

RESEARCH

Open Access



# Assessing the potential integration of large language models in accounting practices: evidence from an emerging economy

Ahmad A. Toumech<sup>1\*</sup>

## Abstract

This research intends to demonstrate the potential integration of large language models (LLMs) in accounting practices in Jordan. It is a mixed methods study that employs semi-structured interviews and content analysis of published financial reports. A total of 13 semi-structured interviews are conducted with various accounting professionals, such as accountant, financial analyst, financial controller, auditor, tax consultant, and finance manager. In addition, the study includes a thorough content analysis of financial reports, which reveals a compelling pattern highlighting the distinct narrative content richness prevalent across financial, industrial, and service sectors. The results emphasize the need for sector-specific adaptation, suggesting a paradigm shift in financial reporting practices. This study represents the initial empirical exploration in Jordan. It serves as a bridge between theory and application, offering both theoretical insights and practical guidance for accounting professionals. Ultimately, the study envisions a future where LLMs significantly enrich financial reporting practices across diverse sectors.

**Keywords** Accounting practices, Accounting professionals, Artificial intelligence, ChatGPT, Jordan, Large language models

## Introduction

In the rapidly evolving landscape of modern accounting, the integration of innovative technologies stands as a critical force poised to reshape traditional practices [31, 42, 48, 50]. In this era of digital transformation, where data is abundant and complexity is the norm, Large Language Models (LLMs) represent a beacon of promise for financial and accounting professionals [4, 44]. These sophisticated models, rooted in Artificial Intelligence (AI) and powered by natural language processing capabilities and stochastic analysis, hold the potential to revolutionize the interpretation, analysis, and communication of financial information [19, 23, 35]. Extensive progress

has been achieved in natural language processing in recent years [5, 33]. The models undergo training on vast volumes of textual data, enabling them to produce text that closely resembles human language, provide accurate responses to queries, and excel in various language-oriented tasks [28, 40].

The transformative influence of AI on multiple industries is indisputable, and accounting is no exception [1, 21, 27, 30, 41]. The advent of LLMs has ushered in a new era in which machine learning algorithms can comprehend, analyze, and generate human-like text [59]. In financial contexts, this means a potential leap forward in the ability to process massive volumes of textual data contained in financial reports, disclosures, and other narrative content El-Haj et al. [15, 63]. In a global context where financial professionals are increasingly integrating LLMs into their analytical toolkit, the examination of Jordanian accounting practices assumes particular significance. Jordan, with its unique economic and cultural

\*Correspondence:

Ahmad A. Toumech  
a.toumech@zuj.edu.jo

<sup>1</sup> Faculty of Business, Al-Zaytoonah University of Jordan, Amman 11733, Jordan

landscape, presents a distinctive canvas where the story of technological adoption unfolds differently than in more globally exposed markets. Understanding how LLMs fit into this narrative becomes critical for both practitioners and researchers alike [24, 64].

Amidst the global landscape of AI adoption, the field of accounting in Jordan presents an interesting context. As the global community embraces technologies like LLMs for enhanced financial analysis and reporting, it raises questions regarding the adoption patterns, challenges, and opportunities unique to the Jordanian context. This study aims to unravel this narrative by investigating the specific complexities that characterize the adoption—or perhaps the non-adoption—of LLMs within Jordanian accounting practices. The underlying rationale for this research is rooted in the gap between the demonstrated potential of LLMs and the uncertainties surrounding their inclusion in Jordanian organizations [2]. Thus, there is a need to examine whether, how, and to what extent LLMs are making inroads into the daily practices of accounting professionals in Jordan. The motivations, challenges, and perceptions that shape this narrative are yet unknown, calling for a thorough exploration.

This research is motivated by a set of interconnected purposes, utilizing the Technology Acceptance Model (TAM) [12, 13] and the Diffusion of Innovation Theory (DOI) [38, 39]. First, it aims to comprehensively investigate the current landscape of accounting practices in Jordan, including existing procedures, challenges, and technological infrastructure. Second, it seeks to assess the awareness and perceptions of accounting professionals regarding LLMs. Third, the research endeavors to identify potential barriers and challenges that hinder the seamless integration of LLMs into Jordanian accounting practices. Finally, the study discovers specific areas within financial reports where the application of LLMs could potentially improve analysis, interpretation, or communication.

The investigation into Jordanian accounting practices assumes particular importance due to the distinctive interplay of economic, cultural, and regulatory aspects in the Jordanian business environment. The specific economic environment, shaped by market dynamics and regional factors, impacts accounting practices and requires an examination into how LLMs can be integrated in this context. Cultural differences in communication styles and decision-making methods in Jordan contribute to the uniqueness of accounting practices, emphasizing the need for a focused research to capture these cultural dynamics. The regulatory environment also affects accounting practices, making a localized examination essential for aligning recommendations with Jordan's specific regulatory framework. Moreover, sector-specific

challenges and opportunities within the financial, industrial, and service sectors highlight the relevance of tailoring insights to address the distinctive needs of each sector. Given Jordan's emerging technological landscape and its practical value for accounting professionals, this study envisions providing actionable guidance that facilitates a smooth transition to a technologically enriched accounting setting within this particular geographic and cultural context.

The significance of this study is twofold. First, on an academic level, it contributes to the evolving discourse on the adoption of advanced technologies in a specific regional context. The results have the potential to improve the theoretical framework of technology adoption in accounting, incorporating the unique viewpoints of a Jordanian perspective. Second, on a practical level, the insights gained are positioned to offer actionable guidance for accounting professionals in Jordan. Practitioners can make informed decisions to adapt their practices in the face of technological advancements by understanding the current state of affairs and the potential benefits LLMs can bring.

Furthermore, the practical implications of this study research extend far beyond the academic realm, directly influencing the day-to-day practices of Jordanian accounting professionals. The insights garnered from this research provide a roadmap for practitioners navigating the complex landscape of technology adoption. Accounting professionals in Jordan gain a better understanding of the landscape they navigate as the findings shed light on their awareness levels, perceptions, and existing challenges. This increased awareness is a catalyst for proactive decision-making, enabling professionals to anticipate challenges, utilize opportunities, and strategically incorporate LLMs into their workflows where appropriate.

This research is an important component of the ongoing dialog surrounding the adoption of advanced technologies within a specific regional context, namely Jordan. The results have the potential to extend and enrich the theoretical frameworks that underpin the comprehension of technology integration in diverse economic and cultural environments. This research offers a more inclusive and comprehensive view by concentrating on the landscape of technology adoption in Jordan. The global discourse on technology adoption often originates from Western contexts, potentially overlooking the unique challenges, economic and technology factors, cultural dynamics, and regulatory considerations prevalent in the Middle East.

For example, Jordanian firms often operate in challenging economic environments, which necessitates a sophisticated approach to implementing technology. Economic factors such as limited resources, market conditions, and

limited technology infrastructure impact organizations' readiness to adopt AI technologies. In addition, Jordanian organizations function within a collaborative cultural structure, with decision-making typically involving collective input. This aspect of culture could influence the acceptance and incorporation of AI technologies into organizational structures. Nevertheless, this article acts as a corrective lens, providing a more inclusive and comprehensive view that integrates the intricacies of the Jordanian business environment. The insights contribute to refining and expanding existing theoretical frameworks, allowing for a more sophisticated understanding of how LLMs take root within distinct regional landscapes.

The findings offer a foundation for comparing and analyzing global technological adoption trends in the accounting profession. The study's recommendations for sector-specific adaptation, as well as considerations for regulatory and ethical issues, are relevant to international professionals in financial, industrial, and service sectors. These insights provide practical guidance for a seamless transition to a technologically advanced accounting environment. Further, the theoretical frameworks used in this study contribute to the existing literature on technology adoption, while the implementation insights serve as a valuable resource for international practitioners seeking to incorporate LLMs into their accounting practices globally.

The rest of this study is organized as follows: the second section outlines the theoretical framework and research questions, followed by the third section which discusses the research methodology. The fourth section presents the major findings, drawing from both semi-structured interviews and content analysis. Finally, the fifth section concludes the study.

### **Theoretical framework and research questions**

Over the past few years, there has been an emergence of extensive language models, including Generative Pre-trained Transformers (GPT), Bidirectional Encoder Representations from Transformers (BERT), Generalized Auto-Regressive model (XLNet), T5, and Robustly Optimized BERT Pre-training Approach (RoBERTa), with GPT-3 being particularly prevalent [21]. These models employ transformer architecture and undergo pre-training on large text datasets, enabling them to generate human-like text, answer questions, assist with translation and summarization, and effectively handle various natural language processing tasks through a unified pre-training and fine-tuning approach [18, 28, 43, 64]. The increasing range of LLMs signifies an important advancement in the field of AI. The prevalence of these models has grown significantly in recent years, leading to several

research being conducted to examine and assess their expanding capabilities [19, 44].

Previous researchers (e.g., [5, 26, 29, 33, 35, 40, 45, 57, 59]) from various disciplines have conducted extensive studies on the rise of LLMs, revealing insights into their notable advancements, diverse applications, and potential to transform tasks ranging from text generation and comprehension to the demonstration of reasoning skills. LLMs like ChatGPT are a recurring topic and numerous experts anticipate substantial disruptions, particularly within the field of accounting. The model's frequent mention in the media emphasizes its growing impact and suggests that it is poised to bring about noteworthy changes in this professional domain. Projections of major influences imply that ChatGPT has the potential to reshape traditional practices and procedures, sparking debate about the transformative effect it may have on accounting processes. [4, 16].

Utilizing the preferred reporting items for systematic reviews and meta-analyses framework, Bahroun et al. [6] examined the transformative impact of Generative Artificial Intelligence (GAI) in education by analyzing 207 research papers. The study explored the applications of GAI in medical and engineering education, with a focus on areas such as assessment, personalized learning support, and intelligent tutoring systems. Ethical considerations, interdisciplinary collaboration, and responsible technology use were highlighted to emphasize the importance of transparent GAI models and addressing biases. A bibliometric analysis identified ChatGPT as a dominant GAI tool and indicated significant growth in GAI research. Further, Siano and Wysocki [45] analyzed accounting disclosures using machine transfer learning methods, specifically focusing on the BERT language model. They demonstrated the effectiveness of relatively small disclosure datasets in fine-tuning BERT, achieving results that outperformed other tools commonly used in accounting literature. Their study highlighted the ease of application, implementation of broadly available and low-cost computing resources, and outstanding performance of these machine transfer learning tools.

Vasarhelyi et al. [52] investigated the impact of LLMs like ChatGPT in accounting, covering education, research, and professional auditing. The study discovered that the introduction of AI tutors in education could address Bloom's Two Sigma Problem, thus promoting personalized learning. The study also highlighted the potential benefits of LLMs in accounting research, particularly in tasks involving natural language processing. In professional auditing, ChatGPT's ability to identify risks in accounts offered the potential for more responsive audit plans. Despite these advantages, Vasarhelyi et al. [52] acknowledged potential pitfalls and

emphasized the need for careful navigation. Additionally, Fotoh and Mugwira [17] expressed concerns regarding the use of ChatGPT in external audits, specifically regarding the reliability of information sources, inaccurate responses, restricted data access, and negative effects on the critical thinking of external auditors. They also raised ethical concerns, including confidentiality, intellectual property rights, accountability, auditors' independence, privacy, and confidentiality. In this respect, Hadi et al. [20] emphasized the importance of ensuring the safe and ethical use of AI tools like ChatGPT. The study identified concerns related to security, ethics, the economy, and the environment, and stressed the need for guidelines and regulations. Hadi et al. [20] demonstrated the critical importance of responsibly integrating LLMs in healthcare, academia, and industries. This responsible integration is essential for these tools to effectively support and enhance human endeavors while upholding values such as integrity, privacy, and fairness.

Moreover, Street et al. [47] observed that LLMs like ChatGPT can improve the effectiveness of routine language generation tasks performed by Certified Public Accountants (CPAs). However, the use of LLMs introduces specific risks. The study proposed six guiding principles for CPAs to help them maximize the benefits of integrating LLMs into their professional work. These principles include: formulating specific questions and avoiding broad requests, actively engaging in the inquiry and interpretation process by breaking down complex tasks into verifiable subtasks, understanding the contextual boundaries of LLMs, refraining from inputting private, sensitive, or proprietary information, scrutinizing and recalculating quantitative responses, relying on other sources for factual information, particularly for less prominent topics, and leveraging LLMs to improve rather than replace human expertise. In contrast, Cheng et al. [10] investigated the capabilities of ChatGPT to provide solutions to eight educational accounting scenarios. They found that ChatGPT performs poorly on tasks such as preparing financial statements, journal entries, or using software. However, they affirmed that the detection tools offered by ChatGPT's developer were ineffective at recognizing text created by Artificial Intelligence Text Generators (AITG).

The theoretical foundations of this study draw upon established frameworks such as TAM [12, 13] and DOI [38, 39]. These widely accepted frameworks in the field of technology adoption provide valuable insights into the complex interplay of psychological and social factors that influence individuals and organizations in their decisions to embrace or resist technological innovations [22], Min et al. [34, 49]. When applied to the unique context of Jordanian accounting practices, these frameworks serve as

a lens through which one can unravel accounting professionals' perceptions and adoption patterns regarding LLMs.

The TAM suggests that an individual's intention to use a technology is affected by their perception of its ease of use and usefulness [55, 62]. TAM is a widely used framework for predicting and explaining user acceptance of information technologies. The reliability and validity of the original scales used to measure TAM constructs have been confirmed through multiple replications and applications across various technologies and user groups [14]. According to TAM, an individual's behavioral intention to use a system is shaped by two key beliefs: perceived usefulness, which assesses the extent to which a person believes that using the system will enhance their job performance, and perceived ease of use, which reflects the extent to which a person believes that using the system will be effortless [53]. TAM suggests that the impact of external factors, such as the development process and system characteristics, on the intention to use is mediated through the lenses of perceived usefulness and perceived ease of use [54]. To gain insights into the adoption dynamics of LLMs, it is crucial to investigate how accounting professionals in Jordan perceive the ease of use and usefulness of these models [7].

Complementing TAM, DOI theory explains how innovations, such as LLMs, spread and are adopted within a social system [32, 36]. Rogers [39, p. 5] demonstrated that diffusion is "the process by which an innovation is communicated through certain channels over time among the members of a social system." The central principle of the DOI is that individuals in a social system must consider their interdependence when making decisions about adopting a new innovation. The adoption of an innovation by one person significantly affects the decisions of others within the same social framework. When someone considers embracing an innovation, they go through a thorough evaluation process, including a cost-benefit analysis [38]. However, a key challenge in this decision-making process is the presence of uncertainty. Prospective adopters weigh the potential benefits against the potential risks and uncertainties associated with the innovation. Adoption is based on the perceived overall utility, with individuals preferring innovations that improve well-being [37]. The decisive factor is the perceived relative advantage over existing ideas, which influences attitudes and decisions among members of the social system. Understanding the role of relative advantage in adoption dynamics is crucial in the diffusion process within a community or social network [58].

These theories provide a framework for examining the factors that influence adoption rates, the channels through which innovation is communicated, and the



characteristics that affect the adoption decision [46, 65]. Thus, applying these theories allows for the contextualization of LLM diffusion patterns within the Jordanian accounting landscape. This includes considering factors such as the innovativeness of professionals, communication channels, and the social system in which these innovations are introduced.

The literature review extensively explores the presence of LLMs in the accounting field, revealing a wide range of opportunities and obstacles associated with their incorporation. Among the potential benefits are elevated narrative content analysis and more effective decision-making processes. Alshurafat [4] demonstrated that LLMs created by OpenAI (e.g., ChatGPT) have the capacity to transform the working methods of accounting professionals, offering enhanced efficiency, increased productivity, and valuable insights. On the contrary, significant challenges such as data privacy concerns, integration with existing systems and processes, ethical considerations, and the need for upskilling among accounting professionals arise. In Jordan, Alrfai et al. [3] highlighted that Jordanian firms face challenges in keeping their accounting systems up-to-date with cutting-edge technologies. This is primarily due to the demand for readily available programs and the necessity to train accountants with the required skills to navigate and utilize these programs.

Global accounting trends indicate a significant shift due to the widespread use of AI technologies, particularly in the field of LLMs [57, 61]. Understanding these global trends provides a benchmark against which the unique factors shaping LLMs adoption in Jordan can be assessed. This comparison allows discernment of whether the adoption patterns observed in Western contexts are also seen in Jordan or if there are distinct characteristics in the Jordanian accounting landscape. Crucially, the adoption of LLMs is not universal, and regional differences play a crucial role [59]. In the Middle East, including Jordan, cultural, economic, and regulatory factors greatly influence technology adoption patterns [51, 60]. Examining studies that explore technology adoption in this regional context provides beneficial insights into the challenges and opportunities specific to the Jordanian business environment. These insights are essential for understanding how accounting professionals in Jordan navigate the adoption of LLMs within the unique cultural and regulatory landscape of the country.

This thorough examination sets the stage for investigating the specific manifestations of these opportunities and challenges within the context of accounting in Jordan. Additionally, it is crucial to explore the awareness levels and perspectives of accounting professionals regarding LLMs in order to understand the human aspect of

technology adoption. There is a lack of prior research in this specific context, focusing on how professionals in Jordan perceive the practicality, feasibility, and ethical considerations associated with integrating LLMs into their daily routines. By bringing together these insights, the anticipation is to gain a deeper understanding of the attitudes and beliefs that influence the acceptance of LLMs among accounting professionals in Jordan. This will establish the foundation for a thorough examination of the adoption scenario. Therefore, based on this reasoning, the research questions can be formulated as follows:

- RQ1: What is the awareness and comprehension level of Jordanian accounting professionals regarding LLMs, encompassing their understanding of capabilities and functions?
- RQ2: What are the initial perceptions, motivations, challenges, and concerns driving Jordanian accounting professionals toward integrating LLMs into their accounting practices?
- RQ3: In what areas do Jordanian accounting professionals perceive potential applications for LLMs in their practices, and how can LLMs enhance the richness and quality of narrative content in financial reporting across different sectors in Jordan?

## Methodology

To address the research questions, this study used a mixed-methods research approach. It combined semi-structured interviews and content analysis to thoroughly examine the awareness, perceptions, motivations, challenges, and potential applications of LLMs in the context of Jordanian accounting practices.

## Participants

The study involved a purposive sample of participants from diverse roles within various sectors in Jordan. The selection of interviewees followed a purposeful sampling approach, with the aim of capturing a range of perspectives and roles within Jordanian firms. A total of 13 interviews with individuals who possess at least a minimum level of knowledge about LLMs were conducted. The minimum knowledge requirement was defined as a basic understanding of LLMs, including their general applications and significance in the field of accounting. Prior to scheduling the interviews, a brief questionnaire was administered to potential participants to confirm that they possessed the necessary knowledge about LLMs. The questionnaire included inquiries such as: Have you been introduced to LLMs previously? Could you please provide a brief explanation of what LLMs are? Are you familiar with any practical applications of LLMs in real-life situations? Only candidates who responded positively

and showed a fundamental grasp of LLMs were selected for the interviews.

Further, participants were chosen based on their roles, expertise, and relevance to the research questions. The participants included individuals such as financial analyst, CFO, accountant, senior auditor, tax consultant, auditor, and risk analyst. This deliberate selection aimed to gather insights from professionals with different responsibilities and perspectives. The participants were from a diverse range of listed firms on the Amman Stock Exchange, representing various organizational backgrounds including financial, industrial, and service sectors. This allowed for a thorough investigation of perspectives. While the study aimed to incorporate a wide range of organizational contexts, participant confidentiality and privacy were also prioritized. Participants were not exclusively from the same organization, in order to gather a broader and more diverse set of insights.

#### **Semi-structured interviews**

The research used semi-structured interviews as a method to gather qualitative data. The interview protocol included four main themes: awareness of LLMs, perceptions and motivations, challenges and concerns, and potential applications in accounting practices. The questions within each theme were designed to explore participants' perspectives and gain a comprehensive understanding of their views on integrating LLMs into accounting practices.

#### **Interview protocol**

The interview protocol consisted of inquiries aligned with the four primary themes:

- Awareness of LLMs: Participants responded to queries regarding their familiarity with the term "Large Language Models" and analogous technologies within the realm of accounting.
- Perceptions and motivations: Questions delved into participants' initial viewpoints on how LLMs might impact accounting practices and the motivations driving their inclination toward integrating these models into accounting processes.
- Challenges and concerns: Participants were systematically examined about the challenges they foresaw in the integration of LLMs, including specific concerns related to data privacy, security, or ethical considerations.
- Potential applications: Questions were directed at eliciting participants' perspectives on the areas of accounting where LLMs could potentially be applied and their imaginative scenarios envisioning

the use of LLMs to enhance the analysis, interpretation, or communication.

The four themes in the interview protocol were selected based on their strategic alignment with the overarching research questions and the study's objectives. Each theme was developed to investigate specific aspects of the participants' perceptions, motivations, challenges, and potential applications for the integration of LLMs into Jordanian accounting practices. The first theme, "Awareness and Understanding of LLMs," was developed to assess participants' familiarity and comprehension of LLMs. The second theme, "Perceptions and Motivations for Integration," focused on the participants' initial impressions and the reasons behind considering LLMs integration. The third theme, "Challenges and Concerns in LLMs Integration," explored anticipated obstacles and reservations. Lastly, the fourth theme, "Potential Applications of LLMs in Accounting Practices," aimed to identify specific areas where participants envisioned the practical utility of LLMs. The rationale for this thematic structure was to systematically capture a comprehensive range of insights, resulting in a more sophisticated comprehension of the factors impacting LLMs integration in Jordan.

#### **Summary of interview themes and questions**

##### *Awareness of LLMs*

- Question: "Have you come across the term 'Large Language Models' or similar technologies in the context of accounting?"
- Question: "How would you describe your current level of understanding regarding 'Large Language Models' as an accounting professional in Jordan?"

##### *Perceptions and motivations*

- Question: "What are your initial perceptions of how Large Language Models could impact accounting practices?"
- Question: "Are there specific motivations or incentives for integrating Large Language Models into accounting processes?"

##### *Challenges and concerns*

- Question: "What challenges do you anticipate in the integration of Large Language Models into accounting practices?"

- Question: "Are there any specific concerns related to data privacy, security, or ethical considerations when using LLMs in accounting?"

#### *Potential applications*

- Question: "In which areas of accounting do you see the potential application of Large Language Models?"
- Question: "Can you envision scenarios where the use of Large Language Models might enhance the analysis, interpretation, or communication of financial information?"

The thematic coding process was systematically conducted to analyze qualitative data derived from semi-structured interviews and content analysis. Initially, themes were identified based on recurring patterns, concepts, and ideas present in the dataset. Subsequently, each segment of the data was carefully assigned to relevant themes, ensuring a comprehensive and in-depth coverage of the key topics and insights obtained from the interviews and financial reports [9]. Next, the qualitative data were analyzed thematically, involving systematic coding and categorization of the interview transcripts according to the pre-identified themes. This analytical approach revealed patterns, trends, and a range of diverse perspectives within each theme, providing a comprehensive understanding of the insights expressed by the participants [11].

#### **Content analysis**

In addition to the qualitative insights gathered from semi-structured interviews, a quantitative approach was also employed in this research. This involved conducting content analysis of financial reports from various industry sectors, such as financial, industrial, and service industries. The financial reports were chosen based on their availability in publicly accessible databases and their representation of the economic significance of each sector in Jordan. To conduct a comprehensive analysis, the study focused on key criteria, such as the depth of narrative content and the relevance of the information to the study's objectives.

The content analysis in this study followed established principles and methodologies outlined in the relevant literature. The content analysis process involved systematically examining the textual data retrieved from financial reports. The goal was to identify recurring patterns, themes, and the richness of narrative content. Narrative content richness refers to the depth, breadth, and quality of information provided in written or verbal narratives [25]. In the context of financial reporting, narrative

content richness includes the extent to which financial reports include detailed clarifications, contextual information, and insights in addition to numerical data. This richness encompasses explanations of organizational strategies, market trends, potential risks, and other qualitative aspects that contribute to a comprehensive understanding of a business's financial performance and prospects. Essentially, narrative content richness adds value by providing stakeholders with useful information and facilitating better decision-making.

This process was inspired by the works of Vourvachis and Woodward [56] and Beck et al. [8], who emphasized the importance of content analysis in extracting meaningful insights from textual data. Initially, a comprehensive coding framework was developed based on identified categories. The coding process was iterative, ensuring thorough and consistent implementation of codes across the dataset. However, the primary focus of this analysis was to measure and compare the richness of narrative content across sectors, identifying patterns and variations in how information is communicated, with specific attention to the potential for enhancing LLMs within the management discussions and analysis sections of these reports. This quantitative analysis provided a systematic and structured examination of reporting practices, enabling a comparison between different industries to identify patterns and variations in narrative content.

#### **Integration of findings**

The qualitative insights gained from interviews and the quantitative results obtained from content analysis were combined to give a thorough understanding of the landscape. This integration made it possible to explore the complex dynamics surrounding the adoption of LLMs in Jordanian accounting practices in a strong and comprehensive way. However, ethical considerations were of utmost importance throughout the research process. Informed consent was obtained from all participants to ensure their voluntary participation, and confidentiality and anonymity were maintained during data collection, analysis, and reporting to protect the identities and responses of the participants.

## **Results and discussion**

### **Qualitative findings**

Through conducting semi-structured interviews, a wide range of diverse perspectives and insights were discovered. These perspectives were deeply interconnected through the different participant roles that were represented. This exploration led to the emergence of four main thematic threads: awareness of LLMs, perceptions and motivations, challenges and concerns, and potential applications. The voices of participants, including

financial analyst, CFO, accountant, senior auditor, tax consultant, auditor, and risk analyst, shed light on these distinct themes and offered a comprehensive understanding of the integration of LLMs into accounting practices.

**Awareness of LLMs**

The awareness of LLMs in Jordanian accounting practices is important for understanding how advanced technologies could be adopted and integrated into this professional field. Table 1 presents a comprehensive overview of participants’ familiarity with LLMs, offering insights into the current level of awareness among different roles.

To assess the interviewees’ understanding of LLMs, a structured evaluation framework was utilized. This framework employed a combination of self-assessment and knowledge-based questions to classify their understanding into three levels: "high," "moderate," or "low." Interviewees were requested to rate their own comprehension of LLMs on a 3-point Likert scale. A score of 1 represented low understanding, 2 indicated moderate understanding, while a score of 5 denoted high understanding. Participants were also asked to articulate their familiarity with LLMs using their own words, citing specific examples of their encounters and applications.

Table 1 illustrates different levels of awareness among the participants. The financial analyst, finance manager, and senior auditor show a notably higher understanding of LLMs, indicating that they may have been exposed to these technologies in their professional contexts through industry seminars, educational initiatives, or practical

experience. This group’s awareness could position them as early adopters or supporters of LLM integration within their organizations. On the other hand, accountant, tax consultant, and risk analyst demonstrate lower awareness levels of LLMs, suggesting a potential gap in knowledge dissemination within these specific segments of the accounting profession. This difference in awareness emphasizes the importance of targeted educational interventions, particularly for roles that may not have been extensively exposed to or involved in discussions about LLMs.

The data imply a critical need for comprehensive educational strategies. These strategies should ensure that professionals across all roles are well-informed about the capabilities and implications of LLMs, facilitating more inclusive decision-making processes when integrating these advanced technologies. In the broader context of Jordanian accounting practices, addressing the spectrum of awareness levels becomes a foundational step toward establishing a baseline for successful technology assimilation. This interpretation serves as a preamble to further investigation into participants’ perceptions, motivations, challenges, and potential applications of LLMs, thereby contributing to a comprehensive understanding of the dynamics surrounding the adoption of advanced technologies in the Jordanian accounting landscape.

**Perceptions and motivations**

As the accounting landscape in Jordan explores the potential of LLMs, Table 2 illustrates the initial perceptions and motivations of professionals regarding the integration of these advanced technologies. This research provides a comprehensive understanding of how various roles within the Jordanian context view LLMs and the factors that influence their potential adoption.

As reported in Table 2, the participants’ initial perspectives on LLMs reveal a range of sentiments within the Jordanian accounting community. Senior accountant, financial controller, and CFO exhibit an optimistic outlook, anticipating potential benefits in terms of enhanced data analysis, efficiency improvements, deeper insights into financial information, and enhanced financial reporting quality. This positive reception positions these roles as potential advocates for the integration of LLMs, foreseeing valuable contributions to their professional endeavors. On the other hand, tax consultant, risk analyst, and internal auditor present a spectrum of viewpoints, indicating a more varied landscape of opinions. They express doubts about the feasibility of LLMs integration, emphasizing the importance of addressing specific concerns or uncertainties within these roles. This variety highlights the importance of tailored strategies for communicating the practical advantages of LLMs,

**Table 1** Awareness of LLMs in Jordanian accounting practices

Participant ID	Role	Understanding of LLMs
1	CFO	Moderate
2	Accountant	Low
3	Financial analyst	High
4	Auditor	Moderate
5	Finance manager	High
6	Tax consultant	Low
7	Senior accountant	Moderate
8	Treasury analyst	Low
9	Senior auditor	High
10	Budget analyst	Moderate
11	Internal auditor	Low
12	Financial controller	Moderate
13	Risk analyst	Low

This table shows the awareness levels of Large Language Models (LLMs) among various roles within Jordanian accounting professionals. The awareness levels are categorized as Low, Moderate, or High based on participants’ understanding of LLMs, providing insight into the current knowledge landscape regarding LLM adoption in the Jordanian accounting sector



**Table 2** Perceptions and motivations for LLMs integration

Participant ID	Role	Initial perceptions	Motivations for integration
1	CFO	Positive impact on data analysis	Efficiency improvement, enhanced insights
2	Accountant	Uncertain about practicality	Concerns about implementation complexity
3	Financial Analyst	Opportunity for automation	Time-saving, increased accuracy
4	Auditor	Potential for enhanced audit processes	Improved audit efficiency, data accuracy
5	Finance Manager	Positive outlook on technology adoption	Streamlining financial planning processes
6	Tax Consultant	Skeptical about feasibility	Low potential compliance and accuracy issues
7	Senior Accountant	Expectation of improved reporting	Streamlined financial analysis, better insights
8	Treasury Analyst	Positive impact on treasury management	Improved cash flow forecasting, risk mitigation
9	Senior Auditor	Anticipation of efficiency gains	Enhanced internal control assessment
10	Budget Analyst	Enthusiastic about potential benefits	Streamlining budgeting processes, improved accuracy
11	Internal Auditor	Doubtful about practicality	Concerns about data security and integrity
12	Financial Controller	Positive outlook on technology's role	Improved financial reporting quality
13	Risk Analyst	Uncertain about impact	Potential risk assessment challenges

This table presents the initial perceptions and motivations for integrating Large Language Models (LLMs) among various roles within the context of Jordanian accounting practices. It provides insights into participants' views on the feasibility, potential benefits, and concerns regarding LLM adoption in accounting processes

alleviating uncertainties, and aligning motivations with potential benefits.

The motivations for integrating LLMs across roles converge on improving efficiency, enhancing accuracy, and streamlining financial processes. The data suggests that fine-tuning communication strategies is necessary to clarify the distinct advantages that LLMs can bring to roles where motivations might be less clear. This emphasizes the need for a customized approach to communicating the value of LLMs within specific aspects of accounting practices. For instance, one of the motives identified in the analysis is the potential for LLMs to streamline financial planning processes. This could be achieved through the automation of routine tasks such as data collection, analysis, and reporting, which are traditionally time-consuming and labor-intensive for accounting professionals. LLMs can parse large volumes of financial data, extract relevant insights, and generate comprehensive reports in a fraction of the time it would take for manual processing, by leveraging natural language processing capabilities. Additionally, LLMs can facilitate real-time data analysis, enabling professional accountants to make more informed decisions and adapt quickly to changing market conditions. Furthermore, the integration of LLMs in financial planning processes can enhance data accuracy and consistency, reducing the risk of errors and discrepancies in financial reports.

However, Table 2 provides insight into the perceptions and motivations that shape the initial reception of LLMs in Jordanian accounting practices. This understanding serves as a crucial foundation for developing targeted strategies that raise awareness, address uncertainties, and foster a collective vision for the potential contributions

of LLMs within the dynamic landscape of Jordanian accounting practices. Overall, the adoption of LLMs has the potential to revolutionize financial planning practices, enabling organizations to optimize resource allocation, identify growth opportunities, and achieve strategic objectives with greater efficiency and precision.

#### **Challenges and concerns**

In navigating the transformational journey of incorporating LLMs into Jordanian accounting practices, accounting professionals are expecting to encounter various challenges and significant concerns. Table 3 provides a detailed analysis of the anticipated challenges faced by participants in different roles during the integration of LLMs. This analysis aims to provide a thorough understanding of the obstacles that could potentially influence the trajectory of this technological assimilation.

Table 3 reveals that concerns regarding resistance to change are most prominent among financial controller, internal auditor, and risk analyst. This shared apprehension underscores the importance of acknowledging and addressing potential reluctance among staff members. It also emphasizes the necessity of implementing tailored change management strategies that align with the unique dynamics of each role. Furthermore, there is a collective recognition among participants, such as treasury analyst, financial controller, and senior accountant, regarding the importance of data security and ethical considerations. This reflects their shared commitment to upholding the highest standards in the utilization of LLMs. Given the prominence of these concerns, especially among roles that extensively handle financial data, it is crucial to establish robust safeguards and implement

**Table 3** Challenges and concerns in LLMs integration

Participant ID	Role	Anticipated challenges	Concerns about LLMs
1	CFO	Lack of understanding among staff	Data security, ethical considerations
2	Accountant	Resistance to change	Implementation complexity
3	Financial Analyst	Integration complexity	Privacy concerns, potential biases
4	Auditor	Lack of resources for implementation	Potential impact on audit quality
5	Finance Manager	Compatibility with existing systems	Data security, potential disruption of financial processes
6	Tax Consultant	Uncertainty about relevance to tax processes	Confidentiality concerns, potential errors
7	Senior Accountant	Resistance from team members	Data security, impact on job roles
8	Treasury Analyst	Lack of expertise in technology adoption	Data security, potential errors in treasury management
9	Senior Auditor	Concerns about system reliability	Ethical considerations, potential biases in audit process
10	Budget Analyst	Integration with existing budgeting tools	Data accuracy, potential errors in budget forecasts
11	Internal Auditor	Resistance to change	Data security, integrity issues
12	Financial Controller	Resistance from accounting team	Data security, potential disruption of financial reporting
13	Risk Analyst	Lack of understanding among colleagues	Potential risk assessment challenges

This table illustrates the anticipated challenges and concerns that are expected to arise during the integration of Large Language Models (LLMs) into Jordanian accounting practices. These challenges and concerns have been identified by participants from different roles

a comprehensive ethical framework to guide the ethical integration of LLMs into the accounting environment.

In addition, auditor, senior auditor, and budget analyst provide an intriguing perspective that goes beyond conventional understanding. While they acknowledge potential challenges, their relatively lesser emphasis on data security concerns suggests a distinct point of view. This realization highlights the importance of recognizing concerns specific to each role and tailoring strategies accordingly, given the diverse landscape within Jordanian accounting practices. Furthermore, as Jordanian accounting moves toward technological integration, the findings from Table 3 serve as a compass, guiding

the development of strategies that not only address challenges but also promote a culture of adaptability and ethical responsibility. These insights lay the foundation for refining the approach to integrating LLMs, ensuring a seamless integration of technology into the structure of Jordanian accounting practices.

**Potential applications**

Table 4 illustrates the perspectives of different roles on where and how advanced technologies can enhance the investigation of potential applications of LLMs within Jordanian accounting practices. This investigation focuses on the areas where LLMs could revolutionize the

**Table 4** Potential applications of LLMs in accounting practices

Participant ID	Role	Identified areas of application	Envisioned scenarios
1	CFO	Streamlining narrative content generation	Improved financial reporting, enhanced communication
2	Accountant	Automated data entry and reconciliation	Improving data accuracy, reducing manual errors
3	Financial Analyst	Automated data extraction and analysis	Quick insights, streamlined audit processes
4	Auditor	Enhanced data analysis in audit processes	Improved risk identification, streamlined reporting
5	Finance Manager	Automated financial planning	Efficient budgeting, improved decision-making
6	Tax Consultant	Uncertain about practical applications	Addressing confidentiality concerns, improving tax compliance
7	Senior Accountant	Improved financial analysis	Streamlined data interpretation, better insights
8	Treasury Analyst	Enhanced cash flow forecasting	Improved liquidity management, risk mitigation
9	Senior Auditor	Automated internal control assessment	Efficient risk identification, improved compliance
10	Budget Analyst	Streamlining budgeting processes	Improved accuracy in budget forecasts
11	Internal Auditor	Uncertain about practical applications	Enhancing data security, improving audit processes
12	Financial Controller	Enhanced financial reporting	Streamlined financial processes, better insights
13	Risk Analyst	Enhanced risk assessment	Better predictive analytics, improved risk management

This table provides a summary of the identified areas where Large Language Models (LLMs) can be applied and the envisioned scenarios for integrating them into Jordanian accounting practices. The information is based on interviews conducted with different accounting professionals

interpretation, analysis, and communication of financial information within Jordan's complex accounting context.

Participants in various roles in Jordan highlight a wide range of potential applications for LLMs. The main focus is on three areas: streamlining the generation of narrative content, improving data analysis capabilities, and automating financial planning processes. This shared vision underscores the potential of LLMs to enhance efficiency, accuracy, and overall optimization of accounting practices. Notably, financial analyst, CFO, and financial controller see LLMs as playing a significant role in simplifying the generation of narrative content in financial reports. This application aligns with the natural language processing capabilities of LLMs, indicating a recognition of the technology's potential to simplify and expedite the creation of textual content in financial documentation.

An agreement emerges among different roles on the potential of LLMs to enhance data analysis. The envisioned applications vary from interpreting large amounts of textual data found in financial reports to extracting meaningful insights. This aligns with the broader trend of using machine learning algorithms to extract valuable information from the extensive datasets inherent in accounting practices. The prospect of automating financial planning processes resonates among different roles, indicating a shared understanding of LLMs' potential to contribute to strategic decision-making. The emphasis on automation suggests that LLMs will become essential tools for handling complex financial scenarios and aiding in more informed and timely decision-making processes.

Essentially, Table 4 not only reveals the collective vision of participants regarding the potential applications of LLMs but also indicates a future in which these technologies play a significant role in shaping the context of

Jordanian accounting practices. This exploration sets the stage for further investigation into the practical implementation of LLMs and their impact on the daily workflows of accounting professionals in Jordan.

### Content analysis findings

#### *Narrative content richness*

During a thorough examination of financial reports using content analysis, an intriguing pattern was discovered, shedding light on the distinct richness of narrative content that is prevalent across various sectors. This variation highlights the unique communication styles that are embedded within different segments of the business landscape, particularly focusing on the financial, industrial, and service sectors.

As shown in Table 5, financial reports within the financial sector placed a significant emphasis on narrative elements. These reports served not only as repositories of numerical data, but also as comprehensive sources of qualitative information. They went beyond the surface level, providing stakeholders with a contextual understanding of the sector's financial performance and market dynamics by delving into detailed explanations of financial instruments, market trends, and regulatory considerations. This trend toward narrative richness in the financial sector suggests a deliberate effort to convey complex concepts, innovations, and industry nuances through qualitative information.

Reports originating from the industrial sector revealed a remarkable balance of quantitative data and qualitative insights. These reports went beyond presenting financial figures and provided a deeper understanding of production processes, supply chain dynamics, and strategic initiatives. The narratives aimed to provide a comprehensive

**Table 5** Narrative content richness across sectors

Sector	Narrative content richness
Financial sector	Financial reports in the financial sector are known for their rich narrative content. These reports go beyond presenting numerical data and delve into a deep exploration of financial instruments, market trends, and regulatory considerations. The narratives provide detailed explanations, giving stakeholders a comprehensive contextual understanding of the sector's financial performance and market dynamics. The wealth of content in these reports helps shed light on complexities that go beyond what is apparent on the surface, enabling a more informed analysis of the financial sector.
Industrial sector	In the industrial sector, there is a moderate level of narrative content richness. Reports in this sector strike a balance between quantitative data and qualitative insights. They go beyond simply presenting financial figures and instead provide a deeper understanding of production processes, supply chain dynamics, and strategic initiatives. The narratives aim to convey a holistic picture of the industry's financial health and operational efficiency. This combination of quantitative and qualitative information caters to a diverse range of stakeholders, helping them to better appreciate the intricacies of the industrial sector.
Service sector	Reports from the service sector exhibit an impressive level of narrative content. These reports focus on qualitative aspects, providing detailed explanations of service offerings, client relationships, and market positioning. The narratives offer stakeholders a comprehensive understanding of the industry's strategic direction and competitive landscape, going beyond traditional financial metrics. This emphasis on qualitative content enhances the transparency of financial reporting in the service sector, leading to a more insightful interpretation of its overall performance.

This table categorizes sectors based on the depth of qualitative insights provided in their financial disclosures, illustrating the narrative content richness in financial reports across different sectors.

picture of the industry’s financial health and operational efficiency. The moderate level of narrative content richness indicates a sector-specific approach, integrating both quantitative and qualitative aspects to communicate a comprehensive overview. This approach reflects the complexity of the sector and the need for a broad narrative to convey a comprehensive understanding to diverse stakeholders.

Similarly, reports from the service sector focus on qualitative aspects. These reports extensively elaborate on service offerings, client relationships, and market positioning, extending beyond traditional financial metrics. The narratives give stakeholders a complete picture of the industry’s strategic direction and competitive landscape. The emphasis on qualitative information in the service sector’s reports reflects a concerted effort to communicate not only financial data but also the strategic intricacies that shape the industry’s narrative. This strategic richness contributes to a more insightful interpretation of the sector’s overall performance.

This variation in narrative content richness demonstrates the significance of recognizing and respecting distinct communication dynamics across industries. Understanding and aligning with the distinct narrative preferences and regulatory intricacies inherent in each industry becomes critical for effective and tailored implementation as organizations consider the integration of LLMs. Future research should look into how businesses can use sector-specific insights to improve the

effectiveness of their communication strategies and adapt to evolving reporting standards.

**Potential for LLM enhancement**

After conducting an extensive content analysis of financial reports, key opportunities for integrating LLMs have been identified. One area where LLMs can have a transformative impact is in the management discussions and analysis sections. These sections are crucial for providing insightful, data-driven narratives. The potential of LLMs to enhance narrative content within management discussions and analysis sections is due to their natural language processing capabilities. These sections often contain intricate insights, strategic considerations, and forward-looking perspectives, making them an ideal environment for LLM application. Traditional reporting boundaries can be surpassed through leveraging advanced language models, allowing for a comprehensive understanding of the complex financial landscapes discussed in these sections (Table 6).

Significantly, the recognition of LLMs’ potential to enhance narrative content goes beyond specific sectors, suggesting that they can be used in various industries. This widespread recognition shows that LLMs can adapt to the unique communication nuances of different sectors. Additionally, LLMs have the ability to enrich narrative content across industries, indicating that they can be transformative tools with broad applicability. This,

**Table 6** Potential areas for LLM enhancement in financial reports

Financial report section	Identified opportunities for LLM enhancement
Management discussions and analysis	The content analysis highlights the important role of the management discussions and analysis section in enhancing LLMs. This section is particularly effective in utilizing LLMs’ capabilities to provide more insightful and data-driven narratives. LLMs, with their natural language processing skills, are well-equipped to unravel complex insights, strategic considerations, and future-oriented perspectives. The integration of LLMs in the management discussions and analysis section has the potential to go beyond simply presenting data, offering a transformative opportunity to enhance the quality and depth of this crucial section
Other sections	While opportunities for enhancing LLMs are recognized in other sections of financial reports, their prominence is not as pronounced as in the management discussions and analysis section. The potential impact of LLMs in these sections may vary depending on the specific content and communication requirements. Consequently, the study recommends further exploration to uncover additional areas where LLMs could contribute to enhancing narrative content

This table highlights the potential areas where Large Language Models (LLMs) can be integrated into financial reports, with a specific focus on the Management Discussions and Analysis (MD&A) section

in turn, can lead to a more standardized and advanced approach to financial reporting.

In essence, the content analysis not only identified specific areas within financial reports, but also revealed numerous possibilities for integrating LLMs. The management discussions and analysis sections, in particular, were identified as strategic domains where LLMs could enhance narratives by offering stakeholders a deeper understanding of the complexities that shape financial landscapes. This recognition spans industries, positioning LLMs as flexible assets capable of revolutionizing narrative content in various sectors and contributing to a more advanced and insightful era of financial reporting.

## Conclusion

This comprehensive study combines insights from interviews and content analysis to shed light on the complex interplay between narrative content richness in financial reports and the potential for enhancement through the integration of LLMs. The blend of qualitative and quantitative findings broadens our understanding of communication dynamics within different industry sectors and the transformative impact that LLMs can have on financial reporting practices.

Distinctive areas within financial reports, particularly the management discussions and analysis sections, emerge as focal points ripe for improvement through LLM integration. LLMs' inherent natural language processing abilities align perfectly with the intricate insights and forward-thinking perspectives embedded in these sections. Importantly, the recognition of LLMs' potential extends beyond specific industries, indicating their universal applicability across multiple sectors. With this universal potential, LLMs can be transformative tools capable of standardizing and advancing financial reporting practices on a larger scale.

The findings highlight the importance of accounting professionals and industry stakeholders recognizing and adapting to the unique communication dynamics in their respective sectors. Furthermore, the universality of LLMs signifies a shift in financial reporting practices, leading to more standardized and advanced approaches. Further research should delve into the practical implementation of LLMs across different industries, exploring specific use cases and addressing potential challenges. To bridge the gap in awareness, targeted educational programs are recommended to enhance accounting professionals' understanding of LLMs capabilities. Collaborative workshops and forums should be organized to bring together diverse stakeholders, encouraging knowledge exchange and collectively addressing application concerns. However, it is essential to establish sector-specific ethical guidelines in collaboration with regulatory bodies to overcome

industry-specific challenges and ensure responsible adoption of LLMs.

Moreover, the study's actionable guidance helps in developing best practices specifically for the Jordanian context. These recommendations empower accounting professionals to effectively integrate LLMs, address region-specific challenges, and maximize the technology's potential. As a result, this research facilitates a smoother and more successful transition to a technologically advanced landscape, ensuring that Jordanian accounting practices remain innovative and efficient. This study not only contributes to the theoretical understanding of technology adoption in accounting but also provides practical guidance for practitioners navigating the evolving landscape of technological advancements in Jordan.

In conclusion, the combination of content analysis and interviews offers a thorough understanding of the context where narrative content richness intersects with the potential of LLMs. As industries adapt to the changing landscape of financial reporting, the incorporation of LLMs holds promise for generating more insightful, data-driven narratives. This study serves as a guide, pointing toward a future where LLMs significantly enhance the richness and sophistication of financial reporting practices across various sectors.

## Abbreviations

LLMs	Large language models
AI	Artificial Intelligence
TAM	Technology acceptance model
DOI	Diffusion of innovation theory
GPT	Generative pre-trained transformers
BERT	Bidirectional encoder representations from transformers
XLNet	Generalized auto-regressive model
RoBERTa	Robustly optimized BERT Pre-training approach
GAI	Generative artificial intelligence
CPAs	Certified public accountants
AITG	Artificial intelligence text generators
CFO	Chief financial officer

## Acknowledgements

Not applicable.

## Author contributions

The author read and approved the final manuscript.

## Funding

The author states that there is no financial support or funding.

## Availability of data and materials

The datasets generated and/or analyzed during the current study are available in the [https://www.ase.com.jo/en/history?history\\_category=64](https://www.ase.com.jo/en/history?history_category=64) repository.

## Declarations

### Ethics approval and consent to participate:

Not applicable.

### Consent for publication

Not applicable.



### Competing interests

The author declares that they have no competing interests.

Received: 20 March 2024 Accepted: 25 June 2024

Published online: 16 July 2024

### References

- Abu Afifa MM, Nguyen NM (2022) Nexus among big data analytics, environmental process integration and environmental performance: moderating role of digital learning orientation and environmental strategy. *VINE J Inf Knowl Manag Syst*. <https://doi.org/10.1108/VJKMS-05-2022-0186>
- Abu-Farha R, Fino L, Al-Ashwal FY, Zawiah M, Gharaibeh L, Mea'ad, M. H., & Elhajji, F. D. (2023) Evaluation of community pharmacists' perceptions and willingness to integrate ChatGPT into their pharmacy practice: a study from Jordan. *J Am Pharmacist Assoc* 63(6):1761–1767
- Alrfai MM, Alqudah H, Lutfi A, Al-Kofahi M, Alrawad M, Almaiah MA (2023) The influence of artificial intelligence on the AISs efficiency: moderating effect of the cyber security. *Cogent Soc Sci* 9(2):2243719
- Alshurafat H (2023) The usefulness and challenges of chatbots for accounting professionals: application on ChatGPT. Available at SSRN 4345921.
- Ambalavanan AK, Devarakonda MV (2020) Using the contextual language model BERT for multi-criteria classification of scientific articles. *J Biomed Inform* 112:103578
- Bahroun Z, Anane C, Ahmed V, Zacca A (2023) Transforming education: a comprehensive review of generative artificial intelligence in educational settings through bibliometric and content analysis. *Sustainability* 15(17):12983
- Baytak A (2023) The acceptance and diffusion of generative artificial intelligence in education: a literature review. *Curr Perspect Educ Res* 6(1):7–18
- Beck AC, Campbell D, Shrivs PJ (2010) Content analysis in environmental reporting research: enrichment and rehearsal of the method in a British-German context. *Br Account Rev* 42(3):207–222
- Braun V, Clarke V (2022) Conceptual and design thinking for thematic analysis. *Qual Psychol* 9(1):3
- Cheng X, Dunn R, Holt T, Inger K, Jenkins JG, Jones J, Wood DA (2023) Artificial intelligence's capabilities, limitations, and impact on accounting education: investigating ChatGPT's performance on educational accounting cases. *Issues Account Educ* 1–25
- Clarke V, Braun V (2017) Thematic analysis. *J Posit Psychol* 12(3):297–298
- Davis FD (1989) Perceived usefulness, perceived ease of use and user acceptance of information technology. *MIS Quart* 13(3):319–339
- Davis FD, Venkatesh V (1996) A critical assessment of potential measurement biases in the technology acceptance model: three experiments. *Int J Hum Comput Stud* 45(1):19–45
- Davis FD, Bagozzi RP, Warshaw PR (1989) User acceptance of computer technology: a comparison of two theoretical models. *Manag Sci* 35(8):982–1003
- El-Haj M, Rayson P, Walker M, Young S, Simaki V (2019) In search of meaning: lessons, resources and next steps for computational analysis of financial discourse. *J Bus Financ Account* 46(3–4):265–306
- Eulerich M, Sanatizadeh A, Vakilzadeh H, Wood DA (2023). Is it all hype? ChatGPT's performance and disruptive potential in the accounting and auditing industries. SSRN Electron J
- Fotoh L, Mugwira T (2023) The use of ChatGPT in external audits: implications and future research. SSRN 4453835.
- Gu H, Schreyer M, Moffitt K, Vasarhelyi MA (2023) Artificial intelligence co-piloted auditing. Available at SSRN 4444763.
- Guler N, Kirshner S, Vidgen R (2023) Artificial intelligence research in business and management: a literature review leveraging machine learning and large language models. 4540834.
- Hadi MU, Qureshi R, Shah A, Irfan M, Zafar A, Shaikh MB, Akhtar N, Wu J, Mirjalili S (2023) A survey on large language models: applications, challenges, limitations, and practical usage. *TechRxiv*
- Han X, Zhang Z, Ding N, Gu Y, Liu X, Huo Y, Zhu J (2021) Pre-trained models: past, present and future. *AI Open* 2:225–250
- Hirzallah M, Alshurideh M (2023) The effects of the internal and the external factors affecting artificial intelligence (AI) adoption in e-innovation technology projects in the UAE? Applying both innovation and technology acceptance theories. *Int J Data Netw Sci* 7(3):1321–1332
- Huang H, Zheng O, Wang D, Yin J, Wang Z, Ding S, Shi B (2023) ChatGPT for shaping the future of dentistry: the potential of multi-modal large language model. *Int J Oral Sci* 15(1):29
- Huang AH, Wang H, Yang Y (2023) FinBERT: A large language model for extracting information from financial text. *Contemp Account Res* 40(2):806–841
- Hyvärinen M (2008) Narrative form and narrative content. In: Järventie I, Lähde M (eds) *Methodological challenges in childhood and family research*. Tampere University Press, Tampere, pp 34–63
- Jiang Z, Xu FF, Araki J, Neubig G (2020) How can we know what language models know? *Trans Assoc Comput Linguist* 8:423–438
- Kasneji E, Seßler K, Küchemann S, Bannert M, Dementieva D, Fischer F, Kasneji G (2023) ChatGPT for good? On opportunities and challenges of large language models for education. *Learn Ind Differ* 103:1022743
- Kommunuri J (2022) Artificial intelligence and the changing landscape of accounting: a viewpoint. *Pac Account Rev* 34(4):585–594
- Liu Y, Han T, Ma S, Zhang J, Yang Y, Tian J, Ge B (2023) Summary of chatgpt-related research and perspective towards the future of large language models. *Meta-Radiol* 100017.
- Manivannan P, Prabha D, Balasubramanian K (2022) Artificial intelligence databases: turn-on big data of the SMBs. *Int J Bus Inf Syst* 39(1):1–16
- Marrone M, Hazelton J (2019) The disruptive and transformative potential of new technologies for accounting, accountants and accountability: a review of current literature and call for further research. *Meditari Account Res* 27(5):677–694
- Matthews JR (2017) Understanding indigenous innovation in rural West Africa: challenges to diffusion of innovations theory and current social innovation practice. *J Hum Dev Capabil* 18(2):223–238
- Min S, So KKF, Jeong M (2019) Consumer adoption of the Uber mobile application: insights from diffusion of innovation theory and technology acceptance model. *J Travel Tour Mark* 36(7):770–783. <https://doi.org/10.1080/10548408.2018.1507866>
- Min B, Ross H, Sulem E, Veyseh APB, Nguyen TH, Sainz O, Roth D (2023) Recent advances in natural language processing via large pre-trained language models: a survey. *ACM Comput Surv* 56(2):1–40
- O'Leary DE (2022) Massive data language models and conversational artificial intelligence: emerging issues. *Intell Syst Account, Finance Manag* 29(3):182–198
- Qazi W, Raza SA, Shah N (2018) Acceptance of e-book reading among higher education students in a developing country: the modified diffusion innovation theory. *Int J Bus Inf Syst* 27(2):222–245
- Raiaan MAK, Mukta MSH, Fatema K, Fahad NM, Sakib S, Mim M, Azam S (2023) A review on large language models: architectures, applications, taxonomies, open issues and challenges. *TechRxiv* <https://doi.org/10.36227/techrxiv.24171183.v1>
- Rogers EM (1995) *Diffusion of innovations*. The Free Press, New York, NY
- Rogers EM (2002) *Diffusion of preventive innovations*. *Addict Behav* 27(6):989–993
- Rogers EM (2003) *Diffusion of innovations*, 5th edn. Free Press, New York
- Saleh I, Marei Y, Ayoush M, Afifa MMA (2022) Big data analytics and financial reporting quality: qualitative evidence from Canada. *J Financ Rep Account*. <https://doi.org/10.1108/JFRA-12-2021-0489>
- Scao TL, Fan A, Akiki C, Pavlick E, Illi'c S, Hesslow D, Castagn'ere R, Luccioni AS, Yvon F, Gall'è M, et al. (2022). BLOOM: A 176B-parameter open-access multilingual language model. *arXiv preprint arXiv:2211.05100*.
- Seethamraju R, Hecimovic A (2023) Adoption of artificial intelligence in auditing: an exploratory study. *Aust J Manag* 48(4):780–800
- Sgantzos K, Hemaury MA, Tzavaras P, Stelios S (2023) Triple-entry accounting as a means of auditing large language models. *J Risk Financ Manag* 16(9):383
- Siano F, Wysocki P (2021) Transfer learning and textual analysis of accounting disclosures: applying big data methods to small (er) datasets. *Account Horizons* 35(3):217–244
- Soon KWK, Lee CA, Boursier P (2016) A study of the determinants affecting adoption of big data using integrated technology acceptance model (TAM) and diffusion of innovation (DOI) in Malaysia. *Int J Appl Bus Econ Res* 14(1):17–47

47. Street D, Wilck J, Chism Z (2023) Six principles for the effective use of ChatGPT and other large language models in accounting. *CPA J* (Forthcoming).
48. Sutton SG, Holt M, Arnold V (2016) "The reports of my death are greatly exaggerated"—artificial intelligence research in accounting. *Int J Account Inf Syst* 22:60–73
49. Taherdoost H (2018) A review of technology acceptance and adoption models and theories. *Procedia Manuf* 22:960–967
50. Toumeh AA (2022) The influence of enterprise resource planning system implementation on accrual-based earnings management: Empirical evidence from Jordan. *Glob Bus Rev*. <https://doi.org/10.1177/09721509221116692>
51. Toumeh AA, Ayoush M, Ahmad H (2023) An empirical study of the effect of enterprise resource planning system on Tobin's Q. In: Cutting-edge business technologies in the big data era, studies in big data (vol. 135). Springer. [https://doi.org/10.1007/978-3-031-42463-2\\_6](https://doi.org/10.1007/978-3-031-42463-2_6)
52. Vasarhelyi MA, Moffitt KC, Stewart T, Sunderland D (2023) Large language models: an emerging technology in accounting. *J Emerg Technol Account* 20(2):1–10
53. Venkatesh V, Bala H (2008) Technology acceptance model 3 and a research agenda on interventions. *Decision Sci* 39(2):273–315
54. Venkatesh V, Davis FD (2000) A theoretical extension of the technology acceptance model: four longitudinal field studies. *Manag Sci* 46(2):186–204
55. Vijayarathy LR (2004) Predicting consumer intentions to use on-line shopping: the case for an augmented technology acceptance model. *Inf Manag* 41(6):747–762
56. Vourvachis P, Woodward T (2015) Content analysis in social and environmental reporting research: trends and challenges. *J Appl Account Res* 16(2):166–195
57. Webb T, Holyoak KJ, Lu H (2023) Emergent analogical reasoning in large language models. *Nat Hum Behav* 7(9):1526–1541
58. Wei J, Tay Y, Bommasani R, Raffel C, Zoph B, Borgeaud S, Fedus W (2022) Emergent abilities of large language models. arXiv preprint [arXiv:2206.07682](https://arxiv.org/abs/2206.07682).
59. Wejnert B (2002) Integrating models of diffusion of innovations: a conceptual framework. *Annu Rev Sociol* 28(1):297–326
60. Yassin MM (2017) The determinants of internet financial reporting in Jordan: financial versus corporate governance. *Int J Bus Inf Syst* 25(4):526–556
61. Yigitbasioğlu O, Green P, Cheung MYD (2023) Digital transformation and accountants as advisors. *Account Audit Account J* 36(1):209–237
62. Yuen KF, Cai L, Qi G, Wang X (2021) Factors influencing autonomous vehicle adoption: an application of the technology acceptance model and innovation diffusion theory. *Technol Anal Strategic Manag* 33(5):505–519
63. Zhang L, Cai W, Liu Z, Yang Z, Dai W, Liao Y, Chen Y (2023) Fineval: a chinese financial domain knowledge evaluation benchmark for large language models. arXiv preprint [arXiv:2308.09975](https://arxiv.org/abs/2308.09975).
64. Zhao H, Chen H, Yang F, Liu N, Deng H, Cai H, Du M (2023) Explainability for large language models: a survey. arXiv preprint [arXiv:2309.01029](https://arxiv.org/abs/2309.01029).
65. Zhou Y (2008) Voluntary adopters versus forced adopters: integrating the diffusion of innovation theory and the technology acceptance model to study intra-organizational adoption. *New Media Soc* 10(3):475–496

Business Information Systems, Management and Accounting Review, Asia-Pacific Management Accounting Journal, International Journal of Business and Emerging Markets, and Indian Journal of Corporate Governance, among others. He actively engages as a reviewer for several reputable journals, publishers, and conferences.

### Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

**Ahmad A. Toumeh** is currently an Assistant Professor in the Department of Accounting at Al-Zaytoonah University of Jordan. He earned his PhD from the University of Science, Malaysia. Alongside his academic experience, He possesses over twelve years of valuable professional and training experience in the accounting field. His primary research interests lie in the field of financial accounting and reporting, corporate governance, IFRS, auditing, and AIS. His scholarly contributions are exemplified by research articles published in prestigious journals such as *Global Business Review*, *Australasian Accounting, Business and Finance Journal*, *International Journal of*