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AI-Driven Data Automation and Financial Reporting Timeliness and Accuracy: Evidence from Nigeria's Federal Public Sector

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Abstract

Late and error-prone government accounts weaken legislative oversight and citizen scrutiny. This study examines whether documented adoption of artificial intelligence (AI)-driven data automation is associated with the timeliness and accuracy of financial reports in Nigeria's federal public sector. Using a ten-year balanced panel (2015–2024) of five purposively selected institutions, the Federal Ministry of Finance, the Office of the Accountant-General of the Federation, the Federal Inland Revenue Service, the Central Bank of Nigeria and the Bureau of Public Procurement, the study scores documentary evidence from annual reports, financial statements and official AI-implementation documents on a five-point (0–4) rubric and estimates pooled, fixed-effects, trend-adjusted, first-difference and lagged panel regressions, interpreted through agency theory. AI-driven data automation is positively and significantly associated with the composite measure of reporting timeliness and accuracy (pooled $\beta = 0.717$, $R^2 = 0.845$; within-institution $\beta = 0.706$, within $R^2 = 0.818$). The association remains positive and significant after controlling for a common time trend ($\beta = 0.641$), in first differences ($\beta = 0.761$) and when automation is lagged one year ($\beta = 0.631$). A one-point higher automation score is therefore associated with roughly 0.6 to 0.8 points higher reporting quality on the five-point scale. Because the design is observational, the measures are documentary indices, and the sample is small and purposively selected, the results indicate association rather than proven causation and are interpreted for the five institutions examined rather than for all federal ministries, departments and agencies. The findings support targeted investment in AI-enabled data capture, validation and reconciliation, accompanied by governance arrangements, human review and skills development.

Keywords: *artificial intelligence; data automation; financial reporting timeliness; reporting accuracy; public sector accounting; Nigeria.*

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Introduction

Financial reporting is a fundamental component of public sector accountability, transparency and effective financial management. It provides information through which legislators, auditors, policymakers and citizens assess how public resources are collected, allocated and utilised. However, the usefulness of financial reports depends not only on the availability of financial information but also on its timeliness and accuracy. Timely reporting ensures that financial information is available when required for decision-making and oversight, while accurate reporting promotes the reliability and credibility of financial statements. In the public sector, delays and inaccuracies in financial reporting can weaken legislative scrutiny, impede the detection of financial irregularities, and undermine public confidence in government institutions (Njoku et al., 2024). Consequently, improving the timeliness and accuracy of financial reporting remains an important objective of public financial management, particularly in developing economies such as Nigeria.

In Nigeria, concerns about the timeliness and reliability of federal public sector financial reporting are reflected in the challenges associated with preparing, consolidating, auditing and submitting government financial statements. According to the Office of the Auditor-General for the Federation (2024), the Federal Government's consolidated financial statements for 2020 were submitted for audit in April 2022, while adjusted statements followed in March 2023. The audit report was subsequently transmitted to the National Assembly on 30 November 2023. The report further indicated that, as of August 2024, the consolidated financial statements for 2022 and 2023 had not been submitted for audit, while the 2021 statements were submitted in July 2024, more than three years after the end of the financial year. These delays raise concerns about the availability of current financial information for legislative oversight, budgetary decisions and public accountability. Similarly, the audit of the 2020 consolidated financial statements identified the use of unaudited trial balances from ministries, departments and agencies (MDAs), alongside continued reliance on transitional exemptions under accrual-based International Public Sector Accounting Standards (IPSAS), and resulted in a qualified audit opinion (Office of the Auditor-General for the Federation, 2024). Although these findings do not independently establish the causes of reporting deficiencies, they demonstrate the practical importance of examining approaches that could improve the speed, completeness and reliability of public sector accounting processes.

One technological development with potential implications for these challenges is artificial intelligence (AI)-driven data automation. AI encompasses technologies capable of performing tasks such as pattern recognition, prediction, classification and the analysis of complex data. When applied to accounting processes, these capabilities can support the automated processing of transactions, identification of inconsistencies, reconciliation of accounts, detection of unusual entries and preparation of financial information. Robotic process automation (RPA), when combined with intelligent technologies, can further reduce repetitive manual tasks and standardise routine accounting workflows (Aguirre & Rodriguez, 2017; Willcocks et al., 2017). Research on intelligent data automation also highlights the potential of automated systems to improve the efficiency of information-processing activities (Huang et al., 2019). In accounting and auditing, AI applications have increasingly attracted attention because of their potential to strengthen analytical procedures, identify anomalies and improve the quality of financial information (Adeoye et al., 2023; Jejeniwa et al., 2024). These capabilities suggest that AI-driven data automation may contribute to shorter reporting preparation periods and fewer processing errors, although the extent of these benefits depends on implementation quality, data integrity, system integration and appropriate human oversight.

The relevance of these technologies to Nigeria's public sector is reinforced by the broader movement towards digital transformation and technology-supported public financial management. Research on Nigerian public institutions has examined the relationship between AI adoption and financial accountability, the application of automation to financial reporting, and the use of digital technologies to improve public financial management (Nwachukwu et al., 2022; Sanni et al., 2023). Studies have also considered AI and fraud detection in Nigerian public financial management, suggesting that intelligent analytical tools may assist in identifying suspicious transactions and strengthening financial control (Ezeani & Maduka, 2023). Nevertheless, the adoption of digital technologies should

not be treated as equivalent to the implementation of AI-driven data automation. Electronic accounting systems, digital record-keeping and integrated financial management platforms may improve information processing without necessarily employing machine learning, intelligent classification or other AI capabilities. It is therefore important to distinguish general computerisation from documented AI-driven automation when examining its relationship with financial reporting outcomes.

Furthermore, the potential benefits of AI-driven data automation must be considered alongside the limitations of automated decision-making. AI systems can produce unreliable outputs when trained on incomplete, inconsistent or biased data, while complex models may make it difficult for users to understand how particular outputs are generated. Explainability and accountability are therefore important considerations in the deployment of AI in financial reporting (Adadi & Berrada, 2018; Raji et al., 2020). In the federal public sector, where financial statements support public accountability and compliance with established reporting requirements, automated outputs require appropriate validation, audit trails and human review. Accordingly, the value of AI-driven data automation should be assessed not merely in terms of technological adoption but also in relation to measurable improvements in reporting timeliness and accuracy.

Although the existing literature provides useful insights into AI adoption, accounting automation, fraud detection and financial reporting quality, further empirical investigation is needed into the relationship between documented AI-driven data automation and specific reporting outcomes in Nigeria's federal public sector. Nigerian studies have explored AI adoption and financial accountability (Nwachukwu et al., 2022), AI-based automation and financial disclosure timeliness (Eze & Okafor, 2021), and the application of robotic process automation to financial reporting in government agencies (Sanni et al., 2023). However, evidence concerning the relationship between institution-level variations in AI-driven data automation and both the timeliness and accuracy of financial reporting over multiple years remains an important area for investigation. In particular, the use of documentary evidence can help establish whether observed changes in reporting outcomes coincide with documented changes in automation, while accounting for differences across institutions and periods.

Against this background, this study examines AI-driven data automation and financial reporting timeliness and accuracy in Nigeria's federal public sector. It investigates whether variations in documented AI-driven data automation are associated with variations in the timeliness and accuracy of financial reports across selected federal public sector institutions and years. The study conceptualises AI-driven data automation as the documented use of AI-enabled capabilities in accounting and financial reporting processes, rather than the mere presence of computerised financial systems. It further recognises that an observed association does not, by itself, establish a causal relationship. Its findings are therefore intended to provide evidence on the nature and robustness of the relationship between AI-driven data automation and financial reporting outcomes, with implications for technology adoption, financial control and accountability in Nigeria's federal public sector.

Statement of the Problem

Timely and accurate financial reporting is essential for effective public financial management because it enables government institutions to demonstrate accountability, supports legislative and audit oversight, and provides a basis for evaluating the utilisation of public resources. Despite the importance of these qualities, Nigeria's federal public sector continues to face challenges in the preparation, consolidation, verification and submission of financial statements. The delays documented in the Federal Government's consolidated financial statements and the audit concerns regarding unaudited MDA trial balances demonstrate that the production of complete and reliable financial information within a reasonable period remains a significant practical concern (Office of the Auditor-General for the Federation, 2024). These challenges create a need to investigate approaches that could improve reporting processes without compromising the reliability and verifiability of reported financial information.

Traditional accounting and reporting processes may involve extensive manual data entry, reconciliation, classification, verification and consolidation across multiple departments and agencies. Where these activities are

fragmented or dependent on manual procedures, they may contribute to processing delays, inconsistencies, duplication and errors. AI-driven data automation offers potential solutions through intelligent data processing, automated validation, anomaly detection and the reduction of repetitive tasks. Existing research has examined AI adoption and financial accountability in Nigeria (Nwachukwu et al., 2022), AI-based automation and financial disclosure timeliness in Nigerian parastatals (Eze & Okafor, 2021), and robotic process automation in government agency financial reporting (Sanni et al., 2023). However, the potential of these technologies should not be interpreted as proof that their adoption necessarily produces faster or more accurate financial reports. Their effectiveness may depend on the quality of accounting data, the compatibility of existing systems, staff competence, implementation arrangements and the strength of internal controls.

The central problem, therefore, is the limited institution-level empirical evidence establishing whether documented AI-driven data automation is associated with improved financial reporting timeliness and accuracy in Nigeria's federal public sector. While the existing literature discusses the opportunities presented by AI and digital technologies, it remains necessary to distinguish between the general adoption of information technology and the use of identifiable AI-driven automation in accounting activities. Without this distinction, improvements attributed to AI may actually reflect other developments, such as the introduction of electronic accounting systems, changes in reporting procedures, staff training or wider public financial management reforms. Consequently, the relationship between AI-driven data automation and reporting outcomes requires a clearly defined empirical assessment.

A further problem concerns the measurement of financial reporting outcomes. Faster preparation of financial statements does not necessarily mean that the statements are more accurate. Automation may accelerate transaction processing while allowing errors in source data, classification or system configuration to pass through the reporting process. Conversely, additional verification procedures may improve accuracy but increase the time required to finalise financial statements. An assessment that focuses exclusively on speed or general reporting quality may therefore overlook the possibility that these outcomes respond differently to automation. Ideally, timeliness and accuracy should be examined as distinct dependent variables; however, where documentary evidence does not permit reliable separation, a composite measure that captures both dimensions offers a practical alternative, provided its limitations are acknowledged.

The problem also has an empirical identification dimension. Changes in automation and financial reporting outcomes may occur alongside broader institutional reforms, improvements in information technology infrastructure, changes in personnel or common trends affecting federal public sector institutions. Consequently, a simple association between automation and reporting performance may not adequately account for institutional differences or changes over time. Institution-level, multi-year documentary evidence, where sufficiently complete and comparable, can help address these concerns by examining variations across institutions and reporting periods. Nevertheless, such an approach must distinguish robust associations from causal effects, particularly where the available evidence does not support a credible causal identification strategy.

Accordingly, this study seeks to address the gap by examining the relationship between AI-driven data automation and financial reporting timeliness and accuracy in Nigeria's federal public sector. Specifically, it investigates whether variations in documented AI-driven data automation are associated with changes in the composite measure of reporting timeliness and accuracy. By distinguishing AI-driven automation from general computerisation and accounting for relevant institutional and temporal differences, the study aims to provide evidence that can inform decisions about the adoption and evaluation of AI technologies in federal public financial management. The ultimate concern is whether documented AI-driven data automation is meaningfully associated with better financial reporting outcomes, rather than whether the technology is simply available or theoretically capable of improving accounting processes.

Objectives of the Study

The main objective of this study is to examine the effect of AI-driven data automation on the timeliness and accuracy of financial reports in Nigeria's federal public sector.

The specific objective is:

i. To examine the effect of AI-driven data automation on the timeliness and accuracy of financial reports in Nigeria's federal public sector.

Research Question

i. What is the effect of AI-driven data automation on the timeliness and accuracy of financial reports in Nigeria's federal public sector?

Research Hypothesis

H_1: AI-driven data automation has a positive and significant effect on the timeliness and accuracy of financial reports in Nigeria's federal public sector.

H_0: AI-driven data automation has no significant effect on the timeliness and accuracy of financial reports in Nigeria's federal public sector.

Significance of the Study

This study is significant for policy, practice and research.

For policy, the findings will provide evidence on whether documented AI-driven data automation is associated with improvements in financial reporting outcomes in Nigeria's federal public sector. This evidence can inform decisions about the adoption and evaluation of AI technologies in public financial management, particularly in the context of ongoing reforms such as the Treasury Single Account and the Integrated Financial Management Information System.

For practice, the study will identify whether federal institutions that have adopted AI-driven automation document better reporting timeliness and accuracy. It will also highlight the conditions — data quality, system integration, staff competence and internal controls — on which the benefits of automation depend, and will recommend the publication of operational indicators such as reporting lags, reconciliation discrepancies and audit adjustments so that effects can be tracked directly.

For research, the study will contribute institution-level, multi-year evidence to a literature that has relied largely on descriptive designs, small-sample surveys and respondent perceptions. It will also demonstrate a documentary measurement strategy that distinguishes AI-driven automation from general computerisation, and will identify directions for future research, including transaction-level analysis, user acceptance and causal designs.

Scope of the Study

The study covers five purposively selected federal institutions: the Federal Ministry of Finance, the Office of the Accountant-General of the Federation (OAGF), the Federal Inland Revenue Service (FIRS), the Central Bank of Nigeria (CBN) and the Bureau of Public Procurement (BPP). Each institution is observed annually from 2015 to 2024, yielding a balanced panel of 50 institution-year observations. The study is limited to documentary evidence, annual reports, financial statements and official documents concerning AI implementation and does not collect survey or interview data. The findings are interpreted for the selected institutions and the period examined, not for all federal ministries, departments and agencies.

Review of Related Literature

AI-Driven Data Automation in Financial Reporting

AI-driven data automation refers to the application of artificial intelligence technologies, including machine learning (ML), natural language processing (NLP), intelligent data classification and robotic process automation (RPA), to automate accounting and financial reporting activities. These technologies support the collection, processing, classification, validation, reconciliation and presentation of financial information with reduced dependence on repetitive manual procedures (Huang et al., 2019; Davenport & Ronanki, 2018). Unlike conventional computerisation, which primarily digitises existing accounting procedures, AI-driven automation can identify patterns in financial data, detect unusual transactions, support predictive analysis and facilitate the interpretation of unstructured financial documents. Its application in financial reporting therefore extends beyond transaction processing to include the identification of errors, the assessment of anomalies and the improvement of information available for managerial and regulatory decisions (Jordan & Mitchell, 2015; Jejeniwa et al., 2024).

The relevance of AI-driven data automation to public sector accounting lies in the complexity and volume of financial transactions processed by government institutions. Federal ministries, departments and agencies handle expenditure records, revenue transactions, payroll information, procurement documents, budgetary allocations and other financial data that must be consolidated into reliable financial reports. When these activities depend heavily on manual data entry, spreadsheet-based processing and repeated verification, the reporting process may become time-consuming and vulnerable to inconsistencies. AI-driven automation can support the standardisation of accounting entries, the matching of transactions across financial records and the early identification of missing or inconsistent information. These capabilities are particularly relevant in public financial management, where reporting quality affects budgetary oversight, compliance monitoring and the accountability of public officials (Agba et al., 2023; Njoku et al., 2024).

A central mechanism through which AI-driven automation may improve financial reporting is the reduction of repetitive processing activities. Conventional accounting procedures often require personnel to extract information from different documents, transfer figures between systems, reconcile balances and prepare supporting schedules before financial statements can be compiled. RPA can automate rule-based activities, while machine learning can support more complex classification and anomaly-detection tasks. Natural language processing can also assist in extracting relevant information from textual documents and making financial disclosures more accessible to users (Aguirre & Rodriguez, 2017; Willcocks et al., 2017; Kumar & Singh, 2023). When these technologies are properly integrated into accounting workflows, the time required to prepare financial statements may decrease because fewer tasks require repeated manual intervention.

The potential contribution of automation to reporting accuracy is equally important. Financial reporting errors may arise from incorrect data entry, duplicate transactions, inconsistent classifications, incomplete records and mistakes during consolidation. Automated validation and reconciliation can compare records against predefined accounting rules, identify discrepancies and flag transactions that require further examination. Machine learning models can complement these controls by identifying unusual transaction patterns that may not be readily apparent through conventional review procedures (Ngai et al., 2011; Sadgali et al., 2019; Ali et al., 2022). In accounting environments, deep learning and anomaly-detection techniques can also help identify irregularities in large datasets, although their effectiveness depends on the quality and representativeness of the available data (Schreyer et al., 2017; Craja et al., 2020).

Nevertheless, the relationship between AI-driven automation and reporting accuracy should not be treated as automatic. An automated system may process incorrect source data consistently, reproduce errors embedded in existing records or misclassify unusual but legitimate transactions. Model performance can also deteriorate when accounting practices, reporting requirements or transaction patterns change. Consequently, the benefits of automation depend on the quality of the underlying data, the appropriateness of the models, the design of internal

controls and the availability of qualified personnel to review system outputs. Explainable artificial intelligence is relevant in this context because it can help users understand why a system flags a transaction or produces a particular prediction (Adadi & Berrada, 2018; Samek et al., 2017). Human oversight remains necessary to distinguish genuine errors and suspicious transactions from legitimate exceptions.

A further conceptual distinction concerns the difference between AI-driven automation and general digitalisation. Electronic accounting systems, digital record-keeping and integrated financial management platforms can improve information processing without necessarily incorporating artificial intelligence. AI-driven automation involves the application of capabilities such as learned classification, intelligent extraction, predictive analysis or pattern-based anomaly detection, whereas conventional automation may operate entirely through predetermined rules. This distinction is important for empirical research because attributing improvements to AI when the underlying intervention is merely electronic processing may produce misleading conclusions. The study therefore conceptualises AI-driven data automation as the documented use of AI-enabled capabilities in accounting and financial reporting processes, rather than the mere presence of computerised financial systems.

The Nigerian public sector provides an important setting in which to examine these issues. Studies addressing digital transformation and AI adoption in Nigeria's public financial management have considered the potential of these technologies to improve financial accountability, reporting efficiency and audit effectiveness (Nwachukwu et al., 2022; Adeoye et al., 2023; Nsoke, 2024). Research on AI adoption in accounting and auditing also suggests that automation can support the processing of financial information and strengthen the identification of irregularities (Akinadewo et al., 2023; Owonifari et al., 2023). However, the existence of these potential benefits does not establish that AI-driven automation has been implemented consistently across federal institutions or that its adoption has produced measurable improvements in reporting outcomes.

Financial Reporting Timeliness and Accuracy in the Public Sector

Financial reporting timeliness and accuracy are fundamental dimensions of public sector financial reporting quality. Timeliness refers to the availability of financial information within a period that allows its users to evaluate performance, monitor expenditure and make informed decisions. Accuracy concerns the extent to which reported financial information faithfully represents the underlying transactions and financial position of the reporting institution. Together, these attributes support accountability, transparency and effective public financial management. When reports are delayed, their usefulness for immediate oversight diminishes; when they contain errors, their usefulness is undermined even if they are published promptly (Rezaee, 2017; Knechel et al., 2018).

In the public sector, the importance of timely reporting extends beyond the needs of organisational management. Legislatures require financial information to scrutinise public expenditure, auditors need reliable records to assess compliance and financial stewardship, and citizens depend on accessible disclosures to evaluate how public resources are managed. Delays can weaken the effectiveness of these accountability mechanisms because financial information may become available only after opportunities for corrective action have passed. Similarly, inaccurate reporting can distort assessments of budget implementation, expenditure patterns and institutional performance. These concerns make timeliness and accuracy particularly important for federal institutions responsible for managing public funds.

Several organisational and institutional factors may influence reporting timeliness. These include the complexity of transactions, the effectiveness of internal controls, staff capacity, accounting procedures, audit arrangements and compliance with applicable reporting standards. Research on Nigerian public sector institutions has examined the relevance of International Public Sector Accounting Standards (IPSAS) and organisational characteristics to reporting quality and timeliness (Olaoye et al., 2022; Mohammed et al., 2024). Other studies have investigated audit characteristics and board attributes as factors associated with the timeliness of financial reports in Nigerian organisations (Inneh et al., 2022; Lawal & Tahir, 2024). This literature suggests that reporting performance cannot

be attributed to technology alone; it also depends on institutional arrangements and the processes through which financial information is generated, reviewed and approved.

Accuracy is similarly influenced by the quality of accounting records, the strength of internal controls, staff competence and the effectiveness of verification procedures. Financial statements are produced through multiple interconnected activities, and weaknesses at any stage can affect the final output. Incomplete source records, inconsistent classifications, unreconciled balances and inadequate review may result in errors that persist through consolidation. Research on financial reporting quality in Nigerian public institutions highlights the relevance of accounting standards, institutional characteristics and the effectiveness of reporting processes (Akinwunmi et al., 2024; Oyetola et al., 2024). These considerations reinforce the need to examine whether technology-enabled process improvements are associated with more reliable financial information.

AI-driven automation may contribute to both dimensions by reducing the time spent on repetitive accounting tasks and strengthening the identification of inconsistencies. Automated reconciliation can facilitate the comparison of balances across records, while anomaly-detection models can flag transactions that warrant further examination. Automated data extraction and classification may also reduce inconsistencies arising from manual transcription and repeated data handling (Ngai et al., 2011; Ali et al., 2022). In principle, these capabilities can shorten reporting preparation time while improving the consistency of accounting information.

However, timeliness and accuracy may respond differently to automation. Faster processing does not necessarily guarantee more accurate reports, particularly when the system relies on incomplete records or poorly configured rules. Likewise, accuracy improvements may require additional validation and human review, potentially increasing the time required to finalise a report. The relationship between these outcomes therefore depends on how automation is designed and integrated into existing reporting procedures. This is one reason the present study treats timeliness and accuracy as dimensions of a composite index rather than as wholly interchangeable outcomes; the data do not permit reliable separation, and the composite is interpreted with that limitation in mind.

For empirical assessment, reporting timeliness can be operationalised using an appropriate measure of the time elapsed between the financial year-end and the submission or completion of the relevant report. Where the available data permit, this can be measured in days, with shorter reporting lags indicating better timeliness. Accuracy requires a clearly defined and consistently applied indicator, potentially based on documented audit adjustments, identified reporting errors, reconciliation discrepancies or audit findings. These measures should be selected according to the availability and comparability of documentary evidence across institutions and years. An audit opinion alone, for example, may not provide a sufficiently granular measure of accuracy because it can reflect several issues relating to compliance, evidence and accounting treatment.

Accordingly, this study conceptualises financial reporting timeliness as the promptness with which federal public sector institutions prepare or submit their financial reports and accuracy as the extent to which those reports are free from identifiable errors and material inconsistencies. These dimensions are combined in the FRQ1 composite index, which allows the study to investigate whether documented AI-driven automation is associated with improvements in reporting performance without assuming that either dimension necessarily follows from technology adoption.

AI-Driven Accounting Automation, Internal Control and Financial Reporting Quality

Internal control provides an important conceptual link between AI-driven accounting automation and financial reporting quality. Internal controls comprise the policies, procedures and monitoring mechanisms established to safeguard assets, ensure reliable records, promote compliance and support organisational objectives. In public financial management, these controls help ensure that transactions are properly authorised, accurately recorded, consistently classified and appropriately disclosed. Weak controls can allow errors and irregularities to persist, while effective controls can detect and correct problems before they affect the final financial statements.

Traditional accounting controls frequently depend on manual verification, supervisory approval, periodic reconciliations and sample-based reviews. Although these procedures remain important, their effectiveness may be constrained when institutions process large volumes of transactions across multiple departments and systems. Continuous auditing and continuous monitoring offer an alternative approach by enabling financial information and control exceptions to be examined more frequently (Alles, 2021). AI-enabled tools can extend these approaches by identifying unusual patterns, prioritising high-risk transactions and supporting the examination of large datasets that may be difficult to review manually.

Machine learning-based fraud and anomaly-detection techniques are especially relevant to this process. Such models can identify patterns associated with potentially irregular transactions, unusual expenditure movements or inconsistencies between related financial records. Reviews of financial fraud detection have documented the application of classification, clustering and other data-mining methods to identify suspicious activity (Ngai et al., 2011; Al-Hashedi & Magalingam, 2021; Ali et al., 2022). Deep-learning approaches have also been investigated for detecting irregularities in financial statements and accounting datasets (Craja et al., 2020; Schreyer et al., 2017). When incorporated into accounting workflows, these tools may improve the speed with which exceptions are identified and reduce the likelihood that inconsistencies remain undetected until the final reporting stage.

The implications for public sector reporting are twofold. First, automated control procedures may reduce the time required to identify and resolve accounting discrepancies, thereby supporting more timely reporting. Second, more consistent validation and risk-based review may strengthen the reliability of the financial information included in reports. These benefits are particularly relevant where accounting records are generated by multiple MDAs and must be consolidated into institution-wide or government-wide statements. Nevertheless, anomaly detection should not be equated with proof of fraud or error. A flagged transaction requires appropriate investigation, and the absence of a flag does not establish that a transaction is correct.

The contribution of AI-driven automation to internal control also depends on the governance arrangements surrounding its use. Poorly documented models, inadequate access controls, insufficient audit trails and limited human oversight may introduce new risks into financial reporting. An algorithm may generate an output that is difficult for auditors or accounting personnel to interpret, particularly when it relies on complex machine-learning techniques. Explainable AI can help address this challenge by providing information about the factors underlying a prediction or classification (Adadi & Berrada, 2018; Raji et al., 2020). Such transparency is important when automated outputs influence the classification of transactions, the prioritisation of audit reviews or decisions concerning the acceptance of financial records.

Data protection and cybersecurity are additional considerations. Financial reporting systems contain sensitive information relating to government expenditure, employees, suppliers and other stakeholders. Integrating AI into these systems may create additional data-access, model-security and privacy risks if appropriate safeguards are not implemented. Research on AI governance and data privacy emphasises the need to balance technological innovation with accountability, security and responsible data use (Floridi et al., 2018; Jobin et al., 2019; Shin et al., 2021). Consequently, the expected benefits of automation should be assessed in conjunction with the institutional capacity to manage its operational and governance risks.

For Nigerian federal institutions, these considerations suggest that the relationship between AI-driven automation and financial reporting quality is likely to depend on the extent to which automated processes are integrated with established accounting controls. AI tools may support faster processing and more systematic verification, but their effectiveness remains contingent on data quality, staff capability, system reliability and appropriate oversight. The study therefore examines the association between documented AI-driven automation and reporting outcomes while recognising that differences in institutional control environments may also influence the results.

Theoretical Framework: Agency Theory

This study is anchored on Agency Theory, developed by Jensen and Meckling (1976). The theory explains the relationship between principals, who delegate responsibilities, and agents, who perform those responsibilities on their behalf. It emphasises information asymmetry, conflicting interests and the costs associated with monitoring agents' actions. In the public sector, citizens and their elected representatives expect government officials to manage public resources responsibly, while auditors and legislative oversight bodies monitor compliance and financial performance. However, these stakeholders depend on financial reports prepared by public institutions to assess how public funds have been managed. Delayed or inaccurate reports can therefore increase information asymmetry and weaken accountability.

Financial reporting serves as an important mechanism for reducing this information gap. Timely reports enable oversight institutions to review expenditure and identify irregularities promptly, while accurate reports provide a reliable basis for evaluating financial performance and compliance. When reporting processes are slow or prone to errors, the effectiveness of monitoring may be compromised. Consequently, improving the timeliness and accuracy of financial reports is important for reducing information-related agency costs and strengthening accountability in the Nigerian federal public sector.

AI-driven data automation may contribute to these objectives by automating repetitive accounting activities, facilitating transaction reconciliation, validating financial records and identifying inconsistencies. Machine learning and other AI-enabled techniques can support the analysis of large financial datasets and help identify unusual transactions, while robotic process automation can reduce manual intervention in routine accounting procedures (Huang et al., 2019; Alles, 2021; Ali et al., 2022). These capabilities may shorten reporting preparation time and improve the consistency of financial information available to oversight institutions.

Nevertheless, Agency Theory does not imply that adopting AI automatically guarantees better reporting outcomes. The effectiveness of automation depends on the quality of source data, the strength of internal controls and the reliability of the systems used. Automated processes may reproduce existing errors if the underlying records are incomplete or inaccurate. Therefore, AI-driven automation should be understood as a potential mechanism for improving reporting performance rather than a substitute for effective governance and human oversight.

Agency Theory is appropriate for this study because it establishes the accountability rationale for examining financial reporting timeliness and accuracy as outcomes of AI-driven data automation. It suggests that improvements in these reporting dimensions may reduce information asymmetry and facilitate more effective monitoring of public resources. Accordingly, the study hypothesises that AI-driven data automation is positively associated with the timeliness and accuracy of financial reports in Nigeria's federal public sector.

Empirical Review

Nsoke (2024), in a study titled Artificial Intelligence Enhancement in Government Financial Management: The Nigeria Experience, conducted qualitative research using interviews and document analysis as primary data collection methods, and employed efficiency theory as a framework. The study focused on AI implementation within Nigeria's public financial systems. Findings revealed that AI significantly improves operational efficiency, accuracy and budget forecasting in financial reports. Despite challenges such as inadequate expertise and high initial setup costs, the study affirmed the strategic value of AI integration in enhancing financial transparency in the public sector.

Ogungbangbe and Kalu (2024), in their work Artificial Intelligence and Financial Sector Regulation: Implications for Accountants in Nigeria Economy, carried out an analytical study using qualitative analysis of policy documents and expert interviews, exploring the relevance of AI for accountants in regulatory environments. They found that AI-driven automation facilitates accurate and timely financial reporting while supporting risk prediction and compliance. The authors recommended that Nigerian institutions adopt machine learning systems and continuously train financial professionals to meet evolving technological demands.

Oyeniyi et al. (2024), in their article The Influence of AI on Financial Reporting Quality: A Critical Review and Analysis, employed a qualitative methodology involving document review and thematic analysis to assess the relationship between AI and reporting standards in Nigeria. The study indicated that AI enhances the timeliness and reliability of financial reports by automating data entries and error detection, thus promoting efficient fiscal decision-making processes within public sector institutions.

Jejeniwa et al. (2024), in their review A Comprehensive Review of the Impact of Artificial Intelligence on Modern Accounting Practices and Financial Reporting, provided a systematic synthesis of existing literature. They concluded that AI reduces manual accounting errors, supports predictive reporting and accelerates report generation. The study emphasised that AI adoption can transform government accounting processes, provided there is adequate technical infrastructure and regulatory support.

Omotoso et al. (2024), through their empirical study titled Leveraging Artificial Intelligence for Enhanced Financial Data Analysis: Implications for Accounting Transparency and Risk Management, used logistic regression on secondary data from 2014–2023 to evaluate AI-generated anomaly scores. Their results showed that AI systems are effective in identifying reporting inconsistencies, thereby strengthening accountability and reducing financial misstatements in the public sector.

Mwachikoka (2024), in the study Effects of Artificial Intelligence on Financial Reporting Accuracy, investigated how AI influences accuracy levels in financial reporting through a broad analytical framework-based qualitative study. The research affirmed that AI tools significantly reduce data inconsistencies, promote faster reporting cycles and enhance data accuracy, while also emphasising the need for adaptive governance mechanisms to maintain integrity during AI adoption.

Abdullahi and Abubakar (2024) performed a bibliometric analysis in their work Bibliometric Analysis of Accounting Literature on Artificial Intelligence (AI) Adoption in Organizational Functions. Employing PRISMA guidelines and VOSviewer software, they analysed AI adoption trends in accounting literature from 2015 to 2024. The study revealed a growing interest in AI applications within accounting, highlighting the transformative potential of AI in organisational decision-making processes.

Ekunke et al. (2024) explored the implications of AI on public governance in Sub-Saharan Africa in their study Artificial Intelligence (AI) and Public Governance in Sub-Saharan Africa: Assessing its Implication for Job Losses. Utilising a correlational research approach with secondary data, they found that AI applications pose a risk to employment, particularly in agriculture. The study recommends cautious adoption of AI in governance to mitigate potential job losses.

Benjamin et al. (2024), in their research titled Implementation and Integration of Artificial Intelligence for Financial Process Innovation of Commercial Banks in Nigeria, investigated the strategic implementation of AI for financial process innovation within commercial banks. Using a mixed-method approach, data were collected from 143 participants comprising staff from 10 major banks. The findings indicated a significant positive impact of AI implementation on financial process innovation. The study recommended investment in AI infrastructure, ethical AI practices, customer education and regulatory support to drive innovation and enhance customer satisfaction.

Usman et al. (2024) studied The Role of AI in Enhancing Audit Quality and Financial Reporting Accuracy in Nigerian Public Sector. Employing a cross-sectional survey of 120 auditors in federal agencies, combined with secondary data analysis, their results indicated that AI tools such as robotic process automation (RPA) lead to improved timeliness and completeness of financial reports. The study recommended policy incentives for AI adoption in the public sector.

Okoye and Nnamani (2024) analysed Robotic Process Automation and Financial Report Accuracy in Nigerian Local Governments. They used surveys with 75 finance staff and secondary data from financial reports, finding that RPA reduced manual data input errors by 30% and improved report submission punctuality. The study calls for governmental support for wider RPA integration.

Akanbi and Yusuf (2024) report that AI reduced reporting delays in Nigerian parastatals by about 28 per cent and improved accuracy through automated reconciliation. Adigun and Balogun (2023) report reductions in report preparation time of about 27 per cent and gains in data accuracy of about 18 per cent in public sector entities. Sanni et al. (2023) find that robotic process automation shortened reporting time and raised data accuracy in government agencies, while Olalekan and Eziyi (2023) report faster report preparation and better error detection in public institutions. Chukwuemeka and Ibrahim (2024) associate machine learning with real-time processing and lower delays in federal agencies. Related work in public universities and hospitals points in the same direction (Okafor & Ezeani, 2024; Adejumo & Afolabi, 2023). Review articles and qualitative studies reach comparable conclusions while stressing infrastructure, regulation and skills as conditions for success (Jejeniwa et al., 2024; Mwachikoka, 2024; Nsoke, 2024; Oyeniyi et al., 2024; Usman et al., 2024).

Research Gap

The literature reviewed demonstrates that AI-based methods have been applied to accounting and financial reporting and that reporting quality depends on effective monitoring, internal controls and institutional accountability. However, three issues warrant further investigation. First, much of the technical literature evaluates the performance of automation tools on transaction-level datasets or through qualitative reviews (e.g., Jejeniwa et al., 2024; Oyeniyi et al., 2024), which does not necessarily establish whether institutional adoption is associated with improved financial reporting outcomes. Second, much of the Nigerian evidence relies on surveys, interviews or small samples (e.g., Nsoke, 2024; Usman et al., 2024; Okoye & Nnamani, 2024), and survey-based perceptions of effectiveness may not correspond to documented reporting performance. Third, the relationship between AI adoption and reporting outcomes may be influenced by institutional differences and broader improvements in the financial control environment, making it important to examine whether any observed association persists under alternative empirical specifications.

The gap, then, is empirical rather than conceptual: whether documented AI-driven data automation and financial reporting timeliness and accuracy move together in Nigerian federal institutions, once institutional differences and common temporal trends are accounted for, has not been examined with institution-level, multi-year documentary evidence. This study addresses the gap by examining the association between documented AI-driven data automation and a composite measure of reporting timeliness and accuracy in five selected Nigerian federal public institutions over the period 2015–2024. The longitudinal design enables the study to examine changes over time and assess the stability of the observed association under alternative specifications. Although the design cannot establish a definitive causal effect, it provides an empirical basis for evaluating whether documented AI adoption and reporting outcomes move together after accounting for time-invariant institutional differences and common temporal trends.

Methodology

Research Design and Sample

This study adopts a longitudinal archival research design to examine the association between documented AI-driven data automation and the timeliness and accuracy of financial reports in selected Nigerian federal public institutions. The study covers the period 2015–2024 and comprises a balanced panel of five purposively selected institutions: the Federal Ministry of Finance (FMF), the Office of the Accountant-General of the Federation (OAGF), the Federal Inland Revenue Service (FIRS), the Central Bank of Nigeria (CBN) and the Bureau of Public Procurement (BPP). Each institution is observed annually from 2015 to 2024, giving a balanced panel of 50 institution-year observations. Complete documentary coverage was confirmed for all 50 institution-year cells.

The institutions were selected based on their relevance to federal financial management, revenue administration, public expenditure oversight, financial reporting and related control functions, as well as the availability and consistency of documentary evidence for the study period. The data were obtained from institutional annual

reports, financial statements, audit-related publications and official documents concerning the implementation or use of AI-based analytical systems. The sample is not probability-based, and results are interpreted for these institutions, not for all federal ministries, departments and agencies.

The purposive selection procedure was intended to support longitudinal comparison across institutions for which documentary evidence could be assessed using a consistent framework. However, the relatively small, non-probability sample limits the generalisability of the findings to the wider population of Nigerian federal public institutions. Accordingly, the results are interpreted in relation to the five selected institutions and the period examined rather than as representative estimates for all federal MDAs.

Measurement of Variables

The study examines two principal variables: AI-driven data automation (AIDA), the explanatory variable, and the timeliness and accuracy of financial reports (FRQ1), the dependent variable. Both variables are composite indices constructed from documentary evidence using a five-point scoring rubric (0–4), with higher scores indicating greater documented automation or better reporting outcomes, respectively.

AI-driven data automation (AIDA): AIDA measures the extent to which documentary evidence indicates that an institution has adopted or used AI-enabled capabilities in accounting and financial reporting processes. The index is derived from a five-point documentary assessment rubric, with higher scores representing stronger documented adoption. The scoring framework distinguishes evidence of actual implementation from general policy statements or intentions to introduce AI. The rubric assigns scores as follows: 0 = no documentary evidence of AI-driven automation; 1 = policy statement or strategic intention only, with no implementation; 2 = pilot, tender or procurement stage documented; 3 = partial deployment in at least one functional area; 4 = full documented deployment across core financial reporting operations. Component indicators include documented use of AI tools for automated transaction processing, intelligent classification, automated reconciliation, anomaly detection and report assembly. The composite score is the mean of the component indicator scores, rounded to the nearest integer.

Timeliness and accuracy of financial reports (FRQ1): FRQ1 is a composite index intended to capture the speed of report preparation and the degree of correctness of the financial statements. Higher scores indicate more favourable documented outcomes. The index is assessed using a five-point rubric (0–4) applied to two dimensions: (i) reporting timeliness, scored on the documented interval between financial year-end and submission or completion of the financial statements, and (ii) reporting accuracy, scored on the documented incidence and correction of reporting errors, audit adjustments and qualifications. Each dimension is scored 0–4 using the same level descriptors as the AIDA rubric, and the composite FRQ1 score is the mean of the two dimension scores. The FRQ1 scoring procedure distinguishes, to the extent permitted by the available records, between the detection of irregularities and documented improvements in reporting quality, so that improved detection capacity is not conflated with improved reporting quality.

Both variables are ordinal-derived indices. Although they are analysed as numerical scores in the regression models, the estimated coefficients represent changes in the assigned index scores rather than physical measures such as days of delay or percentage error rates. Interpretation therefore depends on the consistency and validity of the scoring procedure.

To support the consistency of the scoring procedure, all documents were coded by the researcher using the rubrics described above. A second coder independently scored a random subset of 20% of the institution-year observations, and inter-rater agreement was assessed; discrepancies were resolved through discussion and, where necessary, by re-examining the underlying documentary evidence. The final scores reflect the reconciled assessments.

A further measurement consideration is that stronger detection or automation capacity may initially increase the number of documented irregularities by identifying previously unrecognised problems. Consequently, the

identification of anomalies must be distinguished from evidence that errors have been corrected or that reporting quality has improved. The relationship between AIDA and FRQ1 is therefore interpreted as an association between documented adoption and documented reporting outcomes, rather than direct evidence that AI adoption improves the underlying quality of financial reporting.

Model Specification and Estimation

The baseline model is specified as:

$$\boldsymbol{FRQ1_{it} = \beta_0 + \beta_1 AIDA_{it} + \varepsilon_{it}}$$

where $\boldsymbol{FRQ1_{it}}$denotes the reporting outcome score for institution $\boldsymbol{i}$in year $\boldsymbol{t}$, $\boldsymbol{AIDA_{it}}$represents the corresponding AI-driven data automation score, $\boldsymbol{\beta_0}$is the intercept, $\boldsymbol{\beta_1}$is the coefficient of interest, and $\boldsymbol{\varepsilon_{it}}$is the error term. The model is estimated by pooled ordinary least squares (OLS) and by a fixed-effects (within) estimator with institution dummies, using HC3 heteroskedasticity-robust standard errors, which are preferable to clustered errors when, as here, there are only five clusters.

A random-effects specification was also estimated. A Hausman test does not reject random effects ($\boldsymbol{\chi^2 = 0.215}$, $\boldsymbol{p = 0.643}$), and its slope (0.717) is close to the fixed-effects slope (0.706), so the fixed-effects estimate is retained as the more conservative specification.

Because both the automation index and reporting quality rise over the decade, a simple association could reflect a shared trend. Three further specifications therefore test robustness:

(i) a fixed-effects model with a linear year trend:

$$\boldsymbol{FRQ1_{it} = \alpha_i + \beta_1 AIDA_{it} + \beta_2 Trend_t + \varepsilon_{it}}$$

(ii) a first-difference model, which relates year-on-year change in reporting quality to year-on-year change in automation:

$$\boldsymbol{\Delta FRQ1_{it} = \beta_1 \Delta AIDA_{it} + \Delta \varepsilon_{it}}$$

(iii) a lagged specification, which asks whether earlier automation predicts later reporting quality:

$$\boldsymbol{FRQ1_{it} = \alpha_i + \beta_1 AIDA_{i,t-1} + \varepsilon_{it}}$$

These alternative specifications provide complementary assessments of the stability of the estimated association. However, neither differencing nor lagging the explanatory variable, on its own, establishes a causal relationship.

Statistical significance is assessed at the 5% level. The results are interpreted with consideration of the small number of institutions, the documentary basis of the measurements and the observational nature of the research design. In particular, the use of heteroskedasticity-consistent standard errors does not, by itself, eliminate concerns about serial dependence or common shocks in a panel containing only five institutions, so the reported p-values are treated as lower bounds on uncertainty rather than as exact. The estimates are therefore interpreted conservatively: the pooled and fixed-effects coefficients are treated as upper references, the trend-adjusted and first-difference coefficients as the more demanding tests, and the lagged coefficient as evidence on timing rather than on contemporaneous association.

Results

Descriptive Statistics

Mean reporting timeliness and accuracy across the panel is 3.64 on the five-point scale (SD = 0.51), and mean automation is 3.79 (SD = 0.66). Both indices rise over time. Averaged across the five institutions, timeliness and accuracy increase from 3.06 in 2015 to 4.30 in 2024, while automation rises from 3.00 to 4.77. The two measures are strongly correlated (r = 0.92), reflecting this common upward drift. Institutions differ in level: the CBN and FIRS record higher average scores on both indices than the OAGF and the Ministry of Finance, and the BPP records the lowest.

The high correlation and the parallel upward trends in both series motivate the estimation strategy set out: while the pooled and fixed-effects models capture the raw association, the trend and first-difference specifications are needed to assess how much of that association survives once common temporal drift is removed.

Table 1. Descriptive statistics and correlation matrix (N = 50)

Variable	Mean	SD	Min	Max	1	2
1. FRQ1 (timeliness and accuracy)	3.64	0.51	2.00	5.00	1.00	
2. AIDA (AI-driven data automation)	3.79	0.66	2.00	5.00	0.92	1.00

Note: Scores are composite indices on a 0–4 rubric, rescaled here to a 1–5 reporting range for presentation. The final two columns report pairwise Pearson correlations; the diagonal is 1.00 by construction and the upper triangle is left blank. Source: Author's computation from the panel dataset.

Main Estimates

Table 2 reports the main estimates across the five specifications. Automation has a positive and statistically significant coefficient in every specification, though the magnitude varies with the specification. In the pooled model, a one-point increase in the automation score is associated with a 0.717-point increase in timeliness and accuracy (SE = 0.044, t = 16.15, $p < 0.001$), and the model explains 84.5 per cent of the variation in timeliness and accuracy ($R^2 = 0.845$; F = 260.9). The within-institution estimate is similar (0.706, robust SE = 0.050), and the within R^2 of 0.818 indicates that changes in automation track changes in timeliness and accuracy inside each institution over time, not only differences between institutions. Residual diagnostics are satisfactory: the Durbin–Watson statistic of 2.12 is close to the conventional value of 2, indicating no first-order autocorrelation; the Breusch–Pagan test does not detect heteroskedasticity ($p = 0.908$); and the Jarque–Bera test does not reject normality of residuals ($p = 0.743$). On this evidence the null hypothesis of no association (H_0) is rejected in favour of the alternative (H_1).

Table 2. Automation and the timeliness and accuracy of financial reports (dependent variable: FRQ1)

Specification	Coefficient on AIDA	Robust SE	p-value	N
Pooled OLS	0.717	0.044	< 0.001	50
Fixed effects (institution)	0.706	0.050	< 0.001	50
Fixed effects + linear trend	0.641	0.153	< 0.001	50
First differences	0.761	0.197	< 0.001	45
Fixed effects, AIDA lagged one year	0.631	0.100	< 0.001	45

Note: The pooled OLS model has a constant of 0.930 ($p < 0.001$) and $R^2 = 0.845$. Standard errors are conventional for pooled OLS and HC3-robust for the fixed-effects, fixed-effects with linear trend, first-difference and lagged models. The first-difference and lagged models lose the first year for each institution (5 observations), yielding N = 45. Source: Author's computation from the panel dataset; models estimated in EViews 14.0.

Robustness

The key question is whether the association is a by-product of both series trending upward. It is not wholly so. Adding a linear trend lowers the coefficient from 0.706 to 0.641, which implies that part of the raw association reflects common improvement over time, but the remaining slope is large and highly significant. In first differences, which remove all institution-level and slow-moving factors, the coefficient is 0.761 (robust SE = 0.197). Using last year's automation to predict this year's reporting quality yields 0.631. Taken together, the preferred conservative estimate, that of the trend-adjusted model, suggests that one additional point of automation is associated with roughly 0.6 points of additional reporting quality, with the pooled estimate of 0.7 serving as an upper reference.

Discussion

The results are consistent with the agency-theoretic expectation that technology which accelerates and cleans the production of accounting information improves the quality of the information principals receive. They are also consistent with Nigerian studies reporting shorter reporting cycles and fewer errors following automation (Adigun & Balogun, 2023; Akanbi & Yusuf, 2024; Sanni et al., 2023). The size of the association is practically meaningful: on a five-point scale, an institution that moves from a score of 3 to a score of 4 on automation is, on the conservative estimate, associated with about 0.6 points higher reporting quality.

Several features of the evidence temper a strong reading. First, the automation index is built from documents, and the absence of a reference to AI in an annual report does not prove the absence of AI. Second, Nigeria's wider public financial management reforms over the period, including integrated financial management information systems and the Treasury Single Account, run in parallel with AI-related developments, and documentary scoring cannot always disentangle them; part of the estimated association may therefore reflect digitalisation more broadly. Third, causation may also run in the other direction: institutions with better reporting capacity may be better placed to adopt and document automation. The lagged specification, which remains strongly significant, helps with this concern but does not eliminate it. Fourth, five institutions and ten years are a small sample, and the institutions were chosen for documentary availability, which may favour better-resourced entities. Fifth, the dependent variable is a composite of timeliness and accuracy; the data do not allow the two to be separated.

The findings speak to the practical conditions under which the apparent benefits of automation are likely to materialise. They are more likely to be realised where staff are trained, systems are integrated into routine procedures and automated outputs are subject to human review and audit trails.

Conclusion and Recommendations

Conclusion

This study examined the relationship between AI-driven data automation and the timeliness and accuracy of financial reports in Nigeria's federal public sector over the period 2015–2024. Using a balanced panel of 50 institution-year observations from five purposively selected federal institutions and a composite-index measurement strategy, the analysis finds a positive and statistically significant association in every specification estimated. The pooled and fixed-effects models produce coefficients of 0.717 and 0.706 respectively; the association remains large and significant when a linear time trend is added (0.641), in first differences (0.761) and in the lagged specification (0.631).

The conclusion must nevertheless be stated with precision. The coefficients are associations between two documented indices, not causal estimates of the effect of AI on reporting quality. The shrinkage under the trend specification shows that part of the raw association reflects common temporal drift, the simultaneous strengthening of public financial management reforms over the period, and the fixed-effects and lagged results mitigate, but cannot eliminate, concerns about reverse causality. The findings therefore support a conditional and directional conclusion: in the selected institutions, deeper documented AI-driven data automation is associated with better

documented reporting timeliness and accuracy, with the conservative estimate placing the association at roughly 0.6 index points per additional point of automation. They do not establish that AI adoption caused reporting quality to improve, nor that the pattern generalises to Nigeria's wider federal public sector.

Recommendations

i. **Policymakers and financial management authorities:** The evidence supports continued, gradual integration of AI-driven automation into accounting and financial reporting processes, particularly transaction recording, data validation and reconciliation. This should be supported by investment in reliable data infrastructure, system integration and continuous staff training so that automated processes produce accurate and dependable financial information. Automation should be understood as one component of a functioning reporting chain, data quality, system integration, human review and audit trails, rather than a substitute for effective governance.

ii. **Accountability and audit authorities:** Federal institutions and audit authorities should establish and publish measurable performance indicators, reporting delays, reconciliation discrepancies, audit adjustments and error rates, so that the effects of automation can be tracked directly rather than inferred from composite indices. Publishing these indicators would also allow future research to move from index-based to transaction- and case-level analysis.

iii. **Regulators**: Regulators should require explainability, documentation and audit trails for AI tools used in financial reporting. Because automated outputs may be wrong, human review remains essential, and the reporting gains observed in this study depend on that review actually occurring.

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