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From Data to Decisions: The Role of AI and Big Data Analytics in Modern Auditing

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Abstract

The expansion of digital business has increased the volume and complexity of information available to auditors. Reviewing these records through manual procedures alone can be demanding and may leave important patterns unexplored. Artificial Intelligence (AI) and Big Data Analytics (BDA) offer complementary ways to organise information, identify exceptions and support risk-focused audit work. This paper considers how these technologies contribute to the movement from raw data to informed audit decisions. It adopts a descriptive, secondary-source approach and organises the discussion around applications, benefits, implementation constraints and professional judgement. Potential uses include transaction analysis, anomaly detection, document review, risk prioritisation and recurring exception monitoring. Their value nevertheless depends on reliable data, suitable model validation, secure information handling and staff competence. Wider transaction coverage does not automatically establish sufficient appropriate audit evidence, and an unusual pattern does not prove fraud. The paper proposes an implementation framework centred on data integrity, explainability, human review and ethical compliance. It concludes that AI and BDA should strengthen, rather than displace, the auditor's responsibility to investigate exceptions, evaluate evidence and exercise professional scepticism.

Keywords: Artificial Intelligence; Big Data Analytics; Auditing; Audit Decision-Making; Fraud Detection; Risk Assessment; Continuous Auditing; Data Governance.

1. Introduction

Independent auditing supports confidence in financial reporting by providing reasonable assurance about whether financial statements are free from material misstatement. Auditors use inspection, confirmation, recalculation, analytical procedures and other techniques to obtain evidence. Sampling is one approach to selecting items for testing, but the suitability of any procedure depends on the audit objective and the risks involved.

Business information now flows through accounting applications, enterprise resource planning systems, payment platforms, e-commerce channels and cloud services. Records may be extensive, rapidly updated and distributed across incompatible formats. These conditions create opportunities for broader analysis while also making data preparation and reliability assessment more demanding.

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BDA can help auditors organise and analyse large transaction populations. AI adds capabilities such as learning patterns, classifying documents and extracting information from text. Used together, these tools can direct attention towards records that warrant investigation. They do not remove the need to assess source information, corroborate findings and document the basis of an audit conclusion.

2. Conceptual Background

2.1 Artificial Intelligence

AI describes systems that perform tasks associated with learning, prediction, classification or language interpretation. Audit applications may include identifying unusual journal entries, locating contractual clauses and categorising invoices. The reliability of these applications depends on their design, training information, operating context and the controls applied to their use.

2.2 Big Data Analytics

BDA refers to methods for examining large or complex datasets to produce useful patterns and indicators. In auditing, relevant information can include ledger entries, sales records, procurement data, payroll files and inventory movements. Analytical procedures can compare these sources, reveal inconsistencies and help auditors identify areas requiring further work. AI and BDA overlap; they are not mutually exclusive technologies.

Table 1. BDA and AI in audit work

Dimension	Big Data Analytics	Artificial Intelligence
Primary emphasis	Organising and analysing extensive datasets	Learning, prediction, classification and interpretation
Illustrative methods	Queries, statistical analysis, reconciliation and visualisation	Machine learning, language processing and document classification
Audit applications	Population profiling and cross-system comparisons	Anomaly scoring and extraction of contractual information
Typical outputs	Dashboards, trends and exception lists	Risk scores, classifications and alerts
Human responsibility	Design procedures and evaluate patterns	Validate outputs and assess their audit significance

3. Review of Literature

Research on audit analytics describes both opportunities for broader testing and difficulties in turning additional information into sound judgement. The selected works below provide a foundation for discussing analytical capability, behavioural limitations and organisational change. Publication details should be checked against the original articles before final submission.

Table 2. Selected literature and its relevance

Study	Central topic	Relevance
Earley (2015)	Opportunities and challenges in audit analytics	Frames the discussion of skills, implementation and changing procedures.
Cao, Chychyla and Stewart (2015)	BDA in financial statement audits	Provides a basis for considering broader data analysis.
Brown-Liburd, Issa and Lombardi (2015)	Behavioural implications of Big Data	Highlights the importance of information processing and

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Study	Central topic	Relevance
		professional judgement.
Appelbaum, Kogan and Vasarhelyi (2017)	Research needs in modern audit analytics	Connects analytical development with audit-engagement requirements.
Gepp et al. (2018)	Big Data techniques in audit research and practice	Supports classification of analytical applications and research directions.
Salijeni, Samsonova-Taddei and Turley (2019)	Big Data and changes in audit technology	Adds an organisational perspective on technology-enabled audit work.

The draft supplied for revision also listed Hezam et al. (2023), Murikah et al. (2024), Suyono et al. (2025), Anwar (2026) and Alkhatib et al. (2026). These entries are not relied upon in this version because their publication details have not been independently established. They should be restored only after the original publications have been located and checked.

4. Research Gap

This paper focuses on three issues that merit closer examination rather than claiming that earlier research has overlooked them entirely. The first is the practical integration of AI and BDA within audit procedures. The second is the transition from a system-generated indicator to an evidence-based audit response. The third is the balance between analytical capability and constraints such as cost, data reliability, accountability and explainability.

The proposed contribution is a conceptual account of this decision process. It brings technology applications and governance considerations into one framework without claiming to establish their effectiveness through empirical testing.

5. Research Objectives

Objective 1: To examine the applications of AI and BDA in financial data analysis and audit procedures.

Objective 2: To evaluate their potential benefits and practical constraints, with particular attention to audit decisions and professional judgement.

6. Research Methodology

The paper is presented as a descriptive, qualitative discussion based on secondary literature and professional material. Its thematic structure covers applications, benefits, implementation challenges and decision-making. It does not report primary interviews, surveys, experiments or independent tests of audit software.

The author-supplied draft identifies Scopus, Google Scholar, ScienceDirect and publications from IAASB, AICPA and ICAI as possible sources. However, it does not provide a reproducible search log, screening criteria or final source count. Consequently, this paper should be described as a narrative review rather than a systematic literature review. Before submission, the authors should document the searches actually conducted, their dates and the criteria used to select material.

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7. Analysis and Discussion

7.1 Applications in audit procedures

Analytical techniques can be used at planning, testing and completion stages. Their role should be defined by the audit objective rather than by the availability of a particular tool. The examples below are illustrative applications, not results from software testing undertaken for this paper.

Table 3. Applications of AI and BDA

Application	Illustrative technique	Audit contribution
Transaction testing	SQL queries, reconciliation and population profiling	Locate duplicates, missing sequences and unusual values.
Anomaly detection	Clustering and Isolation Forest models	Prioritise records that differ from expected patterns.
Fraud-risk identification	Pattern matching, suitable supervised models and digit analysis	Identify indicators for investigation; these do not establish fraud.
Risk prioritisation	Predictive models and risk-scoring routines	Help target further procedures to selected accounts or business units.
Routine automation	RPA and optical character recognition	Support repetitive matching and document extraction; extracted data need checking.
Recurring monitoring	Scheduled data feeds and exception routines	Identify changes or exceptions between periodic reviews.
Document review	Natural language processing	Locate relevant clauses in contracts, leases and loan documents.

Benford's Law is not suitable for every dataset and should not be used as a stand-alone fraud test. Similarly, testing an entire available population does not establish that the population is complete or that all relevant assertions have been addressed. Recurring monitoring by management should also be distinguished from independent audit procedures.

7.2 From indicators to audit responses

A useful decision sequence is to validate the input, generate an indicator, examine the exception, obtain corroborating evidence and document the response. Statistical rarity alone does not establish materiality or misstatement. Auditors must consider the business context and whether the procedure addresses the relevant assertion.

Table 4. Illustrative risk-response matrix

Audit area	Indicator	Possible response
Revenue	Unusual period-end or weekend sales	Inspect dispatch evidence, assess cut-off and consider customer confirmation.
Accounts payable	Bank-account changes before large payments	Verify changes independently using trusted contact details and inspect authorisation.
Payroll	Bank details shared between employees and vendors	Check legitimate explanations, HR records and supporting documentation.
Journal entries	Late postings or activity outside expected permissions	Inspect supporting records, assess access rights and investigate

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Audit area	Indicator	Possible response
		management override risk.

7.3 Benefits and implementation constraints

Table 5. Potential benefits and necessary conditions

Benefit	Potential contribution	Condition or qualification
Efficiency	Reduce selected repetitive tasks	Savings depend on preparation costs, tool suitability and review effort.
Broader coverage	Examine more available transactions	Population completeness and relevant assertions still require evaluation.
Pattern identification	Link information across systems	Matching quality and business explanations must be checked.
Timeliness	Identify exceptions more frequently	Data feeds, thresholds and escalation processes must be maintained.
Communication	Display findings through charts and dashboards	Visualisations should retain context, limitations and traceability.

Table 6. Challenges and safeguards

Challenge	Risk	Suggested safeguard
Data quality	Incomplete or inconsistent inputs distort results	Reconcile extracts, validate fields and preserve data lineage.
Confidentiality	Sensitive information is exposed or reused improperly	Use access restrictions, encryption and approved hosting arrangements.
Cybersecurity	Data are compromised during transfer or storage	Apply secure transfer methods, logging and access reviews.
Explainability	Outputs cannot be understood or challenged	Choose suitable models and document assumptions and limitations.
Cost and competence	Implementation exceeds resources or staff capability	Pilot limited applications and provide role-specific training.
Model performance	False alerts or missed exceptions misdirect effort	Validate performance and review thresholds and changes over time.
Automation bias	Staff accept system outputs without sufficient challenge	Require independent review and corroboration of significant results.

8. Professional Judgement and Decision-Making

Technology changes the information available to an auditor, not the auditor's responsibility for the conclusion. An alert should initiate consideration of alternative explanations, not automatically determine the result. A transaction may be unusual because it is erroneous, fraudulent, exceptional but legitimate, or poorly represented in the dataset.

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The audit file should connect significant analytical findings to the work performed and the conclusion reached. Where a model is unsuitable, insufficiently transparent or based on unreliable data, the auditor may need different procedures. IAASB guidance specifically addresses the risk of overreliance on automated tools and techniques (IAASB, 2021).

Table 7. Changes in the audit work emphasis

Dimension	Conventional procedures	Technology-supported procedures
Coverage	Selected items or samples where appropriate	Larger datasets where access and reliability permit
Timing	Planned interim and year-end procedures	May include more frequent analytical procedures
Work emphasis	Evidence collection, inspection and verification	Additional emphasis on data validation and exception investigation
Judgement	Assess evidence and determine further work	Also assess model limitations and the meaning of outputs
Accountability	Remains with the auditor	Remains with the auditor

9. Limitations of the Study

- The paper relies on secondary material and does not include evidence collected from practising auditors.
- The source-selection process is not documented sufficiently to support a claim of systematic coverage.
- AI capabilities and professional guidance develop quickly, which may limit the continuing relevance of particular examples.
- Costs, infrastructure and specialist skills differ across large networks and smaller practices.
- Legal and professional requirements differ between jurisdictions; this paper does not provide jurisdiction-specific compliance advice.
- No independent estimates of accuracy, false-positive rates, time savings or return on investment are produced.

10. Governance and Implementation Framework

A practical implementation programme should begin with a clearly defined audit objective and a limited pilot. Responsibilities for approving tools, validating data, reviewing exceptions and maintaining documentation should be allocated before deployment. IAASB's Technology Position provides context for the appropriate use of technology in audit and assurance work (IAASB, 2024).

Table 8. Proposed governance framework

Stage	Principal action	Documentation
Define the purpose	Specify the assertion, risk and intended use of the tool	Approved use case and responsibility allocation
Validate the data	Check completeness, accuracy and extraction controls	Reconciliations, validation results and data lineage
Assess the model	Evaluate suitability, assumptions and performance	Validation records, limitations and version details
Review exceptions	Investigate significant alerts and corroborate findings	Supporting evidence and professional assessment
Protect information	Apply confidentiality and security controls	Access approvals, retention rules and incident procedures
Reassess use	Monitor changes in data, tools and	Periodic reviews, change logs and

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Stage	Principal action	Documentation
	audit requirements	improvement actions

11. Recommendations

Audit firms should introduce analytics in phases, beginning with clearly defined applications and measurable review criteria. Training should combine data-handling skills with auditing knowledge, professional scepticism and an understanding of model limitations. Firms should retain established procedures where automated analysis cannot provide appropriate evidence.

Professional bodies should continue clarifying expectations for tool validation, documentation, confidentiality and the evaluation of technology-generated information. Educational institutions should integrate practical data analysis, information-system controls and ethical reasoning into accounting programmes without weakening core auditing knowledge.

12. Conclusion

AI and BDA can help auditors move from extensive digital records towards more focused investigation. Their potential lies in organising data, identifying patterns and directing attention to matters that warrant further evidence. These capabilities should not be equated with automatic improvements in audit quality, because outcomes depend on implementation and professional review.

A defensible approach combines suitable technology with reliable inputs, documented validation and accountable human judgement. Auditors remain responsible for challenging outputs, investigating significant exceptions and determining whether the evidence supports their conclusions.

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