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The Role of Big Data Analytics in the Digital Transformation of Auditing Practices: The Case of Tunisia

Abstract

Purpose: This study pursues two main objectives through an analysis of auditors' perceptions: first, to assess the current state of digital transformation adoption in auditing practices; and second, to identify both the challenges and opportunities associated with the implementation of Big Data Analytics (BDA) within the Tunisian audit profession.

Study design/methodology/approach: Using a qualitative methodology, we conducted semi-structured interviews and thematic analysis.

Sample and data: A purposive sample of 24 Tunisian auditors was taken from across the hierarchical levels. Data was collected via face-to-face and online channels.

Results: The study reveals a fragmented understanding of digital transformation among Tunisian auditors, with notable disparities between local firms and international networks. While BDA is perceived as a catalyst for innovation—enhancing risk detection, audit precision, and operational efficiency—its adoption faces barriers such as skill gaps, high costs, and organizational resistance. Despite these hurdles, respondents acknowledged BDA's strategic value, though they emphasized that professional judgment remains irreplaceable in audit decision-making.

Originality/value: This pioneering study of BDA adoption in Tunisia provides empirical insights into the views of auditors on the technological benefits and implementation barriers of BDA, as well as the evolving role of human expertise. The study's findings contribute to academic debate and inform digital transformation strategies in emerging economies.

Research limitations/implications: To harness BDA, Tunisian audit firms must overcome conservatism, invest in skills and infrastructure, and secure data. This study provides practical guidance to support digital transition efforts.

Keywords: Digital Transformation, Big Data Analytics, Auditing Practices, Tunisia.

JEL classification: M42, O33, D83

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الملخص

دور تحليلات البيانات الضخمة في التحول الرقمي لممارسات التدقيق: بحث تطبيقي في تونس

سوسن الكسيبي

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جامعة منوبة

تونس

هدف الدراسة: تسعى الدراسة إلى تحقيق هدفين رئيسيين من خلال تحليل تصورات المدققين: أولاً، تقييم الوضع الراهن لاعتماد التحول الرقمي في ممارسات التدقيق؛ وثانياً، تحديد التحديات والفرص المرتبطة بتطبيق تحليلات البيانات الضخمة (BDA) في مهنة التدقيق في تونس.

تصميم/ منهجية/ طريقة الدراسة: اعتمدت الدراسة منهجية نوعية، حيث أجريت مقابلات شبه منظمة، وتحليل البيانات باستخدام التحليل الموضوعي.

عينة الدراسة وبياناتها: تكونت عينة الدراسة من 24 مدققاً تونسياً من مستويات وظيفية مختلفة، تم اختيارهم بطريقة هادفة. وجمعت البيانات من خلال قنوات مباشرة وأخرى عبر الإنترنت.

نتائج الدراسة: كشفت الدراسة عن فهم مجزأ للتحول الرقمي بين المدققين التونسيين، مع وجود تباينات ملحوظة بين الشركات المحلية والشبكات الدولية. في حين يُنظر إلى تحليل البيانات الضخمة على أنه محفز للابتكار - يعزز الكشف عن المخاطر ودقة التدقيق والكفاءة التشغيلية - فإن اعتماده يواجه عوائق مثل الفجوات في المهارات والتكاليف المرتفعة ومقاومة المنظمات. على الرغم من هذه العقبات، أقر المشاركون بالقيمة الاستراتيجية لتحليل البيانات الضخمة، لكنهم أكدوا أن الحكم المهني لا يزال لا غنى عنه في اتخاذ قرارات التدقيق.

أصالة الدراسة: تُعد هذه الدراسة من الدراسات الرائدة حول اعتماد تحليلات البيانات الضخمة في تونس، إذ تقدم رؤى تجريبية حول آراء المدققين بشأن الفوائد التكنولوجية، ومعوقات تنفيذ هذه التحليلات، فضلاً عن الدور المتطور للخبرة البشرية. كما تسهم النتائج في إثراء النقاش الأكاديمي، وتقديم مؤشرات داعمة لاستراتيجيات التحول الرقمي في الاقتصادات الناشئة.

حدود الدراسة وتطبيقاتها: للاستفادة من تحليل البيانات الكبيرة، ينبغي على شركات التدقيق التونسية التغلب على المحافظة، والاستثمار في تطوير المهارات والبنية التحتية، وتعزيز أمن البيانات. وتوفر هذه الدراسة إرشادات عملية لدعم جهود التحول الرقمي في القطاع.

الكلمات المفتاحية: التحول الرقمي، تحليل البيانات الضخمة، ممارسات التدقيق، تونس.

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Introduction

In an era characterized by rapid data proliferation and automation, audit firms face an imperative to integrate advanced technologies to maintain audit quality, efficiency, and relevance (Alotaibi et al., 2021; Zhang & Balia, 2024). This strategic shift reflects a broader digital transformation of the auditing profession (Abdelwahed et al., 2025; Alrashidi et al., 2022; Kend & Nguyen, 2020; Lohapan, 2021), driven by the demands technological advancements associated with the era of 'Audit 4.0 (Al-Hattami et al., 2021; Dai & Vasarhelyi, 2016).

It is important to distinguish among the technological tools currently available to auditors. While CAATs automate well-established procedures on structured datasets (Ghani et al., 2022), and Audit Data Analytics (ADA) applies targeted analytical techniques for verification and assurance (Ditkaew & Suttipun, 2023), Big Data Analytics (BDA) is distinguished. BDA is uniquely characterized by its capacity to process massive, varied volumes of both structured and unstructured data, thereby enabling unprecedented predictive and prescriptive analytics (Enholm et al., 2022; Polak, 2021).

Rather than simply automating existing workflows, BDA fundamentally transforms the audit paradigm by enabling exhaustive analysis of entire data populations, thereby moving beyond traditional sampling methods (Jamwal et al., 2021; Salijeni et al., 2019).

Despite its transformative potential, the adoption of BDA remains uneven, particularly in emerging economies such as Tunisia. In these contexts, auditors frequently encounter significant constraints, including significant financial constraints, underdeveloped digital infrastructure, and a critical shortage of specialized skills (Abdelwahed et al., 2024).

While the bulk of existing research predominantly focuses on large international firms, there is limited research exists exploring local audit environments (Abdelwahed et al., 2024; Thottoli et al., 2022). This oversight is critical, as the challenges of digital transformation are often exacerbated in resource-constrained settings.

Despite extensive international research, predominantly conducted in developed countries, highlighting the transformative potential of BDA (Enholm et al., 2022), its adoption in understudied contexts, particularly Tunisia, remains inadequately understood. Tunisia's unique environment, characterized by a dualistic

auditing profession (local firms versus international networks), a distinct Francophone regulatory heritage, and an active national digital strategy (2021–2025) aimed at modernizing its digital ecosystem (Ministry of Communication Technologies and Digital Transformation, 2021), presents a rich and unique setting for analyzing differentiated adoption dynamics. The Tunisian context thus transcends mere geographical novelty, offering profound insights. The profession's dualistic structure, juxtaposing international networks with local firms, creates distinct institutional pressures that uniquely shape BDA adoption. While Anglo-Saxon systems typically emphasize mimetic and normative pressures fostering innovation through market and professional networks (DiMaggio & Powell, 1983; Wang & Cuthbertson, 2018), Tunisia presents a contrasting dynamic. Here, coercive pressures from the Tunisian Order of Chartered Accountants (OECT) play a more prominent role, often leading to local firms' imitation of the Big Four often appears more symbolic than genuinely strategic. This institutional configuration, a legacy of the historically French-influenced legal and professional model, tends to orient BDA adoption toward compliance and formal conformity rather than organizational efficiency. These specificities, combined with a national digital strategy (2021–2025) and persistent infrastructure constraints, also shed light on auditors' perceptions of usefulness and ease of use, as conceptualized in the Technology Acceptance Model (TAM). Indeed, these perceptions are strongly influenced by the actual availability of digital infrastructure.

Thus, the Tunisian case offers a pertinent analytical through which to understand how institutional logics, professional dynamics, and individual perceptions interact in the adoption of technology within emerging economies. Beyond providing an additional empirical illustration, it refines our understanding of isomorphism mechanisms in Francophone emerging contexts, where compliance logics may prevail over efficiency logics in the adoption of advanced technologies.

This study aims to address this gap by examining the adoption of emerging technologies, particularly BDA, within the Tunisian audit profession. Specifically, the study seeks to elucidate the current extent of technological integration, the perceived benefits and obstacles, and the comparative dynamics between international Big Four networks and local firms.

To achieve these objectives, a qualitative approach was adopted, involving semi-structured interviews with 24 auditors representing diverse firm types, including representatives of the Big Four.

The remainder of this article is structured as follows: Following this introduction, next section presents the theoretical and literature frameworks. After that details the research methodology, while next section presents the empirical results followed by a discussion of these findings, and the paper concludes with a summary of conclusions and implications.

Theoretical and Literature Framework

This section provides a critical analysis of the extant literature on digital transformation (DT) and Big Data Analytics (BDA) in auditing. It begins by defining key concepts and scrutinizing their influence on audit quality, concurrently identifying associated benefits and challenges within a global context. Beyond a descriptive review, this analysis delves into conceptual tensions in the literature by integrating both foundational works and recent empirical studies.

Furthermore, it elucidates how various theoretical lenses, particularly institutional theory, explain how external and internal pressures influence on technology adoption within audit firms. Collectively, these perspectives aim to enhance our understanding of technology-driven changes in auditing and underscore the specific research gaps that this study endeavors to address in the Tunisian context.

Conceptual Framework

This conceptual framework defines digital transformation (DT) and Big Data Analytics (BDA) within the auditing domain, analyzing how these emerging technologies are fundamentally reshaping audit practices, from a global perspective.

Digital transformation

Digital transformation is broadly understood as the strategic integration of digital technologies to fundamentally enhance an organization's performance, competitiveness, and adaptability (Vial, 2019; Westerman et al., 2014).

Within the auditing profession, this digitalization transcends mere process automation; it profoundly reconfigures traditional methodologies and value creation (Amghar et al., 2023). Indeed, digitalization has proven effective in optimizing assessment processes and significantly reducing risk in both public and private company audits (Ouhoud & El Ouafa, 2025; Vial, 2019).

While numerous studies underscore the imperative of holistic digital tool in-

tegration to enhance efficiency and agility (Amghar et al., 2023; Chapco, 2018), significant tensions persist. These tensions arise notably between pressures for innovation driven by technology and the critical need to maintain methodological rigor and professional skepticism within auditing (Elhamma & El-Moumane, 2023; Zine El Abidine & El Kadiri, 2022).

Recent studies highlight a gap between theoretical potential and practical implementation, especially evident in emerging economies. In these contexts, a confluence of institutional, cultural, and resource-related factors creates unique barriers to adoption. This inherent tension between rapid technological advancement and deeply entrenched professional traditions constitutes a central and underexplored challenge, which this study specifically investigates within the Tunisian audit context.

Big data analytics (BDA), big data (BD) and audit data analytics (ADA)

Digital auditing increasingly relies on Big Data (BD) and Big Data Analytics (BDA). The sheer volume, velocity, and variety (the ‘3Vs’) of BD fundamentally challenge traditional auditing tools and methods (Chen et al., 2012). BDA, in turn, empowers auditors to derive sophisticated predictive and prescriptive insights from these complex datasets (Davenport & Dyché, 2013). Its importance continues to grow as the scope of data expands beyond structured financial information to encompass vast amounts of unstructured and non-financial data. While BD refers to datasets too large for conventional systems, BDA encompasses the advanced methods and tools used to analyze these datasets to improve organizational performance. Consequently, BDA is increasingly applied in financial audits to detect patterns, identify anomalies, and extract relevant insights (AICPA, 2017; Almarafi et al., 2025; Ghani et al., 2022).

Adopting Big Data Analytics (BDA) is profoundly transforming the auditing profession, impacting audit processes, auditor competence, and even audit fees. However, the integration of BDA presents challenges, notably substantial technology costs, the need for extensive staff training, and the difficulty in recruiting adequately skilled staff. The precise effect on audit fees remains a subject of debate, with some studies reporting higher fees due to increased initial costs, while others emphasize potential long-term efficiency gains that could ultimately lead to lower costs (Abdelwahed et al., 2025).

Concurrently, Audit Data Analytics (ADA) specifically applies analytical techniques to structured data for risk detection and fraud identification (Appelbaum et al., 2017; Eilifsen et al., 2020).

Collectively, ADA and BDA significantly enhance efficiency, effectiveness, and client segmentation. Recent literature reviews indicate that research on Big Data Analytics (BDA) in auditing generally focuses on three areas: its transformative impact on the audit process, the factors promoting or hindering its adoption, and its implications for auditor training (Abdelwahed et al., 2024). Despite this growing interest, however, adoption remains uneven in developing countries largely attributable to a persistent lack of skills, inherent technological limitations, and organizational resistance (Perera & Abeygunasekera, 2021). Furthermore, the integration of artificial intelligence (AI) holds the potential to further enhance BDA's capabilities, enabling even sophisticated analyses and real-time decision-making (Yoon, 2020; Zhang et al., 2020). However, empirical studies examining the unique challenges, adoption barriers, and contextual dynamics of BDA within Tunisia remain scarce. This significant research gap is precisely what this study aims to address.

Audit practices

Audit Evolution: Navigating the Continuum Between Tradition and Digital Transformation Auditing has evolved significantly from a primarily compliance-focused verification process to become a vital component of corporate governance and assurance (Watts & Zimmerman, 2006). While this historical progression is well-documented, a critical examination reveals persistent tensions between conventional audit approaches and the imperatives of digital transformation. This ongoing shift is increasingly framed within the paradigm of 'Audit 4.0,' a concept driven by the disruptive technologies of the Fourth Industrial Revolution.

Despite significant evolution in its methods and tools, the fundamental objective of auditing—to provide independent assurance—remains unchanged (Dai & Vasarhelyi, 2016). Nevertheless, Audit 4.0 is expected to profoundly reshape the profession by automating routine procedures, substantially broadening the audit scope, significantly reducing audit time, and ultimately enhancing the overall quality of assurance (Dai & Vasarhelyi, 2016; Rustam et al., 2024).

Within Tunisia, the audit profession exhibits a pronounced technological divide: international firms (Deloitte, KPMG, PwC, and EY) actively invest in advanced digital tools and data-driven methodologies (Deloitte, 2016; El Haiba & Maimoun, 2024; KPMG, 2016; PwC, 2017), whereas local firms contend with severe structural constraints and markedly limited technological resources. This dichotomy raises fundamental questions regarding equitable access to innovation and professional development within the Tunisian context.

The integration of Big Data Analytics (BDA) is transforming audit practices by enhancing analytical precision and anomaly detection capabilities (Vasarhelyi et al., 2015). However, this rapid digital evolution concurrently introduces significant tensions; while automation boosts efficiency (Issa & Kogan, 2014; Kokina & Davenport, 2017), it also challenges traditional audit judgement. Furthermore, it highlights the growing need for technical skills (Bonsón & Bednárová, 2019) and ethical frameworks for data privacy (Salijeni et al., 2019). These challenges are particularly acute in Tunisia's evolving audit landscape.

Regulatory Framework for Auditing Practices the International Standards on Auditing (ISAs) distinguish between the setting of objectives and the planning, risk assessment and analysis involved in execution. Although ISAs 240 and 500 encourage the use of data analytics for fraud detection, they offer little guidance on BDA (Appelbaum et al., 2017; Vasarhelyi et al., 2015). This regulatory gap contrasts to the growing use of BDA for anomaly detection, which highlights potential inconsistencies in audit methodology across countries (IAASB, 2019; Salijeni et al., 2019; Vasarhelyi et al., 2015).

In emerging contexts such as Tunisia, these challenges are amplified. The Tunisian Order of Chartered Accountants (OECT) aligns with international standards and promotes adaptation to technological change (Appelbaum et al., 2017). However, empirical data reveal a gap between international standards and local capabilities, creating strategic and regulatory challenges for audit modernisation.

Theoretical Framework

This study uses an integrated theoretical framework that combines three complementary perspectives to analyse the adoption of big data analytics (BDA) in Tunisian auditing.

This multi-theoretical approach is necessary because the adoption of BDA involves interconnected individual, organisational, and institutional dimensions that cannot be fully captured by a single theory.

The Technology Acceptance Model (TAM) (Davis et al., 1989) focuses on individual perceptions, such as perceived usefulness and ease of use (Gefen et al., 2003). However, TAM alone is insufficient in contexts such as Tunisia, where organisational and institutional factors strongly influence individual perceptions. Although positive perceptions, training and support are critical for BDA adoption (Ferri et al., 2021b; Muthia & Siti, 2023; Pedrosa et al., 2020; Qasim & Kharbat, 2020; Usman et al., 2022; Vărzaru, 2022; Vasarhelyi & Halper, 2019), these factors are also affected by wider institutional forces.

Institutional theory (DiMaggio & Powell, 1983) addresses this limitation by emphasising that regulatory, normative, and mimetic pressures influence organisational adoption (Wang & Cuthbertson, 2015). In the Tunisian context, for instance, the regulatory framework of the Tunisian Order of Chartered Accountants (OECT) and isomorphic pressures exerted by international and local audit firms create distinct adoption pathways. This theory helps to explain why similar technologies diffuse differently across organisational fields.

Innovation diffusion theory (Rogers, 2003) complements this framework by explaining how adoption varies according to firm size and openness. Larger firms adopt BDA more quickly in order to improve efficiency (Zhang et al., 2020). This perspective sheds light on the structural constraints that differentiate the adoption capabilities of large international firms from those of smaller local practices.

Integrating these theories provides a multi-level analytical framework. TAM examines micro-level perceptions, institutional theory addresses macro-level pressures, and diffusion theory captures meso-level organisational dynamics. Each theory offers a different way of interpreting Tunisian data. Together, they move beyond technological determinism, revealing how global technological imperatives are interpreted, adapted, and sometimes contested within Tunisia's unique institutional and professional context. In summary, these three approaches inform the coding process by focusing on three dimensions — individual perceptions, institutional pressures, and organisational capabilities — and by structuring

the interpretation of empirical data at micro (individual), meso (organisational), and macro (institutional) levels.

Empirical Studies of Digital Transformation in the Auditing Profession

Recent studies have examined how auditing adapts to technologies such as BDA, revealing global, regional and firm-level patterns. Despite the growing interest in emerging economies, Tunisia remains under-explored.

Empirical approaches to technology adoption

Although BDA enhances audit accuracy, adoption faces persistent barriers including skills gaps, resistance to change and limited technological infrastructure (Ferri et al., 2021a; Vasarhelyi & Halper, 2019). Studies in Jordan and other countries emphasise the importance of training and organisational support (Alshurafat et al., 2021). Conversely, research conducted in Saudi Arabia and Sri Lanka has emphasised the impact of regulatory pressures on technology adoption. This suggests that similar factors could influence the adoption of BDA in Tunisia, although there is currently a lack of empirical evidence to support this claim (Perera & Abeygunasekera, 2021). The capacity for adoption also depends on firm size, in line with contingency theory (Fiedler, 1964).

Emerging technologies such as BDA require advanced technical competencies and significant cultural adaptation (Ferri et al., 2021a; Usman et al., 2022). In contrast, newer tools generally require only incremental training, with minimal disruption to established practices (Vasarhelyi & Halper, 2019). Consequently, the former face stronger adoption barriers, while the latter primarily aim to improve organisational performance and efficiency.

Impact on auditor practices and role

Technological advances enable more proactive and continuous audits (Bonsón & Bednárová, 2019). Automation improves efficiency and provides access to advanced analytics (Issa & Kogan, 2014; Kokina & Davenport, 2017; Liew et al., 2022), but it also raises ethical concerns, particularly with regard to algorithmic bias and data privacy (Salijeni et al., 2019). Auditors now increasingly need Information Technology (IT) and data skills. BDA improves the reliability and quality of audits (Vasarhelyi & Halper, 2019) but requires ongoing methodological adaptation (Ferri et al., 2021a; Usman et al., 2022). When successfully implemented,

BDA can enhance transparency, efficiency, and risk management although these benefits are often moderated by organisational and contextual factors (Moffitt & Vasarhelyi, 2013).

Challenges and opportunities in digital integration

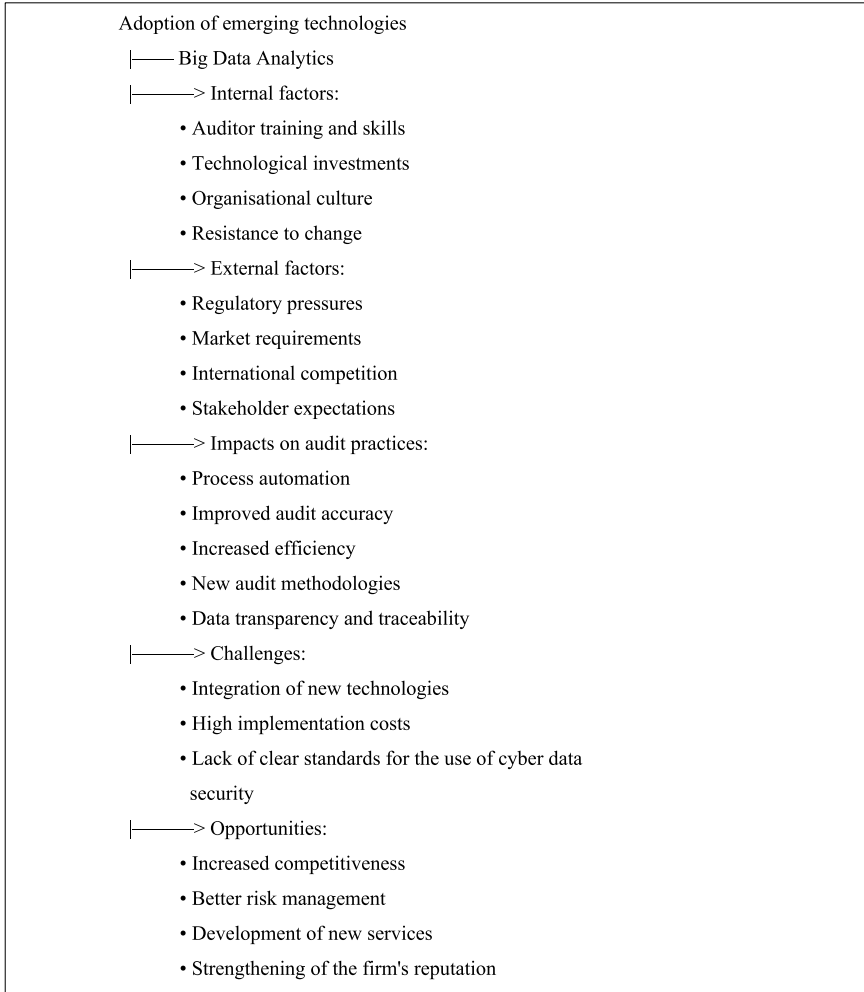
Empirical studies reveal that the adoption of BDA presents a dual reality of significant barriers and transformative potential. Persistent challenges include skills gaps, costs, resistance, cybersecurity and ethical concerns (Bonsón & Bednárová, 2019; Perera & Abeygunasekera, 2021; Thottoli et al., 2022), which are complicated by high training costs and competing skill demands (Dubey & Gunasekaran, 2015).

However, emerging technologies offer opportunities in the form of improved audit quality and reduced risk. CAATs save time and BDA enables comprehensive transaction analysis beyond sampling (KPMG, 2014). This empirical evidence suggests that the landscape of adoption is complex, requiring a balance of challenges and opportunities.

Conceptual Synthesis

Although the technological aspects of Big Data Analytics (BDA) are well documented globally, its socio-institutional dimensions are understudied, particularly in transitional contexts such as Tunisia. Existing research largely overlooks the influence of institutional logics and professional identities on the adoption of auditing technology, creating a significant theoretical gap that extends beyond mere geographical underrepresentation.

This study addresses this dual challenge by developing an integrated framework (Figure 1) that combines institutional theory (DiMaggio & Powell, 1983) and diffusion of innovation theory (Rogers, 2003). The framework examines how external pressures, such as regulatory requirements and professional standards, interact with internal organisational dynamics, such as auditor competencies.



Source: Author

Figure 1: Conceptual Diagram

Rather than merely documenting factors that influence adoption, this research investigates the sociotechnical negotiations that characterise BDA implementation. Moving beyond technological determinism, it explores how global technological imperatives are interpreted, adapted, and sometimes resisted within local audit traditions and institutional arrangements (Kokina & Davenport, 2017; Moffitt & Vasarhelyi, 2013).

Research Methodology

This study adopts an interpretivist paradigm (Perera & Abeygunasekera, 2021) with a constructivist approach. The aim is to explore the perceptions, experiences, and challenges of Tunisian auditors regarding the adoption of Big Data Analytics (BDA). This philosophical stance assumes that reality is socially constructed through individual interpretations, shaped by professional and organisational contexts.

Due to the exploratory nature of the study, following Perea et al. (2021), a qualitative design was adopted to capture the complexity and context-specific realities of digital transformation in audit practices, as recommended by Perea et al. (2021). Semi-structured interviews were employed to enable auditors to express their experiences freely while remaining guided by a flexible thematic framework (Adeoye-Olatunde & Olenik, 2021; Kurki & Järvenpää, 2024). This approach is particularly well-suited to understanding how auditors perceive the opportunities and constraints related to BDA adoption within their professional environment.

Data Collection and Interview Protocol

Semi-structured interviews were used to collect qualitative data focusing on BDA and auditing practices. This method offers both depth and flexibility, enabling participants to express their views freely while maintaining thematic coherence.

Our interview guide (Appendix 1), developed from an extensive literature review, explored three main areas: Auditors' general perceptions of digital transformation, capturing various definitions and experiences. The second area covered the adoption and use of BDA tools, including their adoption levels, the difficulties of integration, and the associated challenges and opportunities of digital evolution. This section also addressed the role of academic and professional training, required skills, and regulatory influences.

The interview guide begins with demographic questions to contextualise responses and identify trends including respondents' profiles (gender, educational qualifications, years of professional experience, among other characteristics). This facilitates comparison across participant profiles between profiles and perceptions of digital transformation. A pilot interview ensured clarity and thematic relevance.

All interviews were conducted in French, with participants' consent, and transcribed using audio transcription software. Triangulation was applied by comparing notes and coded transcripts. A synthesis sheet in English was then sent to

participants for validation, to ensure clarity and prevent misinterpretation. Micro-soft Excel was used to organise and cross- code the data during thematic analysis.

Participant Characteristics

Participants were selected using purposive and snowball sampling methods, following Abakar Moussa and Yilmaz (2023) to ensure diversity in firm size, experience, and organisational role.

Initial contacts were made at the Economic and Accounting Studies Seminar ‘SEEC 2024’ Seminar (which generally brings together professors, researchers, and students to discuss themes related to accounting, auditing, finance, and applied economics) at the Higher Institute of Accounting and Business Administration (IS-CAE), (five participants) followed by additional recruitment through professional networks (16 participants) and LinkedIn connections (three participants). The focus was on managers who were identified at the event and identified as experienced professionals within their firms. Each participant was contacted by phone to explain the study and arrange interviews. Some participants also referred other professionals.

Snowball referrals were used to identify additional auditors who met the inclusion criteria of holding a nationally recognized chartered accountancy qualification and being actively involved in auditing processes in Tunisia. A total of 24 professionals participated in the study, including 15 men and 9 women.

All participants hold nationally accredited qualifications and occupy various roles, including six junior auditors, eight senior auditors, four audit managers, one director and five audit partners. They came from three international networks, 11 Big Four firms and 10 local firms. Their experience ranges from one to over 20 years. Nine participants have less than 10 years’ experience (including three recent graduates with short-term internships), eight have between 11 and 20 years’ experience, and seven have more than 20 years’ experience. Data saturation was reached after 20 interviews, as confirmed by a further four interviews that reinforced thematic stability (De Santis & D’Onza, 2021).

Each interview lasted between 20 and 73 minutes with an average duration of 53 minutes. All participants were informed of the purpose of the study, assured of their right to anonymity and voluntary participation, and informed of their right to withdraw at any stage. Table 1 and related figures summarise the participants’ demographics, showing participant diversity, including a male majority and varied levels of IT proficiency.

Table 1
Participants' Characteristics

Character-istics		Participants	Fre-quency	Total In %
Gender	Male	R1/R4/R5/R6/R7/R8/R9/R14/R15/R16/R17/R20/R22/R23/R24	15	62.5
	Female	R2/R3/R10/R11/R12/R13/R18/R19/R21	9	37.5
Age	21-40 Years	R5/R8/R10/R11/R12/R17/R18/R19/R23/R24	10	41.66
	+40 Years	R1/R2/R3/R4/R6/R7/R9/R13/R14/R15/R16/R20/R21/R22	14	58.3
Years of Experi-ence	0-10 years	R5/R8/R10/R11/R12/R17/R19/R23/R24	9	37.5
	11-20 years	R2/R3/R7/R13/R15/R16//R18/R21	8	33.33
	+20 years	R1/R4/R6/R9/R14//R21/R22	7	29.16
Degrees	National	all	24	100
	International	R17	1	4.16
	Professional Development	R1/R2/R3/R4/R6/R8/R9/R10/R15/R16/R17/R20	12	50
	Local Firm	R5/R6/R9/R12/R13/R14/R15/R19/R20/R21	10	41.6
Type of Firm	International Firm	R2/R4/R7	3	12.5
	Big 4	R1/R3/R8/R10/R11/R16/R17/R18/R22/R23/R24	11	45.83
	Junior Auditor	R5/R8/R12/R19/R23/R24	6	25
Current Level of Responsi-bility	Senior Auditor	R2/R10/R11/R13/R14/R16/R20/R21	8	33.33
	Audit Manager	R4/R7/R17/R18	4	16.66
	Audit Director	R3	1	4.16
	Audit Partner	R1/R6/R9/R15/R22	5	20.83
	Basic	R2/R4/R5/R6/R8/R9/R12/R13/R16/R18/R19/R21	12	50
IT Skills	Advanced	R1/R3/R7/R10/R11/R14/R15/R17/R20/R22/R23/R24	12	50
	International		0	0
	specific		0	0

Interview Procedure

Between 14 February and 17 March 2024, six interviews were conducted (four face-to-face and two online via Messenger or email). One invitee declined participation, citing limited knowledge. Two additional online interviews (via WhatsApp or email) were held between 29 April and 2 May 2024 followed by a further sixteen interviews through professional networks to confirm data saturation.

The interview script (Ben Slama et al., 2021; Bryman, 2016; Fontana & Frey, 2000; Kenno et al., 2017; Lillis, 1999) was divided into three sections, which covered the following: (1) understanding of BDA; (2) its usefulness in auditing and (3) the challenges encountered and emerging opportunities.

All interviews were recorded with consent and transcribed verbatim using dedicated transcription software, to ensure accuracy and completeness. To enhance data credibility, a triangulation process was applied during transcription and initial coding. A summary sheet synthesised in French and translated into English was sent to participants for review and validation of their responses.

Coding Process / Data Analysis

Following Miles and Huberman (2003), a structured coding process was employed. An initial code list was generated and refined throughout the study to align with the research questions.

Summary sheets organised the transcripts into analytical categories and identified key insights which were then validated by the respective participants to prevent misinterpretation. The coding process began with identifying main themes and sub-themes, and sub-categories were created based on interview content and the research questions (Perera & Abeygunasekera, 2021).

The coding was manual and thematic rather than literal, allowing for nuanced interpretation. Contradictions and clarifications were coded individually. The scheme was regularly refined, with some codes being deleted or redefined. Examples of the coding structure and the corresponding mind map are provided in Appendix 2.

To ensure reliability, the same data were recorded at the end of the study, yielding a Kappa coefficient of 0.77 (77%), indicating good agreement between raters ($0.61 \leq \kappa < 0.80$).

Excel facilitated organisation and comparison across interviews. A triangulation procedure and a synthesis sheet translated from French to English ensured

both conceptual clarity and interpretive accuracy.

Credibility, Validity, and Reflexivity

To ensure methodological rigour, several strategies were employed. Peer debriefing sessions were conducted among the researchers to refine the coding framework and verify thematic coherence (Flowers et al., 2025; Nowell et al., 2017). Reflexive notes were maintained throughout the analysis to acknowledge and minimise researcher bias. Ethical procedures, triangulation, and iterative coding collectively enhanced the credibility, transparency, and overall trustworthiness of the findings.

Results

This study explores the perceptions of 24 Tunisian auditors regarding the influence of emerging technologies, particularly Big Data Analytics BDA, on audit practices.

Digital Transformation: Understanding, Usefulness, Integration and Drivers

To examine the perceived usefulness of digital transformation, it is important to understand how auditors conceptualise and interpret digital technologies in their professional context.

Understanding and usefulness of digital transformation

The majority of respondents (45.4%) associate digital transformation with the adoption of advanced technologies (R1, R4, R6, R7, R9, R12, R13, R14, R15, R16 and R19), while 33.3% view it as the gradual integration of digital technologies. R3 explained: *“It’s a very broad concept. In short, I think that in the field of auditing, we have to follow the trends of the companies we audit.”* R2 noted that the use of digital practices, such as remote working, had accelerated due to the pandemic. R11 stated: *“Digital transformation can be defined as the use of digital tools to automate repetitive tasks in the audit process.”*

Among Big Four auditors, 72.7% view digital transformation positively based on their experience. This view is also shared by 80% of auditors at local firms.

Perceived ease of integration and its determinants

Of the 24 respondents, only two provided clear answers regarding the ease of integration. R20 described it as: *“a bit slow”*, while R22 found it: *“very, very easy and simple. You just need the means.”*

Most participants discussed factors indirectly that influence integration. Academic training was highlighted by six respondents (25%). R8 noting that it: *“Ac-*

ademic training enables professionals to easily use and master new technological tools in audit assignments, as it provides them with the necessary skills.” Continuing professional training and hands-on experience were cited by 12 respondents (50%), with R17 underlining: *“technological maturity, auditor training, and client adaptability.”*

The involvement of IT professionals was emphasised by six respondents (25%), as R14 affirmed: *“The involvement of IT professionals is essential for successful integration.”* In addition, 11 respondents (45.8%), including six from local firms, cited infrastructure and resource availability. R21 noted that: *“In a modest company, this can pose a significant challenge.”* Eight respondents from Big Four firms (72.7 %) (R3, R10, R16, R17, R18, R22, R23 and R24) indicated that integration tends to be easier in their context due to structured training programs. R3 explained: *“Specific training courses are set up to update international standards and integrate new digital tools.”* Finally, several participants linked ease of integration to the technical maturity of both firms and clients. R22 noted that: *“clear audit processes facilitate modernisation and consequently the integration of digital tools.”* Tables 2 and 3 summarise these responses by firm type and the main determinants of ease of integration.

Table 2
Understanding of Digital Transformation by Type of Firm

Type of firm	Total Respondents	Main Definitions (Perceptions)	%	Experience and Perception	%	Ease of Integration	%
Big 4	11	* Adoption of new technologies (R1+R16) (2R)	18.18	* Positive perception with experience: Personal development (R1 + R3 + R10 + R11 + R16 + R17 + R18 + R22) (8R)/	72.72	* Depends on academic training (R8+R10+R23) (3R)	27.27
						* Depends on continuing training / experience (R1+ R8+R17+R18+ R23+R24) (6R)	54.54

Cont. Table 2
Understanding of Digital Transformation by Type of Firm

Type of firm	Total Respondents 24	Main Definitions (Perceptions)	%	Experience and Perception	%	Ease of Integration	%
Réseau International	3	* Process of integrating or incorporating digital technologies (R8+R10+R17+R18+R22+R23)(6R)	54.54	* Positive perception of DT even without experience (R8+R11+R18+R21 (4R)	36.36	* Depends on resources (R3+R8+R11+R17+R18) (5R)	45.45
		* Adaptation to the profession and keeping up with trends (R3) (1R)	9.09	* Nuanced perception	0	* Depends on the involvement of IT professionals (R16) (1R)	9.09
		* Automating repetitive tasks using digital tools (0R)	0				
		*Improvement or enhancement of quality (transparency, efficiency, and accuracy) and cost reduction (R1 + R8 + R10 + R11 + R16 + R17 + R22 + R23 + R24) (9R)	81.81	* No experience: newly graduated (R23+R24) (2R)	18.18	* By obligation (through mandatory training) (R3+ R10 + R16 + R17 + R18 + R22 + R23 + R24) (8R)	72.72
		* Adoption of new technologies (R4+R7) (2R)	66.66	* Positive perception with experience: Personal development (R2+R4+R7) (3R)	100	* Depends on academic training (R4) (1R)	33.33
						* Depends on continuing training / experience (R2) (1R)	33.33

Cont. Table 2
Understanding of Digital Transformation by Type of Firm

Type of firm	Total Respondents 24	Main Definitions (Perceptions)	%	Experience and Perception	%	Ease of Integration	%
Local	10	* Process of integrating or incorporating digital technologies (R2) (1R)	33.33	* Positive perception of DT even without experience (0R)	0		
				* Nuanced perception (0R)	0	* Depends on resources (R2+R4) (2R)	66.66
		* Improvement or enhancement of quality (transparency, efficiency, and accuracy) and cost reduction (R4) (1R)	9.09			* Depends on the involvement of IT professionals (R2+R7) (2R)	66.66
				* No experience: newly graduated (0R)	0	* By obligation (through mandatory training) (0R)	0
		* Adoption of new technologies (R6 + R9 + R12 + R13 + R14 + R15 + R19) (7R)	70	* Positive perception with experience: Personal development (R6 + R9 + R12 + R13 + R14 + R15 + R20 + R21) (8R)	80	* Depends on academic training (R6+R21), (2R)	20
				* Positive perception of DT even without experience (R13+R21) (2R)	20	* Depends on continuing training / experience (R6+R9+R12+R13+R14) (5R)	50
		* Process of integrating or incorporating digital technologies (R21) (1R)	10	* Nuanced perception (R2+R14) (2R)	20	* Depends on resources (R6+R9+R15+R21) (4)	40

Cont. Table 2
Understanding of Digital Transformation by Type of Firm

Type of firm	Total Respondents 24	Main Definitions (Perceptions)	%	Experience and Perception	%	Ease of Integration	%
		* Improvement or enhancement of quality (transparency, efficiency, and accuracy) and cost reduction (R6 + R12 + R13 + R14 + R15) (5R)	50			* Depends on the involvement of IT professionals (R12+R13+ R14) (3R)	30
				* No experience: newly graduated (R19) (1R)	10	* By obligation (through mandatory training) (R9+ R13) (2R)	20

Table 3
Summary of Respondents' Understanding of Digital Transformation

Themes	Count	Percentage
Adoption of new technologies	11/24	45.83%
Process of integrating digital technologies	8/24	33.33%
Adaptation to the profession and keeping up with trends	4/24	16.66%
Automation of repetitive tasks using digital tools	3/24	12.5%
Improvement or enhancement of quality (transparency, efficiency, and accuracy) and cost reduction	15/24	62.5%
Respondents who did not mention quality improvement in their understanding of digital transformation	9/24	37.5%
Positive perception with professional experience	19/24	79.16%
Positive perception of digital transformation without experience	6/24	25%
Nuanced perception	2/24	8.33%
No experience: newly graduated	3/24	12.5%
Ease of integration depends on: academic training	6/24	25%
Ease of integration depends on continuing education and experience	12/24	50%

Cont. Table 3
Summary of Respondents' Understanding of Digital Transformation

Themes	Count	Percentage
Ease of integration depends on resources	11/24	45.83%
Ease of integration depends on the involvement of IT professionals	6/24	25%
Ease of integration due to obligation	10/24	41.66%

Respondents' Perceptions of BDA Use, Integration Level and Associated Difficulties

This section explores auditors' views on Big Data Analytics (BDA), focusing on its level of integration and related challenges. It also highlights differences and similarities between professionals in Big 4 firms and local firms, in line with Lugli Bertacchini (2022).

Perceptions of the use of Big Data Analytics and tools: Comparative insights into Big 4 and local firms

Of the 24 respondents, 14 (58%) work for one of the Big Four (11 respondents) or an international network (three respondents). Among the Big Four auditors, six out of eleven (54.5%) reported an increase in the use of BDA. R4 says: *"There is a growing adoption of BDA. Although not fully integrated into all audit processes, we increasingly use data analytics to enrich our engagements."*

However, some respondents (R8, R17 and R18) reported limited use, which implicitly reflects the situation of local firms in Tunisia rather than that of the Big 4. R17 adds: *"I have no visibility on the level of adoption... it mainly concerns data extraction and analysis."* This point was confirmed by 50% of respondents from local firms. Conversely, 12.5% of respondents (R10 and R11 from Big 4 firms, and R12 from a local firm). View BDA as an emerging technology in the field of auditing. R10 states: *"I think we're still a long way from using big data in auditing, especially as we lack the necessary skills."*

While respondents highlighted varying levels of BDA usage, their perceptions also revealed differences in the tools used. Network-specific tools were predominant in Big 4 firms, with 72.7% (8 out of 11) of respondents using them. Meanwhile, 45.5% used internally developed platforms. Data analysis software was also widely used, with 100% of Big 4 respondents and 80% of respondents from

local firms using it. R3 illustrated: *“Yes, it’s the tool we use extensively for analysing accounting records. It’s a tool specific to our international firm.”*

R1 explained: *“For example, EY has developed the “EY X” platform to help with revenue auditing. This demonstrates the technological infrastructure of large firms.”*

Perceived level of integration in audit processes and difficulties: Comparative insights between the Big 4 and local firms

Of the respondents, 42% were Big 4 firm representatives (six respondents, or 54.5%), and four respondents (R6, R12, R13 and R20) were from local firms. These respondents confirmed that the integration of BDA remains limited. R21, a respondent from a local firm, pointed out that advanced tools such as Hadoop and Spark are rarely used, suggesting that BDA integration remains at an early stage. The majority of respondents (87.5%) link the use of BDA to compliance with quality control standards. However, half of the participants believe that adoption is currently restricted to specific audit tasks due to the limited availability of suitable tools (R13 and R20).

All respondents from international firms (R2, R4 and R7) confirmed that BDA integration is currently underway. As R4 notes: *“Our audit methodology is starting to integrate these tools, but.....”* This integration is progressing, yet only 30% of auditors from local firms (R9, R15 and R21) believe that BDA has been effectively integrated within their company. Conversely, none of the professionals from Big4 firms expressed the perception that integration is still under development.

When discussing the level of integration, respondents often highlight practical difficulties they have frequently encountered when implementing BDA. The majority (66.7%), including 81.1% of Big 4 auditors and 50% of local firm auditors, consider a lack of specific user skills to be a major obstacle. Conversely, only 12.5% of respondents (R1, R8 and R24), all of whom were from the Big 4, attributed the difficulty of use to a lack of appropriate training. Another key challenge relates to limited financial and technical resources and was raised by 29.2 % of respondents (including R3, R10, R11, R18 and R22 from Big 4; R9 and R21 from local firms). R3 explained that: *“You always have to make additional investments... it becomes part of continuing professional development”*, while R18 confirmed that funding and skills shortages remain the main hurdles to successful integration. R9 points to financial constraints: *“Small organisations suffer enor-*

mously from the lack of resources, as these investments are very costly.” Finally, 20.8% of respondents (including R5, R9 and R12 from local firms) either did not identify any particular difficulties or did not address the issue. As R12 stated: “We can’t answer this because these tools have not been widely adopted yet.”

In summary, large firms are making progress, but are facing training and skills gaps. Local firms appear to face greater constraints related to technological resources and tool availability.

Table 4 summarises the main difficulties identified by respondents in integrating Big Data Analytics into audit practices, according to firm type and frequency.

Table 4
Respondents’ Perceptions of BDA in Auditing

Sub-Themes	Categories	Count (N = 24)	Percentage (%)
Level of adoption and use	Increasing level	11	45.83
	Limited/low level	8	33.33
	Emerging level	3	12.5
BDA tools used	Data analysis software	21	87.5
	Network-specific tools	12	50
	Developed platforms	7	29.16
Level of integration in audit processes	Limited level	10	41.66
	Complex level	7	29.16
	Under development	6	25
Challenges encountered	Challenges related to specific skills	16	66.66
	Challenges related to resource scarcity	16	66.66
	Challenges related to appropriate training quality	3	12.5
	Challenges not addressed	5	20.83

Challenges and Opportunities: Comparative Insights between Big 4 and Local Firms

After examining perceptions of digital transformation and BDA integration, as well as the levels of integration and the main analytical tools employed in audit practices in Tunisia, the findings reveal that each category of audit firm (Big Four firms, international networks, and local firms) exhibits distinct adoption patterns.

Although BDA is becoming more widely used across the profession, its level of integration remains uneven due to the major challenges faced by audit firms.

The main challenges

As summarised in Table 5, several key barriers affect the digital transformation of audit practices in Tunisia, specifically with regard to BDA.

Table 5
Main Challenges as Perceived by Professionals by Firm Type

Firm Type	Total	Main Challenges	%	% of Total Respondents
Big 4	11	Training/awareness level of students, staff, and managers (R1+R3+R8+R10+R11+R16+R17+R18+R21) (9R)	81.81	37.5
		professional competencies and experience (experience and skills) (R1+R3+R8+R10+R11+R16+R17+R18) (8R)	72.72	33.33
		Availability of human and technical resources (R1+R8+R10+R11+R16+R17+R18+R22+R23+R24) (10R)	90.90	45.83
		Resistance to cultural change (R1+R3+R8+R10+R11+R16+R17+R18+R22+R23) (10R)	90.90	45.83
		Data security (R1+R3+R8+R10+R11+R16+R17+R22+R23+R24) (10R)	90.90	45.83
		Size of the investment (significance) (R1+R10+R11+R16+R17+R18) (6R)	54.54	25
		Regulatory compliance (R1+R17+R18+R22+R23) (5R)	45.45	20.83
		Adaptability/proactivity and agility (ability to adapt to a constantly changing reality) (R3+R24) (2R)	18.18	8.33

Cont. Table 5
Main Challenges as Perceived by Professionals by Firm Type

Firm Type	Total	Main Challenges	%	% of Total Respondents
International Firm	3	Degree of digitization of existing data (digitalized process or not, ERP, etc.) (R17+R22+R23) (3R)	27.27	12.5
		Balance between costs and benefits (R3+R11) (2R)	18.18	8.33
		Training/awareness level of students, staff, and managers (R2+R4+R7) (3R)	100	12.5
		professional competencies and experience (experience and skills) (R2+R7) (2R)	66.66	8.33
		Availability of human and technical resources (R4+R7) (2R)	66.66	8.33
		Resistance to cultural change (R2+R4) (2R)	66.66	8.33
		Data security (R4) (1R)	33.33	4.16
		Size of the investment (significance) (0R)	0	0
		Regulatory compliance (R2) (1R)	33.33	4.16
		Adaptability/proactivity and agility (ability to adapt to a constantly changing reality) (R2+R4) (2R)	66.66	8.33
Local Firm	10	Degree of digitization of existing data (digitalized process or not, ERP, etc.) (0R)	0	0
		Balance between costs and benefits (R2) (1R)	33.33	4.16
		Training/awareness level of students, staff, and managers (R6 + R9 + R12 + R13 + R14 + R15 + R20 + R21) (8R)	80	33.33
		professional competencies and experience (experience and skills) (R9 + R12 + R13+R14+R15) (5R)	50	20.83
		Availability of human and technical resources (R6+R9+R12+R13+R14+R15+R21) (7R)	70	29.16

Cont. Table 5
Main Challenges as Perceived by Professionals by Firm Type

Firm Type	Total	Main Challenges	%	% of Total Respondents
		Resistance to cultural change (R6+R12+R13+R14) (4R)	40	16.66
		Data security (R6+R9+R13+R14+R15+R21) (6R)	60	25
		Size of the investment (significance) (R6+R9+R12+R13+R15+R21) (6R)	60	25
		Regulatory compliance (R6+R9+R12+R13+R15+R21) (6R)	60	25
		Adaptability/proactivity and agility (ability to adapt to a constantly changing reality) (R15+R20+R21) (3R)	30	12.5
		Degree of digitization of existing data (digitalized process or not, ERP, etc.) (R14+R15+R21) (3R)	30	12.5
		Balance between costs and benefits (R6+R14) (2R)	20	8.33
Total	24			

Lack of training, professional competencies and experience and additional costs

The effective adoption of BDA also depends on auditors' intrinsic qualities, which complement their technical skills. These qualities were identified as essential for the successful use of BDA tools by 72.7% of Big 4 respondents and 50% of local firm respondents. Continuing professional development remains essential for developing the technical competencies required for BDA adoption. As R6 points out: "*Mastering the tool requires training and skills*," a view confirmed by R1, who emphasises the importance of ongoing professional development.

Availability of human and technical resources

A lack of human and technical resources also emerges as a major barrier. Among Big 4 respondents, 90.9% reported limitations in human and technical resources, with 63.6% specifically citing a shortage of human resources. Similarly, 70% of respondents from local firms highlight this constraint. As R9 explains: "*Financial and human resources are a major problem, especially for local firms*."

Adapting to new realities and levels of digitalisation

Another challenge concerns adapting to evolving digital environments and digitising client data. This is particularly true for several auditors, including local firms (R14, R15, R20 and R21), as well as 27.3% of Big 4 auditors. These groups have highlighted the difficulty of adapting their practices to new realities and of digitising client data. As R17 mentioned: “*Integrating BDA into audit processes requires significant adjustments.*”

Resistance to change

Almost 70% of respondents identified resistance to change as a major challenge, particularly among Big 4 auditors (90.9%), compared to 40% of those in local firms. As R7 emphasised: “*The culture of change is the main challenge for any adoption.*”

Data security and high investment costs

Of the 24 respondents, 17 expressed concerns about data security and cyber risks. Specifically, 90.9% of Big 4 auditors perceived data security as a key issue. However, only respondents R1, R10, R11, R16, R17 and R18 specifically highlighted the need for additional investment in big data analytics (BDA) and cybersecurity. By contrast, 60% of respondents from local firms mentioned data security, with the same proportion emphasising the need for additional investment.

Regulatory compliance

Regulatory compliance requirements were reported as a constraint by 45.4% of Big 4 auditors and 60% of local firm auditors. R22 observed: “*Challenges include data quality, regulatory compliance and fraud detection.*”

In summary, the principal challenges associated with BDA adoption in Tunisian audit firms include training gaps, costs, resistance to change, resource limitations and regulatory compliance issues.

Opportunities

Despite the challenges, respondents identified clear opportunities and benefits of BDA, summarised in Table 6.

Table 6
Opportunities as Perceived by Professionals by Firm Type

Firm Type	Total	Opportunities Offered	%	% of Total Respondents
Big 4	11	Added value compared to traditional practices (R1+R3+R8+R10+R11+R16+R17+R18+R22+R23+R24) (11R)	100	45.83
		Development of new skills, staying up to date and competitive (R1+R3+R10+R11+R16+R17+R22+R24) (8R)	72.72	33.33
		Provides better time management (R8+R10+R11+R18+R23) (5R)	45.45	20.83
		Provides better data and risk management (R1+R3+R8+R10+R11+R16+R17+R18+R22+R23) (10R)	90.90	45.83
		Automation of repetitive tasks (R3+R8+R11+R18+R22) (5R)	45.45	20.83
		Offering additional services (R10) (1R)	9.09	4.16
		Harmonization of working methods (R3) (1R)	9.09	4.16
International Network	3	Added value compared to traditional practices (R2+R7) (2R)	66.66	8.33
		Development of new skills, staying up to date and competitive (R2+R4) (2R)	66.66	8.33
		Provides better time management (R2+R7) (2R)	66.66	8.33
		Provides better data and risk management (R2) (1R)	33.33	4.16
		Automation of repetitive tasks (0R)	0	0
		Offering additional services (R4) (1R)	33.33	4.16
		Harmonization of working methods (R4) (1R)	33.33	4.16
Local Firm	10	Added value compared to traditional practices (R6+R9+R12+R13+R14+R15+R20+R21) (8R)	80	33.33
		Development of new skills, staying up to date and competitive (R12+R13+R14+R15+R21) (5R)	50	20.83

Cont. Table 6
Opportunities as Perceived by Professionals by Firm Type

Firm Type	Total	Opportunities Offered	%	% of Total Respondents
		Provides better time management (R6+R13+R14+R20) (4R)	40	16.66
		Provides better data and risk management (R6+R12+R15+R21) (4R)	40	16.66
		Automation of repetitive tasks (R14) (1R)	10	4.16
		Offering additional services (R9+R15+R21) (3R)	30	12.5
		Harmonization of working methods (R1+R17+R18+R22+R23) (5R)	50	20.83
Total	24			

Developing new skills and competitiveness

Almost 90% of auditors, including eight from the Big 4, believe that digital tools are essential for developing new skills and maintaining competitiveness. R24 states: “*Digital technologies offer opportunities such as improved audit efficiency and accuracy while enabling the development of new skills and greater value creation for clients.*” R16 adds that these technologies help auditors to remain competitive and complete tasks more quickly.

Improving audit quality

Process automation and advanced data analysis can significantly improve audit quality. All respondents from Big 4 firms (100%) associate BDA with enhanced value creation and improvements in audit quality, particularly in terms of service reliability and transparency. Meanwhile, 80% of respondents from local firms also highlight its positive impact. As R9 notes: “*If we manage to set up a well-digitised firm, its quality will be extremely good, and if we manage to digitise well, we’ll all become rich.*”

Standardising methods

Auditors also reported that digital tools facilitate the standardisation of audit procedures, reducing human error and ensuring consistency. R4 stated: “*Firms can use digital tools and data analytics to standardise their audit processes, leading to greater efficiency and fewer errors.*”

Enhancing data, time and risk management

The majority of Big 4 respondents (90.9%) perceive improvements in data and risk management thanks to BDA, compared to 40% of local firm respondents. Around 40% of auditors from all types of firms also report improvements in time management.

Additional services and client loyalty

A few respondents (one from a Big 4 firm and three from local firms) emphasised their particular interest in this opportunity. They indicated that the BDA could enable them to diversify their audit services and strengthen client relationships.

In summary, the results reveal significant differences in BDA adoption and integration between Big 4 firms and local firms, as well as differences in auditors' perceptions. These differences will be analysed in the following section.

Discussions

Digital Transformation: Understanding, Usefulness, Integration and Drivers

The findings reveal that the majority of Tunisian auditors associate digital transformation with the adoption of advanced technologies and the modernisation of audit processes. This perception is consistent with previous studies that have emphasised the multifaceted nature of digital transformation (Alotaibi et al., 2021; Kend & Nguyen, 2020).

However, the data reveal an important analytical discrepancy: although digital transformation is widely perceived as a necessary evolution, its effective integration remains gradual and uneven across firms. This discrepancy between strategic recognition and operational adoption suggests that the determinants of technological adoption cannot be reduced to individual perceptions of usefulness (TAM), but instead unfold within a complex interplay of organisational capabilities and institutional pressures (DiMaggio & Powell, 1983).

An analysis of disparities between firms, informed by diffusion of innovation theory (Rogers, 2003), suggests that the Big Four act as “early adopters,” benefiting from normative and mimetic pressures stemming from their international networks. Local firms, by contrast, primarily face coercive pressures from the Tunisian Order of Chartered Accountants (OECT) yet lack the resources for substantive adoption.

Therefore, digital transformation in Tunisia is not merely a technological imperative but a process influenced by interconnected institutional and organisational dynamics. The asymmetry of isomorphism pressures highlighted here sheds light on the differentiated adoption mechanisms in Francophone emerging economies and offers a unique contribution to the literature on technology adoption.

Use and Integration of Big Data Analytics in Audit Practices: Perceptions, Integration Levels and Challenges

The results reveal significant differences in BDA adoption rates depending on the firm type. Big Four firms and international network-affiliated firms demonstrate higher levels of integration, supported by dedicated training programs and proprietary analytical tools. These findings are consistent with those of Alles (2015) and Salijeni et al. (2019) who emphasise that international audit firms are leading adopters of data-driven auditing due to their greater access to technological infrastructure and specialised expertise. In contrast, local Tunisian firms primarily rely on basic software such as Excel or Power BI, with limited exposure to advanced analytical platforms. Quantitatively findings indicate that 90.9% of respondents from Big Four firms reported extensive BDA adoption, compared to only 45.4% of respondents from local firms.

Analysed through the lens of Diffusion of Innovation Theory (Rogers, 2003), this divergence confirms that larger organisations have the absorptive capacity necessary to integrate complex innovations, whereas smaller firms face structural constraints that delay adoption. It also highlights an underlying tension: despite mounting institutional pressure, the adoption gap does not appear to be narrowing.

From an institutional perspective, these variations can be explained by normative and mimetic pressures. While Big Four firms act as technological leaders, influenced by international standards and client expectations, local firms tend to imitate these practices when resources permit.

However, our findings reveal a limitation to this mimetic process: imitation is often partial and superficial due to the inability to replicate the conditions under which large firms adopt new practices. This observation contributes to existing research on mimetic isomorphism (DiMaggio & Powell, 1983) by demonstrating that, in contexts where resources are limited, imitation can result in the adoption of symbols or formal practices without substantive changes to audit procedures when resources are limited.

Nevertheless, the findings also coercive pressures, such as client demands and regulatory expectations, also influence adoption decisions highlight the persistence of barriers such as insufficient training and resource limitations, which restrain full integration. This corroborates previous findings that the adoption of technology in auditing is frequently uneven and influenced by contextual factors (Alles, 2015; Appelbaum et al., 2017). Coercive pressures, such as client demands and regulatory expectations, also act as a moderating factor, particularly for local firms trying to catch up.

Without adequate normative support, the combination of coercive and mimetic pressures creates a paradoxical situation in which local firms are encouraged to adopt BDA despite lacking the means to implement it effectively. These findings enhance understanding of technology adoption dynamics in emerging economies.

Challenges and Opportunities

Building on the differences in BDA integration identified across firm types identified in previous sections, this section examines the persistent challenges and opportunities that persist in shaping the adoption of technology within Tunisian audit firms. The findings suggest that such adoption depends more on differentiated organisational capabilities and asymmetric institutional pressures than on purely technical factors.

Challenges and determinants of adoption

The results show that local firms face major barriers to adopting BDA, particularly in the form of obstacles related to costs, training and resistance to change. These constraints are not solely technical in nature, but also reflect a lack of normative support and organisational capacity, thereby limiting the effective institutionalisation of analytical technologies.

For instance, 72.7% of respondents from the Big Four and 50% of those from local firms identified auditors' intrinsic qualities, such as aptitude and adaptability, as critical factors in the effective use of BDA. This difference suggests that, even when technological tools are available, their adoption depends heavily on human capital and organisational maturity. This is consistent with the findings of Warren et al. (2015), who emphasise the importance of individual competencies in technological adoption.

From an institutional theory perspective, this configuration reveals an asymmetry in pressure mechanisms. Coercive pressures (notably those emanating from

the OECT and client requirements), as well as mimetic pressures associated with imitating the Big Four, encourage formal BDA adoption. However, the absence of structured normative pressures, such as professional guidelines, institutionalised training programmes and explicit sectoral standards, limits the genuine and sustainable appropriation of analytical tools.

This imbalance among these kinds of pressures is a specific characteristic of the Tunisian context and builds on prior research (Appelbaum et al., 2017; Warren et al., 2015) by showing that in an emerging economy, human and organisational infrastructure is necessary for substantive rather than merely symbolic adoption.

Opportunities and perceived benefits

Despite these challenges, auditors recognise the opportunities associated with adopting BDA. Respondents from Big Four firms emphasised efficiency gains, automation, and improved audit quality, which were also highlighted by Rozario and Vasarhelyi (2018). Using data analytics was perceived as enhancing accuracy, transparency, and client value by taking a more evidence-based approach to auditing. All respondents from the Big Four emphasised the added value of behavioural analysis. Meanwhile, 80% of respondents from local firms acknowledged its positive effect on audit quality.

From a TAM perspective, these positive perceptions of BDA's usefulness should theoretically encourage its adoption. However, the persistent gap in adoption levels between Big Four and local firms, despite a shared recognition of the benefits, reveals that perceived usefulness alone is insufficient without adequate organisational capabilities. This observation modifies the TAM in the context of an emerging economy.

Furthermore, BDA offers opportunities to develop new skills and improve competitiveness. As respondents noted, technological tools contribute to service diversification and client loyalty. These insights align with global trends indicating that data-driven auditing enhances both assurance quality and strategic positioning (Warren et al., 2015). While only a minority of respondents specifically noted service diversification (one from a Big Four firm and three from local firms), their focus on this area suggests potential benefits that warrant further exploration.

Analysed through the lens of Rogers' (2003) diffusion of innovation theory, this evolution suggests that local firms are beginning to recognise the competitive

advantages of BDA. This may accelerate future adoption as the benefits become more tangible and mimetic pressures intensify.

Overall, the discussion highlights that, although the Big 4 are considerably advanced in integrating BDA, local firms are also gradually progressing towards digital transformation. This reflects the broader institutional and developmental dynamics within Tunisia's audit sector, where technological ambitions must be balanced against limited resources and evolving professional practices.

This situation underscores a significant finding of this study: the disparity between technological aspirations and practical organisational capabilities, a phenomenon particularly prevalent in developing economies such as Tunisia.

Furthermore, despite the adoption of emerging technologies such as BDA, human judgement remains essential to the auditing profession. While these tools facilitate data collection, analysis and presentation, they cannot replace the expertise required for interpreting results and making informed decisions. As R2 notes: *"The human aspect remains dominant in audit engagements... professional judgement always comes into play."* This aligns with the views of Knechel and Salterio (2016) and Lillis (1999), who emphasise the ongoing importance of professional judgement and expertise in auditing.

This finding is consistent with TAM and highlights that technology should support, rather than substitute, decision-making. In the Tunisian context, where institutional pressures encourage the adoption of technology without ensuring its effective implementation, safeguarding professional judgement is crucial to prevent mere symbolic adoption.

Conclusions and Implications

This study explores the influence of adopting emerging technologies, particularly Big Data Analytics (BDA), on auditing practices in Tunisia. The study aims to assess the current level of digital transformation, within audit firms and to identify the main challenges and opportunities associated with integrating BDA into auditing activities.

The findings reveal that, although auditors recognise the potential of digital transformation to enhance efficiency, transparency, and quality, its implementation remains uneven. Larger firms, particularly the Big Four, have access to more advanced resources, infrastructure, and training, enabling them to integrate BDA tools more effectively into their audit methodologies.

In contrast, smaller and regional firms continue to face financial constraints, a lack of expertise, and infrastructural weaknesses that impede their progress. These disparities are consistent with prior research on technological maturity, which associates adoption with organisational capacity and resource availability.

From a theoretical standpoint, this study enriches the existing literature on the adoption of technology in emerging contexts such as Tunisia, showing that it is shaped not only by internal readiness but also by institutional pressures and contextual constraints. The findings support the Diffusion of Innovations Theory, demonstrating that access to resources and organisational agility play a decisive role in adoption. They also confirm insights from institutional theory, as many firms report that they mainly adopt digital tools to meet client expectations and regulatory demands rather than out of intrinsic motivation.

Similarly, the limited translation of perceived usefulness into consistent practice reflects the assumptions of the Technology Acceptance Model, which emphasises the need for adequate training and ease of use prior to full integration. In this sense, the Tunisian case adds empirical depth to existing frameworks by highlighting how institutional and environmental factors can outweigh individual attitudes in shaping technological behaviour.

From a practical standpoint, the study offers valuable insights for audit firms and professional bodies. One of the main challenge for large firms is maintaining technological leadership while ensuring that automation does not undermine professional judgement or ethics.

Local firms can help bridge the skills gap and enhance competitiveness by investing in continuous training, strengthening partnerships, and gradually adopting affordable digital solutions.

Professional associations, such as the Tunisian Order of Chartered Accountants, could play a crucial role by supporting digital upskilling initiatives and facilitating access to shared platforms for data analytics. Collaboration between academia and professional practice should also be encouraged to foster innovation and prepare auditors for the new digital landscape. Respondents to this study consistently emphasised that successful transformation requires a cultural shift towards innovation, adaptability and collaboration alongside technological investment.

At the policy level, the results highlight the importance of creating a supportive digital ecosystem. Many small firms continue to face connectivity issues that

hinder the effective use of BDA tools. Improving digital infrastructure across the country would promote fairer access to technology and reduce the urban–rural divide. Regulators should also modernise auditing standards to integrate data-driven approaches in line with international norms, ensuring that technology complements audit judgement rather than replacing it. Policy incentives, such as grants or tax relief for firms investing in digital tools, could further stimulate adoption and help to level the playing field between international and local firms.

Despite these insights, the study has certain limitations. The sample size was relatively small (24 auditors, primarily from Greater Tunis), which may limit the generalisability of the findings. Additionally, conducting interviews online interviews may have limited the depth and diversity of responses. Given these limitations, the results should be interpreted with caution and considered an initial contribution to this developing field.

Future research could build upon these findings by conducting large-scale or comparative studies across different regions and countries in the Middle East and North Africa (MENA) area. Including internal auditors or consultants in the scope of the study would also provide a more comprehensive view of technological integration. Furthermore, examining other emerging technologies, such as blockchain and artificial intelligence, could provide further insight into the ongoing evolution of the audit profession in the digital era.

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Appendix 1

Interview Guide

This interview guide explores the state of digital transformation within the Tunisian audit profession, with particular emphasis on AI and big data analytics.

General Introduction

Digital transformation has revolutionised many sectors, including the audit profession in Tunisia. This interview guide explores the current state of digital transformation in auditing, focusing on the use of artificial intelligence (AI) and big data analytics. It also examines the role of academic training and the effectiveness of audit practices overall.

Each section addresses a specific aspect of digital transformation in auditing. It begins with a general introduction to frame the discussion and is followed by detailed questions that delve deeper into each theme. The aim is to gather information on the use of these technologies in auditing, identify the conditions necessary for their integration and the challenges associated with their use, and assess the role of academic training.

Ultimately, the objective is to assess the impact of these technologies on audit effectiveness and anticipate future developments in auditing in Tunisia.

1 - Understanding Digital Transformation in Auditing

Introduction: Before we explore the details of digital transformation in Tunisia's audit profession, please briefly discuss your general definition of this concept.

- How would you define digital transformation in the context of auditing in Tunisia?
- Could you briefly describe your experience in the audit field and your interest in digital transformation?
- How easy do you think it would be to integrate digital transformation into traditional audit processes in Tunisia?

2 - Big Data Analytics in Auditing

Introduction: Another important aspect of digital transformation is the use of big data analytics in auditing.

- What is the level of adoption of Big Data Analytics in audit practices in Tunisia?
- Which Big Data tools are used?
- How are Big Data Analysis tools integrated into audit processes in Tunisia?
- To what extent does the use of Big Data Analytics enhance risk identification?
- How difficult is it to use big data in the Tunisian audit context?
- What impact does it have on audit quality?

3 - Challenges and Opportunities

Introduction: In this article, we will explore the challenges and opportunities related to digital transformation in the audit profession in Tunisia.

- What are the main challenges encountered when implementing digital transformation in auditing in Tunisia, particularly with regard to data quality and security?
- What opportunities does digital transformation offer professionals, and how can they make the most of the opportunities provided by new technologies?
- What are the main challenges you face in your daily audit work in Tunisia?
- How do you envisage the future of digital transformation in the audit profession in Tunisia?
- What opportunities does digital transformation bring to the audit profession in Tunisia, particularly with regard to developing new skills and creating added value for clients?
- In what ways do regulations and professional standards influence the adoption and use of digital technologies in auditing in Tunisia?

Conclusion

In summary, please reflect on the overall impact of digital transformation on the audit profession in Tunisia.

- What advice would you give to Tunisian audit professionals considering integrating more digital technologies into their work?
- Are there any other points you would like to raise about digital transformation in auditing in Tunisia or any related issues you would like to discuss?

Demographic Information

1 - Type of Audit Firm

- ☐ Independent firm
- ☐ Firm belonging to an international network
- ☐ Big 4 Firm

2 - Gender

- ☐ Male
- ☐ Female

3 - Age

- ☐ 0-20
- ☐ 21-40
- ☐ Over 40

4 - Years of Experience

- ☐ 0-10
- ☐ 11-20
- ☐ Over 20

5 - Current Professional Responsibility Level

- ☐ Junior Auditor
- ☐ Senior Auditor
- ☐ Audit Manager
- ☐ Audit Director
- ☐ Audit partner or Associate Partner

6 - Academic and Professional Qualifications and Certifications in Auditing

- ☐ National
- ☐ International
- ☐ Continuing education

7 - IT Qualification

- ☐ Basic
- ☐ Advanced
- ☐ International
- ☐ Specialized

Appendix 2

Coding of Themes and Sub-Themes

Theme 1: Understanding of Digital Transformation

- Sub-Theme 1.1: Definition
- Sub-Theme 1.2: Experience and Perception
- Sub-Theme 1.3: Determinants of Ease of Integration

Theme 2: Big Data Analytics in Auditing

- Sub-Theme 2.1: Level of Use
- Sub-Theme 2.2: Tools Used
- Sub-Theme 2.3: Perception of Level of Integration in Audit Processes
- Sub-Theme 2.4: Perception of Difficulties in Use

Theme 3: Challenges and Opportunities

- Sub-Theme 3.1: Challenges Encountered
- Sub-Theme 3.2: Emerging Opportunities

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