

Application of Artificial Intelligence in Informal Sector in Africa

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PREFACE

Artificial intelligence (AI) is increasingly transforming operations in virtually all economic sectors. However, despite its immense potential, adoption of AI in Africa's informal sector is fraught with anxiety, particularly with regard to its potential impact on the job market. The apprehension towards adoption of AI mainly stems from fears of job losses, complexity surrounding its deployment and the associated high cost of integration. In this context, there is a clear dichotomy between the anticipated benefits and the prevailing doubts within the informal sector, which is a significant component of African economies.

This study, therefore, seeks to explore the impact of stakeholder's perceptions and beliefs on the deployment and utilization of AI in Africa with specific reference to the informal sector. By examining the potential areas for AI integration, identifying both perceived and real fears, and highlighting success stories, this study aims to provide a comprehensive understanding of the impact of AI on the informal sector. The study is structured around five key themes: possible areas of AI deployment, perceived/real fears of its impacts as well as success stories both in Africa and globally. It also discusses, key challenges and offers recommendations on how AI can be effectively deployed in Africa's informal sector. Essentially, the five pillars shed light on the misconceptions, offer insights into how AI can sustain and enhance operations in the informal sector; it also provide evidence that can be used as basis for developing policies and regulations on effective deployment and integration of AI in Africa's informal sector. The study is intended not only to demystify AI for stakeholders but also encourage informed discussions that could lead to the broader adoption of AI technologies in Africa's informal sector - ensuring its resilience and sustainability in an evolving business landscape.

Findings reveal several areas of AI deployment in Africa's informal sector which include Blockchain technology, automated customer service and communications, predictive analytics for decision making as well as operational efficiency through predictive maintenance. Others include connecting skilled workers in the informal sector with customers, supply chain management, AI-driven credit assessments, Chatbots and mobile applications, prediction of supply and demand patterns, management systems of smart energy and cybersecurity. In this sense, there are several positive impacts of AI in the informal sector including creation of jobs, increased efficiency and reduced costs, improved sales, expanded market reach, communication and information access, enhanced productivity and financial inclusion. However, the aforementioned benefits are slowed down by inadequate policy and governance structures of AI in the continent, especially on issues around privacy, ethics, safety and security and legal.

The study recommends continuous sensitization of key stakeholders on the adoption and utilization of AI to address the fears related to its adoption. In addition, African governments need to create progressive policies around AI, meaningfully engage stakeholders and improve AI infrastructure to support adoption of AI. Also, it would be important to offer incentives to the informal sector in order to ameliorate some of the challenges experienced in that sector in order to boost its potential and enhance capacity around adoption of AI in in this sector.

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ACRONYMS

AI	Artificial Intelligence
UNESCO	United Nations Educational, Scientific, and Cultural Organization
COVID19	Coronavirus disease 2019
SLR	Systematic Literature Review
NLP	Natural Language Processing
SMS	Short Message Service
USD	United States dollar
USSD	Unstructured Supplementary Service Data
IT	Information Technology
UK	United Kingdom
OCR	Optical Character Recognition
IMF	International Monetary Fund
ILO	International Labor Organization
MSME	Micro, Small and Medium Enterprises
SMMEs	Small, Medium, and Micro Enterprises
B2B	Business-to-Business
IBM	International Business Machines
OECD	Organization for Economic Cooperation and Development
ML	Machine Learning
SMEs	Small and Medium Enterprises
P2P	Peer-to-Peer
IFC	International Finance Corporation
STEM	Science, Technology, Engineering and Mathematics
MTN	Mobile Telephone Network
SIM	Subscriber Identity Module
ICT	Information and communication technologies
AU/OECD	African Union and OECD
IOE	International Organization of Employers
UNDP	United Nations Development Programme
UNCTAD	African Union and OECD
MSEs	Micro and Small Enterprises
USD	United States dollar

1. CHAPTER ONE

INTRODUCTION TO THE PUBLICATION

1.1 Background

The precise nature of the informal sector or economy will differ from country to country. According to (Celin, 2017), the informal economy is defined as household enterprises that have some production at market value but are not registered; and, more broadly, underground production, where productive activities are performed by registered firms but may be concealed from the authorities to avoid compliance with regulations or the payment of taxes, or are simply illegal. On the positive side, the informal sector provides a welcome pool of jobs, which is particularly important in countries where the demographics are such that there is a large and growing working-age population that outstrips the pace of job creation in the formal sector¹.

Although the informal sector is a significant component of the economy that seeks to provide livelihoods to a sizeable number of workers and informal traders, this sector is consistently underestimated. Largely missing from economic policy formulation and analysis (Fourie, 2018), the informal sector is frequently associated with precarious employment, social security, tax evasion and poor governmental support. The informal sector is often characterized with self-employment, small-scale businesses, and informal employment arrangements. In the informal sector, economic activities are predominantly carried out by individuals or small enterprises, often with limited capital and resources. These activities can include street vending, home-based businesses, small-scale agriculture, and informal labor arrangements such as casual work or day labor. However, it is also a dynamic industry that fosters job growth. For example, according to the International Monetary Fund (IMF), Sub-Saharan Africa (SSA) continues to have one of the highest percentages of informal economic activity worldwide (IMF, 2017). More than 60% of the world's employed population is in the informal sector. A larger proportion of the employed population (85.8%) in Africa work in the informal sector. In Asia and the Pacific, the proportion is 68.2%; it is 68.6% in the Arab States, 40% in the Americas, and 25.1% in Europe and Central Asia (ILO, 2018).

Africa's informal economy presents a huge opportunity for the continent to create decent jobs. The informal sector, which accounts for approximately 55% of the region's gross domestic product (GDP) and up to 85.8% plays a major role in its economic contribution to developing countries through the creation of jobs, production and supply of affordable goods and services and in the reduction of poverty. However, the sector faces many challenges, including limited access to markets and finance, lack of familiarity with new and changing technology, and lack of awareness, skills and understanding of ICTs (Mutula & van Brakel, 2006). The role of the informal sector is expected to continue in the foreseeable future in light of Africa's growing population, up to 224 million by 2030. The sector has seventy-four percent of women's employment, and informal work is standard among most youth on the continent.

1 Amolo Ngweno and David Porteous, 2018

According to the report (ILO, 2019), the contribution of micro and small enterprises (2–49 employees) to overall employment is close to 40% across country income groups, while micro-enterprises (2–9 employees) considered separately play a much more significant role in low-income and lower-middle income countries (37% and 23%, respectively) than in upper-middle income and high-income countries (22% in both cases). When the self-employed are included, the employment contribution of small economic units is as high as 94% in low-income countries, followed by 90% in lower- middle income and 56% in upper middle-income countries.

Nonetheless, evidence suggests that Sub-Saharan Africa has the most optimistic attitude toward entrepreneurship, with the largest share of its working-age population believing that entrepreneurship is a desirable career option and that it is synonymous with high social status. Much as the informal sector tends to contain relatively low production activities, such that a large informal sector perpetuates low productivity in the economy, this presents a huge opportunity for application of AI. Being a relatively new concept in the informal sector in Africa and Kenya in particular, AI has potentially limitless applications that may totally revolutionize the informal sector².



1.2 The informal sector and the gig economy

People working several gigs inside “somewhat formal” institutions would be the future of work, according to (Ngweno & Porteous, 2018) report. When thinking about the future of work in Africa, we should understand how digital platforms and emerging technologies will make these types of jobs more efficient and of higher quality. The report, on the other hand, argues that the informal sector has many vulnerabilities and lists two key reasons for the informal sector’s “poor reputation”: First, productivity in the informal sector is low. According to the International Monetary Fund (IMF), the formal sector in African countries is much more productive, producing four to five times the per-worker output of informal firms. This translates to low incomes for informal sector workers, a lack of capital for investment, and little contribution to economic activity. Second, there are no legal guarantees for jobs in the informal sector: no minimum wage, no provisions for working hours, safety, benefits, or registration with government programs like health insurance or pensions. Most players in the informal sector are semi-skilled or do not need any unique skills or experience, and only require a small investment in stock, equipment, or properties. The informal sector tends to be robust but unproductive, according to the findings.

Despite these flaws, the study (Ngweno & Porteous, 2018) concludes that the informal sector possesses significant strength: livelihoods are dependent on and readily accessible in this sector. The informal sector has expanded in recent decades in tandem with growing demographics and accelerating urbanization, and has long been the primary driver of employment growth in Africa, absorbing rising urban populations. According to the International Labor Organization (ILO), more than 80% of African youth in school-to-work transit surveys work in the informal sector (ILO, 2018). The study concludes that digital platforms provide a gradual onramp to formalization, while AI platforms provide guidance on how to set rates, customer service training, accounting, and analytics, handle customer service payments and returns. AI offers expanded opportunities for traditional gig industries: for instance shared-ride drivers, homestay hosts, e-commerce sellers and small scale e-commerce

2 Ibid

producers for instance Safaricom employs 5400 people in its formal business but has catalyzed creation of over 130000 mobile money outlets (with each employing one or two or more people) to handle the transition from cash to mobile money. Jumia employs 3000 people across Africa but has signed up to 100000 commission based affiliates who help customers make orders through their online platform as well as opening up new markets to artisans (e.g. Lynk in Kenya) and domestic workers (such as Domestly in South Africa) (Ngweni & Porteous, 2018).



1.3 Technology and the future of work

Estimates on how many workers are at risk of being automated differ, but it is evident that developing countries are more vulnerable than high-income countries to automation. Traditionally, blue-collar routine jobs have been automated, but with the advancement of computing power, artificial intelligence, and robotics, a much broader range of occupations is at risk. Vulnerability to automation is now based on whether jobs or tasks are codifiable and whether they are routine or not. Highly trained and skilled jobs can be more at risk than more varied, lesser skilled jobs (Millington, 2017). The future workforce will likely shift towards more self-employment and online work where employers will think in terms of specialisms rather than employees. This may benefit and expand access to work for women, youth, older workers and the disabled, who may prefer the flexibility of working from home or working flexible hours. Online work will also provide access to a larger global labour market. These staff, on the other hand, would need security from low wages and a lack of job opportunities. Changes in the labor market would necessitate a rethinking of social security and tax policies (World Bank, 2016) ³.

Rather than copying existing models, workers' security would necessitate significant changes in many countries and forward-thinking design in countries just beginning to develop social protection systems. While there is data, knowledge, and discussion about the effect of automation on the labor market in developed countries, there is far less on the potential impact in developing countries, according to this rapid literature review. If you're a "techno-optimist" or a "techno-pessimist," the effect of technology on the labour market would necessitate long-term policy changes and adjustments to ensure the future of work is inclusive and sustainable and addresses increasing income inequality in an ever more automated and digital economy (Gelb & Khan, 2016).

Another study by (Raval, 2019) shows how AI technologies are transforming logistics, supply chains, and various job sectors. The study indicates that in the Global North, automated processes and the emergence of real-time, on-demand labor pools are beginning to replace traditional long-term contracts. Additionally, the report presents evidence that AI platformization is empowering informal workers, particularly through algorithmic platforms that manage real-time worker pools.

According to a World Bank report (2018), technological progress is altering the skills employers seek in their workforce. Workers are now expected to excel in complex problem-solving, teamwork, and adaptability. Moreover, digital technology is transforming not only the way people work but also the terms under which they work. In advanced economies, short-term employment facilitated by formal platforms presents challenges akin to those faced by

³ World Bank 2016.

informal laborers. The report delves into these transformations and explores how governments can best respond to these changes. Reskilling the workforce is crucial, ensuring that workers acquire the skills demanded by the labor market. Governments must also strengthen social protection measures, extending them to all members of society, regardless of the nature of their work. This aspect of the report delves into the ethical considerations surrounding AI.

1.4 Purpose and objectives

The main objective of the research is to examine the impact of stakeholder's perceptions and beliefs on the deployment and utilization of artificial intelligence in Africa with specific reference to the informal sector. The study will be valuable for purposes of challenging perceived fears and beliefs regarding adoption and utilization of AI and offer insights on the impact of artificial intelligence on the informal sector so as to remain sustainable in the dynamic business environment. This study focuses on 5 themes:

- a. Possible areas of deployment of AI in informal in Africa.
- b. Perceived and real fears and negative impacts of AI in informal sector in Africa.
- c. Success stories of AI deployment in informal sector in Africa and elsewhere.
- d. Key challenges to deployment of AI in informal sector in Africa.
- e. Recommendations on how AI can be effectively deployed in the informal sector.

1.5 Statement of the Problem

There is increasing conversation regarding artificial intelligence in virtually every sector regarding the economy in African countries. There is documented evidence where conversation regarding AI has been utilized and adopted leading to increased profits amongst businesses and companies while there are potential fears regarding job losses which affect response mechanisms towards adoption and utilization of AI. According to the (Africa MSME Pulse Survey, 2024), (23.64%) respondents view AI's impact as 'very negative,' with another 19.48% perceiving it as 'somewhat negative.' This skepticism may stem from concerns about the displacement of jobs through automation, the investment required to integrate AI into existing systems, or apprehensions about the complexity of navigating AI technology. Furthermore, the perceived negative influence could also be related to a lack of understanding or fear of the unknown. AI is still a relatively new and complex technology in the context of small and medium-sized businesses in Africa. On the other hand, only a tiny fraction of the survey participants see AI in a 'somewhat positive' (3.12%) or 'very positive' (0.52%) light, suggesting that the potential benefits of AI, such as increased efficiency, cost savings, and enhanced decision-making capabilities, are not yet widely recognized or understood by the majority of MSMEs. Therefore, it is against this backdrop that this research intends to exploit the gaps emanating from these perceptions and beliefs and generate evidence to influence policy decisions for stakeholders and policy makers in Africa.

1.6 Justification for this publication

The study will be valuable for purposes of challenging perceived fears and beliefs regarding adoption and utilization of AI and offer insights on the impact of artificial intelligence on the informal sector so as to remain sustainable in the dynamic business environment. The policy makers will also benefit from this study since it will assist them develop frameworks for policies

which artificial intelligence can be built on. To the stakeholders, the study will try to show the importance of adopting artificial intelligence in the informal sector.



1.7 Methodology of preparing the publication

The study was undertaken mainly through desk study anchored on qualitative research design. The study employed the Systematic Literature Review (SLR) method, based on the work of Kitchenham et al., (2009). This technique offers insights into a research problem and enables a study to gather the available information from a wide range of sources (Kitchenham & Charters, 2007). In addition, SLR results are more reliable and more likely to be unbiased compared to unstructured methods such as the simple literature review (Stapić et al., 2012). SLR consists of three main phases, namely, planning, conducting and reporting, as described by Kitchenham et al., (2009).

- 1. Planning the review:** The planning phase involved determining the research questions, keywords, resources to be searched, inclusion and exclusion criteria and data extraction strategy. To achieve the research objectives, we conducted excessive document review and reports of AI in education sector in an online mode. In order to find literature for the current overview, we used electronic databases as the most efficient way to begin literature search, in particular, ScienceDirect, GoogleScholar, and Emerald. We also searched the reference lists of the relevant primary studies manually to ensure the completeness of our search. While looking for other locations that are appropriate for finding the information we needed, we considered also some scientific journals, whose scope lies in the field of artificial intelligence and informal sector, such as: International Journal of Artificial Intelligence in informal sector; Computers and informal sector; Computers and Human Behaviour. As AI is emerging technology, we also include some information from magazines, journals, and newspapers such as Forbes, AI Magazine and governmental reports.
- 2. Conducting the review and reporting:** Conducting of the review involved three steps – identification and selection of research studies, quality assessment of the identified studies, and data extraction. A quality assessment checklist was adopted from Kitchenham and Charters (2007) to assess the quality of the evidence presented by the selected studies. In the data extraction step, the data units were extracted from the 46 related studies. In this step, we focused on the impact of AI in informal sector in every study.

2. CHAPTER TWO

RESULTS AND DISCUSSIONS

2.1 Possible Areas of deployment of Artificial Intelligence in informal sector

For informal enterprises majority of which are micro-enterprises, artificial intelligence opens up a wide range of possible applications that can lead to a significant increase in competitiveness. These application areas include the following: -

2.1.1 Blockchain technology

Blockchain technology is already being tested by some banks in Kenya and some Government departments including the Ministry of Lands and the Ministry of Health. Small, Medium, and Micro Enterprises (SMMEs) in the informal sector face myriad challenges, including access to loans. Because of its immutability, blockchain technology can provide a solution to these types of challenges. Through blockchain-enabled Mobile Applications, informal SMMEs can record their financials, and give permission to external viewers such as banks to view when applying for a loan (Mosupye, (2023).

Twiga uses AI and blockchain to provide financial services to traders in Kenya. In Kenya, Twiga Foods – a B2B logistics platform for kiosks and food stalls – addresses the challenge that few of the targeted vendors have credit scores. In partnership with IBM, Twiga analyses sales data from mobile transactions using AI to predict their creditworthiness. This enables Twiga to extend its offering to providing working capital for its customers in the informal trade.

An example of blockchain-enabled Mobile Applications in South Africa is CreditRegister, designed by Ortlep (2019) specifically for the financially excluded such as the unbanked and those living in informal settlements, basically those who do not necessarily have payment history records. The App runs on Blockchain technology, and allows loading of transactions by small businesses thereby creating a transaction history, which they give permission to external viewers such as banks to view their profile when they apply for a loan (Ortlep, 2019).

Another Blockchain application called Block Records was developed by (Saba, 2021). This Blockchain Mobile App enables the unbanked rural farmers in Qunu, Eastern Cape in South Africa, to have databases of their transaction records and make them publicly accessible to funders for financial assistance in their farming activities. In other words, there is a possibility that small businesses, even in the informal sector, can create a financial or credit history report, which should be sufficient as a financial record to access a loan because of its authenticity.

2.1.2 Automated customer service and communications

AI-powered chatbots and virtual assistants can handle customer inquiries, provide support, and automate routine tasks for informal sector businesses. AI-powered chatbots and virtual assistants are transforming customer service and operational efficiency for businesses in the informal sector. These intelligent systems excel in handling customer inquiries, offering timely support, and automating routine tasks. For small businesses with limited resources, these AI-driven solutions mean cost-effective and scalable customer engagement. Chatbots can streamline processes, provide quick responses, and enhance overall customer satisfaction, contributing significantly to the growth and sustainability of businesses operating in the informal sector (Chen et al., 2021).

Automation can help informal sector increase their efficiency, reduce costs, and improve their overall competitiveness. For instance, AI can automate mundane and repetitive tasks in the informal sector, freeing up human workers to focus on more complex and creative aspects of their jobs where machines cannot play a role. With the rapid advancement of technology in Africa, informal sector can now access a range of automation solutions, from cloud-based accounting software to intelligent chatbots, which can help them to scale and grow their businesses (Helene, 2023).

For example, AI-integrated chatbots and voicebots can perform pre-programmed contact-center tasks. While chatbots provide text-based responses, voicebots simulate conversation with customers. The AI call-center solutions can provide standard responses to inquiries such as product stock availability, opening hours, and reservation cancellation (Google, 2020). The AI chatbots create a feeling for a customer that they are interacting with a human support, not a machine (Chen et al., 2021).

An example of an automated customer service and communications chatbot in Africa is Omnibot, developed by Chatbots Africa in Kenya to serve as a communication channel for businesses and customers. The Omnibot integrates social media channels and automates all the interactions. The Omnibot has successfully been integrated into WhatsApp Channel and has seen small and large businesses automate their WhatsApp Business operations (Partner, 2022).

Case example: a shop owner who sells clothes and accessories in a stall in Nairobi town centre. He/she mainly relies on in-store visits to make sales. However, referrals and regular customers are requesting if they would be able to view her products without visiting the stall and be able to order and receive wherever they are. So the shop owner gets WhatsApp Business and shares the number with her customers. Now she/he has two points of sale, in-store visits, and orders from WhatsApp. He/she is the only person managing the shop, since it is just a small stall, and handling clients is easy for one person (Partner, 2022).

However, between attending to clients in-store and answering messages on WhatsApp manually, they may find the need to hire extra help, which brings extra costs on their side.

Then comes Chatbots Africa, offering the service to automate WhatsApp communication, from prompt replies to messages, automated ways to view and select orders, receiving payment, and collecting delivery details. Everything is automated and all the shop owner has to do is receive the order notification, pack what has been ordered, and deliver⁴.

⁴ Chatbots Africa is empowering SMEs in Kenya to develop a Social Sales Outlet for free through Chatbots Freemium. Partner, 2022. <https://techcabal.com/2022/03/16/chatbots-africa-is-empowering-smes-in-kenya-to-develop-a->

2.1.3 Predictive analytics for decision making

Predictive analytics uses AI algorithms and machine learning to sift through mountains of customer data. AI-powered data analysis tools enable small businesses to glean valuable insights from their data, empowering them to make informed decisions and identify growth opportunities. According to (Adewusi et al., 2023), predictive analytics helps in route optimization, demand forecasting, and maintenance scheduling in the transportation sector. For instance, ridesharing companies such as Uber, use predictive models to forecast demand and deploy drivers efficiently.

Retailers use predictive analytics to optimize inventory management, forecast demand, and personalize marketing efforts. Predictive analytics helps retailers optimize their inventory levels. Predictive analysis accurately forecasts customer demand, identifies slow-moving products, and minimizes stockouts. Retail predictive analytics leverages historical sales data, market trends, and other relevant factors. (Adewusi et al., 2023). This enables retailers to make data-driven decisions about inventory management. These include business decisions around inventory replenishment, allocation, and assortment planning. For example, Ghanaian retail-tech startup Shopa is redefining informal retail distribution and supply chain by connecting last-mile retailers with suppliers, and enabling access to stock on cash or credit. Shopa leverages digital tools and an integrated delivery network to help informal retailers restock and receive delivery within four hours, without leaving their shops. This ensures that the retailers never stock out.

Another notable example is the deployment of machine learning in the Matatu system, which is a network of privately owned minibuses that serve as a primary mode of transport in many Kenyan cities. Startups like Ma3Route are using ML to crowdsource traffic information and provide real-time updates on matatu routes, helping commuters make informed decisions and avoid congested areas (Wanjala, 2024).

2.1.4 Connect skilled workers from the informal sector with customers

AI can create enhanced possibilities in connecting skilled workers from the informal sector with customers (Ngweno & Porteous, 2018). For example, Lynk in Kenya is an online services platform that connects skilled workers from the informal sector with individuals or companies. Individuals or businesses that want to have work done or need a service can use the platform to find the right professional for the task.

Biscate in Mozambique, is another platform using inclusive technologies such as SMS, USSD and web to connect skilled workers from the informal sector with customers. This service allows the numerous informal and often uncertified skilled workers located throughout the country to register and advertise their services with a basic phone using USSD technology (Coelho, (2022).

Toolboksi in Tanzania, is a platform that uses inclusive technologies such as SMS/Call/Web and Apps to connect skilled workers in informal sector with customers. Toolboksi partners with local artisans/handyman/fundis to increase their access to job opportunities by connecting them with customers. Toolboksi's vision is to transform the informal sector in Tanzania and

Africa by giving informal skilled workers more visibility to jobs and accrediting the uncredited but skilled workers through customer ratings (Mbungo, 2019).

2.1.5 Supply chain management

Informal sector is largely uncoordinated and suffers from structural challenges – the most prominent being in the supply chain between manufacturers, distributors, and micro-retailers. This is where digitization can play a considerable role by formalizing and making more efficient product flows to reduce stock-outs and make routes-to-market more accessible across the value chain⁵.

Recent years have seen the emergence of numerous start-ups digitalising the informal retail sector in African countries. Platforms like Wasoko (previously Sokowatch), TradeDepot, MarketForce and Twiga all offer versions of linking small shopkeepers with merchandise suppliers through apps and other digital channels. Many of these players also provide retailers with credit lines to enable them to access inventory and pay back in instalments as they sell on to their own customers⁶.

For instance, Omnibiz, founded in 2019, is another entrant in the B2B e-commerce space. It's a network of networks for retail supply chains in Nigeria and Ghana. Omnibiz acts as an infrastructure layer that connects supply chain players (from manufacturers to distributors to logistics providers) to the retailer at the last mile. The start-up is differentiated from some other players in that it digitalises and coordinates the existing supply chain instead of building its own logistics operations⁷.

2.1.6 Operational efficiency through predictive maintenance

AI-powered predictive maintenance solutions can help small businesses optimize operational efficiency and reduce downtime. Small companies can proactively predict potential equipment failures and schedule maintenance by utilizing AI algorithms to analyze equipment performance data. For instance, companies like Uptake offer AI-driven predictive maintenance solutions that enable small businesses to maximize the lifespan of their assets and minimize unplanned downtime (Ogundimu, 2024)

2.1.7 AI-driven credit assessments

Predictive analytics plays a crucial role in modernizing credit scoring, offering more nuanced and accurate assessments of creditworthiness. Traditional credit scoring methods, while foundational, have notable limitations that can exclude many potential borrowers. Machine learning based credit scoring models, leveraging predictive analytics, address these gaps by incorporating a broader array of data and more sophisticated algorithms (Adewusi et al., 2023).

AI algorithms can analyze transaction data, assess creditworthiness, and provide tailored financial products to serve some segments of the informal population that were left aside (e.g. small informal businesses or those operating in remote areas). In addition, AI can further

5 From Stockrooms to Stalls: The Role of Digitization in Africa's Informal Supply. Retrieved from: Chain<https://www.kyosk.app/news-and-events/from-stockrooms-to-stalls-the-role-of-digitization-in-africas-informal-supply-chain/>

6 <https://www.howwemadeitinafrica.com/the-case-for-investing-in-the-digitalisation-of-africas-informal-retail-supply-chains/146600/>

7 ibid

facilitate access to credit, especially to informal businesses with no records and credit history, as alternative data sources (e.g. social media activities, online shopping information, shipping data, insurance claims, etc.) allow Fintech actors to better assess SMEs creditworthiness (OECD, 2020).

For example, in Kenya, Twiga Foods a B2B logistics platform for kiosks and food stalls do just that in partnership with IBM, analysing sales data from mobile transactions using artificial Intelligence (AI) to predict creditworthiness. Also in Kenya, AI-powered systems help provide diverse data sources such as M-PESA transactions or digital financial transactions to provide accurate and inclusive creditworthy assessments. The doors of financial services have been widened because of the inclusion of the informal sector. In addition, AI helps lenders improve their risk management practices. Credit scoring can be automated through extracts from documents and historical data. Furthermore, this historical data can help lenders evaluate the risks, potential indicators, and creditworthiness⁸.

2.1.8 Chatbots and mobile applications

Chatbots and mobile applications can deliver personalized information and recommendations to individual businesses. They are transforming the way businesses access information and recommendations. With the ability to understand user queries and preferences, chatbots provide personalized and real-time assistance. Businesses can receive tailored advice, updates, and insights, enhancing decision-making processes. Mobile applications, equipped with intelligent algorithms, analyze user data to offer customized recommendations. This personalized interaction streamlines communication, boosts efficiency, and ensures that businesses receive the information most relevant to their needs, contributing to improved productivity and informed decision-making (Moldstud, 2024).

2.1.9 Supply and demand patterns prediction

Machine learning algorithms can analyze historical data to predict supply and demand patterns, reducing wastage and enhancing efficiency. Machine learning algorithms play a pivotal role in optimizing supply chain management by analyzing historical data to predict supply and demand patterns. This predictive capability enables businesses to anticipate market fluctuations and adjust their production and distribution processes accordingly. By minimizing the gap between supply and demand, companies can significantly reduce wastage and operational costs. Machine learning algorithms enhance efficiency by providing actionable insights, allowing for more informed decision-making in inventory management, production planning, and logistics. This data-driven approach contributes to a more streamlined and sustainable supply chain, positively impacting both the economic and environmental aspects of the business (Nasy, 2024).

For example, Twiga Foods, a Kenyan startup, uses machine learning to enhance supply chain visibility and predict demand. Twiga Foods, which connects farmers with retailers, uses ML algorithms to forecast demand for various agricultural products. By analyzing historical sales

⁸ Five ways AI is changing lending for Kenyan businesses. Fin Tech, February 21, 2024: Retrived from: <https://fin-tech.co.ke/2024/02/21/ai-transforming-lending-kenyan-businesses>.

data, weather patterns, and market trends, Twiga can accurately predict which products will be in demand and ensure timely delivery. This reduces waste, improves efficiency, and helps farmers get better prices for their produce (Wanjala, 2024).

2.1.10 Smart energy management systems

Smart energy management systems can analyze energy usage patterns, identify inefficiencies, and suggest strategies for reducing energy consumption, benefiting both businesses and the environment. Smart energy management systems powered by AI are revolutionizing how businesses approach energy consumption. These systems analyze intricate patterns of energy usage, pinpoint inefficiencies, and propose strategies to curtail consumption. This not only benefits businesses by reducing operational costs but also aligns with environmental sustainability goals. By optimizing energy usage, companies contribute to a greener and more sustainable future. The integration of AI in energy management represents a forward-looking approach that balances economic considerations with environmental responsibility (Bezrukov, 2024).

2.1.11 Cybersecurity

Cybersecurity is an emerging challenge for information technology management in business and society (Hatfield, 2018). AI helps by monitoring normal and abnormal activity and improving security performance and overall protection from an increasing number of sophisticated cyber threats (Chan et al., 2018). In addition, AI in cybersecurity can detect different cyber threats, such as denial of service attacks, remote to local attacks, user to root attacks, and probing and make real-time decisions (Chan et al., 2018). Furthermore, AI supports SMEs in cybersecurity to deal with complex cyber-attacks (Dörpinghaus, 2019), enabling SMEs to detect financial accounting fraud and detect fraud with credit card electronic transactions (Hamal & Senvar, 2021).



2.2 Potential Benefits of AI Deployment in the informal sector

2.2.1 Increased efficiency and reduced costs

By automating routine tasks, such as scheduling appointments, sending invoices, and processing payments, small businesses can save time and reduce the risk of human error. This leaves more time for business owners and employees to focus on delivering high-quality services to customers. Digital platforms can also increase access to supply chain, reducing costs and building efficiencies (War, 2023).

In Nigeria, TradeDepot is improving supply chain management for informal retailers by enabling their connection with manufacturers. In 2018, the number of active retailers on the company's platforms jumped from 2,000 to 15,000; TradeDepot has the potential to serve a large share of the 1.2 million retailers in Nigeria as it scales up rapidly. In Egypt, MaxAB is also connecting informal retailers with manufacturers, serving 22,000 retailers with 1200 products and 40,000 shipments within one and a half years of its founding ⁹.

⁹ "About Us," MaxAB, accessed June 05, 2024, <https://www.maxab.io/>.

Technology helps informal retailers improve their connection with their shoppers, enables them to purchase from suppliers more efficiently and cost-effectively, and even facilitates access to credit. Social media provides an opportunity for larger suppliers to reach potential informal retailer customers through advertising and engagement. In Africa, the continuing growth in use of social media, especially WhatsApp, provides an efficient avenue for communication between informal retailers and potential customers (Smollan, 2022). While this may happen through the WhatsApp Business platform (specifically designed for use by small businesses) on occasion, the relative or perceived complexity of such platforms means that most informal retail B2B action happens more informally through personal WhatsApp chats.

Digital tools enable the smallest informal entrepreneurial firms and farms to access larger networks and markets. For instance, women in Kenya can obtain mobile credit, buy food products from a wider network of farmers to resell in local markets, and thus invest and save more. Social media platforms (such as Instagram, Twitter, and WhatsApp) are being used to advertise goods and services to a larger group of customers and at lower costs. Digital financial services, accessed primarily through mobile phones, enable millions of informal workers to be paid cost-effectively (Hruby, A, 2019).

2.2.2 Improved sales

Social media and purpose-built digital platforms enable businesses to reach a wider pool of customers, outside of their immediate geographies, sometimes outside of their entire countries. This can also enable small businesses to reach higher paying customers. For example, in Nigeria, the use of social media marketing for business by women's micro- and small enterprises was associated with higher enterprise performance compared to women entrepreneurs who did not use social media (Kolawole, 2022).

According to a report by (Zeufack et al., 2021), informal microenterprises use the internet to host their websites and access a series of platforms that will help them scale and widen their geographical reach of customers and supplier networks. For instance, about 78% of the surveyed informal businesses in the region used the internet to develop new ideas on service improvement. The internet helped 64% of the informal microenterprises to connect with their customers and evaluate their consumer needs. The use of the internet has also helped increase the sales of 65% of these informal microenterprises, and it has expanded the geographical reach of consumer and supplier networks for almost half of these firms (Mothobi, Gillwald & Aguera, 2020).

2.2.3 Enhanced productivity

AI can help automate manual and repetitive tasks, thereby increasing productivity and efficiency. For instance, AI-powered chatbots can handle customer inquiries and support, freeing up human resources for more value-added tasks. This automation can enable informal businesses, such as small-scale retailers or service providers, to streamline their operations and expand their customer base (Pavitra, 2024).

For businesses and workers in the informal economy, digital technologies can help them increase productivity. Through technologies, informal sellers can reach new markets by marketing their goods through digital platforms or messenger apps. Technology can help reduce searching costs for taxi drivers or casual labourers. It can also help workers and businesses easily access physical capital they need to improve their productivity (IOE, 2021).

For example, Hello Tractor in Africa helps farmers hire tractors through their mobile phones, and users have reported a 200 % increase in yields.¹⁰

2.2.4 Expanding market reach

Digital solutions could help to expand businesses' market reach. AI can provide the informal business sector access to new markets and customers beyond their borders through e-commerce platforms, social media, and digital marketplaces. AI has been shown to be particularly useful in areas such as customer service, supply chain management, and financial analysis (Kiggundu, 2019). Several initiatives by the United Nations Development Programme (UNDP) have helped informal workers and firms leverage this aspect (Ong, 2021). For example, the UNDP partnered with Jumia, a leading e-commerce company in Uganda, to link around 2,000 informal vendors with their customers online. The UNDP has also helped informal producers and aggregators in Malaysia to sell their products and services through platforms such as WhatsApp Business and Shopee (Maala, 2021).

Steadily increasing mobile penetration and internet connectivity in Africa over the last decade has increased peer-to-peer social media interactions, leading to informal vendors and micro-businesses using popular global social media platforms to promote their goods (GSMA, 2023). Informal MSEs mostly use mobile phones, WhatsApp and Facebook Basics to trade and access new markets (Nagula & Donner 2019). For example, in Nigeria, a distribution platform called TradeDepot relied heavily on digital technologies to improve supply chain management for informal retailers by enabling their connection with manufacturers. In 2018, the number of active retailers on the company's platforms jumped from 2,000 to 15,000. Services like TradeDepot have the potential to serve millions of retailers in Nigeria and across the continent (Partech, 2018).

(Tech savvy report, 2020)¹¹ shows how backyard auto-mechanics use diagnostic software to obtain a competitive edge over other providers of similar services. Informal entrepreneurs, such as hairdressers, tailors and artists, are using social media platforms such as WhatsApp, Instagram and Facebook to market their services. The greater reach increases income and the entrepreneurs' ability to employ workers. Furthermore, Facebook Marketplace provides a space for the marketing of products with minimal cost and effort from the seller. In turn, social media provides an opportunity for larger suppliers to reach informal retail customers (Smollan, 2022).

Digitalization offers improved services to informal businesses. Digitalization can take many forms. For example, in Uganda, the digitalization of informal businesses has improved service delivery, and provided access to new markets through business associations. Through a partnership with Jumia Uganda, informal market vendors have been able to sell to new customers via Jumia's e-commerce platform, leveraging market agents to fulfill orders and drivers to deliver them (UNDP, n.d.).

10 <https://www.brookings.edu/blog/africa-in-focus/2018/01/26/foresight-africa-viewpoint-why-technology-will-disrupt-and-transform-africas-agriculture-sector-in-a-good-way/>

11 See our Tech savvy report: https://cenfri.org/wp-content/uploads/2020/05_Techsavvy-report-on-experimental-qualitative-research.pdf

2.2.5 Financial inclusion

Through digitizing sales, records, and/or supply chain, traditionally informal microenterprises without ‘historically viable’ data points for credit scoring are now able to gain access to a range of financial services, from inventory financing to growth loans (War, 2023).

AI can improve financial inclusion in the informal sector by offering access to mobile banking and payment solutions, enabling informal businesses to conduct financial transactions more efficiently and access formal financing. Fifty-seven percent of Africans do not have a bank account. Mobile banking and payment solutions provide easy ways to carry out financial transactions online. Digital payments enable cost savings that can benefit micro and small businesses and allow them to access finance through traditional banking methods¹².

AI has fostered financial inclusion in Kenya by enabling other financing solutions and micro-lending. Smaller businesses or individuals who lack access to the traditional means of credit have financing solutions. In this sense, communities are empowered to grow as people can scale up operations and do many other things with access to credit. For example, M-Shwari was launched in 2012 by Safaricom PLC and NCBA Group. M-Shwari is a mobile banking platform that is integrated into M-Pesa (a popular mobile money Kenyan financial service). Users can save and earn interest on their deposits on M – Shwari (The Voice of Fintech in Kenya, 2014).

Furthermore, based on transaction history and other data points that are collected with consent, creditworthiness can be assessed, and customers can have access to microloans. Over 30 million registered users are low-income individuals and small business owners. Through M-Shwari, Kenyans can access loans, save, and plan for a more secure financial future (The Voice of Fintech in Kenya, 2014).

Twiga Foods is another startup that works with IBM and uses AI, Big Data, and Blockchain to create a credit score for women who apply for unsecured loans for their micro-enterprises. Through AI, Twiga Foods is able to empower women who ordinarily would not have had access to funding for their businesses¹³.

2.2.6 Communication and information access

An immediate positive outcome of digital connectivity for MSEs is increased access to information and an improved ability to communicate (UNCTAD 2010). MSEs obtain information through various technological channels. However, on account of their wide availability, affordability and low skill barriers, mobile phones and low-bandwidth applications such as WhatsApp or Facebook Basics remain the technologies of choice for informal MSEs across the world and for any MSE in a low income country (Nagula & Donner 2019). MSEs have been found to use mobile phones for a variety of informational purposes – for instance, to receive information about market prices, new products and services, and customer enquiries and feedback. More recent studies have found that digital platforms can become important sources of information for micro entrepreneurs, especially in connection with self-administered training (Schiff, Nagula and Donner 2019).

12 Kilsahconsulting (2023). Promoting Digital transformation in the Informal Sector. Retrieved from: <https://kilsahconsulting.com/promoting-digital-transformation-in-the-informal-sector/>

13 UNESCO. (2019). “Human Learning in the Digital Era.” UNESCO.



2.3 Success stories on Deployment of AI in Africa's Informal Sector

2.3.1 Wasoko (formerly Sokowatch)

Wasoko is a B2B e-commerce startup that has been operating in Africa for seven years. The company has expanded into seven countries across East Africa, francophone Africa, and most recently, Southern Africa. Wasoko is the most funded B2B e-commerce startup in Africa, and its founder, Daniel Yu, believes that the company is poised to be a “foundational company for the African tech ecosystem (Nnamani & Oladunmade, 2023).”

Wasoko is a digital marketplace connecting informal retail shops in East Africa with consumer goods manufacturers, such as Unilever and Procter & Gamble. Sokowatch is transforming communities throughout Africa by revolutionizing access to essential goods and services. By connecting small shops to the digital economy, it fixes inefficient supply chains and provides services that were previously unavailable, such as next day delivery and financing. Some 20,000 retailers in Kenya, Tanzania, Uganda and Rwanda order daily to receive goods quickly and cheaply while accessing financing – many for the first time. Access to financing grows 800% on average.

Notable achievements of Wasoko

The average delivery driver was making \$2 to \$3 per day before Wasoko. Now the base wages are \$10/day which is much more livable. Wasoko has over 15,000 users that include mom and pop shops and informal sector merchants. Secured over \$20M in funding to date including investors from Quona Capital, 4Dx, and TO Ventures. Currently operating in eight Regions.

2.3.2 Lynk (Kenya)

Lynk, a young start-up transforming the informal sector in Kenya. Lynk is connecting Kenyan consumers with African artisans. Lynk is a Nairobi-based enterprise that successfully bridges the gap between informal workers, ranging from carpenters and furniture makers to hairdressers and chefs, and thousands of Kenyan consumers looking for these skills (Accenture, n.d.).

Lynk Job Limited was launched in 2016. It has developed an online services platform that connects skilled workers from the informal sector with individuals or companies. The principle is simple: individuals or businesses that want to have work done or need a service can use the platform to find the right professional for the task. Each proposed professional, whose skills have been previously verified, then enters into contact with the client. Today, Lynk has 1,000 active professionals. As of February 2019, Lynk had enabled over 1,300 informal workers to access over 22,961 jobs, and the platform has transferred more than \$2.5 million to workers in payments.

2.3.3 Jumia (Kenya)

Jumia Kenya is a number 1 online retailer with the aim and vision to become the one-stop shop for retail in Kenya. Jumia believes that technology has the potential to transform everyday life in Africa for the better. Jumia was built to help consumers access millions of goods and services conveniently and at the best prices while opening up a new way for sellers to reach consumers and grow their businesses.

Jumia is the leading e-commerce company in Africa, operating in eleven countries. The Jumia platform consists of a marketplace, which connects sellers with consumers, a logistics service, which enables the shipment and delivery of packages from sellers to consumers, and a payment service, JumiaPay, which offers a safe and easy solution to facilitate online payment transactions. The company offers goods across a broad range of categories, such as phones and electronics, home appliances, fast-moving consumer goods, fashion and beauty. The company generated over USD 1 billion in Gross Merchandise Value in 2022 and has over eight million customers.

2.3.4 Arifu training program (Kenya)

Arifu is a WhatsApp chatbot that provides tips for micro-retailers. It is a personalized, interactive WhatsApp chatbot that provides micro-retailers with practical guidance on digitizing operations and borrowing responsibly. This program is designed to support small-scale retailers to digitize and build resilience to future economic shocks by offering bite-sized, interactive training content on a range of relevant topics (Strive, 2024).

Program overview

Strive Community has partnered with Arifu, a digital content and interactive learning platform, to support micro-retailers in sub-Saharan Africa to digitize their businesses and build resilience to future economic shocks. Arifu offers learners bite-sized, interactive training content on a range of topics, including how to build digital confidence, manage money, secure a business, grow a business, and start a new business.

Content can be accessed by sending a message to WhatsApp or via SMS within Kenya. By leveraging both SMS and WhatsApp channels to deliver content, Arifu meets micro-retailers on the digital channels they are already accustomed to using; the inclusion of the SMS option is particularly important in light of the fact that data constraints deter some users from WhatsApp. This illustrates the importance of both content design and the choice of delivery channels in driving uptake of training programs.

This program builds on Arifu's previous work with the Mastercard Center for Inclusive Growth that provided 18,000 and 20,000 micro-retailers in Kenya and Nigeria respectively with access to financial and business training content to complement the Jaza Duka digital credit offering.

2.3.5 Biscate (Mozambique)

Biscate is a platform using inclusive technologies such as SMS, USSD and web to connect skilled workers from the informal sector with customers. Software solutions start-up UX Information Technologies launched Biscate ("odd-job" in Portuguese) in June 2016. This

service allows numerous informal and often uncertified skilled workers located throughout the country to register and advertise their services with a basic phone using USSD technology. Biscate offers potential customers access to a register of workers sorted by trade, location and experience level. Once a job has been completed, customers can rate workers, further enriching the database (GSMA, 2018).

Since its launch, Biscate has been leveraging the power of mobile technology by offering workers and customers access to the service through three different mobile channels: a mobile-responsive website, a native mobile app (both on Android and iOS) and a USSD service. The latter is by far the most popular among workers with an average of 3,000 daily USSD sessions being recorded on the platform.

Leveraging on the demand for quality services by the emerging middle class, Biscate aims to improve the livelihoods of a currently neglected underprivileged group of individuals by increasing their access to job opportunities and accrediting uncertified but skilled workers through customer ratings.

Between March and July 2017 1,923 female workers registered (a quarter of all registrations over that period of time) on Biscate, including carpenters, welders and electricians who can now access the same job opportunities as men and compete with them.

How the service works

- a. Workers register through their mobile phones by dialing USSD code *777#. Workers input the following information: name, gender, trade, location, level of education and experience, which is captured using a series of menus, most of which use numerical inputs, which are easier to manage for this low-literacy group.
- b. Customers download the native iOS or Android app or visit the website and search by trade, location and ratings to select the worker that they need.
- c. The customer receives the selected worker's contact details by SMS and connects with them.
- d. The worker performs the requested job and gets paid directly by the customer.
- e. The customer rates the service provided by the worker in terms of quality, price and time.

2.3.6 Tala (Kenya)

Tala is a money app for the majority. Tala bridges digital and cash ecosystems to help customers seamlessly manage their financial lives, all in one app - from instant credit to easy money transfers to expansive bill pay options. Tala harnesses the best of artificial intelligence and machine learning to deliver a personalized, rewarding financial experience. Tala's proprietary data tools open vital access to the people that legacy finance has left behind (Global, n.d.).

By creating a digital financial identity for every customer, Tala unlocks safe, flexible and seamless access to money. Tala's credit is a game-changer for those aspiring to invest in themselves, their families and their financial futures.

From leading AI to block-chain powered infrastructure, Tala harnesses the best of next generation technologies to build trusted, real-world financial solutions. The APP provides mobile-first financial platform that makes the difference for millions of customers globally, providing instant access to the capital and tools they need to earn money today and build wealth for tomorrow.

In Kenya, Tala has over six million customers. In 2021, the platform raised \$145 million (KSh 19.9 billion) to expand account and crypto capabilities.

Anyone with an Android smartphone can apply for a loan, get an instant decision and receive funds directly to their mobile money account. Tala's consumer credit platform instantly underwrites and disburses loans to customers regardless of their credit history. Loans range from KSh 2,000 to KSh 50,000 with rates as low as 0.3% per day.



2.4 Impacts of AI Deployment on Jobs in the informal sector

2.4.1 Loss of Jobs

It is well known and established that manual work can be automated. The emergence of greatly improved computing power, artificial intelligence, and robotics that can replace complex cognitive tasks and human decision making by algorithms, machine learning and other computational techniques raises the possibility of replacing labour on a scale not previously observed¹⁴. There is considerable uncertainty over the impact of technology. Sub-Saharan Africa may be less exposed than advanced economies to automation replacing existing jobs directly given the differences in the structures of the economies and wage levels. For sub-Saharan Africa, most employment is in agriculture and consumer services, often in the informal sector and characterized by income volatility. Furthermore, the share of the informal sector in total employment in sub-Saharan Africa remains the highest among all world regions and represents about 86%, compared to only 20% in developed countries

While AI has the potential to create new job opportunities, it is also likely to result in job displacement in certain sectors, including parts of the informal sector. Here are a few areas where jobs in the informal sector might be at risk due to AI:

Potential areas of job losses:

- 1. Manual activities in manufacturing and assembly process in cottage industries and informal sector;** AI-driven automation and robotics can replace manual labor in manufacturing and assembly processes (Blanas et al., 2019). This can affect jobs in small-scale manufacturing, cottage industries, and informal workshops where manual labor is prevalent. In various African countries, the informal sector encompasses small-scale manufacturing and cottage industries. AI-driven automation and robotics can potentially replace manual labor in these industries, leading to job losses for workers involved in informal manufacturing activities (Spencer, 2018; (Williams, 2024).
- 2. Transportation and delivery of goods and services;** The rise of AI-driven ride-hailing platforms and autonomous vehicles can disrupt the informal transportation sector. (Clewlow & Mishra, 2017) Informal taxi and motorcycle taxi services, which are prevalent in many African countries, may face competition from AI-powered transportation alternatives.

With the development of autonomous vehicles and drones, there is a potential for job losses in the informal sector related to transportation and delivery services. This includes

14 How will changes in technology and automation affect the labour market in Africa: <https://gsdrc.org/wp-content/uploads/2017/10/Impact-of-automation-on-jobs-in-Africa.pdf>

15 The Impact of New Technologies on Employment and the Workforce: What are the Implications for Developing Countries, Especially in Africa? <https://www.policycenter.ma/sites/default/files/2022-02/Report%20-%20The%20Impact%20of%20New%20Technologies%20on%20Employment%20and%20the%20Workforce.pdf>

jobs such as rickshaw pullers, motorcycle couriers, and informal trucking services (Williams, 2024).

3. **Data entry jobs;** AI technologies like optical character recognition (OCR) and natural language processing (NLP) are improving data processing capabilities, reducing the need for manual data entry jobs. This could impact informal sector jobs that involve data entry or administrative support tasks (Williams, 2024).
4. **Customer queries and support services;** AI-powered chatbots and virtual assistants are increasingly being used to handle customer queries and support services. This could lead to a reduction in jobs for call center agents, especially in informal call centers (Williams, 2024).
5. **Traditional retail and trade practices;** AI-powered e-commerce platforms and automated retail systems can disrupt traditional informal retail and trade practices. As online shopping gains popularity and automated kiosks become more prevalent, it may reduce the demand for small-scale street vendors and informal market sellers (Jaishankar & Sujatha, 2016).
6. **Informal farm laborers and workers;** AI applications in agriculture, such as automated harvesting machines, precision farming, and drone-based crop monitoring, may lead to reduced demand for manual labor in the agricultural sector. This could affect informal farm laborers and workers involved in activities like crop harvesting and maintenance. AI-driven technologies, such as automated machinery, precision farming techniques, and remote sensing, can increase productivity and reduce the need for manual labor in farming activities (FAO, 2020). This could potentially impact informal farm laborers who rely on agricultural work for their livelihood (Frey & Osborne, 2017).
7. **Loss of jobs in traditional retail sectors;** The rise of online marketplaces will lead to the loss of jobs in traditional retail sectors, such as sales assistants and cashiers. For example, gone are the days when corporations required salespeople for advertising and retail activities. Advertising has shifted towards web and social media landscapes. The built-in target marketing capabilities in social media allow advertisers to create custom content for different types of audiences (Wbcom Designs, 2024).

2.4.2 Creation of jobs

Areas where jobs are likely to be created

The future workforce will likely shift towards more self-employment and online work where employers will think in terms of specialisms rather than employees. This may benefit and expand access to work for women, youth, older workers and the disabled, who may prefer the flexibility of working from home or working flexible hours. Online work will also provide access to a larger global labour market. However, these workers will require protection against poor pay and lack of career prospects¹⁶

Artificial intelligence has the potential to increase employment, create new jobs, and improve the economy. The replacement effect is the destruction process; as new technology replaces older technology, jobs dependent on the older technology are also replaced, inevitably resulting in job loss. The unemployment issue will worsen as technology continues to permeate every aspect of human life. The fear that humans will be replaced by robots is currently being fueled by the realization that artificial intelligence can replace jobs in many spheres of

16 How will changes in technology and automation affect the labour market in Africa: <https://gsdrc.org/wp->

life¹⁷Future employment growth is likely to come from jobs that cannot be fully or partially automated. Among the low skilled, some services that must be delivered face-to-face or require awareness and situational adaptability (housekeepers, hairdressers) are likely to grow.¹⁸

Some automation technology platforms, especially AI, may facilitate the creation of new tasks. A recent report by Accenture identified entirely new categories of jobs that are emerging in firms using AI as part of their production process (Accenture PLC, 2017). These jobs include “trainers” (to train the AI systems), “explainers” (to communicate and explain the output of AI systems to customers), and “sustainers”(to monitor the performance of AI systems, including their adherence to prevailing ethical standards)¹⁹

Some of the areas where AI could create jobs in Africa include:

1. AI can facilitate the growth of e-commerce and online platforms, which can connect informal sector workers with potential customers. These platforms can enable artisans, craftsmen, and other informal workers to showcase and sell their products or services to a wider audience. AI algorithms can also personalize recommendations and enhance user experiences, leading to increased sales and job opportunities. For instance, Lynk startup is connecting Kenyan consumers with African artisans. It has developed an online services platform that connects skilled workers from the informal sector with individuals or companies. Another example is Fundis LLC founded in 2018 by Kenyan entrepreneur Alex Kamanga. Fundis is a Kenyan online P2P platform addressing the fragmented repairs industry by connecting users with competent and vetted artisans. Through the mobile application, Fundis helps users get their repairs and maintenance tasks done better and faster while reducing the time artisans spend looking for clients. Workers on the platform also get trained in soft skills and digital literacy while enjoying continuous access to decent income opportunities. The Fundis app currently has a network of over 2,000 artisans spread across Kenya, including plumbers, electricians, painters, and carpenters²⁰.
2. Research by (Dupoux et al.,2019) indicates that online marketplaces will create around 3 million new jobs in Africa by 2025. The research further, estimate that the number of Africans directly employed by online-marketplaces—workers such as platform developers and operations and marketing personnel, will reach around 100,000. Indirect employment generated by marketplaces, including workers such as merchants, logistic clerks, passenger-vehicle drivers, hotel staff, and housekeepers, will amount to one million more jobs. An additional 1.8 million jobs will be “induced,” or created through the additional economic activity stimulated by online marketplaces. For example, E-commerce platforms are spreading across the continent. Jumia, also dubbed the “African Amazon,” now connects buyers and sellers in 14 African countries, and has 500,000 merchants registered on its platform.

In Kenya, one of the most advanced African countries in terms of digital innovation, there are now online platforms for services as diverse as artisanal work, homecare and cleaning services, and micro-task work in the information technology sector (Lakemann L., 2019).

17 The Impact of Artificial Intelligence on Employment: Evidence in Africa. https://www.researchgate.net/publication/370778167_The_Impact_of_Artificial_Intelligence_on_Employment_Evidence_in_Africa

18 How will changes in technology and automation affect the labour market in Africa: <https://gsdrc.org/wp-content/uploads/2017/10/Impact-of-automation-on-jobs-in-Africa.pdf>

19 Daron Acemoglu and Pascual Restrepo (2018), Artificial Intelligence, Automation and work

20 Oluwafisayo Dorcas Adeyooye. How Fundis LLC is Organizing and Refining Kenya’s Informal Sector. Retrieved from: <https://www.builtinafrica.io/videos/fundis-llc-kenya>

Further, in South Africa, Airbnb reported generating an estimated US\$678 million for the South African economy, creating 22,000 jobs and an estimated US\$260 million for hosts across the country (African News Agency, 2018).

3. AI systems require large amounts of labeled data to train and improve their algorithms. The task of labeling and annotating data can be performed by individuals in the informal sector who have the necessary skills. Companies and organizations can create micro-tasking platforms that allow people to contribute by labeling images, transcribing audio, or tagging data, providing them with income-generating opportunities. For example, in East Africa, local companies such as Africa AI Labs, Kaziremote, Sama, and Cloud Factory are building a managed workforce of young workers to undertake tasks such as data labelling, annotation, transcription, translation among others (Ngene, 2022).
4. As AI adoption increases, there will be a growing demand for AI service providers who can develop, implement, and maintain AI solutions tailored to the needs of informal sector businesses. This can include developing AI-powered inventory management systems, demand forecasting models, or customer analytics (Arntz et al., 2016).

For example, according to (Google and IFC, a member of the World Bank Group, 2020) report, in a push to expand technology proficiency among Africa's youth, after-school programs and coding classes are driving the growth in software development training. Training programs from companies such as Decagon, Gebeya, Google, Moringa School, Gebeya, Semicolon, and Umuzi blend traditional learning with online, flexible learning and bootcamp-style experiences. These STEM-related programs, outside of formal education institutions, fill knowledge and skills gaps and equip participants with the expertise they need for increasingly advanced jobs in technology.

5. AI can create jobs by driving the need for skills development and training programs. Initiatives can be launched to equip individuals in the informal sector with AI-related skills, such as data analysis, basic programming, or AI system maintenance. Training programs, both online and offline, can empower individuals to leverage AI technologies effectively and explore new opportunities within the informal sector. Online or offline platforms can help micro-entrepreneurs become better at conducting business online by guiding them through best practices. Some examples in Africa include (Partnership for Finance in a Digital Africa, 2019):
 - a. Periodic text messages sent to drivers on the Bolt (formerly Taxify) ride-hailing app guide their drivers as to where they should go to maximize earnings.
 - b. Offline training conducted by employees of the platform helps coach micro-entrepreneurs through consultative tactics to improve their business. For example, Jumia Kenya provides offline training to all their vendors for free²¹.
 - c. Jumia also provides comprehensive online training tutorials for their merchants.
 - d. Mosabi is an African company which focuses on skilling informal sector workers, and also providing them with access to finance so that learners can start their own micro-enterprises once they are equipped with the skills.

In low-income environments, low-skill-biased digital technologies (for example, instructional videos, voice-activated tactile screens, and simple-to-use applications)

21 vendorhub.jumia.co.ke/2018/12/20/book-your-offline-training/

can empower low-skilled informal workers to perform higher-skill tasks and learn on the job. Such technologies can help workers to accumulate small savings, access credit and insurance products based on their savings and purchase habits, and move to better jobs over time.

6. AI is also opening up new possibilities for non-traditional jobs and entrepreneurship. With access to AI-based tools and resources, individuals can create their own businesses based on innovative and customized solutions. Digital technologies help create jobs for a significant share of low skilled workers in the region, helping them to save and later use those savings to start their own firms—mostly formal firms. A typical example of this phenomenon is when MTN Ghana introduced credit transfer technology that allowed people to buy a SIM card, load it with money (credit), and sell the credits in smaller units to customers. Over time, many credit sellers were able to save and transform their businesses into larger, formal telecommunication support businesses, sometimes even selling mobile phones (Choi et al.,2020.).
7. AI-powered tools can provide insights into crop management, soil analysis, and weather patterns, enabling farmers to make informed decisions and improve yields. This can lead to increased productivity, market access, and job opportunities for small-scale farmers in the informal sector. For example, this can open up opportunities for new roles such as “agrotechnologists” who combine agricultural expertise with advanced AI knowledge to maximize efficiency and sustainability in the industry (Lacoviello, 2023).
8. AI can facilitate the creation of collaborative platforms and networks among informal sector workers. By connecting workers with complementary skills or facilitating knowledge sharing, these platforms can enable informal workers to collaborate on larger projects or gain access to resources and opportunities that they wouldn’t have individually. This collaborative environment can lead to job creation and collective growth within the informal sector (Hyland, n.d.).
9. The expansion of mobile phones and the development of mobile money has indirectly created many newer jobs (e.g., sales, agents) than the production and installation of ICT infrastructure. These jobs are for the most part not high-skill ones; on the contrary, most are in the informal retail sector. For instance, mobile money, invented and developed in Kenya, has revolutionized banking in Africa, in the process creating jobs for over 240,000 self-employed agents in Kenya alone (AU/OECD, 2021).

Digital technologies enable new business models. This can create work opportunities, but not necessarily of a completely different nature. For instance, mobile payment services on the continent are facilitated by a multitude of cash-in and cash-out agents. These services are not dissimilar to those rendered by bank tellers since the advent of networked banking. However, the existence of digital communications has enabled these ‘tellers’ to be located far from bank branches and within pre-existing small local businesses. In the process, hundreds of thousands of new income-earning opportunities were created (Ng’weno and Porteous, 2018). Again, the business model is new, but the jobs look distinctly familiar and even ancient in content.

10. The MasterCard Foundation and Samasource have partnered to create technology-enabled jobs and training for thousands of marginalized youth in East Africa. Samasource has employed young people across Kenya and Uganda to train data and transmit human

intelligence to AI for big-tech companies including Google, Microsoft and Yahoo²². Over 1100 young people are working on various projects across Kenya and Uganda with incomes that support, for example, the education of their siblings and overall living conditions of their families, to the extent that over 50,000 people are now benefitting from this process²³.

11. The expansion of e-commerce in Africa has created demand for bicycle, motorcycle, and taxi drivers to provide on-demand delivery services for vendors, including food service vendors, in the process creating more and better informal jobs. (Fox & Signé, 2022) reckons that some observers envisage these platforms as being used routinely to request and book services delivered in-home by informal service providers, such as hairdressers and manicurists, and to find a reliable self-employed craftsperson (e.g., plumber, gardener, home repair person) (Fox & Signé, 2022).
12. According to a 2019 insight2impact study, Africa is already home to more than 250 digital platforms with 1.3% of adults in the focus countries earning an income from these platforms. (The Boston Consulting Group, 2019) estimates that these digital platforms can create up to three million new jobs in Africa by 2025. These digital platforms will create demand for marketers, craftspeople, logistics, clerks, drivers and hospitality staff.



2.5 Key challenges of AI deployment in the informal sector

2.5.1 Policy issues governing artificial intelligence

According to (Miles & Joanna, 2016), regulation covers a broad variety of potential strategies to modify a science or technology field's developmental course and diffusion. It is not necessary for technology to be completely developed before it becomes essential. It simply refers to a set of decisions that societies, through their governments, make about what they do and do not want to permit, and what they do or do not want to encourage. In the case of AI, a number of such decisions are already being made.

Researchers have been thrilled with the potential uses of AI systems to help manage some of the world's hardest problems and improve countless lives. However, the problems associated with AI growth must be tackled in order to realize this potential. Since AI has made considerable progress in recent years, it has had ramifications in a variety of policy areas, including economics, social issues, education, and even defense. It is therefore prudent that governments consider these issues while making guard rails that would guarantee acceptable use of AI. (Sorina, 2016) outlines some of these policy issues that include;

- a. **Economic and Social:** Artificial intelligence can enhance the quality and variety of existing goods and services while also developing new ones, resulting in the creation of new business sectors. However, in order for this potential to be fully realized, it is important to ensure that the economic benefits of AI are widely shared at all levels of society, as well as that any negative impacts are adequately addressed. This, therefore, calls for governmental commitment towards adapting the workforce to AI, thereby preparing new generations

22 Ogiemwonyi, Elsahn, Olan and Elsahn. Artificial intelligence in Africa: challenges and opportunities. Northumbria University Doha Institute for Graduate Studies. In: The Fourth Industrial Revolution: Implementation of Artificial Intelligence for Growing Business Success. 2021.

23 Ibid.

and allowing the current workforce to re-skill and up-skill itself to guarantee sustainable economic and social balance.

- b. Development:** There is need for governments to actively support research and innovation in the field of AI and increase related funding to address issues such as effective human-AI collaboration, understanding the ethical, legal, societal and even safety of AI systems. Policies hence need to be developed to ensure there is a legal framework that supports such provisions.
- c. Privacy:** AI systems operate with vast quantities of data, which poses privacy and data security issues. AI apps must protect the privacy and confidentiality of the data they use, as well as the credibility of the data they use. In order to comply with the concepts of necessity and proportionality, AI should provide privacy and data security guarantees. It also calls for the development of standards for the concepts of privacy by design, privacy by default, informed consent, and encryption in AI systems.
- d. Ethics:** Concerns have been raised about ethics, equity, justice, openness, and accountability as AI systems require evaluations and decision-making, essentially replacing similar human processes. One such problem is the possibility of prejudice and bias in AI decisions. Although there seems to be a general understanding on the need for algorithms and architectures to be verifiably consistent with existing laws, social norms, and ethics, achieving this might be a challenge because of ethical issues varying according to culture, religion, and belief.
- e. Safety and Security:** AI applications in the physical world, such as transportation or medicine, raise concerns about human safety and the need to design systems that can react appropriately to unforeseen situations while minimizing unintended consequences. AI has consequences for cyber security as well. If AI becomes more ingrained in critical networks, it must be protected from cyber-attacks.
- f. Legal:** There is the age-old question of “If something goes wrong, who is responsible especially in cases of automated vehicles? Is it the manufacturer, the software developer, the owner of the vehicle? This question raises issues of civil, and even criminal liability, and there is a need to further discuss such issues and its legal ramifications on all parties involved. In terms of policy, the capacity of algorithms or trained systems to represent human values such as fairness, accountability, and openness is perhaps the most noticeable and evolved area of AI policy to date (Calo & Ryan, 2017).

3. CHAPTER THREE

CONCLUSIONS AND RECOMMENDATIONS

3.1 Conclusion

The overall objective of this study was to generate evidence that can be used by stakeholders and policy makers to accelerate the deployment of artificial intelligence in the informal sector while providing measures to address any fears and ethical issues as well as challenges that may affect the deployment of AI to a scale that can have impact in the informal sector in Africa. From an exhaustive search through using Systematic Literature Review (SLR) method, several studies were selected to provide answers to the five established research objectives. The conclusions obtained in this paper in relation to the proposed objectives are set out below.

3.1.1 Possible areas of deployment of AI in informal sector in Africa

Results from this study shows that there are several possible areas of deployment of AI in informal sector in Africa. Some of the areas identified included Blockchain technology, automated customer service and communications, predictive analytics for decision making as well as operational efficiency through predictive maintenance. Others include connecting skilled workers from the informal sector with customers, supply chain management, AI-driven credit assessments, Chatbots and mobile applications, supply and demand patterns prediction, smart energy management systems and cybersecurity. Most of the studies reviewed identified automated customer service and communications as one of the most important roles of AI in informal sector. The study concluded that digital platforms and emerging technologies (AI) can be deployed in Africa to enhance efficiency and quality of jobs in the informal sector.

3.1.2 Perceived and real fears and negative impacts of AI in informal sector in Africa

This study further found out some of the perceived and real fears and negative impacts of AI in informal sector in Africa. These perceived fears and negative impacts identified included job losses and job disruptions. It is emerging that if these perceived and real fears and negative impacts of AI in informal sector in Africa are not addressed then it will hinder or slow down the deployment of AI in informal sector in Africa.

However, the research also found out that there are several positive impacts of AI in the informal sector like job creation, increased efficiency and reduced costs, improved sales, expanding market reach, communication and information access, enhanced productivity and financial inclusion. In this regard, adoption of artificial intelligence in the Informal Sector in Africa has the potential to increase employment, create new jobs, and improve the economy.

3.1.3 Success stories of AI deployment in informal sector in Africa and elsewhere

This study documented some success stories of AI deployment in informal sector in Africa and elsewhere. This study found out that there are many success stories of AI deployment in informal sector in Africa and elsewhere. The study therefore picked a few of these success stories including Wasoko, Lynk, Jumia, Arifu, Biscate and Tala. However, the study found out that these success stories have been implemented on a small scale in Africa. Utilization of AI technologies in informal sector in Africa has considerable promise for the future. Africa must address the challenges hampering the adoption and utilization of AI, as technology is advancing rapidly, and opportunities await those who embrace it.

AI can provide solutions to some of the problems faced by informal sector in Africa, from lack of access to funds, to lack access to markets and low productivity. Deployment of AI-powered solutions such as chatbots, data analysis tools, content marketing optimization, and personalized marketing campaigns, small businesses in informal sector can enhance operational efficiency, improve customer experiences, and gain a competitive advantage in their respective industries.

3.1.4 key challenges to deployment of AI in informal sector in Africa

This study found out that policy issues governing artificial intelligence as the main challenge to deployment of AI in informal sector in Africa. These policy issues include economic and social, development, privacy, ethics, safety and security and legal. Therefore, if these challenges are not dealt with by African countries they will hinder or slow down the deployment of AI in informal sector in Africa.



3.2 Recommendations

The overall and specific objectives of this study were met despite several challenges from which the following recommendations can be assimilated:

- a.** From the gatherings in this study, there is a dire need for continuous sensitization by stakeholders on adoption and utilization of AI since the fears and threats perceived to be associated with it have not been adequately addressed yet, in the end, its benefits outweigh its drawbacks.
- b.** African governments also need to initiate policy formulations, stakeholders' involvement and infrastructure development in readiness for AI adoption.
- c.** Offer incentives to the informal sector in order to ameliorate some of the challenges experienced in that sector in order to boost its potential for increasing opportunities that may be derived from use of artificial intelligence.
- d.** Need for organizations that adopt artificial intelligence/ deep digital technology to retrain their staff in order to gain the skills that are necessary for utilization of AI.

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ANNEX 1

Table 4: Quality Assessment of Included Studies

STUDY ID	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	TOTAL CORE	% MAX S
IJ-1	1	1	0.5	1	1	1	0.5	1	1	8	89
IJ-2	1	1	0	1	1	0.5	0.5	0.5	1	6.5	72
IJ-3	1	1	1	1	0.5	1	0.5	1	1	8	89
IJ-4	1	1	0.5	1	0.5	0.5	1	1	1	7.5	83
IJ-5	0	0	0.5	0	1	0.5	0.5	1	1	4.5	50
IJ-6	0	0	1	0	1	0	1	1	1	5	56
IJ-7	0	0	0.5	0.5	1	0.5	0.5	1	1	5	56
IJ-8	0.5	0.5	0.5	0.5	1	0	0.5	1	1	5.5	61
IJ-9	1	0.5	0.5	0.5	0.5	0	0.5	0.5	0.5	4.5	50
IJ-10	1	1	0.5	1	0.5	0.5	0.5	1	1	7	78
IJ-11	1	0.5	0.5	0.5	1	0	0	1	1	5.5	61
IJ-12	0.5	0.5	1	0	1	0.5	0.5	0.5	0.5	5	56
IJ-13	1	1	0.5	1	1	0	1	0	0.5	6	67
IJ-14	0.5	0.5	1	0.5	0.5	0	0.5	0.5	0.5	4.5	50
IJ-15	0	0	0.5	0	1	1	0.5	1	1	5	56
IJ-16	1	1	1	0	1	1	1	1	1	8	89
IJ-17	0	0.5	0.5	0	1	0	0.5	1	1	4.5	50
IJ-18	1	1	0	0.5	0.5	0	0.5	0.5	0.5	4.5	50
IJ-19	0.5	0.5	1	1	0.5	1	1	1	1	7.5	83
IJ-20	1	1	0.5	1	0.5	1	0.5	1	1	7.5	83
IJ-21	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	4.5	50
IJ-22	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	4.5	50
IJ-23	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	5	56
IJ-24	1	1	0.5	0.5	0.5	1	0.5	1	1	7	78
IJ-25	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	1	5.5	61
IJ-26	1	1	0.5	0.5	0.5	0.5	1	1	0.5	6.5	72
IJ-27	1	0.5	0.5	0.5	0.5	0.5	0.5	1	1	6	67
IJ-28	1	1	0.5	1	1	0.5	0.5	0.5	0.5	6.5	72
IJ-29	0	0	0.5	0	1	0.5	0.5	1	1	4.5	50
IJ-30	1	1	1	0.5	0.5	0.5	1	1	1	7.5	83
IJ-31	0	0	1	0.5	0.5	0.5	0.5	0.5	1	4.5	50
IJ-32	1	0.5	0.5	1	1	1	0.5	1	1	7.5	83
IJ-33	0	0	0.5	0.5	1	1	0	1	1	5	56
IJ-34	1	1	0.5	1	0.5	0	0	0.5	0.5	5	56
IJ-35	0	0	1	0.5	0.5	0.5	0.5	0.5	1	4.5	50
IJ-36	1	1	0.5	1	1	1	1	0.5	1	8	89
IJ-37	1	1	1	1	1	1	0.5	0.5	1	8	89
IJ-38	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	5	56
IJ-39	1	1	0.5	0.5	0.5	1	0.5	1	1	7	78
IJ-40	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	1	5.5	61
IJ-41	1	1	0.5	0.5	0.5	0.5	1	1	0.5	6.5	72
IJ-42	1	0.5	0.5	0.5	0.5	0.5	0.5	1	1	6	67
IJ-43	1	1	0.5	1	1	0.5	0.5	0.5	0.5	6.5	72
IJ-44	0	0	0.5	0	1	0.5	0.5	1	1	4.5	50
IJ-45	1	1	1	0.5	0.5	0.5	1	1	1	7.5	83
IJ-46	0	0	1	0.5	0.5	0.5	0.5	0.5	1	4.5	50

ANNEX 2

Table 5: Summary of Role and Impact of AI in Education

Study ID	Author	Impact of AI in Informal Sector
IJ-1	Mosupye, (2023)	➤ use of AI and blockchain to provide financial services to traders
IJ-2	(Ortlep, 2019)	➤ use of AI and blockchain to provide financial services to traders
IJ-3	(Saba, 2021)	➤ use of AI and blockchain to provide financial services to traders
IJ-4	(Helene, 2023)	➤ automate routine tasks for informal sector businesses
IJ-5	(Google, 2020)	➤ automate routine tasks for informal sector businesses
IJ-6	(Adewusi et al., 2023)	➤ Predictive analytics for decision making
IJ-7	(Wanjala, 2024)	➤ Predictive analytics for decision making
IJ-8	(Ngweno & Porteous, 2018)	➤ AI can Connect skilled workers from the informal sector with customers
IJ-9		➤ Supply Chain Management
IJ-10	(Adewusi et al., 2023)	➤ AI-driven credit assessments
IJ-11	(OECD, 2020)	➤ AI-driven credit assessments
IJ-12		➤ Chatbots and mobile applications can deliver personalized information
IJ-13		➤ Machine learning algorithms play a pivotal role in optimizing supply chain management
IJ-14		➤ Smart energy management systems can analyze energy usage patterns
IJ-15	(Hatfield, 2018)	➤ AI in cybersecurity can detect different cyber threats
IJ-16	(Chan et al., 2018)	➤ AI in cybersecurity can detect different cyber threats
IJ-17	(Dörpinghaus, 2019),	➤ detect financial accounting fraud and detect fraud
IJ-18	(Hamal & Senvar, 2021)	➤ AI in cybersecurity

IJ-19	(Daron A. & Pascual R., 2018)	➤ AI and Automation of work
IJ-20	(Dupoux et al., 2019)	➤ job creation
IJ-21	(Lakemann L., 2019).	➤ job creation
IJ-22	(African News Agency, 2018)	➤ job creation
IJ-23	(Google and IFC, 2020)	➤ job creation
IJ-24	(AU/OECD, 2021)	➤ job creation
IJ-25	(Ng'weno & Porteous, 2018)	➤ job creation
IJ-26	(Fox & Signé, 2022)	➤ job creation
IJ-27	(The Boston Consulting Group, 2019)	➤ job creation
IJ-28	(Ogiemwonyi, Elsahn, Olan & Elsahn, 2021)	➤ job creation
IJ-29	(Smollan, 2022)	<ul style="list-style-type: none"> ➤ Communication and information access ➤ provides an opportunity for larger suppliers to reach informal retail customers
IJ-30	(GSMA, 2023)	➤ Expanding market reach
IJ-31	(Ong, 2021)	➤ Expanding market reach
IJ-32	(Maala, 2021)	➤ Expanding market reach
IJ-33	(Kiggundu, 2019)	➤ Expanding market reach
IJ-34	(Mothobi, Gillwald & Aguera, 2020).	➤ expanded the geographical reach of consumer and supplier networks
IJ-35	(Zeufack et al., 2021)	➤ scale and widen their geographical reach of customers and supplier networks
IJ-36	(Kolawole, 2022)	➤ higher enterprise performance
IJ-37	(War, 2023)	<ul style="list-style-type: none"> ➤ increase access to supply chain, reducing costs and building efficiencies ➤ reach a wider pool of customers, outside of their immediate geographies ➤ access to a range of financial services
IJ-38	(Nagula & Donner 2019)	<ul style="list-style-type: none"> ➤ access new markets ➤ Communication and information access
IJ-39	(UNDP, n.d.)	➤ provided access to new markets
IJ-40	(Hruby, A, 2019)	➤ enable millions of informal workers to be paid cost-effectively

IJ-41	(IOE,2021)	➤ improve their productivity
IJ-42	(Tech savvy report, 2020)	➤ market their services
IJ-43	Kilsahconsulting (2023)	➤ access to finance
IJ-44	(The Voice of Fintech in Kenya, 2014)	➤ access to finance
IJ-45	(Schiff, Nagula and Donner 2019)	➤ self-administered training
IJ-46	(Sorina, 2016)	➤ policy issues

