

Leveraging Artificial Intelligence to Formalize Kenya's Informal Sector: A Pathway to Youth Employment and Equitable Taxation

Subtheme: Resilient business models for a changing global economy

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Abstract

Kenya's economy is characterized by a disproportionately large informal sector, which accounts for over 80% of employment and contributes significantly to the country's GDP. However, this sector remains largely unregulated, untaxed, and excluded from formal economic planning. Youth unemployment in Kenya, currently estimated at over 35%, is exacerbated by barriers to formal employment and limited access to business support infrastructure. Despite their entrepreneurial drive, many young people engage in informal economic activities with limited growth, security, or government recognition. This paper explores the transformative potential of Artificial Intelligence (AI) in formalizing Kenya's informal sector, with a focus on youth engagement and equitable taxation. We propose an AI-driven framework that utilizes mobile and digital platforms to identify, register, and support informal enterprises run by youth. AI technologies such as natural language processing (NLP), machine learning, and chatbots can be deployed to automate business registration, provide tailored financial literacy, and connect youth to digital marketplaces and government services. Additionally, AI-powered data analytics can help government agencies better understand the informal economy, design responsive policies, and broaden the tax base without imposing punitive measures. By facilitating low-cost, accessible, and intelligent onboarding of informal businesses into formal economic structures, this approach is expected to achieve dual outcomes: empowering youth through job creation, digital inclusion, and access to credit; and increasing public revenue through equitable and data-informed taxation mechanisms. This paper provides a practical roadmap for implementing AI solutions in Kenya's socio-economic context and offers policy recommendations for a collaborative public-private effort to harness technology for inclusive development.

Key words: Artificial Intelligence (AI), Informal sector, Unemployment, Formalize, Tax equity

1.0 INTRODUCTION

1.1 Background

Unemployment remains one of the most persistent global development challenges, disproportionately affecting young people and undermining inclusive economic growth. Although the global unemployment rate reached a historic low of 5% in 2024, this figure conceals deeper structural issues, particularly the precarious situation faced by the youth. Young people aged 15 to 24

continue to be three times more likely to be unemployed than adults, with a global rate of approximately 12.6% (ILO, 2024).

In Africa, the situation is acute. Across Africa, every year up to 12 million graduates enter the labour market but only 3 million find jobs. In Botswana, youth unemployment hits 45.4%. In Ghana, approximately 19.7% of youth face unemployment. In Uganda, unemployment hits 83% among the youth aged 15 to 24. Generally, more than 75% of non-agricultural employment in Africa is informal, with most young people engaged in low-productivity, insecure and poorly remunerated work.

Kenya's unemployment rate in 2024 was estimated to be around 5.43% (KNBS, 2024). A significant concern was youth unemployment, particularly among those aged 20-24 years, which was notably higher than the overall rate at 16.80%. Additionally, a World Bank report indicated that nearly 75% of Kenyans under 35 years face limited job opportunities. The unemployment crisis in Kenya calls for an urgent action particularly for the youth.

The informal sector is an important part of economies, employing majority of the working population and serving as a key source of livelihoods especially for youth and low-income households. Globally, the informal sector accounts for more than 60% of non-agricultural employment in developing countries (ILO, 2018). Informal sector provides 85% to 90% of jobs in sub-Saharan Africa and contributes roughly 35% to 60% of the GDP. In Nigeria, the informal sector provides 92% of the total employment. In South Africa informal sector account for 30% to 35% of the jobs, in Senegal informal, sector account for 94% of the jobs Youth and women are the major participants where women dominate trading and domestic work, while youth are actively in digital gig jobs and informal transport. The informal sector is not a problem to eliminate but a reality to transform, with the right support, digital tools, fair policies and investment in youth the informal workers can fuel inclusive resilient economies across the continent.

In Kenya, the informal sector contributes nearly 35% of the GDP and absorbs most new labour market entrants, especially youth and women. Kenya's informal sector constitutes over 90% of employment and plays a pivotal role in sustaining the national economy (Kenya National Bureau of Statistics [KNBS], 2022). While the informal sector is known for its flexibility and adaptability, it also reflects high levels of precarity, low productivity, and limited access to credit, training, and social protection (International Labour Organization [ILO], 2018).

The informal sector in Kenya comprises of unregistered small scale and often self-employed economic activities that are not regulated or taxed by the government. It may include street vendors, Jua kali artisans, small scale traders, boda boda riders, domestic workers, casual laborers and many micro enterprises. In the year 2023, the informal sector employed over 83% of Kenya's workforce and contributed between 33- 40% of GDP (KNBS, 2023).

The informal sector has low barriers to entry, where it is easy to start informal businesses with minimal capital or regulation, but it is faced with challenges where it lacks social protection where workers have limited or no access to health insurance pensions or labor rights. They lack formal recognition and legal protection. They have limited access to training and skills upgrading. Transactions are mostly in cash without proper records or receipts. They also face Limited access to credit where they face exclusion from financial services or markets. They may also be taxed without representation where some are taxed informally or through fees without clear benefits, opportunities for growth and formalization. Many informal businesses struggle to grow due to lack of financing or formal markets linkages. Despite the challenges the informal sector absorbs economic shocks and provides livelihoods in both urban and rural areas.

1.2 Need for Formalization

Kenya Vision 2030 recognizes the need to integrate the informal sector into Kenya's formal economy. The informal sector can today benefit from AI and data systems, where they can leverage on AI for profiling credit scoring and micro taxation models. The digital platforms like mobile money, E-commerce and gig platforms can formalize records and expand markets. Policy reforms like flexible regulations, tax incentives and legal protections may be beneficial if tailored to informal sector businesses. Youth may need skills development where there is need for training in business tech and vocational skills to support transitions to formal work. There is need for social protection for the informal workers. NHIF, NSSF and digital pension schemes designed for informal sector would be beneficial.

The micro and small enterprises authority (MSEA) supports formalization of informal sectors. The formalization of informal sector would increase the tax base without overburdening micro entrepreneurs. It may also help to improve the quality of the job and social protection. Unlocking credit and business growth potential would be attained through formalization of the informal sector. In addition, it would promote inclusive economic development by empowering the youth and women who dominate informal work. Formalization would also ensure the informal sector's access to government support. Strengthening the informal sector by simplifying tax procedures and providing support to informal businesses can boost productivity and create more decent jobs.

The government of Kenya has developed some platforms like Ajira digital programs, where they help the youth to earn online and digitize informal work. The Hustler fund, though insufficient, provides affordable credit to informal entrepreneurs.

1.3 Statement of the Problem

Despite its size, the informal sector operates largely outside the regulatory framework leading to lost tax revenue, unprotected workers and stifled growth. Despite its critical role, informal workers are typically invisible in national statistics, excluded from

social protection, and underrepresented in policy making. They also contribute minimally to the national tax base, limiting government revenue and public investment (Republic of Kenya, 2021).

The government of Kenya has placed job creation at the top of its policy agenda. The current government initiatives like the bottom-up economic transformation agenda (BETA) is a government strategy aimed at addressing unemployment by focusing on sectors like agriculture, manufacturing and tourism. Key policy documents including Kenya vision 2030, Economic Recovery Strategy for Wealth and Employment Creation (ERSW) and the National Youth Policy Document have also acknowledged the problem of youth unemployment and prescribed strategies to deal with it. In spite of all these efforts, unemployment and under-employment among the youth remain a big problem. The Kenya unemployment rate was 5.43% (KNBS, 2024) which is still very high. Many youths in Kenya remain unemployed and vulnerable to crime and social unrest. Unemployment in Kenya is still a significant challenge and impending threat to stability of the country. This is a problem that the country must address to avert uprising and therefore maintain peace. It will help to attract investment, create wealth and much-needed employment.

Several initiatives in Kenya have sought to bring informal workers into the formal economy. These include financial literacy training, access to microfinance, simplified licensing procedures, and mobile money innovations like M-Pesa products. However, most efforts have focused narrowly on financial inclusion, often neglecting broader dimensions of governance, regulation, and youth empowerment. Moreover, many past interventions have lacked data integration and monitoring capacity, making it difficult to assess their impact or adjust them dynamically (Ndiaye et al., 2018).

Over a million youth enter the labour market annually yet formal job creation remains sluggish. Lack of data, bureaucratic red tape and mistrust in government deter informal sector from formalizing. Traditional attempts to formalize the informal economy—such as licensing schemes and registration drives—have yielded limited results due to mistrust, bureaucratic hurdles, and weak institutional incentives. This paper suggests ways of Leveraging artificial intelligence to formalize Kenya's informal sector, which would be a pathway to youth employment and equitable taxation.

1.4 Objective of the paper

This paper explores how artificial intelligence (AI) can be leveraged to formalize Kenya's informal sector while simultaneously addressing youth unemployment and creating a fairer, broader tax system.

1.5 Significance of leveraging AI

Artificial intelligence offers scalable, data-driven, and user-friendly tools that can modernize how governments interact with the informal economy. Through mobile-based platforms, chatbots, and AI analytics, informal actors can be engaged in ways that reduce compliance costs, build trust, and deliver real-time public services. AI also enables governments to collect and analyze granular economic data, which is critical for developing inclusive policies and taxation frameworks. Such innovations present an opportunity to leapfrog traditional bottlenecks in public administration (UNESCO, 2022).

AI offers a unique ability to gather real-time data, automate processes, and deliver personalized services. Governments in countries like India and Rwanda have started piloting AI tools for public service delivery, identity verification, and economic profiling. In Kenya, similar approaches could be adapted to build an inclusive AI-driven formalization ecosystem.

This paper proposes a conceptual framework for using AI to formalize the informal sector in Kenya. At the center of this framework are accessible digital tools—such as chatbots and voice assistants—that facilitate simple registration processes through widely used platforms like WhatsApp, SMS, and USSD. These tools can guide informal entrepreneurs through the registration journey in local languages and with minimal data costs. AI-enabled identity verification (e.g., through facial recognition or ID scanning) can further reduce fraud and bureaucratic delays (Kieti & Wanyama, 2020).

In addition, AI can enhance financial inclusion by tailoring digital training content to specific business types and literacy levels. AI-based recommender systems can suggest microloans, insurance products, and e-commerce opportunities to informal actors based on their transaction patterns and risk profiles. Through such innovations, youth entrepreneurs can be empowered with tools to grow their businesses and improve their livelihoods.

2.0 Literature Review

The rise of artificial intelligence (AI) and digital technologies presents a promising pathway to formalizing Kenya's informal sector, with implications for youth employment and equitable taxation. Digital platforms and AI-enabled services contribute traceable data infrastructures capable of integrating informal actors into formal economic systems.

KIPPRA (2019) conducted a study aimed at investigating the determinants of informality in the informal sector in Kenya. The study employed probit regression to statistically analyze the determinants of informality at the enterprise level in Kenya. The findings were that: there lacked a well-defined policy framework addressing the informal sectors in Kenya. The study also found out that simply lowering the cost to register a business had minimal impact on formalizing enterprises, suggesting that cost is not the only barrier. According to the study, providing tax incentives and other formalization incentives had a notable positive impact

on enterprises' transitioning to and sustaining formality.

KIPPRA (2025) identifies gig platforms as potential structured pathways to formalization for Kenyan youth—if accompanied by simplified tax regimes for platform income, secure data-sharing protocols with the Kenya Revenue Authority (KRA) and sustained digital skill programs. Concurrently, KRA (2023–2024) is piloting informal sector onboarding through taxpayer education, digital facilitation, and the use of payment data for identification. Yet, trust deficits, perceived high compliance costs, and poor record-keeping remain key challenges.

The World Bank's *Future of Work in Africa: Harnessing the Potential of Digital Technologies for All* (2020) adopted a **mixed-methods research design** that combined quantitative and qualitative approaches. The study began with an extensive **multi-country desk review** of existing literature, policy documents, and statistical reports to map the spread and use of digital technologies across Sub-Saharan Africa. This was complemented by **secondary data analysis** drawing on household and labour force surveys, which provided nationally representative measures of employment patterns, technology adoption, and skill levels. The World Bank (2020) highlighted that digital financial services (DFS) and AI-powered platforms can lower transaction costs for informal workers, expand opportunities for youth, and facilitate registration and tax compliance—though uneven access and skill deficits limit these benefits. The study recommends investments in connectivity, youth digital skills, and integrated identity-payment systems to streamline business formalization.

Mercy Corps (2019) finds that the gig economy creates accessible income streams for Kenyan youth in ride-hailing, delivery, and digital freelancing. Yet, digital illiteracy, volatile earnings, and absent social protection keep many in informality and outside taxation systems. The report calls for platform-level protections, streamlined income reporting, and digital upskilling for youth.

The United Nations University (UNU, 2022) posits that AI tools—such as alternative credit scoring, demand forecasting, and automated supply-chain matching—can enhance productivity among informal enterprises while generating economic trails useful for formalization. However, it warns of algorithmic biases and privacy threats, urging transparent governance and consent-based data use.

UNESCO's (2023) assessed AI readiness for Kenya in order to gauge the country's preparedness for the ethical and responsible adoption of AI. The study employed a structured multidimensional framework, evaluating legal and regulatory, social and cultural, economic, scientific and educational and technology and infrastructural frameworks. The study found promising AI research and startup activity but identifies major gaps in datasets, technical skills, and regulatory frameworks—limiting scalable AI applications in public-good domains like formalizing informal sector participants.

The African Centre for Technology Studies (ACTS, 2021) offers applied examples across Africa—chatbots for customer service, AI inventory tools for micro-retailers, and blockchain for product provenance—that enhance operations and create digital records. However, scarce adoption due to cost, trust deficits, and weak infrastructure impedes impact. ACTS recommends subsidized pilots, interoperable data standards, and co-design with informal traders.

A conceptual exploration in *MDPI* (2024) theorizes that generative AI (GAI) could lower entry barriers for creative and knowledge-based micro-entrepreneurship, enabling informal actors to provide design, marketing, or content services. However, if access to GAI remains unequal, low-skill workers could be displaced, exacerbating inequalities.

Empirical research by Mutua et al. (2025) in marginalized Kenyan counties reveals that digital financial access positively correlates with formal savings behavior and willingness to register formally, indicating that AI-enabled services like alternative credit scoring may further boost formalization where digital inclusion foundations are in place.

Literature consistently underscores that AI and digital platforms offer the infrastructure needed to trace, formalize, and tax informal sector activity. Youth stand to benefit considerably—if access barriers and skills gaps are addressed. Equitable taxation depends on simplified, low-cost compliance regimes coupled with robust data governance. Finally, there remains a critical need for AI-enabled pilot programs and rigorous impact evaluations to determine effectiveness in promoting youth employment and tax compliance among informal actors in Kenya.

3.0 METHODOLOGY

Collecting accurate data on the informal sector is notoriously difficult due to its unregulated, unregistered and often hidden nature. However, several best practice methodologies may be developed to estimate its size, dynamics and to identify incentives for formalization. This paper proposes a dynamic, AI powered framework to incentivize informal sector workers, primarily the youth to register and transition into the formal economy. The methodology comprises three interconnected components: Designing incentives, engaging the youth in data collection and deploying AI tools for sustained monitoring and formalization.

3.1 Designing and offering incentives

To effectively coax informal sector actors into formalization, a multi-tiered incentive structure is crucial. Drawing upon policy evidence from Kenya and comparative international experiences, there are many incentives, including:

Fiscal relief and transitional tax incentives, which involve offering a tiered tax holiday or reduced turnover tax such as 1% for an

introductory period, easing the financial burden of formal registration.

Enhancing access to finance and credit facilities. An incentive such as facilitating preferential access to microfinance, seed capital or government backed credit like linking formal registration for eligibility for Hustler Fund or similar programs.

Preferential market access and procurement. The government may guarantee youth- owned formally registered enterprises access to government procurement through the set- asides like the Kenya Youth Access to Government Procurement Opportunities (YAGPO), or inclusion in initiatives like the tujiajiri business challenge.

Inclusion in social protection and welfare through offering entry into social safety nets such as the healthcare, pension or welfare schemes after formal registration of businesses. Evidence from West Africa suggests that flexibility in social protection offerings strongly motivates formalization.

Administrative simplification and support reduce bureaucratic burden by streamlining registration processes like having fewer steps and clear cost structures. For example, Peru succeeded in having a unified registration model.

3.2 Proposed Methodology for Kenya

This study proposes a practical and culturally resonant methodology to formalize Kenya's informal sector by leveraging the strong motivation among Kenya's for direct financial benefit. This was evidenced by the World Coin initiative of 2022, where many Kenya's willingly participated in biometric data collection in exchange for cash incentives. The core of this methodology centers on an incentive package combining immediate financial rewards, social welfare inclusion, access to credit and a tiered tax payment system designed to reduce barriers and encourage sustained formal registration.

Direct financial incentive upon registration: Drawing inspiration from the World Coin success in Kenya, the government will provide an upfront, guaranteed cash transfer or mobile money payment to informal workers who register their businesses. This immediate, tangible reward addresses the urgent need for cash among many informal sector participants, serving as a strong initial motivator to engage with formalization effort.

Inclusion in Social Welfare Programs: Registered individuals will be automatically enrolled in existing or expanded social protection schemes such as Social Health Authority (SHA), NSSF or unemployment benefits. The promise of access to these safety nets provides long term security, reinforcing the value of formalization beyond the initial cash incentive.

Access to Credit and financial services: Formal registration will unlock access to affordable credit facilities, microloans and

savings schemes targeted at informal entrepreneurs, including government funds like the Hustle Funds. Access to finance enables business growth and incentivizes continued participation in the formal economy.

Tiered tax payment system: To ease the transition into formality, a graduated tax structure will be implemented. New registrants will enjoy a reduced tax rate or a tax holiday for a defined introductory period, with tax obligations increasing gradually as the business grows. This phased approach mitigates the fear of high immediate tax burden that often discourages informal operators from formalizing.

3.3 Engaging Youth through Data driven participation

Youth involvement is central, not only as beneficiaries but as active agents in data collection and peer mobilization. The engagement strategy in this case may include:

Recruitment of Youth ambassadors: Partnering with youth groups, SACCOs and trade associations to nominate and train youth ambassadors. These ambassadors will register the informal workers through mobile platforms, aiding in onboarding and educating peers.

Mobile reporting and incentive tracking: Develop a mobile application or SMS- based system through which the youth ambassadors submit the registration data, client profiles and monitor uptake of incentives. Participation may be rewarded with performance-based credit, airtime or service vouchers.

Training and capacity building: Offering structured, certified business and digital skills training to the youth ambassadors and their communities will help build confidence and credibility. Empirical research from Kenya and Tanzania shows that training boosts earnings and productivity of informal workers.

3.4 AI tools and infrastructure for sustained formalization

AI will underpin the system's scalability, efficiency and longevity through:

Mobile data ingestion and Database Management: Machine learning models will be used to ingest and validate data from youth ambassador's entries such as business type, location and revenue bracket. This will involve using intelligent OCR or parsing of receipts, IDs or mobile money history.

Risk- based incentive targeting: Predictive models will be developed to segment informal businesses into survival-oriented

versus growth-oriented. Incentives are then tailored

accordingly where survival- focused groups receive affordable registration and training while the growth-oriented group may be offered credit and procurement access.

Personalized nudges and Reminders: Sending behaviorally informed mobile nudges such as reminders about expiring incentives, benefits of formalization or upcoming trainings- leveraging AI to adapt language and timing to individual user behavior.

Monitoring, reporting and evaluation dashboard: Building a real-time dashboard for the policy makers to track registration rate, demographic breakdowns, incentive uptake and tax revenue impact. Visualization tools powered by AI will enable trend forecasting

Feedback loop and continuous improvement: Data will be collected from participants and NLP- based sentiment analysis will be used to refine incentive design; messaging and process flows over time.

4. 0 Expected outcomes

Increased formalization of the informal sector: Leveraging AI driven data analytics will identify informal sector participants, accurately enabling targeted incentives such as direct financial transfers, social protection inclusion and access to credit services. This will encourage informal businesses and workers to transition to the formal economy.

Enhancing youth employment: It will also enhance youth employment, where integrating AI tools to analyze labour market trends and youth participation, the model will facilitate the creation of job opportunities tailored to young people's skill and market demand, thus reducing unemployment rate among the Kenyan youth.

Equitable Taxation and revenue generation: The introduction of a tiered tax payment system informed by AI will ensure that informal sector operators pay taxes proportionate to their income and business scale. This approach will improve tax compliance, broaden the tax base and increase government revenue without overburdening the small businesses.

Improved access to financial and social services: AI-enabled profiling and segmentation will enable informal workers and businesses to gain better access to credit facilities and social protection programmes, enhancing their financial stability and resilience.

Data-driven policy making and monitoring: Continuous AI powered data collection and analysis will provide real-time insights for policy makers, enabling adaptive strategies and more effective monitoring of the informal sectors' formalization process.

4.1 Challenges and Mitigation

Data privacy and security concerns may be a challenge. Collecting and analyzing data from informal sector participants might raise privacy issues and risk data breaches.

This will be mitigated by implementing robust data protection frameworks, anonymize data where possible and ensure compliance with Kenya's data privacy laws such as Data Protection Act (2019).

The other challenge would be limited digital literacy and access where many informal workers may lack the digital skills or infrastructure to engage with AI driven platforms.

This challenge may be solved by developing user-friendly interfaces, conducting digital literacy training programs and leveraging mobile based solutions, given Kenya's high mobile penetration.

Resistance to formalization might be another challenge where the informal sector operators may fear taxation, bureaucracy or loss of flexibility, resulting in reluctance in formalizing. This will be addressed by designing incentive programs that clearly communicate benefits, reduce bureaucratic hurdles and provide phased or tiered taxation to lower entry barriers.

Infrastructure and funding constraints might also limit application of this methodology. Implementing AI systems at scale requires significant investment in infrastructure and human resources. This will be addressed by seeking private- partnerships, international funding and phased roll out to manage cost and build capacity progressively.

4.2 Conclusion

The integration of artificial intelligence into Kenya's informal sector formalization efforts presents a promising pathway towards boosting youth employment and achieving equitable taxation. By leveraging AI's capabilities to enable data driven participation and targeted incentives, the government can bridge existing gaps between informal workers and formal economic structures. However, addressing challenges related to data privacy, digital inclusion and stakeholders' trust is critical to ensuring the success and sustainability of this approach. With careful design and implementation, AI can be a transformative tool in promoting economic inclusion and social equity in Kenya.

4.3 Recommendations

- i. Establish a multi-stakeholder taskforce, a collaborative platform involving government agencies, tech firms, youth organizations and financial institutions to oversee AI integration and informal sector formalization.
- ii. Invest in digital infrastructure and literacy. Prioritize expanding affordable internet access and digital skills training, especially targeting the youth and informal sector participants.
- iii. Develop transparent and inclusive AI systems. Ensure AI tools are transparent, ethical and inclusive by engaging community representatives and continuously evaluating algorithmic fairness.
- iv. Design flexible incentive schemes like implementation of a tiered tax system and customizable financial incentives that accommodate diverse informal sector profiles to encourage participation without imposing undue burdens.
- v. Strengthen legal and regulatory frameworks by updating and enforcing laws to safeguard data privacy, promoting fair taxation and supporting the digital economy.
- vi. Promote continuous monitoring and evaluation by using AI analytics to regularly assess the impact of formalization effort and make data-driven adjustments to policies and programs.

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