

Effectiveness of Artificial Intelligence on Public Service Delivery in Nigeria

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Abstract

Artificial Intelligence is a computer's ability to imitate human intelligence while improving performance, increasing productivity and reducing costs. Nowadays, governments are exploring the advantages of AI in providing services to the public at a reduced cost and with efficiency. The study's targeted population were the government employees and users of services in Nigeria. Using the survey method, purposive sampling was adopted to generate data from a large number of participants based on their experiences. The generated data were analysed using SPSS Version 27 to code and analyse questionnaire responses; hence, simple percentages, mean scores, and standard deviations were used to summarise the data, while regression and correlation analyses were used to examine the relationship between AI and service delivery outcomes. The study's findings revealed that AI is a transformative force for Nigeria's public service delivery; it enhances transparency, improves service quality, and simplifies government processes at a lower cost. Therefore, the study recommended that the Nigerian government make it mandatory for every government institution to fully apply AI in its processes, raise awareness of AI's impact, and improve internet access nationwide.

Keywords: Artificial intelligence, automation, effectiveness, technology, public service delivery.

Introduction

Artificial intelligence is a powerful digital technology that enables machines to think, act, reason and even make decisions like humans in a transparent, efficient, and cost-effective manner for the betterment of the general public. As a result, it is becoming increasingly relevant in delivering public services globally. It helps governments in making informed decisions by analysing large volumes of information that humans cannot process efficiently. AI is increasingly playing an important role in governance by transforming how governments design policies, deliver public services, and interact with citizens through inclusive and responsive governance. Technology application is becoming the order of the day with the growing demand for efficient public service delivery; nevertheless, artificial intelligence is barely sixty years old; perhaps its emergence in governance led to the invention of technology in modifying human intelligence through artificial intelligence. Decades ago, Artificial intelligence (AI) had been globally recognised as a tool that

behaves and thinks like humans, thereby simplifying human work. “AI is the science of making machines do things that would require intelligence if done by men” (Minsky, 1968).

According to the European Economic and Social Committee (EESC), there is no single accepted and rigid definition of AI. AI is a catch-all term for a large number of sub-fields such as cognitive computing (algorithms that reason and understand at a higher (more human) level, machine learning (algorithms that can teach themselves tasks), augmented intelligence (cooperation between human and machine) and AI robotics (AI embedded in robots) (European Economic and Social Committee (EESC), 2017). Technology is one of the central and most significant elements used in managing organisations effectively; it has penetrated almost every aspect of our daily lives, engulfing business, leisure, and the entire society. It simplifies processes, automates operations, works speedily with little error, improves product quality and boosts production, disseminate information at a faster, easier and more accurate rate.

In broader terms, just like any other ICT, AI has significantly changed the narrative of the working environment with automation of the workforce and productivity. The McKinsey Global Institute expects that “rapid advances in automation and artificial intelligence will have a significant impact on the way we work and our productivity” (Gaurav et al., 2018). More specifically, virtual workforces, so-called intelligent automation, as well as labour and capital augmentation where AI can complement the skills of existing workforces, lead to cost efficiency and savings (Bataller & Harris, 2016).

Accordingly, Purdy and Daugherty (2016) posit that, within the next 15 years, AI has the potential to increase the annual economic growth rates in the United States, Germany, and Japan by up to 2 percentage points. These technological advancements in AI and the associated value potential are also increasingly gaining importance in the context of governance. Precisely, China and the United States have recognised the value of AI for the public sector and their competitiveness in the global economy. For example, the government of China has shown an extraordinary commitment to catch up with the AI development of the Western world in the next 3 years (Knight, 2017).

In Nigeria, technology application in public service has been identified as a critical reform strategy for strengthening service delivery, particularly within the framework of the National Digital Economy Policy and Strategy (NDEPS 2020-2030). The federal government recognised the need to digitise public services to reduce inefficiency, promote accountability, and foster inclusiveness in governance (Federal Ministry of Communications and Digital Economy, 2021). The automation of public services with the aid of technology, precisely using AI tools in public service via the use of computers, fax machines, mobile phones, and internet are the universal and common way of operating in almost every organisation. These new instruments have heralded an era of increased productivity, better service delivery, greater profitability and clutter-free working conditions for all. Governments have long been using computers and/or machines to assist officials in making decisions and increasingly to automate those decisions without human involvement; this in turn necessitates the relevance of AI in public service delivery.

Despite the well-circulated acceptance of technology for public service delivery, certain pitfalls also emerge in the areas of administrative decision-making, where there is complexity of decision that is human in nature; human administrators are required to exercise professional judgment and discretion to best determine how the rules apply in complex situations. As is well documented, automating administrative decision-making has reduced human discretion and gives rise to concerns that an individual’s situation may not have been appropriately considered in making an administrative decision (Adler & Henman, 2009; Evans & Hupe, 2020; Garson, 1989).

While AI has the capacity to be more nuanced than standard algorithms, it is also less clear how decisions on specific cases are made.

It's pertinent to note that the study is aimed at exploring the effectiveness of artificial intelligence for public service delivery in Nigeria with specific focus on the following;

1. To determine the extent of AI implementation in Nigeria's public service
2. To identify the challenges associated with AI in public service delivery in Nigeria
3. To proffer solutions to AI-related challenges in public service delivery in Nigeria.

Literature Review

Artificial Intelligence

According to Dastin (2020), AI is a subset of cognitive computing, which is the process of developing systems that simulate human thought patterns in order to tackle challenging issues. To comprehend and engage with the world, cognitive AI systems employ perception, reasoning, and problem-solving abilities. The Swedish report defines AI as 'the ability of a machine to imitate intelligent human behaviour' (Vinnova 2018). According to the European Commission (2018), AI 'refers to systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals. Bellman (1978) defines AI as "The automation of activities that we associate with human thinking, activities such as decision-making, problem solving, and learning." This definition underscores AI's goal of automating cognitive tasks traditionally performed by humans. Consequently, artificial intelligence is that activity devoted to making machines intelligent, and intelligence is that quality that enables an entity to function appropriately and with foresight in its environment" (Nilsson, 1998).

Similarly, Russell et al. (2021) conceived AI "as the study of agents that receive percepts from the environment and perform actions." They explain that an intelligent agent is a system that perceives its environment and takes actions that maximise its chances of achieving its goals. Based on these scholarly perspectives, Artificial Intelligence (AI) is the branch of computer science concerned with designing and developing intelligent machines or computer systems capable of performing tasks that normally require human intelligence, including learning, reasoning, problem-solving, perception, language understanding, and decision-making. AI systems achieve these capabilities through algorithms, data, and computational models that enable them to perceive their environment, adapt, and act toward specific goals.

Public Service Delivery

Public Service delivery refers to the process through which government institutions provide goods and services to citizens, ensuring that their needs are met in a timely, efficient, and equitable manner (Okeke, 2024). It encompasses both tangible services, such as issuing identification cards, licenses, and social welfare support, and intangible services, such as information dissemination, consultation, and citizen engagement. Effective service delivery is a core indicator of good governance because it directly affects public satisfaction, trust, and the legitimacy of government institutions (Adeleke, 2022).

According to the Asian Development Bank (2013), service delivery is the provision of basic services such as water, sanitation, and primary education. Such services cannot be left to the market alone since they have the characteristics of public goods. Modern public administration emphasises citizen-centred service delivery, where the focus is on responsiveness, transparency, and quality, aligning with principles of New Public Management (NPM) and e-governance frameworks (Kettunen & Kallio, 2022). Okafor et al. (2014) see service delivery as "the result of the intentions, decisions, and actions undertaken and decisions made by people employed in

government institutions," They posit that it is "the provision of public goods or social (education, health), economic (grants), or infrastructural (water, electricity) services to those who need them.

Forms of Artificial Intelligence

It's imperative to note that Artificial intelligence is becoming the order of the day in the provision of public services globally.

1. **Computer Integrated Manufacturing (CIM)** is the application of computer systems to integrate the automated production activities and the business operations of a manufacturing enterprise into a unified system (Groover, 2020). Example: In Nigeria's FIRS, they can use CIM for the whole tax process. Citizens will apply for tax payments electronically; AI will verify through the NIN database; a tax record will be generated; payment will be processed, and a receipt will be generated electronically.
2. **Robotics** is a technology concerned with the design, construction, programming, and application of robots for industrial and service tasks (Groover, 2020). It recognises faces and voices, detects fraud, responds to queries, and analyses patterns. Examples of AI robotics in Nigeria are: traffic control systems, automated detective door control, security surveillance, customer services, health care provision to assist doctors in surgery or deliveries in public hospitals, etc.
3. **Mobile Phones:** According to the International Telecommunication Union (2023), a mobile phone is a portable telephone that can make and receive calls over a radio frequency link while the user is moving within a telephone service area. It provides mobile services using mobile devices and smartphones, which are basically powered by AI. The public services provided are SMS systems and chatbots, where citizens can use their mobile phones to access services quickly and efficiently, at reduced cost, transparently, with the fastest communication feedback and better outreach. Examples: in a hospital, a patient can use a mobile phone to book an appointment; in the educational sector, AI can be used for teaching and learning using students' apps; in an emergency situation, an SMS alert can be sent for disaster management and security updates.
4. **Video conferencing** is a synchronous communication technology that allows participants in different geographical locations to communicate through live audio and video connections. (Garrison, 2017). This is an AI-enabled technology used in public offices to remotely deliver public services; it ensures proper interactions within and outside government offices to seamlessly conduct consultations, conduct training, virtual court hearings, remote administrative meetings, online interviews, and provide feedback in an online real-time without physical presence. it can also be used in detecting voices, translating language barriers, facial recognition and noise cancellation.
5. **Online Meeting:** Laudon and Laudon (2022) define online meeting as a virtual gathering in which participants communicate and collaborate in real time over the internet using web-based technologies that support audio, video, messaging, and document sharing. This is an interface that allows government officials and citizens to communicate, collaborate and make decisions without physical presence. It saves costs, enhances transparency, connects with rural areas, speeds up decisions and improves continuity in service delivery.

Effects of Technology on Public Service Delivery in Nigeria

1. Improved efficiency: Technology application reduces the time and effort required to deliver services. Organisations can process transactions, maintain records, and communicate more quickly than with manual systems.
2. Improved record management: Electronic database applications facilitate the secure storage, retrieval, updating, and sharing of records, reducing the risk of data loss and improving organisational efficiency.
3. Reduced operational cost: Automation and inclusion of technology in public service reduce the use of paper, minimise administrative costs, and lower labour expenses, enabling organisations to deliver services more economically.
4. Enhanced collaboration: The use of ICT tools such as cloud computing and collaborative software enables employees and departments to work together effectively, regardless of their geographical location.
5. Increased accessibility: Digital platforms allow users to access services anytime and from virtually any location. This is particularly beneficial for people in remote or underserved areas.
6. Greater transparency and accountability: Inclusion of technology in public service simplifies transaction processing, making it easier to monitor activities, detect irregularities, and reduce opportunities for corruption.
7. Better decision-making: ICT enables organisations to collect, analyse, present and interpret information efficiently. Hence, accurate, timely and reliable information is better used in making informed decisions and improving service quality.

Impediments Associated with Artificial Intelligence on Service Delivery in Nigeria

Despite the benefits of technology application in public service delivery, numerous challenges hinder its effectiveness in the delivery of better public service, such as:

1. Lack of resources and high cost of AI acquisition: There are limited resources for acquiring and managing AI facilities for public service delivery in Nigeria.
2. Resistance to change and adoption of new technology (AI): This has to do with public servants' attitudes in adopting new technologies.
3. Cyber threats such as hacking, malware and data breaches: This is a potential danger to computer systems and networks arising from unauthorised access, attacks, or malicious activities intended to compromise information security.
4. Inadequate ICT infrastructure, particularly in Nigeria: This refers to the lack of sufficient telecommunications networks, broadband connectivity, computing facilities, and related digital infrastructure necessary to support economic development and the effective delivery of digital services.
5. High cost of implementation: Organisations incur substantial costs when implementing ICT because of expenditures on infrastructure, software acquisition, system integration, employee training, maintenance, and continuous technological upgrades.
6. Data privacy and security issues: These are the risks, vulnerabilities, and challenges involved in safeguarding personal and organisational data against unauthorised access, disclosure, modification, destruction, theft, or misuse while ensuring compliance with privacy laws, ethical standards, and organisational policies.
7. Low data quality and poor internet connectivity: these are characterised by errors, inconsistencies, incompleteness, and obsolescence that reduce their value for organisational decision-making.

Theoretical Framework

This provides a framework of analysis that underpins the relationship between AI and public service delivery in Nigeria. Therefore, the study's most relevant theory is Technological Determinism.

Technological Determinism Theory, developed by scholars such as Marshall McLuhan and Thorstein Veblen, posits that technology is a primary driver of social change and organisational transformation (Adeleke, 2022). According to this theory, the adoption of new technologies shapes organisational structures, processes, and outcomes, often independently of human or institutional preferences. In the context of public service delivery, technological determinism suggests that the introduction of digital tools, ICT systems, and AI in governance can fundamentally influence how public services are delivered, managed, and experienced by citizens.

The theory provides a framework for understanding how the public sector provides services to citizens with the application of technology. Key applications include:

1. **Technology as a Driver of Change:** This may apply to almost any public institution in Nigeria; for instance, NIMC's adoption of online registration portals, biometric verification, and centralised databases reflects the principle that technology can transform traditional bureaucratic procedures. These tools reduce manual errors, improve record-keeping, and facilitate faster service delivery (Okeke, 2024).
2. **Automation and Efficiency:** Technological determinism emphasises that automated processes inherently improve operational efficiency, thereby linking all government ministries and other Parastatals through online platforms via websites. Facilitating the shift from paper-based identity management to digital platforms has reduced administrative delays, enhanced data accuracy, and minimised duplication of records (Mutula, 2021).
3. **Citizen Interaction and Engagement:** Technology influences how citizens engage with public institutions. Digital platforms allow citizens to pay taxes, generate receipts, and validate and update their NIN online, reducing the need for physical visits and long queues. The theory highlights that technology not only facilitates access but also shapes citizens' perceptions and satisfaction (Adebayo, 2021).
4. **Interoperability and Integration:** Technological determinism uses AI to underscore the ability of ICT systems to link multiple agencies and services, creating integrated governance networks across different platforms, thereby enhancing service delivery (Okunola & Oyeyemi, 2023).

Technological Determinism is directly relevant to this study because it provides a lens to examine how technological tools, particularly AI, will transform Nigeria's public service. By focusing on technology as a transformative agent, the study can assess the extent to which artificial intelligence will enhance administrative efficiency, provide citizens with satisfactory access to better services, and to foster integration among government agencies. Additionally, the theory allows the study to identify potential limitations, such as resistance to change, infrastructure challenges, and digital literacy gaps, which may influence the outcomes of AI in Nigeria's public service delivery.

Methodology

To study the effects of AI in public service delivery, this paper analyses the controversies surrounding AI in governance by adopting a descriptive survey design because it will enable the systematic collection of information from respondents to describe their opinions on the applicability, relevance and otherwise of AI in governance. The population of this study are the entire Nigerian public service across various MDAs. Hence, Yamane's (1967) formula was applied to calculate the sample size, which was used to further determine the representative

proportion from the study area, where n = sample size, N = population, and e = error tolerance taken at 0.05. However, a structured questionnaire was administered to the two major targeted participants (public servants and citizens who have interacted with technology at work and the outcomes of the services provided with the use of technology in 2020 and 2025). The questionnaire captured variables such as service efficiency, accessibility, ease of use of digital platforms, satisfaction levels, and challenges encountered. The technique used in sampling was purposive sampling applied to government employees who have direct involvement in AI application and governance operations and citizens as users of services, ensuring only knowledgeable and relevant respondents contribute to the study. This approach provides a holistic perspective, combining citizen experiences with internal staff insights, which is essential for a comprehensive analysis of service delivery outcomes. The preliminary analysis involved the use of descriptive statistics such as frequency distributions, percentages, and graphical illustrations to summarise demographic characteristics of respondents and highlight general trends in the application of AI in public service delivery in Nigeria. Mean scores and standard deviations were computed to determine central tendencies and variability in responses on Likert scale items. To address the research hypotheses, inferential statistical analysis was conducted using the Chi-square test of independence, which was suitable for evaluating the relationship between categorical variables such as Artificial Intelligence and various dimensions of public service delivery.

Outcomes of the Hypotheses Tested

Hypothesis One (H_{01}): Artificial Intelligence has no significant effect on service delivery in Nigeria.

Based on the comprehensive analysis of data generated on the effectiveness of AI in public service delivery in Nigeria, a decisive majority (79.7%) agreed that AI improves overall public service quality, and strong majorities confirmed its positive effect on speed, queue reduction, data accuracy, and transparency; the null hypothesis (H_{01}) is rejected.

Summary of Major Findings

This study investigated the effects of AI in service delivery in Nigeria from 2020 to 2025, based on a complete census of 126 administered questionnaires returned by both public sector employees and service users. The analysis reveals a clear and compelling narrative of high potential tempered by significant practical constraints. The data suggest an overwhelming consensus on the positive impact of AI: A decisive majority of respondents perceive AI as a transformative force for Nigeria's public service delivery. Data indicate strong agreement that digital platforms:

- i. Enhance Efficiency: Inter-governmental communication is effected when done electronically (78% agree), and citizens' perception of low-cost services (72% agree).
- ii. Improve Quality: Increase data accuracy (76% agree) and promote transparency in processes (75% agree).
- iii. Elevate Service Standards: Ultimately improve overall service quality (80% agree).

This widespread positive perception validates the core premise that digitisation drives public sector reform toward greater efficiency and citizen-centric service. It also underscores that the success of AI is inextricably linked to solving broader national issues beyond software deployment.

Conclusion and Recommendations

Based on the comprehensive analysis of the study's findings, it is concluded that AI in governance represents a pivotal and beneficial reform with proven potential to enhance service delivery in Nigeria. The widespread positive perception among both staff and users, coupled with measurable improvements in efficiency and transparency, confirms that the strategic integration of digital technologies is a correct and necessary path for modernising public service in Nigeria.

However, the study also concludes that the full promise of digital transformation is currently constrained by severe, multi-faceted challenges. The path to effective and inclusive AI is obstructed by a lack of resources, knowledge gaps and infrastructural deficits, a noticeable gap in staff technical capacity, and legitimate public concerns over data security. The identified "inclusiveness gap" further reveals that without deliberate efforts to bridge the digital divide, AI in governance risks exacerbating existing social inequalities rather than alleviating them.

Ultimately, the research concludes that the future of AI in Nigeria's public sector hinges on a fundamental recognition: technological adoption alone is insufficient. Success requires a holistic approach that concurrently addresses the tripartite challenges of the knowledge gap, lack of resources and resistance to change. The overwhelming public demand for increased investment is not merely a suggestion but a critical prescription for translating digital potential into operational reality. Therefore, AI ultimately stands at a critical juncture where strategic, sustained, and inclusive investment will determine whether it evolves into a truly equitable, reliable, and secure system that delivers on its promise to all Nigerians.

Drawing from the conclusions, the following recommendations are made for improved public service delivery in Nigeria:

1. Government across all levels should establish community digital literacy hubs in partnership with local governments and NGOs to train citizens on the use of online services.
2. To establish an inter-agency technical committee to regularly review integration challenges, data-sharing protocols, and jointly address systemic bottlenecks in AI practices in governance.
3. A change management strategy should be implemented to foster a culture of innovation, adaptability, and citizen-centric service among staff, moving beyond traditional bureaucratic mindsets.
4. A nationwide public awareness campaign should be launched to educate citizens on data protection measures in place and how to securely use digital platforms, thereby building confidence and driving compliance.
5. Ensure all AI-related platforms (websites, USSD codes, mobile apps) are designed with accessibility features for people with little knowledge, illiterates and available in major local languages for ease of interaction.

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