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THE ROLE OF ARTIFICIAL INTELLIGENCE AND BIG DATA IN ENHANCING TAX INVESTIGATION AND AUDIT FUNCTIONS

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ABSTRACT
Tax evasion and non-compliance pose significant threats to public revenue, particularly in developing economies where tax gaps remain wide. The emergence of Artificial Intelligence (AI) and Big Data offers transformative potential for tax investigation and audit functions. This paper presents a qualitative analysis of the role of AI and Big Data in enhancing tax enforcement, with a focus on global best practices and lessons for African tax administrations. Drawing on secondary data from peer-reviewed studies, international reports, and case studies in Nigeria, South Africa, and OECD countries, the findings reveal that AI and Big Data improve efficiency, detection accuracy, and fraud prevention. However, challenges related to infrastructure, legal frameworks, and ethical considerations must be addressed to maximize benefits. Recommendations are proposed to guide effective adoption in both developed and emerging contexts.

Keywords: Artificial Intelligence, Big Data, Tax Investigation, Audit, Fraud Detection, Predictive Analytics, Revenue Mobilization

INTRODUCTION
BACKGROUND
Tax revenue forms the financial backbone of governments, enabling the provision of public goods and services (OECD, 2021). Yet, tax evasion and avoidance undermine fiscal capacity, especially in low- and middle-income countries where informal economies are large and enforcement resources are limited (IMF, 2020). Traditional tax investigation methods — including manual audits and whistleblower reports — have limitations in speed, accuracy, and scalability.

Problem Statement
Despite global advances in technology, many tax administrations in Africa still operate with outdated systems that limit their capacity to detect sophisticated fraud schemes. As economies digitize, taxpayers increasingly leverage complex financial instruments, cross-border transactions, and cryptocurrency to obscure taxable activities. Without advanced analytical capabilities, tax authorities risk widening revenue gaps.

Objectives of the Study
This paper seeks to:
1. Examine the role of AI and Big Data in enhancing tax investigation and audit functions.
2. Identify global best practices and their applicability in the African context.
3. Highlight challenges and propose recommendations for effective adoption.

Literature Review
Artificial Intelligence in Tax Administration
AI refers to computational systems capable of simulating human intelligence through processes such as learning, reasoning, and self-correction (Russell & Norvig, 2020). In taxation, AI has been applied to:

Anomaly Detection: Identifying irregularities in taxpayer declarations.
Predictive Analytics: Estimating the likelihood of tax evasion based on behavioral patterns.
Automated Decision Support: Prioritizing audit cases based on risk scoring models (Almeida et al., 2019).

Big Data Analytics in Tax Enforcement
Big Data encompasses high-volume, high-velocity, and high-variety datasets that cannot be processed effectively using traditional tools (Gandomi & Haider, 2015). Sources relevant to taxation include:

Banking and payment transaction records
Customs and trade data
Corporate filings and beneficial ownership registries
Utility consumption and social media data
By integrating such datasets, tax authorities can detect discrepancies between reported and actual economic activity (World Bank, 2022).

Synergistic Impact of AI and Big Data
The combination of AI's analytical capabilities with Big Data's breadth enables proactive fraud detection, real-time monitoring, and more accurate audit selection (OECD, 2021).

Case Examples from Literature
Estonia: Uses AI to analyze VAT transactions in real-time, reducing fraud by 20% (European Commission, 2020).

Brazil: Employs data mining to cross-check corporate tax declarations with sales receipts, improving compliance rates (Pomeranz, 2015).

METHODOLOGY

This study adopts a qualitative desk research approach. Sources include peer-reviewed journals, international organization reports (OECD, IMF, World Bank), and official tax authority publications. Data from 2015–2024 were thematically analyzed under three themes: (i) technological applications, (ii) benefits and challenges, and (iii) case study insights. The study focuses on three jurisdictions for comparative analysis: Nigeria, South Africa, and OECD countries.

FINDINGS AND DISCUSSION

Applications in Tax Investigation and Audit

Application	Description	Impact
Data Matching	Cross-verifying taxpayer returns with third-party data	Detects hidden income and false reporting
Predictive Risk Modelling	AI algorithms assign compliance risk scores	Targets high-risk cases efficiently
Network Analysis	Mapping relationships between taxpayers and shell firms	Uncovers complex evasion networks
Real-Time Transaction Monitoring	Tracking high-value transactions as they occur	Enables rapid enforcement interventions

Country Case Studies
Nigeria: The Federal Inland Revenue Service (FIRS) has piloted e-filing systems and data integration platforms but faces infrastructure and capacity gaps. Potential exists to use AI for VAT fraud detection, given the high incidence of under-declared sales.

South Africa: The South African Revenue Service (SARS) uses advanced analytics to profile taxpayers, integrating customs, banking, and third-party data. AI-driven audit selection has reduced compliance costs.

OECD Countries: Jurisdictions like the UK and Canada employ machine learning models for compliance risk assessment, with significant reductions in audit cycle times.
Benefits
1. Efficiency Gains: Automates labor-intensive processes.
2. Accuracy: Reduces false positives and audit waste.
3. Proactive Enforcement: Detects risks before significant revenue losses occur.
4.4 Challenges

Legal and Privacy Concerns: Compliance with GDPR and local data protection laws.
Infrastructure Deficits: Limited in many developing countries.
Algorithmic Bias: Potential for unfair targeting of certain taxpayer groups.

CONCLUSION AND RECOMMENDATIONS

Conclusion
AI and Big Data offer transformative potential for tax investigation and audit functions. When deployed strategically, they improve detection accuracy, reduce audit costs, and enable proactive compliance strategies.

Recommendations
1. Infrastructure Investment: Upgrade ICT infrastructure for tax authorities.
2. Legal Frameworks: Ensure strong data protection laws.
3. Capacity Building: Train staff in AI and analytics.
4. Pilot Programs: Start with small-scale AI projects before full deployment.
5. Public Trust: Maintain transparency in AI use to prevent distrust.

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