



TECHNOLOGY GOVERNANCE AND YOUTH SELF-RELIANCE THROUGH ROBOTICS INNOVATION IN KOGI STATE, NORTH-CENTRAL NIGERIA

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Abstract

This study examines how technology governance shapes the capacity of robotics innovation to advance youth self-reliance in Kogi State, North-Central Nigeria. Despite considerable public and institutional expenditure on robotics education, artificial intelligence infrastructure, and technology incubation schemes, the state has yet to convert trained young people into sustainable robotics-based livelihoods and ventures. Using a qualitative case-study approach grounded in secondary policy documents, institutional reports, and media coverage, the study argues that this shortfall is fundamentally a governance problem: robotics initiatives are announced and funded, but they are weakly coordinated, insufficiently accountable for outcomes, and poorly supported by enabling infrastructure, finance, and markets. Five governance gaps are identified: infrastructure governance; skills and curriculum governance; industry-academia coordination; financing and market governance; and ecosystem coordination and accountability. The study concludes by proposing a multi-pronged governance framework encompassing a multi-stakeholder coordinating mechanism, foundational infrastructure upgrades, curriculum reform, dedicated finance and incubation support, locally relevant robotics applications, and outcome-based monitoring. The analysis offers transferable insights for technology governance across sub-Saharan Africa, where similar mismatches between ambition and implementation are common.

Keywords: Technology Governance, Robotics Innovation, Youth Self-Reliance, Entrepreneurship Education, Institutional Coordination

1. Introduction

Across sub-Saharan Africa, technology and entrepreneurship have been increasingly promoted as vehicles for economic emancipation, especially in Nigeria, where youth unemployment exceeds 40% and formal-sector job creation lags far behind population growth (Adebayo & Oluwaseun, 2023). Successive federal and state administrations have accordingly elevated entrepreneurship and skills education to strategic priorities, framing them as a means to curb joblessness, stimulate innovation, and reduce dependence on oil revenues. More recently, this policy thrust has extended into emergent technology domains,

with robotics, artificial intelligence, and automation heralded as frontier arenas for innovation and youth self-reliance (National Board for Technical Education, 2024).

Kogi State, situated in Nigeria's North-Central geopolitical zone, exemplifies this trajectory. In early 2025, the state government unveiled what it termed an "inclusive entrepreneurial ecosystem" designed to catalyse economic growth and empower local business owners (Kogi State Government, 2025a). Concurrently, tertiary institutions within the state, notably the Federal University Lokoja and the Nigeria-Korea Friendship Institute of Vocational and Advanced Technology,

secured substantial grants and accreditation to establish centres of excellence and programmes in robotics, AI, and cybersecurity (Daily Trust, 2026; Voice of Nigeria, 2025). Senatorial interventions have further trained hundreds of youths in drone piloting and digital competencies, ostensibly to nurture self-reliance and close the technology skills deficit (Vanguard, 2025).

Yet, beneath this flurry of activity, a governance question persists: are these initiatives steered, coordinated, financed, and held to account in ways that allow robotics innovation to translate into lasting youth self-reliance? This study contends that they are not. Robotics initiatives in Kogi State are largely announced, funded, and celebrated as separate events, without the institutional coordination, enabling infrastructure, financing arrangements, and outcome-based accountability that genuine innovation and livelihood creation require.

The study pursues three interlocking objectives: (i) to map and critically assess the policy and institutional architecture governing robotics innovation in Kogi State; (ii) to identify the governance gaps that obstruct the translation of technical training into livelihoods and ventures; and (iii) to advance a practical governance framework for building authentic and inclusive robotics capability among young people.

The investigation carries relevance well beyond Kogi. Across Nigeria and comparable African settings, exuberant technology-policy discourse frequently coexists with meagre implementation. Examining the governance of robotics innovation in one locale therefore illuminates broader dynamics, contributing to scholarly and policy debates on technology, public administration, and youth development in the Global South.

2. Literature Review

2.1 Technology Governance and Innovation Policy

Technology governance refers to the rules, institutions, and coordination arrangements through which public and private actors steer the development, adoption, and social benefit of technology. Rather than treating

innovation as the automatic result of funding or training, a governance perspective asks who sets direction, who coordinates the actors involved, who provides the enabling conditions, and who is answerable for results. The responsible-innovation literature stresses that effective governance is anticipatory, reflexive, inclusive, and responsive to the needs of those it is meant to serve (Stilgoe et al., 2013). Research on collaborative governance similarly shows that outcomes depend on clear institutional design, trust, and sustained cooperation among public agencies and non-state stakeholders (Ansell & Gash, 2008).

For technology-based development, the triple-helix model adds that innovation flourishes where universities, industry, and government interact closely and continuously (Etzkowitz & Leydesdorff, 2000). Where these interactions are weak, public investment in technology tends to remain institutional rather than translating into enterprise and employment. This makes governance, and not merely funding, the decisive variable in whether robotics innovation can support youth self-reliance.

2.2 Entrepreneurship Education and Self-Reliance in Nigeria

The nexus between entrepreneurship instruction and self-reliance has long featured in Nigerian educational policy. Following the fiscal crises of the 1980s and the attendant structural adjustment programmes, entrepreneurship was embraced as a countermeasure to escalating unemployment and external dependency (Ogunleye & Adebayo, 2022). The National Policy on Education, revised iteratively since 1981, has consistently underscored the cultivation of entrepreneurial aptitudes as a core educational objective, aspiring to produce graduates who create jobs rather than compete for scarce positions (Federal Republic of Nigeria, 2014).

This policy orientation has spawned numerous federal and state initiatives. The National Youth Service Corps (NYSC) Skills Acquisition and Entrepreneurship Development (SAED) scheme, for example, aims to equip corps members with vocational skills for self-

employment (Voice of Nigeria, 2026). Kogi State's recent launch of an "inclusive entrepreneurial ecosystem" is the most current incarnation of this enduring policy lineage (Kogi State Government, 2025a).

Empirical assessments of entrepreneurship education in Nigeria yield equivocal results. Some scholars document positive impacts, including heightened entrepreneurial intentions and the emergence of successful startups (Adegbite & Oladele, 2023). Others underscore persistent shortcomings: curricula remain overly theoretical, funding and physical infrastructure are deficient, instructors lack practical experience, and linkages with the broader entrepreneurial milieu are tenuous (Okafor & Eze, 2024; Nwachukwu et al., 2023). These are, in substance, governance shortcomings, and they align closely with the concerns animating the present study.

2.3 Robotics Education, Innovation, and Competence

Robotics instruction is a comparatively recent addition to Nigeria's educational landscape. The National Board for Technical Education (NBTE) has promulgated Robotics Engineering Craft Programmes aimed at imparting skills in the design, fabrication, maintenance, and troubleshooting of robotic systems (NBTE, 2024). Universities such as Nile University of Nigeria offer mechatronics engineering curricula that blend mechanical, electrical, computer, and control engineering with robotics and automation components (Nile University, 2024), and institutions like Yaba College of Technology have signalled intentions to integrate AI and robotics into their academic offerings (Yabatech, 2024). Summer bootcamps, such as those conducted by the University of Lagos AI & Robotics Laboratory, offer immersive experiences in robotics and drone technology (University of Lagos, 2025), while the Nigeria-Korea Friendship Institute in Lokoja has introduced programmes in cybersecurity, AI, and robotics (Punch, 2025).

Nevertheless, the pathway from robotics education to livelihoods and technology ventures remains

underexplored in the Nigerian context. Competence in this field entails not only technical proficiency but also opportunity recognition, resource mobilisation, and the ability to turn ideas into value for others (Bacigalupo et al., 2016; Lackéus, 2015; Marvel & Lumpkin, 2007). A young person may possess robotics skills yet lack financial literacy, marketing capability, or networks, and even the most capable individual depends on an enabling environment. A few notable exceptions exist, such as Arone Technologies in Enugu, which locally manufactures drones and modular solar energy systems (TechCabal, 2026), but these are outliers rather than harbingers of a widespread trend.

2.4 Infrastructure and Innovation in Nigeria

A robust corpus of literature documents the infrastructural handicaps confronting Nigerian innovators. Electricity supply is notoriously erratic, compelling businesses to rely on costly diesel generators (Oyedepo, 2023). Internet connectivity, though improving, remains patchy, especially beyond major urban centres (BusinessDay, 2026a). Road networks are often dilapidated, raising logistics costs and constricting market reach (BusinessDay, 2026b).

These deficits are particularly acute for robotics, which demands stable electricity for equipment operation, high-bandwidth Internet for research and collaboration, and dependable supply chains for components and spares. Recent research on Nigeria's innovation hubs underscores their vulnerability: most operate with fewer than ten full-time staff and are highly susceptible to rising electricity tariffs and Internet instability (Guardian, 2026). This fragility cascades to the young innovators the hubs nurture.

2.5 Analytical Framework: Dimensions of Technology Governance

Drawing on the literature above and on entrepreneurial ecosystem theory, which emphasises the interdependent contributions of diverse actors, institutions, and resources (Stam, 2015; Spigel, 2017), this study assesses the governance of robotics innovation in Kogi State along five dimensions: (1) strategic direction and

policy coherence; (2) institutional coordination and partnership; (3) enabling infrastructure and finance; (4) inclusion and responsiveness to local needs; and (5) accountability for outcomes. Where these dimensions are weak, investment in robotics education and infrastructure is unlikely to yield sustainable youth self-reliance, however substantial the inputs.

3. Methodology

This inquiry adopts a qualitative case-study design, synthesising multiple secondary data sources to examine the governance of robotics innovation in Kogi State. The case-study approach is well-suited to investigating complex, context-bound phenomena where the boundaries between phenomenon and context are blurred (Yin, 2018). Kogi State was purposively selected owing to its recent and pronounced policy emphasis on robotics and technology development, rendering it a revealing instance of broader Nigerian patterns.

Data sources encompass: (i) official policy documents and government releases from the Kogi State Government and federal agencies; (ii) institutional reports and announcements from educational providers in Kogi, including the Federal University Lokoja and the Nigeria-Korea Friendship Institute; (iii) Nigerian newspaper and online media coverage of robotics and entrepreneurship initiatives in the state; (iv) peer-reviewed literature on technology governance, entrepreneurship education, and infrastructure in Nigeria; and (v) reports from international organisations and development partners active in technology and enterprise promotion.

Thematic analysis guided data interpretation, involving the identification, coding, and synthesis of recurring patterns across the corpus (Braun & Clarke, 2006). Themes were derived both deductively from the five governance dimensions set out in Section 2.5 and inductively from the data themselves. The analysis centred on three interconnected concerns: (a) the governance landscape for robotics innovation; (b) the governance gaps obstructing the translation of training

into livelihoods and ventures; and (c) the implications for youth self-reliance.

Several limitations warrant acknowledgment. As a secondary analysis, the study relies on data collected for other purposes, potentially omitting relevant dimensions. The single-case focus limits generalisability, though the aim is analytical rather than statistical generalisation. Additionally, the absence of primary data from young people, entrepreneurs, and policymakers precludes direct capture of lived experiences and perspectives.

4. Results and Discussion

4.1 The Governance Landscape of Robotics Innovation in Kogi State

Kogi State exemplifies a common paradox in technology governance: abundant pronouncements coexisting with meagre tangible outcomes. In January 2025, the state government inaugurated a "comprehensive entrepreneurial ecosystem" intended to bolster economic growth, empower entrepreneurs, and advance sustainable development (Kogi State Government, 2025a). The Kogi MSME Financial Inclusion Conference 2025, convened at the Government House in Lokoja, was touted as a pivotal move in the administration's broader vision to unlock economic opportunities (Tribune, 2025), and commitments to disburse loans, grants, and equipment to businesses were reiterated (Kogi State Government, 2025b).

Concurrently, substantial investments have flowed into robotics and technology infrastructure. The Federal University Lokoja secured a N3 billion grant from the Tertiary Education Trust Fund (TETFund) to establish a Centre of Excellence in Artificial Intelligence, Robotics, and Cyber Security (Daily Trust, 2026; Leadership, 2026). The Vice Chancellor hailed the centre as a "transformative intervention" that would broaden prospects for technological advancement, innovation, and professional development across the North Central zone (Federal University Lokoja, 2026). The Nigeria-Korea Friendship Institute of Vocational

and Advanced Technology in Lokoja has likewise expanded its technology portfolio, securing full NBTE accreditation for all its programmes, introducing new curricula in cybersecurity, AI, and robotics (Punch, 2025), and recording "massive growth" in student numbers (Voice of Nigeria, 2025).

Politically, entrepreneurship has been championed as a priority. The Corporate Affairs Commission (CAC) has sought partnership with the Confluence University of Science and Technology (CUSTECH) Osara to produce graduate entrepreneurs, with the CAC Registrar expressing a desire to see students become "job creators who will contribute meaningfully to Nigeria's economic growth" (Radio Kogi, 2025). Senator Natasha Akpoti-Uduaghan has trained and equipped 250 youths from Kogi Central with digital and technical skills, including drone technology, aimed at promoting self-reliance (Vanguard, 2025; Guardian, 2025).

Superficially, this landscape appears robust: policy commitment, institutional investment, curricular development, and targeted training all seemingly aligned toward robotics innovation and youth self-reliance. However, a governance-oriented examination reveals that these actors operate under separate mandates, funding streams, and reporting lines, with no evident mechanism binding them into a coherent whole.

4.2 Governance Gaps in Robotics Innovation

The disjuncture between aspiration and outcome in Kogi State is multi-dimensional. Five critical governance gaps are identified below.

4.2.1 Infrastructure Governance

The most palpable impediment is the pervasive infrastructural deficit and the absence of governance arrangements to address it in step with technology investment. Robotics activity depends on reliable electricity for equipment operation, prototyping, and production. Yet Nigeria's power supply remains notoriously unstable, with businesses enduring multiple daily outages and resorting to expensive diesel generators (Oyedepo, 2023). A recent survey of Nigeria's innovation hubs found that escalating

electricity costs and unstable Internet services are forcing many hubs to struggle for survival (Guardian, 2026). The situation in Kogi State, which lacks the alternative power sources available in larger urban centres, is almost certainly more acute.

Internet connectivity poses a parallel challenge. Nigeria has been ranked 103rd out of 127 countries on the Network Readiness Index, underscoring substantial digital infrastructure gaps (Guardian, 2026b), and rural Internet coverage stands below 30% (BusinessDay, 2026b), a statistic of direct relevance to Kogi State's predominantly rural character. The governance failure lies in sequencing: centres of excellence and training programmes are commissioned without commensurate planning for the power and connectivity on which they depend. Without stable power and Internet, equipment cannot be operated consistently, prototypes cannot be tested, and access to global knowledge and markets is obstructed, so that individual competence becomes largely inconsequential to livelihood outcomes.

4.2.2 Skills and Curriculum Governance

A second gap concerns the governance of robotics education. While the proliferation of robotics training programmes in Kogi State is superficially encouraging, there are grounds to question whether they are steered towards the competencies that livelihoods and ventures require. First, many robotics programmes in Nigeria remain heavily theoretical, with limited hands-on application (Okafor & Eze, 2024), and the NBTE Robotics Engineering Craft Programme, though designed to be practical, may not be uniformly implemented across institutions (NBTE, 2024).

Second, even where practical training is provided, it is seldom aligned with enterprise and livelihood ends. Programmes often focus narrowly on technical skills such as programming, electronics, and mechanical assembly, without addressing opportunity recognition, business modelling, financial planning, marketing, and customer relations. Third, the rapid pace of change in robotics means that curricula can quickly become obsolete, and institutional capacity for curriculum updating in the state is limited. No mechanism is

evident through which employers, young people, or regulators feed outcome information back into curriculum decisions, which is precisely the reflexivity that responsible technology governance requires (Stilgoe et al., 2013).

4.2.3 Industry–Academia Coordination

A third gap is the paucity of coordination between educational institutions and the private sector. Effective technology ecosystems require close collaboration among universities, training institutes, and industry partners to ensure curricular relevance, provide practical experience, and establish clear pathways from education to employment and enterprise (Etzkowitz & Leydesdorff, 2000). In Kogi State, such linkages appear weak. While the CAC has expressed interest in partnering with CUSTECH to produce graduate entrepreneurs (Radio Kogi, 2025), this appears to be an isolated instance rather than part of a broader pattern. There is little evidence of robotics companies or technology firms engaging with educational institutions in the state to shape curricula, offer internships, or support venture creation.

The consequences are considerable. Young people may develop skills that do not match market needs, lack exposure to real-world robotics applications, and have limited access to mentors, networks, and resources. From a collaborative-governance standpoint, the missing ingredients are a shared mandate, clear roles, and a standing forum in which public and private actors can negotiate priorities (Ansell & Gash, 2008).

4.2.4 Financing and Market Governance

A fourth gap concerns access to the financial and market resources essential for robotics activity. Robotics ventures are typically capital-intensive, requiring investment in equipment, materials, and facilities, yet access to capital for technology entrepreneurs in Nigeria is severely constrained (BusinessDay, 2026c). Traditional financial institutions are reluctant to lend to startups where collateral is scarce and perceived risk is high, and venture capital

remains concentrated in a few major cities, largely inaccessible to young people in states like Kogi.

The Kogi State Government has announced commitments to provide loans, grants, and equipment to businesses (Kogi State Government, 2025b), but the implementation of these commitments remains opaque, and there is limited public evidence of substantial funding actually reaching technology entrepreneurs. The N3 billion TETFund grant to Federal University Lokoja is directed toward institutional infrastructure rather than direct support for young innovators (Daily Trust, 2026); the pathway from institutional capacity to individual livelihood support is neither direct nor assured. Market access presents an additional challenge. The state's economy is predominantly agrarian, with a limited industrial or technology sector to demand robotics solutions. Opportunities may exist in precision farming, drone-based crop monitoring, and automated processing, but these markets are not yet well developed, and no public procurement or market-creation policy is evident to nurture them.

4.2.5 Ecosystem Coordination and Accountability

The fifth and most fundamental gap is the absence of a coordinated arrangement capable of supporting robotics innovation from training through to livelihood creation and growth, and of holding actors accountable for results. Innovation ecosystems are complex systems of interdependent actors, institutions, and resources, including educational institutions, funding sources, mentorship and advisory services, incubators, regulatory frameworks, and market access (Stam, 2015; Spigel, 2017).

In Kogi State, the elements of such a system exist in fragmented and disconnected form. There are institutions offering robotics training, policy commitments to entrepreneurship support, individual initiatives such as Senator Akpoti-Uduaghan's training programme (Vanguard, 2025), and institutional investments such as the Federal University Lokoja's AI centre (Daily Trust, 2026). But there is no clear pathway from training to livelihood, no incubators or accelerators focused on robotics, limited mentorship

and advisory support, and no mechanism for connecting young innovators with funding, markets, or partners. Equally, no body appears responsible for tracking whether trainees subsequently find work or start ventures. The parts do not add up to a functioning whole, and this systemic failure of coordination and accountability is perhaps the most fundamental explanation for the gap between investment and outcome.

4.3 Why the Governance Gaps Persist

The gap between policy and practice in Kogi State is sustained by several reinforcing features of current governance. Policy is announcement-driven: government communications emphasise launches, partnerships, and pledges, such as the "inclusive entrepreneurial ecosystem" (Kogi State Government, 2025a), while downplaying the substantial barriers that remain. Accountability is input-based: the announcement of a N3 billion AI centre (Daily Trust, 2026) and the accreditation of new programmes (Punch, 2025) are treated as evidence of progress regardless of whether they yield livelihoods.

Credentials stand in for outcomes. Certificates attest to training completed, not to income earned or ventures sustained, so institutions can report success without measuring it. Media coverage reinforces this pattern by amplifying launches, as when 250 youths were trained in drone technology (Vanguard, 2025), while the subsequent fortunes of those youths attract far less attention. Finally, mandates are fragmented across federal agencies, state ministries, tertiary institutions, and individual political actors, so that no single actor bears responsibility for the end-to-end result. Shared hopes also play a part: young people facing limited opportunities invest confidence in robotics training, and policymakers seeking to demonstrate impact invest in visible programmes, making it uncomfortable to ask whether outcomes match aspirations.

4.4 Implications for Youth Self-Reliance

At the individual level, young people who invest time, effort, and hope in robotics training may find that it does

not translate into viable livelihoods. They may become technically competent yet unable to establish sustainable ventures due to the structural barriers identified above, resulting in frustration, disillusionment, and potentially a retreat from technology as a pathway to self-reliance.

At the community and state level, current governance diverts resources and attention from more effective interventions. Investment in high-profile robotics infrastructure, while not without value, may crowd out investment in more basic infrastructure such as reliable power, Internet connectivity, and transport that would benefit a broader range of economic activities. At the policy level, weak outcome monitoring obscures the need for reform: if policymakers believe that robotics innovation is thriving because inputs are visible, they may see no need to address the barriers that constrain it, and the governance gap becomes self-perpetuating.

5. Conclusion and Recommendations

This study has critically examined the governance of robotics innovation and its implications for youth self-reliance in Kogi State, North-Central Nigeria. It has argued that, notwithstanding substantial governmental and institutional investment in robotics education and technology infrastructure, the state suffers from a persistent gap between trained capabilities and actual livelihood and enterprise outcomes. This gap is best understood as a governance failure: initiatives are announced and funded but weakly coordinated, insufficiently accountable for results, and inadequately supported by infrastructure, finance, and markets.

Five interconnected governance gaps have been identified: infrastructure governance, especially unreliable power and Internet; skills and curriculum governance, marked by a divide between theoretical instruction and practical, enterprise-oriented capability; weak industry–academia coordination; restricted access to capital and markets; and the absence of a coordinated ecosystem with clear accountability for outcomes. These gaps are mutually reinforcing, creating a systemic constraint that individual-level training cannot surmount. The implications are considerable: young

people invest in training that fails to yield sustainable livelihoods, resources are diverted from more impactful interventions, and the weakness of outcome monitoring masks the imperative for reform.

Closing these gaps demands a comprehensive governance strategy. The following recommendations are advanced:

- **Establish a multi-stakeholder coordinating mechanism.** A Kogi State robotics and technology innovation council, drawing together government, tertiary institutions, industry, financial institutions, civil society, and youth representatives, should set a shared strategy, allocate clear responsibilities, and align the separate federal, state, and institutional initiatives.
- **Prioritise foundational infrastructure.** Without stable power and high-speed Internet, robotics innovation cannot thrive in Kogi State. Infrastructure planning should be sequenced with technology investments, recognising the economy-wide benefits beyond the technology sector.
- **Redesign robotics education to embed enterprise outcomes.** Curricula should integrate technical instruction with opportunity recognition, business planning, financial management, marketing, and customer relations. Experiential, project-based learning should supplant passive theoretical delivery.
- **Forge robust industry–academia partnerships.** Institutions should cultivate formal partnerships with technology firms and other relevant industry players. These collaborations should inform curriculum development, provide internship and mentorship opportunities, and create clear pathways from education to enterprise.
- **Establish dedicated support mechanisms.** Incubators and accelerators focused on robotics, mentorship programmes connecting seasoned

entrepreneurs with newcomers, and advisory services on business planning and market access should be created and sustained.

- **Expand access to finance.** Dedicated funding instruments, including grants, concessional loans, and equity investment, should be tailored to the needs and risk profiles of technology ventures, with transparent disbursement rules, streamlined applications, and complementary technical assistance.
- **Develop locally relevant robotics applications.** Efforts should concentrate on solutions that address pressing local challenges. Agricultural robotics, for instance, could serve Kogi State’s agrarian economy and generate immediate value, and public procurement could help create initial markets.
- **Ensure inclusion and youth participation.** Programmes should deliberately reach young women and rural youth, and should involve young people in the design and review of policies affecting them.
- **Institute rigorous outcome-based monitoring and public reporting.** Governance should measure actual outcomes, not merely inputs and activities, tracking employment, venture creation, survival, growth, and socio-economic impact, and publishing results to provide an evidence base for policy refinement and public accountability.

This study has focused on Kogi State as a case of a broader phenomenon in technology governance. Future research should extend this analysis in several directions. Comparative studies across Nigerian states and sub-Saharan African countries could identify contextual factors that shape the policy–practice gap. Longitudinal studies tracking robotics trainees over time could illuminate the pathways from training to livelihood outcomes (or their absence). In-depth qualitative research with young people, entrepreneurs, and policymakers could capture lived experiences that

secondary analysis cannot fully access, and action research could test and refine governance interventions.

The governance gaps identified here are not unique to robotics or to Kogi State. They mirror deeper dynamics of development policy in contexts where aspirations

outstrip capacities and where symbolic commitments substitute for coordinated, accountable investment. Strengthening technology governance is essential if robotics and other emerging technologies are to contribute meaningfully to youth self-reliance and sustainable development in Nigeria and beyond.

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