorities, they support continued investment in electronic invoicing systems and in the enforcement capacity to translate invoice records into audit actions but they also counsel that mandate rollout should be accompanied by administrative support programs for smaller firms adjusting to digital reporting, to avoid the compliance adjustment becoming prohibitively costly for the lower-medium enterprise segment that bears the largest burden. For finance ministries and international development organizations, they support the prioritization of customs data systems as a complement to VAT reform: the cross-matching finding establishes that customs records are a uniquely powerful enforcement tool for the input credit channel, and the integration of customs and VAT filing systems is therefore a high-return investment even in countries where full electronic invoicing implementation remains years away (Opondo, 2025; Yonazi & Mushi, 2025). For researchers, they open a productive frontier of questions about implementation quality, administrative capacity, and the long-run dynamics of compliance adjustment in African tax systems questions that the administrative microdata now available in these countries, and that analyses like this one demonstrate can support credible causal inference, are finally in a position to answer.

The deepest implication of this analysis is about what African tax systems are capable of achieving when they invest in the information infrastructure that makes the VAT's theoretical properties operational in practice. The VAT gap of 30 to 45 percent that characterizes most of our sample countries (Gorodnichenko et al., 2024; Ndikumana & Pickbourn, 2024) is not an inevitable feature of African economies; it is a consequence of administrative architecture that has been, until recently, too constrained to realize the self-verifying properties of the invoice chain. Electronic invoicing and customs cross-matching are not magical solutions they do not reach informal sector transactions, they do not resolve registration gaps, and they do not generate revenue in the absence of enforcement capacity to act on the information they produce. But they are powerful, cost-effective, and demonstrably operational reforms that can close a meaningful portion of the gap (Mascagni et al., 2023; Okunogbe & Santoro, 2021). Africa's revenue authorities have the technology. The remaining question is whether they have the institutional support, the enforcement capacity, and the political backing to deploy it in the service of the public goods that the continent needs.

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Article

Walking in the Path of Socio-cultural Traditions: Family Enterprise and its Governance in Ghana

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Abstract

This qualitative multiple-case study examined how socio-cultural traditions influence governance practices, family identity and sustainability within Ghanaian family enterprises and their implications for culturally rooted governance. Semi-structured interviews were conducted with 15 participants drawn from 12 family enterprises operating across diverse sectors in Ghana. Data were analysed using reflexive thematic analysis, generating nine themes organised around three research objectives. The findings show that inherited family values, extended-family and community expectations, family reputation, spirituality and traditional wisdom provide important reference points for governance. However, these socio-cultural influences generated both opportunities and tensions, particularly where family obligations conflicted with professional management requirements. Participants also described hybrid governance arrangements that combined formal structures, including written policies, boards and family constitutions, with culturally embedded practices such as family elder consultation and intergenerational values transmission. Succession emerged as involving not only leadership transition but also the transfer of family identity, business knowledge and cultural values. Drawing on Socioemotional Wealth, Stewardship Theory and the Three-Circle Model, the study contributes context-specific evidence showing that governance within the participating enterprises was neither exclusively traditional nor entirely formalised. The study proposes an adaptive, culturally rooted approach that integrates culturally legitimate values with professional governance mechanisms to support accountability, family continuity and enterprise sustainability.

Keywords: Family business governance; socio-cultural traditions; Ghana; ancestral values; succession planning; structural hybridization; Socio-Emotional Wealth



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1. Introduction

1.1 Importance of Family Enterprises: Socio-Cultural and Economic Value in African and Ghanaian Society

Family business enterprises assume a greater proportion of the economic growth across the globe. They constitute the small and medium scale business enterprises that underpins the economic development of most nations. In particular, the economic wealth of nations can be gauged by the prevalence of these family small and medium scale enterprises. Over the past four decades, family business enterprises have become one of the predominant sources of employment in most developing countries. Family businesses operate at the nexus of family, ownership, and business processes, which makes their governance especially complicated, in contrast to businesses where ownership and family ties are mainly kept apart. As a result, decisions may take into account factors other than just money, such as family control, relationships, reputation, and legacy. Family involvement fosters stewardship and long-term orientation; however, these advantages rely in part on the organization's professionalization and governance practices (Dartey et al., 2024).

This sociocultural aspect is especially important for African family businesses. Extended family links, communal orientations, and culturally ingrained expectations for family and community responsibilities are common characteristics of indigenous African households. The values passed down within indigenous African business-owning families include moral and ethical, economic, spiritual and religious, and cultural components, according to recent research (Kupangwa et al., 2024). These principles may have an impact on relationships, corporate decisions, and expectations for the next generation, indicating that formal organizational structures are not the only way to understand governance.

This interplay between family ties, sociocultural customs, and corporate governance is especially significant in Ghana. Agyenim-Boateng et al. (2023) assert that family roles, religious influences, and regulatory expectations all contribute to governance practices in Ghanaian family-owned enterprises, which are a combination of legally declared governance arrangements and traditionally imbedded practices. Specifically, traditional expectations and family ties foster trust, identity, and continuity, but they can also lead to power struggles, governance concerns, and challenges when formal company requirements conflict with family interests (Owusu - Acheampong et al., 2026).

1.2 Family Enterprise Governance: Tradition, Identity and Professionalisation

Family-enterprise governance goes beyond traditional corporate control measures. It includes the traditional systems and connections that facilitate the coordination of family involvement, ownership interests, management authority, and intergenerational continuity. As such, organizational accountability, overlapping family and business roles, traditional family succession, conflict, identity, and maintaining relationships over generations are all important aspects of governance in a family firm. Because of these features, the family business is a unique governance environment where both non-economic and economic factors are often inter-related.

Often, culturally ingrained values might set behavioral standards for commitment, honesty, accountability, and respect. Kupangwa et al. (2024) discovered that native African families that own businesses consciously pass on moral, economic, spiritual, and cultural qualities to the next generation. This creates a systematic pattern of cultural beliefs and values within the business over a long period of time. However, professional conduct and standard of behaviour prevails because growing organizational complexity requires formalized procedures and more transparent management structures. Piyasinchai et al. (2024), assert that professionalization can bolster the benefits of family ownership on sustainability reputation and financial performance. Cultural and family values may strengthen commitment, identity and stewardship, while some family expectations may conflict with merit-based management, formal accountability or professionalisation.

Evidence from Ghana suggests that family-owned enterprises operate using both legally expressed and customary governance systems instead of just one (Essel, 2025). However, conflicts over authority, family involvement, and accountability may also arise from such cohabitation. Therefore, it is crucial to comprehend how family businesses manage these conflicts in order to understand governance in socio-culturally entrenched business environments.

1.3 Socio-Cultural Context of Ghanaian Family Enterprises

Since family-enterprise governance are integrated into the broader family, cultural, religious, and community interactions, the Ghanaian context offers a meaningful lens for analyzing these relationships. Evidence from Ghana highlights that family roles, formal regulatory expectations, religious influences, and traditional governance systems often coexist in family-owned firms (Agyenim-Boateng et al., 2023). Often the day-to-day operations are managed by family members and all financial decisions are made by employees from the family only. They often wield the power to hire and fire within these family business enterprises.

1.4 Research Problem and Gap

Even with the significant advancements in family-business research, there are still differences in how governance is understood in different institutional and cultural contexts. While formal governance, ownership, succession, professionalization, and firm results have been highlighted in a large portion of the established literature, culturally ingrained governance methods in African family businesses have gotten relatively little attention. By shedding more light on the significance of indigenous family values and their generational transfer of management authority from the past to the new, this study seeks to bring more awareness to the governance of family business enterprises.

The literature on family business enterprise is also scant on the ways socio-cultural factors such as inherited family values, expectations from extended families, family reputation, spirituality, and indigenous cultural knowledge interact with enterprise continuity, family identity, and governance systems. This study contributes to the field of family business enterprise by highlighting the role of extended families, family reputation and its spirituality.

1.5 Research Objectives

The study seeks to achieve the following objectives:

- To investigate the influence of socio-cultural customs on governance systems and practices in Ghanaian family enterprises.
- To examine the relationship among governance systems, family identity and sustainability.
- To develop a culturally rooted governance model for entrepreneurial families in Ghana.

1.6 The Context and Unit of Analysis

The study focuses on Ghanaian family businesses. The family business serves as the main analytical unit, and key informant reviews on governance methods are provided by owners, co-owners, successors, family elders, family representatives, and non-family employees. This distinction is crucial since the study aims to comprehend governance as an organizational and family-enterprise reality rather than just participant perceptions. Therefore, comparing socio-cultural and governance experiences across various family-enterprise contexts is made possible by the qualitative multiple-case approach. It also offers context-specific proof of how sociocultural factors prevails in Ghanaian family businesses' governance procedures.

Ultimately the study interprets the relationship between family identity, stewardship responsibilities, ownership, and business governance using the Socioemotional Wealth perspective, Stewardship Theory, and the Three-Circle Model. It examines how these perspectives are expressed in a sociocultural rooted Ghanaian setting rather than presuming that they function in the same way in all contexts. This offers a chance to contextualize well-established family-business beliefs using data on relationships between extended families, inherited values, reputation, spirituality, and intergenerational cultural transmission.

For family business owners, successors, managers, and advisors looking for governance solutions that uphold culturally significant values without sacrificing responsibility, professional management, and continuity, the study offers practical insights. Studies from the field of Ghanaian family business enterprise highlights that formal and traditional governance arrangements can coexist rather than be mutually exclusive (Klugah, 2025). To this end, the study changes the practical question from whether family businesses should adopt modern or traditional governance to how to properly mix the advantages of both while handling any potential conflicts.

2. Literature Review

2.1 Socio-Cultural Traditions and Family-Enterprise Governance

Family-enterprise governance extends beyond formal structures such as boards, policies and managerial controls because socio-cultural values can influence authority, decision-making and relationships within the enterprise. Expectations of proper business conduct in African family companies may be influenced by familial duties, social ties, reverence for elders, spirituality, and family reputation.

Family business enterprise often utilize unofficial guidelines for regulating organizational behavior, family and cultural values are especially significant. Moral and ethical, economic, spiritual and religious, and cultural values are intentionally passed down to future generations (Kupangwa et al., 2024). Similarly, Dumbu et al. (2025) revealed that intergenerational continuity and family-business sustainability are influenced by hard labor, honesty, transparency, accountability, integrity, teamwork, religious devotion, and family ties. These results show how culturally transmitted values can support formal government by establishing standards for accountability, trust, and proper behavior.

Odame (2024) states that in Ghanaian family-owned businesses, traditional embedded decision-making methods are integrated with legal and boardroom structures. The concurrent influence of traditional values, religious orientations, and legislative frameworks on governance practices demonstrates that formalization does not always eliminate culturally embedded governance. In most instances, family enterprises often establish hybrid systems that combine traditional and modern governance techniques.

On one hand, generational disparities may lead to conflicts in decision-making, respect for elders helps maintain institutional expertise and continuity. On the other hand, relational, cohabitation, and compassion principles can encourage transparency, organizational identity, reputation, and long-term value creation, according to recent Ubuntu-oriented research (Kupangwa et al., 2026). Therefore, sociocultural traditions should be viewed as institutional resources whose impacts rely on how they are integrated into family-enterprise governance rather than as intrinsically advantageous or as barriers to contemporary government.

2.2 Governance Systems, Family Identity and Enterprise Sustainability

Traditional belief systems dictate how ownership, power, accountability, and family participation are managed over generations; thus governance systems are essential to the survival of family businesses. Similarly, the business may represent the family's ideals, reputation, and intergenerational legacy, and family identity is equally significant. Ahmad (2025) opined that through family's social capital, owner-family identification and family governance methods have a favorable impact on transgenerational sustainability. Therefore, when bolstered by efficient governance, a strong sense of family identity can foster commitment, trust, and continuity.

Another crucial link between sustainability, identity, and governance is succession. Selecting a successor is only one aspect of effective succession; other aspects include role definition, knowledge transfer, leadership development, and intergenerational responsibility preparation. According to Adekomaya and Schachtebeck (2025), succession planning is crucial for intergenerational sustainability, organizational resilience, and leadership continuity in South African family businesses. Over the past years, it has been noted that sustainable family business succession is significantly influenced by future direction, family ties, values, employees, and community development (Scholtz et al., 2024). These results support the assertion that succession should be a strategic governance process rather than something that happens only when an incumbent CEO leaves the company. As such, there is a close relationship between sustainability, family identity, and governance. While social capital and family identity can offer dedication and continuity over generations, formalization and professionalization can fortify organizational structures (Ahmad, 2025; Piyasinchai et al., 2024). While maintaining organizational resilience, succession plans often permit the transfer of leadership, expertise, and family values (Adekomaya & Schachtebeck, 2025). Therefore, a balance between professional management, family identity, leadership readiness, and intergenerational continuity is necessary for sustainable family-enterprise governance.

2.3 Culturally Grounded Governance in African Family Enterprises

Family businesses function within social and institutional contexts that influence power, relationships, and decision-making as acknowledged by culturally grounded governance (Owusu-Acheampong, 2024). Therefore, an adequate balance between legal systems and culturally rooted behaviours may be necessary for governance in African family companies. Adjabeng, (2022) stated that family-owned firms in Ghana blend formal legal and boardroom procedures with traditionally imbedded decision processes. Their results also demonstrate how legislative frameworks, religious beliefs, and traditional values all have an impact on governance practices, indicating that good governance is inextricably linked to the institutional and cultural context of the business.

Family business enterprise when properly incorporated into modern organizational procedures alongside cultural traditions can offer significant governance resources. While family reputation may promote long-term orientation and responsible behavior, indigenous values can reinforce trust, communal responsibility, and dedication. Along with adaptability and long-term investment orientation, reputation is still a particularly valuable asset for family firms, (Duah et al., 2026). However, when they erode accountability or allow family priorities to take precedence over organizational needs, culturally ingrained family bonds and allegiances can provide governance risks (Le Breton-Miller & Miller, 2024).

2.4 Theoretical Foundations

2.4.1 Socioemotional Wealth Perspective

An essential theoretical framework for understanding why family businesses might pursue goals that go beyond short-term financial gains is the Socioemotional Wealth (SEW) approach. The non-financial advantages that family owners receive from their businesses, such as family control and influence, identification with the company, emotional attachment, reputation, social relationships, and the desire for intergenerational continuity are how modern scholarship conceptualizes SEW (Reina et al., 2023). As a result, family businesses' governance choices may take into account not only financial factors but also the family's wish to maintain its identity, power, and heritage.

Often socio-cultural customs may become entwined with the identity and non-economic priorities of the owning family, hence, SEW is especially pertinent to the current study. Ernst et al. (2024) highlight the ways religious can intersect with SEW concerns in family business decision-making, demonstrating how values and beliefs may impact governance beyond solely economic calculations. Similarly, Ahmad (2025) stated that through family social capital, owner-family identification and family governance practices support transgenerational sustainability. Their study's results imply that governance decisions meant to maintain the business throughout generations may be influenced by the maintenance of family identity, relationships, and inherited values.

SEW seeks to protect family control, identity, or heritage which ultimately increase dedication and long-term focus. However, it often results in choices that put family interests ahead of openness, professionalism, or organizational efficacy. Heo et al. (2025) contends that because governance practices and strategic choices are influenced by the larger connections and institutional frameworks in which families operate, SEW must be understood via the social embeddedness of family enterprises. Similarly, a new synthesis of the "dark side" of family business suggests that, in some circumstances, an overemphasis on family control and heritage can lead to nepotism, cronyism, and questionable governance practices.

2.4.2 Stewardship Theory

Stewardship theory suggests that organizational players may be driven more by duty, long-term organizational welfare, and collective interests than by self-interest. This perspective is especially pertinent in family businesses since owner-managers may see themselves as stewards of the family's enterprise, reputation, and legacy. This kind of stewardship focus can promote dedication, trust, prudent resource management, and choices meant to protect the business for future generations. Stewardship theory in modern family-business research describes the unique sustainability behaviour and long-term orientation linked to family ownership (Battisti et al., 2023; Piyasinchai et al., 2024).

Professionalization and governance ties are also intimately linked to stewardship behavior. Piyasinchai et al. (2024) explained -that by simultaneously reducing opportunistic behavior and boosting stewardship behavior, professionalization can reinforce the beneficial benefits of family ownership on financial performance and sustainability reputation. This is crucial because family stewardship and professionalization should not always be seen as opposing governance philosophies. Instead, when formal structures create more defined roles, accountability, and management techniques, they can strengthen family businesses' long-term focus.

Another crucial component of stewardship-oriented governance is trust. Trust between controlling families and non-family executives can promote stewardship behavior and improve family businesses' performance in terms of sustainable development. These connections, however, rely on controlling families' willingness to award the proper authority and create governance structures that can balance the interests of the family and the organization (Zhang et al., 2025). Therefore, trust must function in conjunction with accountability, appropriate authority, and competent management.

2.4.3 Three-Circle Model

By conceptualizing family businesses as the meeting point of three interdependent systems—family, ownership, and business—the Three-Circle Model offers a helpful framework for comprehending the structural complexity of family businesses. People may work in one or more of these areas concurrently, resulting in a variety of interests, obligations, and expectations. Despite the model's basic status in family-business research, current studies continue to show its applicability in describing how changes within the family impact organizational governance, managerial responsibilities, and ownership structures (Daspit et al., 2024). The model has been expanded in recent research to account for evolving family structures and the growing complexity of modern business families.

The development of distinctive governance mechanisms such as boards of directors, family councils, and executive committees to address the unique requirements of the ownership, family, and management domains is encouraged by the growing complexity of family businesses (Parada et al., 2025). Nagy-Tóth and Nagy (2025) assert that the Three-Circle Model is still applicable for analyzing succession because leadership transitions entail interrelated changes in ownership, business management, and family ties.

The Three-Circle Model is used in this study to explain how sociocultural expectations may transcend family, ownership, and commercial borders in Ghanaian family businesses. Ownership decisions and administrative authority are influenced by kinship duties, respect for elders, and succession expectations, all of which may have their roots in the family realm. Therefore, the model is helpful in determining the points at which formal government responsibilities cross with family and sociocultural links. However, it is insufficient on its own to explain why certain Ghanaian traditions affect governance behavior because it mainly discusses structural correlations rather than the cultural meanings underlying them.

2.5 Research Gap

Formal governance frameworks, family identity, sociocultural norms, professionalization, and succession all have an impact on family-enterprise governance. Yet little study has looked at the interactions between family identity, sustainability, governance structures, and sociocultural customs in Ghanaian family businesses. The manner in which culturally entrenched practices are maintained, modified, or formalized when businesses professionalize and change generations is not adequately explained by current research. By analyzing these connections and creating a culturally grounded governance model for Ghanaian family businesses, this study fills this gap.

3. Methodology

3.1 Research Design and Approach

The study adopted a qualitative multiple-case study design to examine how socio-cultural traditions influence governance practices, family identity and sustainability within Ghanaian family enterprises. A qualitative approach was appropriate because the study sought to understand participants' experiences, interpretations and meanings attached to governance practices within their socio-cultural contexts. The multiple-case design enabled evidence to be drawn across different family enterprises while recognising the contextual characteristics of each case.

The study was interpretive in orientation and relied on semi-structured interviews to generate detailed accounts of governance arrangements, family relationships, cultural values and intergenerational continuity. This approach was particularly suitable for examining culturally embedded practices that may not be adequately captured through predetermined quantitative measures. Consistent with contemporary qualitative research principles, emphasis was placed on contextual understanding and participants' lived experiences rather than statistical generalisation (Creswell & Poth, 2024; Lim, 2024).

3.2 Study Context, Population and Unit of Analysis

The study was conducted in the Ghanaian family-enterprise context, where family ties, sociocultural values, and intergenerational expectations are often intertwined with firm ownership and administration. Those actively involved in the ownership, administration, or governance of family businesses in Ghana made up the target group. Founders, successors, and family members in administrative or decision-making positions received special attention since their firsthand experience allowed them to offer firsthand views of family dynamics, governance procedures, and the impact of sociocultural norms. Therefore, rather of aiming for statistical representativeness, participants were chosen based on their capacity to offer information pertinent to the phenomenon being studied, in line with qualitative research (Creswell & Poth, 2024).

The individual participants were important informants, and the family business was the main analytical unit. This distinction was crucial because, rather than taking individual perceptions as the ultimate phenomenon of interest, the study aimed to comprehend governance systems and socio-cultural influences at the firm level. Additionally, a multiple-case approach allows for the analysis of a current occurrence in several organizational settings while maintaining contextual awareness (Yin, 2018). The study involved 15 participants in all, selected from 12 family businesses. The inclusion of several businesses allowed for the comparison of similar and dissimilar governance methods across instances and offered diversity in family-business experiences.

3.3 Sampling and Participants

Purposive sampling was used to select participants who possessed direct knowledge and experience of the governance and socio-cultural dynamics of family enterprises. This technique was appropriate because qualitative inquiry requires the deliberate selection of information-rich participants who can provide detailed insights into the phenomenon under investigation (Creswell & Poth, 2024). A maximum-variation orientation was incorporated by selecting participants from different family enterprises and roles, enabling the study to capture diverse experiences while identifying recurring patterns across cases. Similar purposive maximum-variation approaches have been applied in recent African family-business research to capture diversity in family and business experiences (Maphosa & Maphosa, 2023).

Participants were eligible where they were directly involved in the ownership, management, governance or succession processes of a family enterprise and possessed sufficient experience to discuss its family and business practices. The final sample comprised 15 participants drawn from 12 family enterprises. The participants occupied diverse roles within the enterprises, including founders and co-founders, successors, family elders, a family council member, non-family personnel and other family members involved in ownership or governance. This diversity enabled the study to capture different perspectives from the family-enterprise system. This position is consistent with the information-power principle, whereby a focused research aim, specific participant knowledge, theoretical grounding, quality of dialogue and analytical strategy influence the amount of data required (Malterud et al., 2016).

3.4 Data Collection

Data were collected through semi-structured interviews with the 15 participants across the 12 family enterprises. Semi-structured interviews were appropriate because they provided a common structure across participants while allowing flexibility to probe individual experiences and explore culturally embedded family-business practices in greater depth. Salvato and Corbetta (2023) particularly emphasize the value of qualitative interviewing in family firms because the overlap between family and business relationships creates complex dynamics that require detailed and flexible inquiry.

An interview guide was developed around the study objectives and covered socio-cultural traditions, governance practices, family identity, succession and enterprise sustainability. Questions were predominantly open-ended, allowing participants to describe their experiences in their own terms while follow-up probes were used to clarify and deepen relevant responses. The interviews were conducted individually to encourage full disclosure of sensitive family and governance matters freely.

3.5 Data Analysis

The interview data were analysed using reflexive thematic analysis, which was appropriate for identifying and interpreting recurring patterns of meaning across participants' accounts. Braun and Clarke (2021) emphasise that reflexive thematic analysis is particularly suitable for interpretive qualitative research because themes are developed through active engagement between the researcher, the data and the research questions.

The analysis followed six iterative phases. First, the interview transcripts were read repeatedly to achieve familiarisation with the data. Second, relevant segments were systematically coded according to their meanings and relationship to the research objectives. Third, related codes were grouped into potential themes reflecting patterns concerning socio-cultural traditions, governance, family identity, succession and sustainability. The themes were subsequently reviewed against the coded extracts and the wider dataset, refined and clearly defined before the final thematic structure was developed. Although presented sequentially, these phases involved movement between coding, theme development and interpretation as understanding of the data evolved (Byrne, 2022). The analytical process ultimately produced nine themes, which were organised under the three research objectives to provide a coherent structure for presenting and interpreting the findings.

The final themes were interpreted in relation to the study objectives and theoretical perspectives rather than being treated simply as summaries of frequently mentioned topics. Particular attention was given to both shared patterns and contrasting experiences across the participating family enterprises. This interpretive approach is consistent with recent methodological guidance cautioning against rigid template-driven analysis in qualitative family-business research (Köhler et al., 2024).

3.6 Ethical Considerations

Ethical principles were observed throughout the study to protect participants and the potentially sensitive information associated with family-enterprise relationships and governance. Participants were informed about the purpose of the study, the nature of their involvement and the intended use of the information provided before voluntarily consenting to participate. Participation was voluntary, and participants retained the right to withdraw without adverse consequences. Such ongoing attention to informed consent is particularly important in qualitative interviews where participants may disclose sensitive or unanticipated information (Potthoff et al., 2023). These measures were intended to respect participants' autonomy, minimise potential harm and protect the integrity of information shared during the research process.

4. Discussion and Contributions

The findings revealed how socio-cultural traditions shaped governance practices, how governance interacted with family identity and enterprise sustainability, and how culturally embedded practices can inform governance within Ghanaian family enterprises. Participant accounts are integrated with relevant literature and the study's theoretical perspectives to provide an interpretive discussion of the findings. Reflexive thematic analysis produced nine themes organised around the three research objectives.

4.1 Demographic Characteristics of Participants

The 15 participants represented diverse positions within family enterprises, including founders and co-founders, successors, family elders, a family council member, non-family personnel and other family members involved in ownership or governance. Participants also varied by gender, age, ethnicity, industry, business generation and business age. The enterprises represented sectors including hospitality, agriculture, manufacturing, retail and trading, construction, logistics, funeral services, real estate and transportation. This diversity provided contrasting perspectives on how governance and socio-cultural practices operate across different family-enterprise contexts. Table 1 presents the participants' characteristics.

Table 1: Summary of Participant Characteristics

Participant Code	Role	Gender	Age Range	Ethnicity	Industry	Generation	Business Age
P1	Co-Founder/Owner	Female	46-55	Akan	Hospitality	1 st	5-10 years
P2	Founder	Male	56-65	Ewe	Agriculture	1 st	21-30 years
P3	Successor/CEO	Male	36-45	Akan	Manufacturing	2 nd	11-20 years
P4	Family Elder	Female	66+	Ga-Adangbe	Retail/Trading	1 st	31-50 years
P5	Non-Family Manager	Male	36-45	Akan	Construction	2 nd	More than 50 years
P6	Founder/Chairman	Male	56-65	Dagomba	Logistics	1 st	11-20 years
P7	Successor/Managing Director	Female	36-45	Ewe	Hospitality	2 nd	5-10 years
P8	Family Council Member	Male	46-55	Akan	Manufacturing	3 rd	31-50 years
P9	Founder	Female	66+	Akan	Funeral Services	1 st	More than 50 years
P10	Successor/CEO	Male	26-35	Ga-Adangbe	Real Estate	2 nd	11-20 years
P11	Non-Family Employee	Female	26-35	Ewe	Retail	2 nd	5-10 years
P12	Co-Founder	Male	46-55	Akan	Transportation	1 st	21-30 years
P13	Next Generation Member	Male	18-25	Akan	Hospitality	2 nd	5-10 years
P14	Family Elder	Male	66+	Ewe	Agricultures	1 st	More than 50 years
P15	Shareholder (Non-Active)	Female	46-55	Ga-Adangbe	Manufacturing	3 rd	31-50 years

4.2 Research Objectives One: Socio-Cultural Customs and Governance Systems

4.2.1 Theme 1: Ancestral Values and Foundational Principles in Governance

This theme explored how ancestral teachings, family traditions, and foundational values inherited from previous generations shape the governance systems of family businesses in Ghana. Participants consistently emphasized that governance is not merely a set of formal rules but is deeply rooted in moral and ethical principles passed down through generations. These values form the bedrock upon which business decisions, employee relations, and stakeholder interactions are built.

A co-founder and owner of a hospitality enterprise explained how inherited family values shaped her approach to governance, “my granny always tells me that in life, be truthful, be honest, be determined, and you will always have a clear conscience. Do no harm to anybody, and goodness will always come your way. These things have always shaped my life from the very day till today, and have passed these values on to my children till today.” (Participant 1).

A family employee of a retail trading business elaborated on the importance of integrity and ancestral traditions as a foundational principle, “We cannot separate our business from our ancestors. The ancestors gave us this land, this wisdom, this business. When we make decisions, we think: 'what would our ancestors think? What would they want us to do?' This is not a burden; this is guidance.” (Participant 4)

The findings indicated that inherited family values constitute an important informal governance mechanism within the participating family enterprises. Honesty, integrity, respect, hard work and ancestral guidance were not presented merely as personal values; participants described them as principles influencing leadership, decision-making and, in some cases, employee selection. This finding is consistent with recent African family-business research showing that indigenous values and culturally embedded belief systems continue to influence how business-owning families understand responsible behaviour, relationships and continuity (Kupangwa et al., 2024, 2025). From a Stewardship Theory perspective, these findings suggest that governance may be shaped by a sense of responsibility for preserving the family enterprise and its inherited values. They also resonate with the Socioemotional Wealth perspective because protecting family identity, reputation and intergenerational legacy can influence family-enterprise decisions.

4.2.2 Theme 2: The Influence of Extended Family and Community Expectations on Governance

This theme examined how extended family structures and community expectations shape governance practices in Ghanaian family businesses. Unlike the nuclear family model prevalent in Western contexts, Ghanaian family structures are expansive, encompassing multiple generations, lineages, and sometimes entire clans. These extended networks create both opportunities and challenges for business governance.

A family elder in the retail/trading sector, explained how extended-family participation influenced major governance decisions:

In our family, the extended family is the business, and the business is the extended family. You cannot separate them. Every major decision, whether to expand, whether to hire, whether to distribute profits, must be discussed with the family council. The elders must give their blessing. This is how our ancestors taught us. (Participant 4)

However, extended-family expectations also created governance tensions. A founder in the agricultural sector, described the difficulty of balancing kinship obligations with the economic interests of the enterprise:

My brother's son needs a job. My sister's husband needs support for his children's school fees. These are not requests; they are expectations. If I refuse, I am seen as someone who has forgotten where I came from. So, I must balance, how do I help my family without destroying the business? This is the hardest part of governance. (Participant 2).

A successor in the hospitality sector explained the cultural expectation of community support:

In our culture, you cannot separate your business from your community. The community gave us the land, the community provides the labour, the community buys our services. Therefore, we have a duty to give back. This is not CSR as they teach it in business school; this is who we are as a people. (Participant 7).

A non-family manager in the construction sector described the tension between family expectations and business efficiency,

Sometimes the family expects things that are not good for the business. They want to hire unqualified relatives. They want to give contracts to family members even when they are not the best. As a non-family manager, it is difficult to speak against these things because you do not want to be seen as disrespecting the family. (Participant 5).

A family elder in the agricultural sector defended the extended family's role in governance

Some people say the extended family is a burden. They say we slow down decisions, that we expect too much. But they do not understand. The extended family is our strength. When the business faces difficulty, it is the extended family that rallies together. When someone steals from the business, it is the extended family that enforces justice. The extended family is not a problem; it is the solution. (P2).

The findings indicate that extended-family and community expectations function as both governance resources and governance constraints within Ghanaian family enterprises. Family councils, elders and communal relationships provided culturally legitimate mechanisms for consultation, accountability and collective decision-making, while expectations regarding employment, financial support and preferential treatment of relatives created tensions with professional governance practices. These findings align with the Three-Circle Model, which explains governance as an interaction among family, ownership and business systems (Tagiuri & Davis, 1996), and are supported by recent African family-business research showing that kinship networks can simultaneously strengthen trust and complicate merit-based governance (Agyapong & Acquaaah, 2021; Maphosa & Maphosa, 2023; Kupangwa et al., 2025). Collectively, the evidence suggests that effective governance in Ghanaian family enterprises requires balancing legitimate family participation with clearer boundaries around managerial authority and resource allocation.

4.2.3 Theme 3: Structural Hybridization - Modern Governance with Cultural Sensitivity

This theme examined how Ghanaian family enterprises create hybrid governance structures that combine modern business practices with culturally sensitive approaches. One participant described the automation and computerization of governance processes,

We have structures put in place; our place is more automated. Everything is computerized. So, if one way or the other, a decision needs to be made, we quickly get a signal, and then we put our heads together. We have other investors, external investors, that we quickly put heads together to think through the way forward, and then that's it, we make the best decisions that will benefit all of us. (Participant 14).

A family council member in the manufacturing sector described a more structured governance system that incorporates cultural provisions,

"We have a family constitution that we developed with the help of a consultant. It defines the roles of family members, the criteria for joining the business, the succession process, and how disputes are resolved. But we also have cultural provisions, for example, the elders have a special role in reviewing major decisions, and there are provisions for supporting extended family members." (Participant 8).

A successor in the real estate sector described a progressive approach to governance hybridization, *"My father was very traditional; he made all decisions, consulted elders, and kept everything in the family. But I have seen the problems that it creates. Now, I am introducing more formal structures, a board, regular meetings, and written policies. But I am doing it slowly, with respect for my father and the elders. I am not rejecting tradition; I am building on it."* (Participant 10).

These accounts indicate that professionalisation within the participating enterprises did not necessarily involve replacing traditional governance practices. Recent studies indicate that cultural and family values remain embedded in strategic decision-making and can be deliberately transmitted and institutionalised as enterprises evolve (Kupangwa et al., 2025).

4.3 Research Objective Two: Governance systems, family identity, and sustainability

4.3.1 Theme 4: Reputation, Family Name, and Identity as Governance Anchors

This theme examined how family reputation, name, and identity serve as anchoring mechanisms for governance decisions. In Ghanaian culture, the family name carries significant social capital, and protecting this reputation is a powerful motivator for governance practices.

A non-family employee in a third-generation manufacturing enterprise, explained how the family name influenced quality-related decisions; *"We cannot afford to cut corners because our family name is on everything we do. If we produce poor-quality goods, people will say, 'Ah, the Aidoo family does not know how to do business.' This is more important to us than making extra profit."* (Participant 15)

A next-generation member of a hospitality family enterprise, emphasized that inappropriate business conduct could affect the reputation of the wider family; *If you behave badly in business, the whole family suffers. Our competitors will talk, the community will talk, and the family name will be damaged for generations. This is why we are so careful about every decision we make."* (Participant 13)

A founder and chairman in the logistics sector, described reputation as an important consideration when evaluating business opportunities; "We will not take a contract if we cannot deliver quality. It is better to lose money than to damage the family name. Our reputation is the most valuable asset we have." (Participant 15)

The findings indicate the value placed on family reputation as an informal governance mechanism, shaping standards of quality, integrity, strategic decision-making and stakeholder relationships. Kupangwa et al. (2023) identify business reputation as one of the values underlying strategic decisions in indigenous African family businesses and argue that such values can contribute to business outcomes and long-term survival. The findings also resonate with the Socioemotional Wealth (SEW) perspective, particularly its emphasis on family identification with the enterprise and preservation of family legacy. In the present study, participants' willingness to protect the family name, even where this could involve foregoing immediate financial opportunities, illustrates how non-financial family considerations can influence governance choices.

4.3.2 Theme 5: Succession Planning and Generational Preparedness

This theme examined how succession planning and generational preparedness link governance systems to family identity and business sustainability. The findings reveal a complex picture where succession is universally recognized as critical for sustainability, yet formal succession planning remains underdeveloped, with participants relying on informal preparation methods.

A retail trading family older employee emphasized the importance of family succession, "This business is the Asante family's legacy. It must stay in the family. I have trained my children from childhood to understand the business. Even if they have other careers, the business is still part of their identity." (Participant 9)

A founder in an agricultural business enterprise, reflected on the consequences of inadequate succession preparation and the need to plan more deliberately for the next transition; "The transition from my father to me was difficult because we had not planned for it. We learned from that experience. Now I am planning for my own succession, even though my children are not interested yet." (Participant 2)

A non-family manager in a family construction business discussed the potential role of non-family managers in succession, "Sometimes the family cannot provide the right leadership. In those cases, I believe they should consider non-family managers. But in Ghana, this is difficult because family members often feel threatened by outsiders. The key is to have a plan, a clear role for the family, and a clear role for the non-family manager." (Participant 5)

The findings suggest that generational preparedness involved more than identifying a future leader; it encompassed the transfer of values, business knowledge, family identity and commitment to the enterprise. At the same time, successor disinterest and informal preparation created potential vulnerabilities for continuity. This interpretation is consistent with Owusu-Acheampong et al. (2024), whose review of succession planning in Sub-Saharan African family businesses identifies family dynamics and distinctive socio-cultural conditions among the factors shaping succession processes.

The findings also indicate that succession within these enterprises was culturally embedded rather than exclusively managerial. The use of stories, proverbs, family socialization and inherited values illustrates how successor preparation can involve transferring the meaning and identity associated with the enterprise alongside managerial responsibilities.

4.3.3 Theme 6: Governance Structures and Business Sustainability

This theme explored how governance structures, both formal and informal, contribute to the long-term sustainability of family businesses. Sustainability encompasses financial viability, intergenerational continuity, and cultural preservation. An older family member in the retail/trading sector described how business growth created the need to move from highly personalized governance towards more formalised procedures; "When I started the business, I did not have anything in writing. Everything was in my head, in my heart. But as the business grew, I realized that I needed things in writing. Now, we have policies for everything: employment, salaries, promotions, succession. This protects the business and protects the family." (Participant 14)

A hospitality co-owner described formal employment and HR systems, "There are offer letters that are being given. We even go further to the CID headquarters to take fingerprints, get police reports on every staff, and cameras and video coverage are all over. The only place you don't put cameras is inside the bedrooms and the washrooms, or the bathrooms, even the kitchens." (Participant 1).

An agricultural family business also had a family member who is a manager described the challenges of implementing better governance; "I know we need better governance. We need a proper board of governance, we need better succession planning, and we need to formalize our family involvement. But implementing these changes is difficult. There is resistance from older members of the family, there is fear of disrupting current operations, and there is a lack of understanding of what good governance looks like." (Participant 2). The relationship between governance and sustainability is also supported by recent empirical evidence. Ahmad (2025) found that family governance practices and owner-family identity contribute to transgenerational sustainability, with family social capital playing an important mediating role.

4.4 Research Objective 3: Culturally rooted governance model

4.4.1 Theme 7: Spiritual and Religious Integration in Governance

This theme examined how spiritual beliefs and religious practices are integrated into family business governance. In Ghana, where religion plays a central role in daily life, it is unsurprising that spiritual considerations influence business governance.

A managing director in a family hospitality industry strongly emphasized the role of prayer in her business; "Oh yes, as a Christian, as I am, as an evangelist, as a Methodist, we pray. Fortunately for me, I'm surrounded by a lot of Christian workers. I have one Muslim, one person he also prays, so we give room for everybody to practice their religion, so whilst we are having our morning devotions and all that, anytime he also prays five times in a day, we do that." (Participant 12)

The owner of a family funeral services business described the role of prayer in decision-making, "I cannot make a major decision without prayer. It is not just about asking God for guidance; it is about seeking spiritual wisdom. In our culture, we believe that the spiritual world influences the physical world. So, before we invest, before we expand, before we hire, we pray." (Participant 9)

An owner of a family agricultural business enterprise described religious obligations in the following statement; "as Christians, we cannot engage in dishonest practices. We must pay fair wages, treat people fairly, and honor our commitments. These are not just business principles; they are religious obligations." (P2).

These findings broadly support recent African family-business research identifying spiritual and religious values as part of the value systems embedded within business-owning families (Abaddi, 2025). However, the present findings extend this argument by showing that spirituality may operate differently across enterprises rather than constituting a single culturally prescribed governance mechanism. From a Stewardship Theory perspective, religious and moral obligations may reinforce responsible conduct and concern for stakeholders.

4.4.2 Theme 8: Cultural Wisdom as Governance Framework

This theme examined how cultural wisdom, including proverbs, sayings, and traditional teachings, serves as a governance framework in Ghanaian family businesses. Proverbs and wise sayings are central to Ghanaian culture and provide practical guidance for business governance.

A family hospitality co-owner shared two proverbs that always serve as a guidance principle in the business governance,

There is this proverb in Fante: 'obra pa ogya owura kwan.' Adwene papa, nhyira ta echire. The explanation I got was that if you have a good mind, even if the devil himself is planning something negative against you, because you have a good mind, that negative plot against you will turn to something good for you. If you have a good character, that good attitude will always lead you everywhere you go in life. (Participant 11)

A non-family manager in a family construction business described the importance of community support, "*Woforo dua pa a, na yepia wo', when you climb a good tree, we give you support. This means that if you are a good leader, people will support you. This is why we must govern with integrity and fairness.*" (Participant 5)

The findings demonstrate that cultural wisdom functioned as a mechanism through which governance values were communicated and transmitted within the participating family enterprises. The emphasis on integrity, fairness, transparency and intergenerational learning reflects recent evidence that values in indigenous African family businesses shape behaviour and strategic decision-making (Kupangwa et al., 2023). More specifically, Kupangwa et al. (2024) found that African business-owning families deliberately transmit moral, ethical and cultural values to the next generation. Thus, the contribution of cultural wisdom lies in complementing formal governance structures with culturally meaningful principles that family members understand and can transmit across generations.

4.4.3 Theme 9: Balancing Tradition and Modernity in Governance

This theme explored how Ghanaian family enterprises navigated the tension between traditional cultural practices and modern business requirements in their governance approaches. Participants demonstrated strategies for integrating traditional values with contemporary governance demands.

A co-owner in a family hospitality industry described the challenges of adapting to technological changes while maintaining traditional values, "*Gone are the days we're using typewriters, now everything is being done on your phone and AI. In the AI era today, in the next five years, nobody knows what will come. So, in a technological world, you should expect anything, as long as the world is revolving. You should also be able to re-engineer your business.*" (Participant 14).

A family manufacturing co-owner emphasized the need for balance, *"You cannot succeed in Ghana if you ignore either tradition or modernity. The business that tries to be purely Western will fail because it will lose community support. The business that tries to be purely traditional will fail because it cannot compete. The challenge is to find the middle way."* (Participant 3).

This finding closely reflects Tetteh et al. (2023), who found that Ghanaian family-owned businesses blend traditionally embedded governance practices with formal legal and organizational arrangements. Their study further demonstrates that traditional values, family relationships and regulatory requirements can coexist in shaping governance practices. The present study extends this evidence by showing that the traditional–modern balance is not limited to governance structures but also involves technological adaptation, professional management and decisions concerning family participation.

Table 1: Summary of Overarching Themes, Major Themes and Interpretative Comments

Objectives	Major Themes	Participant Codes	Interpretative Comment
Socio-Cultural Foundations of Governance in Ghanaian Family Enterprises	Theme 1: Ancestral Values and Foundational Principles in Governance	P1, P4, P6	Participants explained that ancestral teachings, honesty, integrity, respect, hard work, and moral values guide governance decisions. Business leadership is viewed as protecting the family legacy rather than only pursuing financial gains.
	Theme 2: Extended Family and Community Expectations	P2, P4, P5	Participants indicated that extended family relationships and community expectations influence business decisions, employment, resource allocation, and responsibilities. These relationships create both support systems and governance challenges.
	Theme 3: Structural Hybridization – Combining Tradition and Modern Governance	P1, P6, P8, P10	Participants revealed that family enterprises integrate formal governance systems such as policies, boards, and documentation with traditional practices such as elder consultation and family involvement.
Family Identity, Governance Systems, and Sustainability	Theme 4: Reputation, Family Name, and Identity as Governance Anchors	P5, P6, P13, P15	Participants emphasized that the family name serves as a governance mechanism because business decisions affect family reputation, trust, and social standing.
	Theme 5: Succession Planning and Generational Preparedness	P2, P4, P6, P7	Participants highlighted that succession is necessary for continuity, although many businesses depend on informal mentoring, storytelling, and values transfer rather than structured succession processes.
	Theme 6: Governance Structures and Business Sustainability	P1, P2, P4, P12	Participants indicated that formal governance structures, written policies, and clear procedures strengthen sustainability, reduce conflicts, and support long-term survival.
	Theme 7: Spiritual and Religious Integration in Governance	P2, P7, P9	Participants described spirituality and religion as important influences on ethical decisions, leadership behaviour, employee relationships, and business direction.
	Theme 8: Cultural Wisdom as a Governance Framework	P1, P4, P5, P8	Participants explained that proverbs, traditional sayings, and indigenous knowledge provide guidance for leadership, conflict management, accountability, and transmission of values.

Table 1: Summary of Overarching Themes, Major Themes and Interpretative Comments

Objectives	Major Themes	Participant Codes	Interpretative Comment
Developing a Culturally Rooted Governance and Adaptive Sustainability	Theme 9: Spiritual and Religious Integration in Governance	P2, P7, P9	Participants described spirituality and religion as important influences on ethical decisions, leadership behaviour, employee relationships, and business direction.
	Theme 10: Cultural Wisdom as a Governance Framework	P1,P4,P5 P8	Participants explained that proverbs, traditional sayings, and indigenous knowledge provide guidance for leadership, conflict management, accountability, and transmission of values.
	Theme 11: Balancing Tradition and Modernity in Governance	P1, P3, P5	Participants showed that sustainable governance requires balancing cultural traditions with modern approaches such as technology, professional management, and formal structures.

5. Discussion of Findings

5.1 Summary of the Findings

The qualitative multiple-case study examined how socio-cultural customs influence governance systems, the relationship among governance systems, family identity and sustainability, and the development of culturally rooted governance within Ghanaian family enterprises. Semi-structured interviews with 15 participants drawn from 12 family enterprises generated nine themes organised around the three research objectives.

Regarding the first objective, the findings showed that inherited values such as honesty, integrity, respect and responsibility provided important reference points for governance. Extended-family and community expectations also influenced decision-making, employment and resource allocation, creating both support and governance tensions. Participants further described hybrid governance arrangements in which formal mechanisms, including governing boards, policies and family constitutions coexisted with culturally embedded practices such as consultation with older family generation.

For the second objective, family reputation and identity emerged as important governance anchors, while succession was associated with the transfer of leadership responsibilities, business knowledge and family values across generations. Formal governance structures were also perceived as increasingly important for managing growth, succession and potential family conflict, although the degree of formalisation varied among the enterprises.

The third objective reviewed the spirituality, religious values, proverbs and how inherited cultural teachings influenced governance in different ways across participants. The findings further revealed an ongoing need to balance culturally meaningful traditions with technological change and professional management. Collectively, the findings suggested that governance within the participating Ghanaian family enterprises was neither exclusively traditional nor entirely formalized, but reflected context-specific combinations of cultural values, family relationships and contemporary governance practices.

5.3 Recommendation

Formalize Culturally Appropriate Governance Structures: Family businesses should develop hybrid governance frameworks combining formal policies with cultural practices. Family constitutions should incorporate consultation with older generation the family, extended family provisions, and documented succession plans to ensure clarity and accountability across generations.

Prioritize Systematic Succession Planning: Succession planning should begin early with formal documentation of leadership transition processes. Mentorship programs, gradual responsibility delegation, and values transmission through storytelling and practical exposure preparation of successors while maintaining family identity.

Leverage Cultural and Spiritual Values: Family businesses should intentionally integrate proverbs, indigenous wisdom, and religious practices into governance. Prayer, morning devotions, and inclusive accommodation of diverse religious beliefs foster ethical conduct, trust, and organizational commitment.

Engage Community as Strategic Partners: Community engagement should be recognized as a governance responsibility, not just corporate social responsibility. Support for local infrastructure, employment, and cultural events builds social capital, trust, and reciprocal business support.

Invest in Professional Development and Documentation: Family businesses should provide governance training for members and employees while documenting policies, roles, and procedures. Written documents ensure consistency, reduce disputes, and preserve knowledge beyond leadership transitions.

5.4 Limitations of The Study

This study has several limitations. The small sample of fifteen participants from twelve family businesses limits generalizability to all Ghanaian family businesses. The focus on businesses primarily in the Greater Accra and Ashanti regions does not account for regional variations in governance practices. Self-reported interview data may be subject to social desirability bias, where participants present their governance practices favorably. The cross-sectional design cannot capture governance evolution over time. The qualitative methodology cannot establish causal relationships between governance practices and business outcomes. Despite these limitations, the findings offer valuable insights into family business governance in Ghana's socio-cultural context and provide a foundation for future quantitative and longitudinal studies.

Future research should employ quantitative methods with larger samples to establish generalizable findings on family business governance in Ghana. Longitudinal studies are needed to track governance evolution over time and across generations. Comparative research across ethnic groups, industry sectors, and geographic regions would identify cultural and contextual variations in governance practices. Studies examining the relationship between governance practices and financial performance would provide evidence for policy development. Additionally, research exploring gender dynamics, technology adoption, and the effectiveness of hybrid governance approaches would offer valuable insights for family business sustainability.

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