

The Impact of Data Analytics Capabilities on External Audit Quality and Auditor Professional Judgment: Evidence from Algeria

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Abstract:

This study examines the impact of data analytics capabilities on external audit quality and auditor professional judgment among external auditors in Algeria. Despite the growing use of data analytics in auditing, empirical evidence on how these capabilities shape both audit quality and auditors' professional judgment in emerging economies remains limited. Drawing on Agency Theory, the Resource-Based View, the Technology Acceptance Model, and Decision-Usefulness Theory, the study develops and empirically tests a research model in which external audit quality acts as a mediating variable.

A quantitative cross-sectional survey was conducted using data collected from 135 external auditors in Algeria. The proposed research model was tested using Partial Least Squares Structural Equation Modeling (PLS-SEM). The measurement model showed satisfactory reliability and validity, with Cronbach's Alpha ranging from 0.879 to 0.887, Composite Reliability from 0.901 to 0.906, Average Variance Extracted (AVE) from 0.512 to 0.529, and HTMT values below 0.85. The findings indicate that data analytics capabilities positively influenced external audit quality ($\beta = 0.470, p < 0.001$) and auditor professional judgment ($\beta = 0.219, p = 0.023$). External audit quality also had a positive effect on auditor professional judgment ($\beta = 0.352, p < 0.001$) and partially mediated the relationship between data analytics capabilities and auditor professional judgment ($\beta = 0.165, p = 0.001$).

Overall, the findings suggest that strengthening data analytics capabilities can improve audit quality and support auditors' professional judgment, offering useful implications for audit firms, professional bodies, and regulators in emerging economies.

Keywords: Data Analytics Capabilities; Audit Quality; Professional Judgment; PLS-SEM; Emerging Markets.

Jel Classification Codes : M42; M15; C83

I. Introduction:

The auditing profession is undergoing a significant transformation as rapid technological advancements and increasing organizational complexity challenge traditional audit approaches. Conventional audit methodologies, which rely heavily on sampling techniques and manual procedures, are becoming less effective in dealing with the large volumes of data generated in modern business environments. In response, data analytics has emerged as a promising tool capable of enhancing audit efficiency, improving risk assessment, and supporting more informed audit decisions.

Despite this growing interest, the existing literature remains fragmented and does not fully explain how data analytics capabilities influence key audit outcomes. While several studies emphasize the potential of data analytics to improve audit processes, limited attention has been given to its combined impact on audit quality and auditor professional judgment, particularly in emerging markets (Agmas & Lakatos., 2024). highlight persistent gaps in the literature, including the limited number of empirical studies, low adoption of artificial intelligence in internal audit functions across countries, and the absence of comprehensive frameworks for effective implementation. These challenges are even more relevant in developing environments such as Algeria, where regulatory frameworks, technological infrastructure, and auditor competencies are still evolving. Given the limited empirical research in Algeria, understanding how data analytics affects auditing practices becomes particularly important.

More specifically, several research gaps can be identified. First, most empirical evidence on data analytics in auditing is concentrated in developed economies, while emerging markets—characterized by resource constraints and institutional differences—remain underexplored. Second, although data analytics is often examined as a direct determinant of audit quality, and audit quality is separately linked to professional judgment, the potential mediating role of audit quality in this relationship has not been empirically tested. Third, the literature lacks an integrated theoretical framework that combines key perspectives such as agency theory, the resource-based view, the technology acceptance model, and decision-usefulness theory within a single model in the auditing context. Finally, prior research identifies several barriers to technology adoption, including skill shortages, data reliability issues, and financial constraints, yet their specific impact on audit quality in resource-constrained environments is still not well understood.

In response to these gaps, this study aims to examine the impact of data analytics capabilities on external audit quality and auditor professional judgment in the Algerian context. It also investigates whether audit quality plays a mediating role in the relationship between data analytics capabilities and professional judgment.

Accordingly, the study addresses the following research questions:

- What is the impact of data analytics capabilities on audit quality in Algeria?
- How do data analytics capabilities influence auditor professional judgment?
- Does audit quality mediate the relationship between data analytics capabilities and auditor professional judgment?

This study specifically contributes to the auditing literature in the Algerian context by integrating data analytics, audit quality, and professional judgment within a unified analytical framework. It provides empirical evidence from an emerging market that has received limited academic attention and offers a clearer understanding of the mechanisms through which data analytics influences audit outcomes, particularly through the mediating role of audit quality.

The remainder of this paper is organized as follows. Section II presents the theoretical foundations and conceptual framework. Section III describes the research methodology. Section IV reports the empirical results. Section V interprets the findings on external audit quality, while Section VI discusses the implications of the findings for auditor professional judgment. Section VII integrates the findings within the Algerian auditing context. Section VIII highlights the theoretical, practical, and methodological contributions of the study. Finally, Section IX concludes the paper.

II. THEORETICAL FOUNDATIONS AND CONCEPTUAL FRAMEWORK:

II. 1 Multi-Theory Integration:

This study integrates four complementary theoretical perspectives to develop a robust conceptual foundation. To enhance clarity, the following figure provides a structured overview of how these perspectives jointly inform the study framework.

Figure (1): Theoretical Framework of the Study



Source: Author's own elaboration based on literature

II. 1 .1. Agency Theory Perspective:

Agency theory (Jensen & Meckling, 1976) posits that auditors act as monitoring agents responsible for reducing information asymmetry between management (agents) and stakeholders (principals). From this perspective, data analytics capabilities strengthen the auditor's monitoring role by enabling more extensive and effective audit testing, thereby reinforcing the agency relationship (Darmawan, 2023). It emphasizes that "the critical role of audit quality in enhancing financial reporting transparency" depends on both auditor independence and competence [5], which can be significantly enhanced through advanced analytical capabilities.

II. 1 .2. Resource-Based View (RBV):

The resource-based view suggests that organizational competitive advantage is derived from unique resources that are difficult to imitate. In this context, data analytics capabilities represent strategic organizational resources that require substantial investment in technology, expertise, and processes. For audit firms, these capabilities serve as key differentiators that enhance audit quality and improve client value delivery. This explains why Big Four firms are generally more advanced in adopting data analytics compared to smaller firms with limited resource capacity (Nguyen, Nguyen, & Le., 2025).

II. 1 .3. Technology Acceptance Model (TAM):

The Technology Acceptance Model explains technology adoption through two main factors: perceived usefulness and perceived ease of use. In emerging markets, auditors are more likely to adopt data analytics when they perceive clear improvements in audit quality and when the tools are compatible with existing workflows and skill levels. Empirical evidence from Malaysia shows that "perceived benefits and ease of use significantly influence technology adoption among internal auditors" (Habibullah, Ismail, & Hassan., 2026), confirming the relevance of TAM in auditing environments.

II. 1.4. Decision-Usefulness Theory:

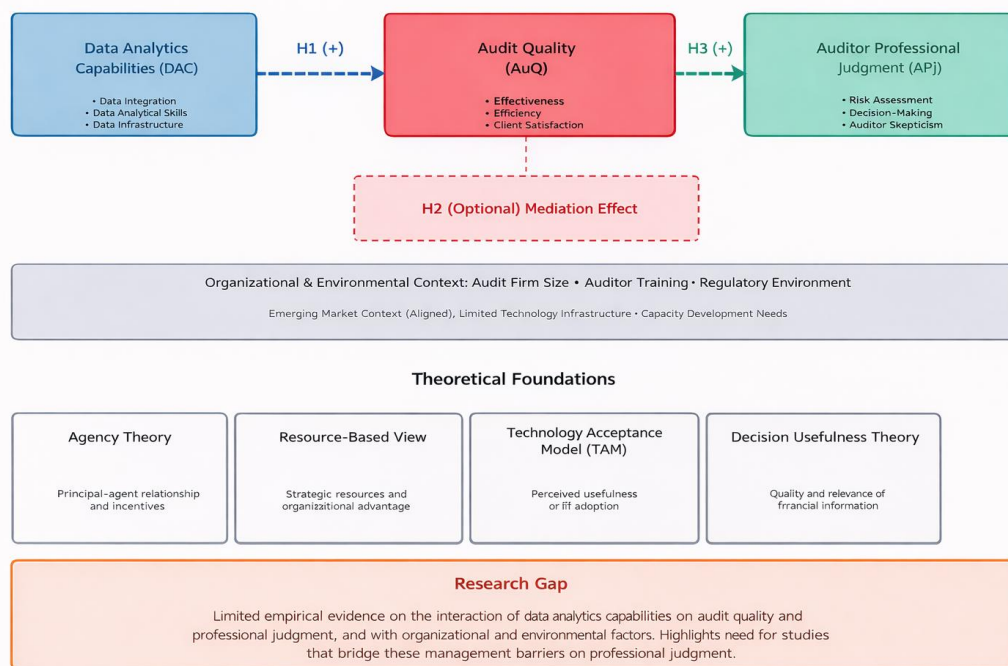
This theory argues that the value of accounting information lies in its usefulness for decision-making purposes. In the auditing context, analytics-enhanced audit quality leads to more reliable and decision-useful financial reporting outcomes. Accordingly, when auditors apply advanced analytics that improve the quality of audit evidence, the resulting professional judgments become more reliable and more decision-relevant.

In the Algerian regulatory setting, this logic is embedded directly in the Algerian Auditing Standards (Normes Algériennes d'Audit, NAA): NAA 200 defines the auditor's overall objective as the exercise of professional judgment and professional skepticism in forming an opinion, while NAA 700 requires that this judgment be translated into a reasoned opinion supported by sufficient and appropriate audit evidence. Decision-Usefulness Theory therefore explains why the analytics-enhanced evidence base emphasized throughout this study is expected to reinforce the decision-relevance of the judgments that NAA 200 and NAA 700 require auditors to form and report.

Taken together, these four theoretical perspectives are complementary rather than competing, and their integration follows a sequential logic: the Resource-Based View explains why data analytics capabilities constitute valuable, firm-specific resources; Agency Theory explains why these resources are expected to strengthen the auditor's monitoring role and thereby raise audit quality; the Technology Acceptance Model specifies the individual-level conditions — perceived usefulness and perceived ease of use — under which auditors actually adopt and use these resources in practice; and Decision-Usefulness Theory explains why the resulting audit evidence translates into more reliable and decision-relevant professional judgment. This chained logic underpins the three direct paths and the mediation path specified in the conceptual model below. Read against recent empirical literature, this integration also clarifies the specific gap motivating the present study: research on artificial intelligence adoption in internal audit functions has documented persistent gaps in empirical coverage and implementation frameworks (Agmas & Lakatos, 2024); studies of big data analytics adoption in financial audit firms have concentrated on internal-control antecedents of adoption rather than its downstream effects on judgment (Nguyen, Nguyen, & Le, 2025); and research on internal auditors' technology use has so far been conducted outside the North African context (Habibullah, Ismail, & Hassan, 2026). None of these studies jointly models data analytics capabilities, audit quality, and professional judgment within a single framework, nor do they examine audit quality as a mediating mechanism between the two — the specific gap this study addresses.

II. 2 Conceptual Model and Research Propositions:

Figure (2): Integrated Conceptual Framework of Data Analytics Capabilities, Audit Quality, and Auditor Professional Judgment



Source: Author's own elaboration based on literature

The conceptual framework (illustrated above) proposes three direct relationships along with one potential mediation effect.

Proposition 1 (H1): Direct Effect of DAC on Audit Quality.

Data analytics capabilities are expected to enhance external audit quality by enabling full-population testing, improving fraud detection, and supporting more precise risk assessment. show that analytics enable auditors to “utilize data-driven insights to prioritize risks based on their potential impact and likelihood” and to “deploy advanced algorithms to uncover complex fraud schemes” (Ilori, Nwosu, & Naiho, 2024). This highlights the direct and functional contribution of analytics to audit effectiveness.

Proposition 2 (H2): Direct Effect of DAC on Professional Judgment.

Data analytics capabilities are also expected to influence auditor professional judgment by providing richer and more structured analytical evidence to support decision-making. Access to large-scale data patterns and anomaly detection systems allows auditors to develop more informed judgments regarding materiality, risk levels, and audit evidence sufficiency.

Proposition 3 (H3): Direct Effect of Audit Quality on Professional Judgment.

High-quality audit environments—characterized by rigorous evidence standards and comprehensive documentation—create a structured learning environment that enhances professional judgment development. Within such environments, auditors are continuously exposed to strong quality control mechanisms and feedback processes, which contribute to more refined judgment capabilities.

Proposition 4 (H4 – Optional): Mediation Effect.

Audit quality may mediate the relationship between data analytics capabilities and professional judgment. In this mechanism, data analytics influence professional judgment not only directly but also indirectly through their positive impact on audit quality, which in turn enhances judgment development

III. RESEARCH METHODOLOGY:

III. 1 Research Design and Sample

This study adopted a quantitative cross-sectional survey design. The main objective was to examine the relationships between data analytics capabilities (DAC), audit quality (AQ), and auditor professional judgment (APJ) among external auditors in Algeria. The cross-sectional design was considered appropriate for efficient hypothesis testing in emerging economy contexts, where longitudinal data collection was often constrained by logistical and practical limitations ((Khalil, Haque, & Senathirajah., 2023).

Population and Sampling Strategy:

The target population consisted of external auditors in Algeria with a minimum of two years of professional experience (approximately 1,200–1,500 practicing auditors).

Sample size determination was based on multiple approaches. The 10-times rule for PLS-SEM suggested a minimum sample of 40 observations (10 times the largest number of indicators on a construct; in this study, the largest dimension included 4 items). In addition, power analysis using G*Power indicated a minimum sample size of 110 respondents to detect medium effect sizes ($f^2 = 0.15$) at 80% statistical power and a 5% significance level. Accordingly, a sample of 120–150 respondents was deemed sufficient to ensure robust structural equation modeling results. Both criteria converged on a comparable minimum threshold, providing convergent methodological support—rather than reliance on a single rule of thumb—for the adequacy of the proposed sample size.

A convenience sampling technique was applied, combined with stratification by firm size (Big Four: 35–40%; non-Big Four: 60–65%) to improve representativeness. This approach acknowledged the possibility of selection bias, as voluntary participants might differ systematically from non-participants. To mitigate this limitation, demographic comparisons with professional association records and subgroup analyses across firm sizes were conducted.

Prior to full-scale distribution, the questionnaire underwent a two-stage validation process, detailed further in Section III.2: content validity was assessed by 10 subject-matter specialists (CVI ≥ 0.80), and a pilot test involving 35 Algerian auditors was conducted to assess item clarity and reliability. The sample size determined above was therefore paired with an equally rigorous validation of the measurement instrument prior to field administration.

Data Collection:

Data were collected through both online and in-person questionnaire distribution during professional events and direct outreach to audit firms. The expected response rate ranged between 35% and 50%, with a minimum target of 100 valid responses.

III. 2 Measurement

All constructs were modeled as first-order reflective constructs, where observed indicators reflected the underlying latent variables rather than forming them.

The survey instrument was developed based on established literature in audit quality and professional judgment (Bahar, 2026). Content validity was ensured through expert evaluation by 10 specialists ($CVI \geq 0.80$). A pilot test involving 35 Algerian auditors was conducted to assess clarity and item reliability. The final questionnaire consisted of 42–46 items, including demographics (8 items), DAC (14 items), AQ (14 items), and APJ (12 items), measured on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree).

The key constructs and their corresponding measurement dimensions were visually summarized in the following figure

Construct Operationalization:

- DAC was measured through four dimensions: data integration and governance, machine learning capability, real-time monitoring, and continuous auditing.
- AQ was measured through four dimensions: testing completeness, risk assessment accuracy, fraud detection effectiveness, and report reliability.
- APJ was measured through four dimensions: risk judgment quality, evidence evaluation, materiality assessment, and decision accuracy.

Measurement Validity Criteria:

Construct reliability and validity were assessed using standard thresholds: Composite Reliability ($CR \geq 0.70$), Average Variance Extracted ($AVE \geq 0.50$), Cronbach's Alpha (≥ 0.70), and indicator loadings ($\lambda \geq 0.60$). Discriminant validity was evaluated using the Fornell-Larcker criterion and HTMT (< 0.85). Items not meeting these thresholds were reviewed for potential removal, provided theoretical coverage was maintained.

III. 3 Data Analysis:

The data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4.0. This method was suitable for prediction-oriented research and was particularly appropriate for structural modeling in emerging market contexts.

PLS-SEM was selected for several reasons. First, the sample size (120–150) was adequate for stable estimation. Second, PLS-SEM was robust to non-normal data distributions, which were common in developing economy survey data (Khaled & Kamilia., 2025). Third, bootstrapping procedures allowed reliable testing of direct and indirect effects (Tetteh & Nyantakyi, 2024).

Structural Model Testing:

Path coefficients (β) were estimated for direct relationships: H1 (DAC $\rightarrow$ AQ), H2 (DAC $\rightarrow$ APJ), and H3 (AQ $\rightarrow$ APJ). Statistical significance was assessed using bootstrapping with 5,000 resamples and bias-corrected confidence intervals ($p < 0.05$). Effect sizes (f^2) were interpreted as small (0.02–0.15), medium (0.15–0.35), and large (> 0.35). Model explanatory power (R^2) and predictive relevance ($Q^2 > 0$) were also reported

Mediation Analysis (H4):

Mediation was tested using bootstrapped indirect effects (5,000 resamples). The indirect effect (DAC $\rightarrow$ AQ $\rightarrow$ APJ) was calculated as $\beta(\text{DAC} \rightarrow \text{AQ}) \times \beta(\text{AQ} \rightarrow \text{APJ})$. Mediation was supported if the 95% bias-corrected confidence interval did not include zero ($p < 0.05$).

Common Method Variance Control:

Common method bias was assessed using Harman's single-factor test (threshold $< 50\%$), marker variable technique, and variance inflation factor ($VIF < 5.0$). Missing data ($< 5\%$) were handled using multiple imputation techniques.

III. 4 Research Model and Hypotheses:

The hypotheses were grounded in Agency Theory and Decision-Usefulness Theory. Agency Theory emphasized the auditor's role in reducing information asymmetry through monitoring functions, while Decision-Usefulness Theory suggested that audit value was derived from the quality of decision-relevant information

- **H1:** Data analytics capabilities were positively associated with audit quality. The rationale was that analytics enabled comprehensive population testing and enhanced fraud detection (Ilori, Nwosu, & Naiho, 2024).
- **H2:** Data analytics capabilities were positively associated with auditor professional judgment. This was because analytics provided objective, data-driven evidence supporting audit decisions.
- **H3:** Audit quality was positively associated with auditor professional judgment. High-quality audit environments enhanced auditor capability through structured procedures and rigorous documentation **(Cakiroglu & Unver, 2023)**.
- **H4:** Audit quality strengthened the mediating effect between data analytics capabilities and auditor professional judgment, suggesting that analytics influenced judgment both directly and indirectly through audit quality improvements.

III. 5 Validity and Ethical Considerations:

Validity:

Content validity was established through expert review ($CVI \geq 0.80$). Construct validity was assessed through measurement model evaluation, including factor loadings, AVE, and discriminant validity. Statistical validity was ensured through appropriate PLS-SEM procedures and subgroup sensitivity analysis.

Study Limitations:

The cross-sectional design limited causal inference over time. Longitudinal studies were recommended for stronger causal validation. Audit quality was measured based on auditor perceptions rather than objective performance indicators. Common method bias was mitigated using multiple statistical techniques. Convenience sampling might introduce selection bias, which was addressed through demographic comparison and subgroup analysis.

Ethical Considerations:

Ethical approval was obtained in accordance with institutional and data protection standards. Informed consent was secured through clear explanation of the study purpose and voluntary participation. Anonymity was ensured through numeric coding without collection of personally identifiable information. Data were securely stored with restricted access and were retained for three years post-publication, after which they were securely deleted.

Table 01. Summary of the Research Design and Methodological Specifications

Element	Specification
Design	Quantitative cross-sectional survey; explanatory, non-experimental
Population	External auditors in Algeria ($n \approx 1,200\text{--}1,500$)
Sample	120–150; convenience sampling with firm-size stratification
Measurement	First-order reflective model; 42–46 items; 5-point Likert
Validity Thresholds	$\lambda \geq 0.60$, $CR \geq 0.70$, $AVE \geq 0.50$, $\alpha \geq 0.70$, HTMT < 0.85
Analytics	PLS-SEM (SmartPLS 4.0); bootstrapping (5,000 resamples)
Hypotheses	4; grounded in Agency + Decision-Usefulness Theory
Key Outputs	Path coefficients, R^2 , Q^2 , indirect effects, effect sizes

Source: Author's own elaboration

IV. RESULTS:

IV.1 Measurement Model Assessment:

The measurement model was evaluated by examining indicator reliability, internal consistency reliability, convergent validity, discriminant validity, and collinearity following the PLS-SEM assessment guidelines recommended by Hair et al. (2022).

IV.1.1 Indicator Reliability:

Indicator reliability was assessed through the examination of outer loadings. Most indicators exceeded the recommended threshold of 0.70, indicating satisfactory reliability. Three indicators—DAC11 (0.658), AQ9 (0.671), and APJ8 (0.664)—recorded loadings between 0.60 and 0.70, a range generally considered acceptable in applied PLS-SEM research. Since the overall reliability and validity of the measurement model remained satisfactory, these indicators were retained for the subsequent analysis.

IV.1.2 Internal Consistency Reliability and Convergent Validity:

Internal consistency was evaluated using Cronbach's Alpha and Composite Reliability. Cronbach's Alpha values ranged from 0.879 to 0.887, while Composite Reliability values varied between 0.901 and 0.906, exceeding the recommended threshold of 0.70.

Convergent validity was examined using the Average Variance Extracted (AVE). The obtained AVE values ranged from 0.512 to 0.529, confirming that each construct explained more than 50% of the variance in its indicators and therefore demonstrated satisfactory convergent validity.

IV.1.3 Discriminant Validity:

Discriminant validity was examined using the Heterotrait–Monotrait Ratio (HTMT). All HTMT values remained below the recommended threshold of 0.85, confirming that the three latent constructs were empirically distinct. The highest HTMT value (0.812) was observed between External Audit Quality and Auditor Professional Judgment, reflecting their conceptual proximity while remaining within the acceptable range.

Overall, the results provide adequate evidence of discriminant validity.

IV.1.4 Collinearity Assessment:

Potential collinearity among the predictor constructs was evaluated using the Variance Inflation Factor (VIF). The obtained VIF values ranged from 1.000 to 1.783, remaining well below the conservative threshold of 5.0. These findings indicate that multicollinearity was not a concern and that the estimated structural relationships could be interpreted with confidence.

IV.2 Structural Model Assessment:

Having established the adequacy of the measurement model, the structural model was evaluated using the bootstrapping procedure with 5,000 resamples.

IV.2.1 Direct Effects:

The findings indicate that Data Analytics Capabilities exerted a positive and statistically significant effect on External Audit Quality ($\beta = 0.470$, $t = 5.949$, $p < 0.001$), thereby supporting Hypothesis 1.

A positive and statistically significant relationship was also found between Data Analytics Capabilities and Auditor Professional Judgment ($\beta = 0.219$, $t = 2.281$, $p = 0.023$), providing support for Hypothesis 2.

Likewise, External Audit Quality had a positive and statistically significant effect on Auditor Professional Judgment ($\beta = 0.352$, $t = 3.868$, $p < 0.001$), supporting Hypothesis 3.

IV.2.2 Effect Size (f^2):

The practical contribution of each structural relationship was assessed using effect size (f^2). Data Analytics Capabilities demonstrated a moderate effect on External Audit Quality ($f^2 = 0.264$). In comparison, the influence of External Audit Quality on Auditor Professional Judgment was small to moderate ($f^2 = 0.121$), whereas the direct contribution of Data Analytics Capabilities to Auditor Professional Judgment was relatively small ($f^2 = 0.042$).

IV.2.3 Mediation Analysis:

The mediating role of External Audit Quality was examined through the bootstrapping procedure. The indirect effect of Data Analytics Capabilities on Auditor Professional Judgment was positive and statistically significant ($\beta = 0.165$, $t = 3.235$, $p = 0.001$). Furthermore, the 95% bias-corrected confidence interval did not include zero, providing additional evidence for the significance of the indirect effect.

The Variance Accounted For (VAF) was approximately 43%, indicating complementary partial mediation. This finding suggests that Data Analytics Capabilities enhance Auditor Professional Judgment both directly and indirectly through improvements in External Audit Quality. Accordingly, Hypothesis 4 was supported.

IV.2.4 Coefficient of Determination (R^2):

The explanatory power of the proposed model was assessed using the coefficient of determination (R^2). Data Analytics Capabilities explained 22.1% of the variance in External Audit Quality ($R^2 = 0.221$). In addition, Data Analytics Capabilities together with External Audit Quality explained 33.4% of the variance in Auditor Professional Judgment ($R^2 = 0.334$). These values indicate that the proposed model provides a meaningful level of explanatory power for both endogenous constructs.

IV.2.5 Predictive Relevance (Q^2):

Predictive relevance was examined using the blindfolding procedure. Positive Q^2 values were obtained for both External Audit Quality (0.128) and Auditor Professional Judgment (0.189), indicating that the structural model possesses satisfactory predictive relevance.

IV.2.6 Model Fit:

Overall model fit was assessed using the Standardized Root Mean Square Residual (SRMR). The estimated model produced an SRMR value of 0.074, which is below the recommended threshold of 0.08, indicating that the proposed model achieved an acceptable level of overall fit.

IV.3 Discussion of Findings:

IV.3.1 Data Analytics Capabilities and External Audit Quality:

The results support Hypothesis 1 by showing that data analytics capabilities have a positive and significant effect on external audit quality. This finding is consistent with Ilori, Nwosu, and. (2024), who reported that data analytics improves auditors' ability to identify unusual transactions, enhance fraud detection, and strengthen risk assessment procedures. It is also in line with Nguyen, Nguyen, and Le (2025), who emphasized the importance of organizational capabilities for the successful implementation of big data analytics in audit firms.

The findings suggest that audit firms with stronger data analytics capabilities are better able to process audit evidence, identify high-risk areas, and improve the quality of audit procedures. Within the Algerian context, where the adoption of advanced audit technologies is still developing, these results indicate that investment in data analytics can contribute to improving audit quality despite existing technological and organizational constraints.

IV.3.2 Data Analytics Capabilities and Auditor Professional Judgment:

The results also indicate that data analytics capabilities have a positive effect on auditor professional judgment, providing support for Hypothesis 2. This finding is consistent with the Technology Acceptance Model, which argues that technological tools improve professional performance when they are perceived as useful and are effectively integrated into daily practice. It also agrees with Habibullah, Ismail, and Hassan (2026), who found that technology adoption among auditors depends largely on perceived usefulness and ease of use.

Although the relationship is statistically significant, its effect is weaker than the effect of data analytics capabilities on audit quality. This suggests that technology alone is not sufficient to improve professional judgment. Auditors must also possess the knowledge and professional experience required to interpret analytical results and incorporate them into audit decisions.

IV.3.3 External Audit Quality and Auditor Professional Judgment:

The positive relationship between external audit quality and auditor professional judgment supports Hypothesis 3. This result is consistent with Çakıroğlu and Unver (2023), who argued that high-

quality audit procedures, sufficient audit evidence, and professional skepticism contribute to better professional judgments.

The findings indicate that improvements in audit quality provide auditors with stronger evidence and more reliable audit procedures, allowing them to make better-informed professional decisions. This highlights the close relationship between the quality of the audit process and the quality of auditors' judgments.

IV.3.4 The Mediating Role of External Audit Quality:

The mediation analysis confirms that external audit quality partially mediates the relationship between data analytics capabilities and auditor professional judgment, supporting Hypothesis 4. This finding suggests that data analytics capabilities improve professional judgment not only directly but also indirectly by enhancing audit quality.

Unlike many previous studies that examined these variables separately, the present study considered them within a single empirical model. The results therefore provide additional evidence that improvements in audit quality represent one of the main mechanisms through which data analytics capabilities strengthen auditors' professional judgment.

IV.3.5 Implications for the Algerian Auditing Environment:

The findings have several practical implications for external auditing in Algeria. Audit firms should view data analytics as a strategic capability that supports higher audit quality rather than simply as a technological tool. At the same time, continuous professional training is essential to ensure that auditors are able to interpret analytical outputs and apply them appropriately during the audit process.

The results also suggest that professional bodies and regulatory authorities can play an important role by encouraging the wider adoption of data analytics and by providing guidance for its application within the framework of the Algerian Auditing Standards (NAA 200 and NAA 700). Such efforts would support the modernization of audit practice and contribute to improving confidence in financial reporting.

V. Interpreting the Findings on External Audit Quality:

The findings presented in Section IV confirm the importance of external audit quality in explaining auditor professional judgment. These results also support the multidimensional view of audit quality discussed in the literature.

V. 1 Audit Quality as a Multidimensional Construct

Audit quality is no longer understood as a single, unified concept; rather, it is a multidimensional construct consisting of several interrelated dimensions. These include effectiveness (the ability to detect material misstatements), reliability (consistency in applying auditing standards), completeness (thoroughness of evidence collection), and a value-added dimension (the provision of insights beyond minimum regulatory requirements) (Darmawan, 2023).

The multidimensional nature of audit quality can be illustrated as follows:

Figure (3): Key Dimensions of Audit Quality



Source: Author's own elaboration based on literature

The literature highlights this multidimensional nature, noting that “audit quality is influenced by factors such as auditor tenure, audit firm size, auditor industry specialization, and audit fees, each playing a nuanced role” (Darmawan, 2023). This complexity creates significant measurement challenges, as prior studies often rely on different proxies for audit quality, which limits comparability across research.

V. 2 Critical Evaluation of Determinants: Evidence of Context-Specificity:

The audit quality literature identifies a wide range of determinants; however, a critical review shows that both the magnitude and direction of their effects vary significantly across contexts.

Auditor tenure illustrates this context dependency. While moderate tenure can enhance audit quality through accumulated client knowledge, excessively long tenure may threaten auditor independence. Moreover, the optimal tenure period differs across jurisdictions and client risk environments.

Similarly, audit firm size demonstrates a complex and non-linear relationship with audit quality. Although Big Four firms are generally associated with stronger quality control systems, evidence from emerging markets shows that smaller specialized firms may outperform larger firms in certain industries or niche contexts.

Critical Gap: Existing literature does not sufficiently explain how organizational and institutional contexts in emerging economies moderate these relationships. In the Algerian audit market, the concentration of Big Four firms in major cities and the relatively limited level of competition suggest that competitive dynamics influencing audit quality may differ significantly from those observed in developed economies.

V. 3 Technology–Quality Relationship: Mechanisms and Boundary Conditions:

Data analytics has the potential to enhance audit quality through three main mechanisms:

Scope Enhancement:

Full-population testing replaces traditional sampling approaches, thereby reducing sampling risk. However, this advantage is highly dependent on data quality and system reliability. In environments with weak data governance, comprehensive testing may instead generate large volumes of irrelevant anomalies, ultimately reducing audit efficiency.

Risk Targeting:

Predictive analytics allow auditors to focus their efforts on high-risk areas (Wang, Ferreira, & Yan, 2023). demonstrate that “integrated risk-based internal audit planning” using multi-criteria optimization “is a useful tool for internal audit planning”. However, its application in external auditing contexts remains insufficiently explored.

Evidence Quality:

Automated procedures and algorithm-based analyses provide more objective audit evidence, reducing reliance on subjective judgment. Nevertheless, this benefit assumes that auditors possess the necessary skills to correctly interpret analytical outputs. Without adequate training, there is a risk of over-reliance on system outputs or misinterpretation of analytical results.

Boundary Conditions:

The positive impact of data analytics on audit quality is contingent upon several critical conditions, including:

- (a) the quality of data infrastructure,
- (b) the technical competence of auditors,
- (c) appropriate calibration and design of analytical models, and
- (d) strong organizational support for technological change.

In the Algerian context, all of these conditions represent potential challenges that may limit the effectiveness of data analytics in improving audit outcomes.

Overall, the findings of the present study support the multidimensional perspective of audit quality discussed in the literature. The positive relationship between data analytics capabilities and audit quality suggests that technological capabilities contribute not only to audit efficiency but also to broader dimensions of audit quality, particularly within the Algerian auditing environment.

VI. Interpreting the Findings on Auditor Professional Judgment:

The empirical findings demonstrate that auditor professional judgment is influenced by both data analytics capabilities and audit quality. These findings provide additional support for the cognitive and professional dimensions discussed in the literature.

VI. 1 Professional Judgment as Cognitive–Metacognitive Integration:

Professional judgment in auditing extends beyond mere technical knowledge application. It requires the integration of cognitive capabilities (such as domain knowledge and analytical reasoning) with metacognitive skills (including self-awareness, bias recognition, and adaptive learning). This multidimensional nature introduces a level of complexity that is often insufficiently captured in literature treating judgment as a unidimensional construct.

In practice, auditors operate under conditions of uncertainty, time pressure, complex auditing standards, and continuously evolving risk environments—conditions that are rarely replicated in controlled experimental settings where much of the existing research is conducted.

VI. 2 Conflicting Evidence Regarding Technology’s Impact on Judgment:

The literature presents divergent perspectives regarding the impact of technology on auditor professional judgment:

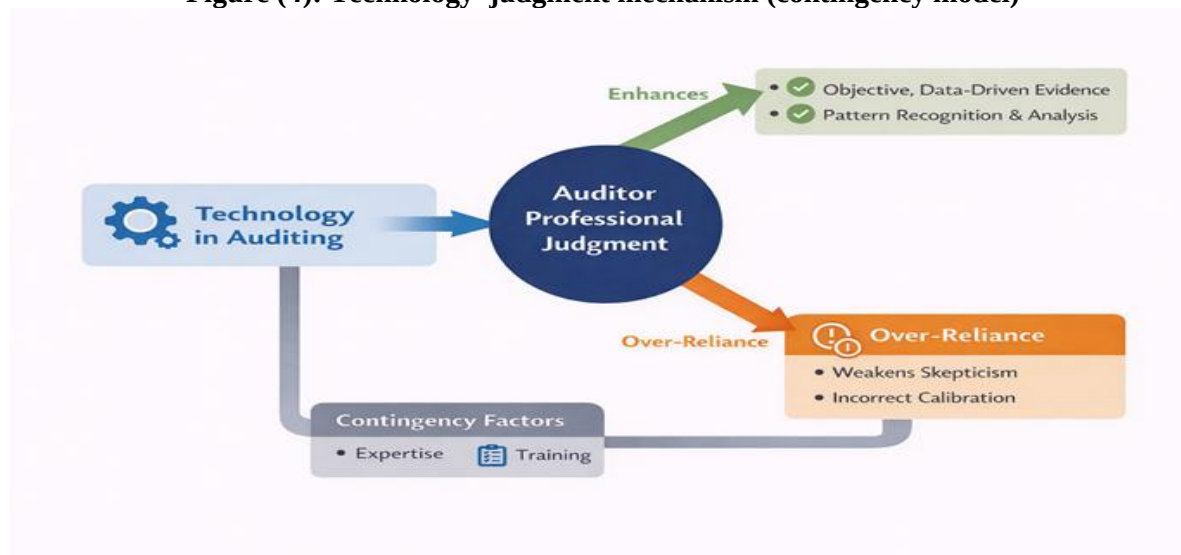
Position A (Technology-Skeptical): Excessive reliance on algorithmic outputs may weaken professional skepticism and reduce independent judgment. When auditors overly depend on analytical systems, they risk adopting a mechanistic decision-making approach that is insufficient for complex or novel audit situations.

Position B (Technology-Optimistic): Data analytics enhances professional judgment by providing objective, comprehensive evidence and reducing cognitive biases associated with heuristic decision-making. It also improves auditors’ ability to identify patterns and avoid selective attention errors.

Position C (Contingency Perspective): The effect of technology on professional judgment is contingent upon factors such as auditor expertise and system design. When supported by highly skilled auditors and well-designed systems, technology enhances judgment quality; however, under conditions of limited expertise or poorly designed systems, it may have adverse effects.

The mechanism through which technology influences auditor professional judgment can be illustrated as follows:

Figure (4): Technology–judgment mechanism (contingency model)



Source: Author’s own elaboration based on literature

Critical Interpretation: The contingency perspective appears to be the most theoretically robust; however, it remains underexplored empirically, particularly in emerging market contexts. This highlights the need for further research examining interaction effects between auditor characteristics, system design, and the broader organizational environment in shaping technology’s impact on judgment.

VI.3 Knowledge, Training, and Judgment Development: Evidence of Heterogeneous Effects

Research indicates that “scientific and professional qualifications significantly impact the efficiency and effectiveness of auditor professional judgment,” with different dimensions of qualifications contributing positively. However, closer examination reveals important nuances.

The effect of qualifications tends to be stronger for routine audit judgments than for complex, non-routine situations. In addition, these effects may diminish under conditions of high time pressure. Expertise development also requires sustained experience and deliberate practice over an extended period, suggesting that investments in professional development do not necessarily yield immediate improvements in judgment quality.

In the Algerian Context: Limited access to structured continuing professional education may further constrain the development of auditor judgment. This suggests that the adoption of data analytics alone—without parallel investment in human capital development—may not be sufficient to achieve the expected improvements in audit quality.

Taken together, these observations are consistent with the empirical findings reported in Section IV. Although data analytics capabilities improve auditor professional judgment, the results also indicate that technological tools are most effective when combined with professional expertise and continuous training.

VII. Integrating the Findings within the Algerian Auditing Context :

The results reported in Section IV highlight the close relationship between audit quality and auditor professional judgment. The following discussion places these findings within the broader theoretical context.

VII.1 Reciprocal Relationship and Feedback Mechanisms:

Although research typically models audit quality as an outcome of auditor characteristics, growing evidence suggests a reciprocal relationship between audit quality and professional judgment. High-quality audit environments—characterized by rigorous standards, comprehensive evidence evaluation, and well-documented audit processes—create reflective settings that foster the development of auditor professional judgment.

Conversely, auditors who possess advanced professional judgment contribute to higher audit quality through more accurate risk assessments and more effective evaluation of audit evidence. This mutual reinforcement generates either virtuous cycles of improvement or vicious cycles of decline, depending on the surrounding organizational and institutional conditions.

VII.2 Organizational Context as a Critical Moderator:

The findings of the present study suggest that organizational context plays an important role in shaping the relationship between data analytics capabilities, audit quality, and auditor professional judgment. Factors such as technological readiness, organizational support, and auditors' professional competencies may influence the extent to which data analytics contributes to improvements in audit quality. These considerations are particularly relevant in the Algerian auditing environment, where the adoption of advanced audit technologies is still evolving.

VII.3 Emerging Market Context Effects: Underdeveloped Theory:

Audit quality research has been largely concentrated in developed economies, where strong regulatory frameworks, high levels of Big Four dominance, and sophisticated stakeholder expectations contribute to standardized audit practices. In contrast, emerging markets present fundamentally different institutional conditions. These typically include: (1) evolving regulatory frameworks, (2) varying levels of audit market concentration that may limit competitive pressure, (3) governance structures often influenced by family ownership, (4) relatively weaker external stakeholder demands, and (5) less advanced technological infrastructure.

Despite these important differences, the literature still provides limited theoretical development on how such contextual factors influence or moderate the determinants of audit quality.

The Algerian Audit Ecosystem: As a middle-income emerging economy characterized by transitional regulatory frameworks and limited academic research in auditing, Algeria represents an underexplored context that requires more context-sensitive theoretical development and empirical investigation.

The empirical findings therefore reinforce the argument that the relationship between data analytics capabilities, audit quality, and auditor professional judgment should be interpreted within its institutional context. In the case of Algeria, organizational readiness, technological infrastructure, and professional competencies appear to influence how these relationships develop in practice.

VIII. RESEARCH CONTRIBUTIONS AND IMPLICATIONS:

VIII.1 Theoretical Contributions:

The present study contributes to the auditing literature in several ways. First, it integrates data analytics capabilities, external audit quality, and auditor professional judgment within a single empirical framework, providing evidence on the relationships among these constructs in the Algerian auditing context. Second, the study extends previous research by demonstrating the mediating role of external audit quality in the relationship between data analytics capabilities and auditor professional judgment. Third, the findings provide additional empirical support for the complementary use of Agency Theory, the Resource-Based View, the Technology Acceptance Model, and Decision-Usefulness Theory in explaining how technological capabilities influence audit outcomes in emerging economies.

VIII.2 Practical Implications:

The findings have several practical implications for audit firms and regulatory authorities in Algeria. For audit firms, the results highlight the importance of investing in data analytics capabilities while simultaneously strengthening auditors' analytical skills through continuous professional training. For professional bodies and regulators, the findings provide empirical evidence that may support the development of guidance and competency frameworks for the effective use of data analytics in external auditing. More broadly, the study suggests that successful implementation of data analytics in emerging economies depends not only on technological investment but also on organizational readiness and professional competence.

VIII.3 Methodological Contributions:

From a methodological perspective, the study provides an empirically validated measurement model for assessing data analytics capabilities, external audit quality, and auditor professional judgment using Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings also demonstrate the usefulness of PLS-SEM in examining both direct and mediating relationships within the auditing context, particularly in emerging economies where empirical evidence remains limited.

IX. CONCLUSION:

This study examined the impact of data analytics capabilities on external audit quality and auditor professional judgment among external auditors in Algeria. The results provide empirical evidence that data analytics capabilities contribute positively to both external audit quality and auditor professional judgment. They also show that external audit quality has a positive effect on professional judgment and partially mediates the relationship between data analytics capabilities and auditor professional judgment. These findings suggest that improving data analytics capabilities can strengthen audit processes while supporting more reliable professional judgments.

The study also contributes to the existing literature by examining these relationships within a single empirical model. While previous studies have generally focused on individual relationships between data analytics, audit quality, or professional judgment, the present study considered these variables together and demonstrated the mediating role of external audit quality. In doing so, it provides empirical evidence from the Algerian auditing environment, where research on data analytics in external auditing remains limited.

From a practical perspective, the findings indicate that investment in data analytics should be accompanied by continuous professional development so that auditors are able to interpret and use analytical evidence effectively. The results also highlight the role of professional bodies and regulatory authorities in supporting the wider adoption of data analytics through training initiatives and practical guidance that is consistent with the Algerian Auditing Standards.

The study is subject to several limitations. The use of a cross-sectional design does not allow changes to be examined over time, and the findings are based on the perceptions of external auditors operating in Algeria. In addition, the use of convenience sampling may limit the generalizability of the findings beyond the study setting.

Future research may examine these relationships using longitudinal data, include additional organizational and technological variables, or validate the proposed model in other institutional settings. Comparative studies involving different emerging economies may also provide a broader understanding of how data analytics capabilities influence audit quality and auditor professional judgment under different regulatory and organizational conditions.

- Appendices:

Appendix A. Measurement Items

Table (2) : Measurement Items

Construct	Code	Measurement Item
Data Analytics Capabilities (DAC)	DAC1	Our audit firm integrates data from multiple sources for audit purposes.
	DAC2	We use advanced data processing tools to analyze financial datasets.
	DAC3	Data governance practices ensure data accuracy and reliability.
	DAC4	Machine learning techniques are used in audit procedures.
	DAC5	Analytical tools help identify unusual patterns in financial data.
	DAC6	Our systems support real-time monitoring of client transactions.
	DAC7	Continuous auditing techniques are applied in our engagements.
	DAC8	Data analytics improves audit efficiency.
	DAC9	Data analytics enhances audit effectiveness.
	DAC10	Our firm invests in data analytics technologies.
	DAC11	Staff are trained to use data analytics tools.
	DAC12	Analytical outputs are integrated into audit decisions.
	DAC13	Data analytics supports fraud detection.
	DAC14	Data analytics improves risk identification.
External Audit Quality (AQ)	AQ1	Audit procedures cover a large proportion of transactions.

Construct	Code	Measurement Item
Auditor Professional Judgment (APJ)	AQ2	Audit testing is comprehensive and thorough.
	AQ3	Risk assessment is accurate and systematic.
	AQ4	Audit teams effectively identify high-risk areas.
	AQ5	Fraud detection procedures are effective.
	AQ6	Analytical tools improve fraud detection capability.
	AQ7	Audit evidence is reliable and sufficient.
	AQ8	Audit documentation is complete and clear.
	AQ9	Audit reports reflect true financial conditions.
	AQ10	Audit conclusions are well supported by evidence.
	AQ11	Audit processes comply with professional standards.
	AQ12	Quality control procedures are strictly applied.
	AQ13	Audit outcomes enhance stakeholder confidence.
	AQ14	Audit work adds value beyond compliance requirements.
	APJ1	I can accurately assess audit risks.
Auditor Professional Judgment (APJ)	APJ2	I evaluate audit evidence critically.
	APJ3	I apply professional skepticism in audit tasks.
	APJ4	I make consistent audit decisions.
	APJ5	I effectively determine materiality levels.
	APJ6	I adapt my judgment to complex audit situations.
	APJ7	I integrate multiple sources of evidence in decisions.
	APJ8	I avoid cognitive biases when making judgments.
	APJ9	I justify my audit decisions clearly.
	APJ10	I make timely audit decisions under pressure.
	APJ11	I evaluate alternative explanations before concluding.
	APJ12	My judgments are aligned with audit standards.

All items were measured using a five-point Likert scale (1 = Strongly Disagree, 5 = Strongly Agree).

Source: Author's own elaboration

Appendix B. Sources of Measurement Scales:

Table (3): Sources of Measurement Scales

Construct	Source
Data Analytics Capabilities	Ilori et al. (2024); Wassie & Lakatos (2024)
External Audit Quality	Bahar (2026); Darmawan (2023)
Auditor Professional Judgment	Bahar (2026); Çelebi Çakıroğlu & Tuncer Unver (2023)

Source: Author's own elaboration

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