

Yassin, Mohammed M.; Toumeh, Ahmad A.

Article

Innovative approaches to accounting education: incorporating business intelligence tools

Cogent Business & Management

Provided in Cooperation with:

Taylor & Francis Group

Suggested Citation: Yassin, Mohammed M.; Toumeh, Ahmad A. (2024) : Innovative approaches to accounting education: incorporating business intelligence tools, Cogent Business & Management, ISSN 2331-1975, Taylor & Francis, Abingdon, Vol. 11, Iss. 1, pp. 1-15, <https://doi.org/10.1080/23311975.2024.2414851>

This Version is available at:

<https://hdl.handle.net/10419/326613>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.



<https://creativecommons.org/licenses/by/4.0/>

Innovative approaches to accounting education: incorporating business intelligence tools

Mohammed M. Yassin & Ahmad A. Toumeh

To cite this article: Mohammed M. Yassin & Ahmad A. Toumeh (2024) Innovative approaches to accounting education: incorporating business intelligence tools, Cogent Business & Management, 11:1, 2414851, DOI: [10.1080/23311975.2024.2414851](https://doi.org/10.1080/23311975.2024.2414851)

To link to this article: <https://doi.org/10.1080/23311975.2024.2414851>



© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



Published online: 24 Oct 2024.



Submit your article to this journal [↗](#)



Article views: 1901



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 1 View citing articles [↗](#)

Innovative approaches to accounting education: incorporating business intelligence tools

Mohammed M. Yassin and Ahmad A. Toumeh 

Faculty of Business, Al-Zaytoonah University of Jordan, Amman, Jordan

ABSTRACT

This study explores innovative approaches to accounting education by incorporating business intelligence (BI) tools. With the rapid advancement of technology and increasing complexity of business operations, traditional accounting education methods are being challenged to keep pace with industry demands. A total of 395 questionnaires were distributed to professional accountants and academic staff members. Data analysis entailed both descriptive and inferential statistics. The analysis revealed distinct insights into the perceptions of incorporating BI tools into accounting curricula. Integration of BI tools in accounting education assures transformative effects, as highlighted by positive responses regarding curriculum adaptation, skills, and competencies as well as career transformation. Furthermore, discrepancies between academics and professionals in research focus confirm the need for further investigation into BI-based accounting. This study shows the significance of BI tools in accounting education for academics, highlighting the need to update curricula to incorporate these advancements. This emphasizes the pivotal role that BI technology plays in advancing accounting practices. Consequently, teaching methods and course materials should evolve to enhance students' skills and increase their employability, thereby contributing to a more competitive workforce.

ARTICLE HISTORY

Received 7 March 2024
Revised 7 August 2024
Accepted 5 October 2024

KEYWORDS

Accounting education innovation; business intelligence tools; curriculum adaptation; research focus; skills and competencies; interdisciplinary collaboration; career transformation

SUBJECTS

Accounting; Management of Technology & Innovation; Accounting Education

1. Introduction

Technology adoption has become a critical driver of success and competitiveness (Tallman et al., 2018; Toumeh, 2022). Accounting procedures have been transformed by the exponential growth of data and the introduction of business intelligence (BI) tools, which have transformed how financial information is processed, evaluated, and utilized. These innovations have prompted a paradigm shift in accounting education to ensure that future accountants possess the skills and knowledge required to survive in this data-driven era (Fu et al., 2021).

Accounting education has traditionally concentrated on fundamental principles and manual processes, preparing students for professions that frequently require repetitive work (Sidorova et al., 2019). However, the incorporation of business intelligence technologies can enable accountants to work quickly with massive amounts of data and draw meaningful insights, resulting in better decision-making (Toumeh, 2024). Because of the possible impact of BI tools on accounting education, the curriculum must be reassessed and restructured to meet the changing professional demands of the profession (Hannan, 2023).

The motivation for this study derives from the urgent need for academia to keep up with the ever-changing needs of the accounting profession. Accounting education must keep up with industry advancements, as firms increasingly rely on data analytics and business intelligence to gain insights into their financial performance. Despite the importance of technology in accounting, the incorporation of business intelligence technologies into the accounting curriculum remains largely unknown. Therefore, knowing both academic and professional viewpoints is critical in identifying potential challenges and opportunities for using BI tools in accounting education.

CONTACT Ahmad A. Toumeh  a.toumeh@zuj.edu.jo  Faculty of Business, Al-Zaytoonah University of Jordan, Amman 11733, Jordan.

© 2024 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

Although numerous studies have focused on the impact of technology on accounting processes and the adoption of business intelligence tools in various industries, there are few systematic research on the implementation of Business Intelligence tools in accounting education. The existing literature focuses on technology adoption in accounting businesses, with little emphasis on the consequences of accounting education. Addressing this research gap will provide accounting educators with significant insights into how to alter their teaching techniques and curricula properly.

The incorporation of business intelligence tools into accounting education creates new obstacles and opportunities. Academics must design new teaching approaches, update course materials, and ensure that students grasp concepts successfully to use such tools (Ayoush et al., 2023; Marshall, 2020). Concerns about potential overreliance on technology and its implications for human judgment and ethical decision-making in accounting merit serious attention (Hannan, 2023).

On the other hand, accounting professionals may face difficulties adapting to new technologies, resolving cybersecurity concerns, and managing the move from traditional to technology-enabled operations (Toume, *in press*). Despite these limitations, incorporating BI tools has the potential to improve accounting education by encouraging students' data literacy, critical thinking, and problem-solving skills (Marshall, 2020). Students' employability and career prospects in a competitive labor market can be considerably improved by providing them with fluency in BI technologies (Chan, 2019).

This study evaluates the introduction of business intelligence tools into accounting education by exploring and comparing the perspectives of academics and industry experts. It provides comprehensive insights into the potential benefits and challenges of implementing BI tools in accounting education by assessing the perspectives of accounting academics, who are instrumental in shaping accounting curricula, and accounting professionals, who have real-world experience and expertise.

Furthermore, accounting professionals' perspectives on the utility and impact of business intelligence technologies in their everyday activities are critical in determining the practical usability of BI tools in real-world accounting settings. Their feedback can provide useful insights into the efficiency of BI technologies in optimizing procedures, boosting accuracy, and improving financial analysis (Chen et al., 2012).

This study aims to make a substantial contribution to the subject of accounting education by shedding light on the underutilized area of utilizing business intelligence tools. It will offer insights of the obstacles and opportunities in incorporating technology into accounting education by contrasting the perspectives of accounting academics and professionals. The findings will allow accounting educators to create creative teaching techniques and curricula in line with the changing needs of the accounting profession in the age of data-driven decision-making.

Further, this study aims to bridge the gap between academia and industry by promoting a more effective and relevant accounting education system that provides accountants with the skills and information they need to flourish in their employment. The following sections of this article will delve into the methodology, data analysis, and discussion of findings, ultimately contributing to the improvement of accounting education in the digital era.

Our research aims to address several key questions in the realm of accounting education and the integration of business intelligence tools. Firstly, how effective is the incorporation of business intelligence tools in accounting education, and what is their impact on learning outcomes and efficiency? Secondly, what are the primary challenges and opportunities associated with integrating business intelligence tools into accounting education, and how can these be navigated effectively? Finally, what are the differing perspectives between academics and professionals regarding the use of business intelligence tools in accounting education, and what points of consensus or divergence exist between these groups? Addressing these research questions, we aim to provide a comprehensive understanding of the implications of incorporating business intelligence tools in accounting education, thereby significantly contributing to the existing body of knowledge in this field.

2. Literature review

In accounting education literature, it is evident that technological developments have changed the shape of accounting curricula. Different technological changes, including BI, have been shown to affect the accounting profession (Brink & Stoel, 2019). This section reviews the most important literature on

incorporating BI tools in accounting education and their significance in affecting the skills and competencies required by accounting graduates.

2.1. The effect of BI tools on accounting practices

Different definitions of BI have been suggested by researchers, but these definitions agree that BI is an umbrella that contains tools, methodologies, and databases combined into a unified software suite. The most recognized definition is suggested by Howard Dresner of Gartner Research in 1989, who is known as the father of BI. He defined BI as 'a broad category of software and solutions for gathering, consolidating, analyzing, and providing access to data in a way that lets enterprise users make better business decisions' (Gibson et al., 2004). Reinschmidt and Francoise (2000) suggested a more operational BI system definition, which defined the BI system as 'an integrated set of tools, technologies, and programmed products that are used to collect, integrate, analyze and make data available'. This definition highlights the importance of BI as a tool that facilitates data accessibility, manipulation, and analysis by decision-makers.

Bhimani and Willcocks (2014) raised concerns about how accountants add value to their organizations and what kind of data they have to work with. These questions have been raised as a result of new technologies such as blockchain, data analytics, BI, and artificial intelligence, which have transformed the accounting profession and the economy as a whole (Abu Afifa et al., 2023; Moll & Yigitbasioglu, 2019; Saleh et al., 2022) and different researchers have highlighted different perspectives regarding the effect of these technologies, especially BI, on the accounting profession and accountants (Appelbaum et al., 2017; Chen & Lin, 2021; Sarigiannidis et al., 2021; Stanciu et al., 2020). Thomson (2018) argues that these technologies will contribute to expanding and redefining the role of accountants and make technological skills more important for accountants than ever before. Others have addressed the ability of BI tools to provide real-time insightful data for decision-makers (Keleko et al., 2022), automation capabilities (Chu & Yong, 2021), minimize the time and resources needed for operations (Huang et al., 2022), reduce errors, increase productivity (Perdana et al., 2023), and lower the risk of financial reporting fraud (Noordin et al., 2022).

The accounting profession is affected by big data manipulation and analyses. Vasarhelyi et al. (2015) provide evidence about the relationship between big data and the accounting profession by discussing the different sources and uses of data in accounting. However, this study did not provide suggestions about the skills needed by future accountants. Schneider et al. (2015) examined some accounting tasks affected by data analytics and highlighted concerns about the effect of data analytics on the accounting profession. Other researchers have also provided insights into the use of data analytics in accounting. Fisher et al. (2010) discuss the benefits of using text analytics in accounting. Debreceny and Gray (2010) describe the use of data mining to detect fraud.

2.2. Incorporating BI tools into accounting education

In response to the market demand from accounting graduates to possess data analytic skills, the Association to Advance Collegiate Schools of Business International (AACSB) requires accounting departments within the accreditation standards to include a minimum level of technology and data analytic skills in their curricula through standard A7 (now standard A5) (Andiola et al., 2020; Polimeni & Burke, 2021). Accounting students should be aware of how business organizations can utilize related technologies to perform their processes and solve business problems (PricewaterhouseCoopers (PwC), 2018). In an effort to align with the rapidly changing technological environment surrounding the accounting profession, the American Institute of Certified Public Accountants (AICPA) jointly with the National Association of State Boards of Accounting (NASBA) has initiated a project called 'CPA Evolution Project'. This project aimed to change the licensure model to adapt it to technological changes (Gioiosa et al., 2024). The project suggested some changes, including the integration of technology into the core practices of accounting, in addition to demonstrating proficiency in technology (American Institute of Certified Public Accountants (AICPA), 2020). Additionally, the Institute of Internal Auditors (IIA) and the Institute of Management Accountants (IMA) have updated their certification programs with a focus on technology (Sarkar et al., 2021). Furthermore, through their education centers, large public accounting firms such as EY and Deloitte are actively incorporated into their classroom materials (Accounting Today, 2019).

In response to the continuous calls about the need to modify accounting curricula to suit rapid technological developments, Polimeni and Burke (2021) believed that accounting educators are required to make radical curriculum changes to meet technological advancements. Leitner-Hanetseder et al. (2021) believed that IT skills such as data analytics should be incorporated into accounting programs. Brink and Stoel (2019) found that accountants are more interested in data communication and interpretation skills than the technicalities of data analytic skills. This assures the intermediary role of accountants in explaining the information provided by data scientists and communicating with users. Furthermore, they suggest that it is necessary to move curricula to an advanced stage by adjusting materials to include, for example, advanced MS Excel, Power BI, or Tableau. Lawson et al. (2014) suggested that the same skills should be added to accounting curricula. Furthermore, McKinney et al. (2017) emphasized that accountants need big data analysis skills.

However, all these steps to find the best combination of BI analytic skills to include in accounting curricula may face some obstacles, such as the lack of financial resources for implementation, students' lack of passion to receive training, the need for interdisciplinary faculty staff, and continuous rapid changes in technology (Leitner-Hanetseder et al., 2021). Furthermore, accountants face challenges related to the analytical skills needed to extract value from the data. On the other hand, academic accounting departments face challenges related to determining the skills required by the accounting industry and the tools needed to deliver these needs (Dzuranin et al., 2018).

Returning to the opportunities and challenges that were presented previously, bridging the practice-theory gap needs to consider both academic and professional perspectives (Kestel, 2023; Losi et al., 2022), to emphasize the efforts of academics to develop comprehensive content, methodologies, and evaluation systems (Falloon, 2020; Paul & MacDonald, 2020). Additionally, accounting professionals provide their experience regarding the practical side of BI tool application (Daff, 2021), and how to emphasize data-driven decision-making (Mcbride & Philippou, 2022).

2.3. Impact of BI tools on accounting education

Academics and business leaders alike have prioritized the integration of Business Intelligence (BI) tools into accounting practice and education. This section examines the various effects of using BI tools, including changes in curricula, research focus, competencies and skills, multidisciplinary cooperation, and career transformation.

2.3.1. Curriculum adaptation

BI was introduced into accounting education as a significant change in curriculum design to align with career standards (Andiola et al., 2020). Babalola et al. (2023) emphasized the introduction of BI as a pragmatic change in accounting education to fulfil growing market demand. This growing demand for BI tools in accounting education is a response to the needs of students, in addition to the market (Dangi et al., 2023). Tan et al. (2022) argued that it is important for students to be provided with knowledge, skills, and competencies to bridge the gap between theory and practice. Similarly, Mcbride and Philippou (2022) showed that incorporating the provision of data analytics skills in the accounting curriculum enhances accounting education to meet market needs. Additionally, Hamad et al. (2023) argued that using BI tools keeps accounting education up-to-date with the ever-changing field.

2.3.2. Research focus

Researchers are responsible for considering the repercussions of the accounting profession (Sutton et al., 2016). There is a need for more research on the latest requirements in accounting and on the skills needed by accountants to adapt to evolving changes in the profession (Moll & Yigitbasioglu, 2019). Many questions related to BI have been introduced and researched. However, there has been little focus on the comparison between theory and market needs (Perkhofer et al., 2019). Furthermore, BI technologies have become an important factor in accounting research as an influential element in financial reporting (Huang et al., 2022), data analytics (Bany Mohammad et al., 2022) and ethics (Ashok et al., 2022). Troshani (2021) emphasized the importance of conference sessions in addressing current and hot topics and their role in reshaping the accounting profession.

2.3.3. Skills and competences

Currently, accountants manipulate and analyze big data. This type of data requires accountants to possess and enhance different analytical skills (Kroon et al., 2021). Accounting students need data analysis and technological skills to succeed in the profession (Li, 2022). In response, the AACSB mandated the integration of the minimum level of data analysis and technological skills in the accounting curricula of accredited accounting programs (Andiola et al., 2020). These skills contribute to saving time and effort in manual work. Accounting professionals are set apart based on their knowledge of BI tools (Sihite et al., 2021). For this reason, business firms have started to invest in these emerging technologies to improve the decision-making process (Ranjan & Foropon, 2021) as a way to overcome the drawbacks of traditional data processing methods. Yassin et al. (2012) stress the increased need for accountants to have such technological skills. Banasik and Jubb (2021) reviewed the master-level accounting curricula of Australian universities to include five employability skills. In terms of digital technology skills, they found that these skills were often not evident.

2.3.4. Interdisciplinary collaboration

Interdisciplinary has become widely accepted across disciplines (Moirano et al., 2020). Interdisciplinary approaches are required to address complex issues in accounting and move beyond their conventional origins (Twyford & Abbas, 2023), especially in the technological era. Accounting graduates should be equipped with BI skills, as required by the industry (Woodside et al., 2020). Junger da Silva et al. (2021) argued that modern technologies are crucial for accountants. For these reasons, accounting curricula should include topics such as BI tools in accounting procedures, which will open the doors for collaboration with other fields in this area (Hamad et al., 2023). These types of collaboration stimulate the interdisciplinary approach to solving different accounting issues, especially those related to technological aspects in accounting (Gulin et al., 2019).

2.3.5. Career transformation

BI, as with any other technological development, has changed workflows and workplaces in the accounting profession. This creates demand for different technological competencies from accountants (Leitner-Hanetseder et al., 2021). The structure and processes in accounting, including the financial reporting process, in addition to financial analysis, have been affected by new technologies (Yassin et al., 2012), creating a space for accountants to learn these technologies and increase the dynamicity and accessibility of financial data to be easily communicated with stakeholders. Furthermore, different studies have examined new technologies and their effects on the accounting profession, in addition to paying attention to changes in tasks as well as the skills needed (Moll & Yigitbasioglu, 2019).

When using BI tools in accounting practices, accountants must be familiar with ethical and regulatory issues (Alles, 2020). They should be aware that these new practices comply with accounting standards and related ethical principles (Martin, 2019).

3. Methodology

3.1. Sampling and data collection

This study targeted professionals in the accounting field and academic staff in accounting departments of Jordanian universities. These two groups of participants were targeted to provide valuable insights into incorporating BI tools in accounting education. Following Pals (2008), to achieve the purpose of this research, a purposive sampling approach was used, which provided more accurate, robust, and comprehensive findings.

An online questionnaire was disseminated to the two groups of participants as follows. The sample of professional accountants was reached through the Jordanian Association of Certified Public Accountants (JACPA). The sample of accounting academic staff was obtained from the accounting department heads of Jordanian universities. The questionnaire link was sent via WhatsApp and email. Participants were asked to use the snowball technique to disseminate the questionnaire to other target participants. After a six-week period, 395 valid responses were used in the analysis. Table 1 shows respondents' profiles.

Table 1. Profile of respondents.

| Socio-demographic variable | Academicians sample | | Practitioners sample | | Total | |
|----------------------------|---------------------|-----|----------------------|----|-------|----|
| | N | % | n | % | n | % |
| Gender | | | | | | |
| Male | 65 | 61 | 181 | 63 | 246 | 62 |
| Female | 42 | 39 | 107 | 37 | 149 | 38 |
| Total | 107 | | 288 | | 395 | |
| Age | | | | | | |
| < 25 | 0 | 0 | 0 | 0 | 0 | 0 |
| 25–35 | 29 | 27 | 85 | 30 | 114 | 29 |
| 36–45 | 21 | 20 | 27 | 9 | 48 | 12 |
| 46–55 | 26 | 24 | 85 | 30 | 111 | 28 |
| > 55 | 31 | 29 | 91 | 32 | 122 | 31 |
| Total | 107 | | 288 | | 395 | |
| Education | | | | | | |
| Diploma | 0 | 0 | 9 | 3 | 9 | 2 |
| Bachelor | 0 | 0 | 94 | 33 | 94 | 24 |
| Master | 38 | 36 | 81 | 28 | 119 | 30 |
| PhD | 69 | 64 | 104 | 36 | 173 | 44 |
| Total | 107 | | 288 | | 395 | |
| Job Level | | | | | | |
| Faculty member | 107 | 100 | 0 | 0 | 107 | 35 |
| Accountant | 0 | 0 | 58 | 20 | 58 | 19 |
| Financial manager | 0 | 0 | 74 | 26 | 74 | 24 |
| Auditor | 0 | 0 | 156 | 54 | 156 | 51 |
| Total | 107 | | 288 | | 395 | |

Table 2. Sources of variables' measures.

| Variable | No of items | References |
|---------------------------------|-------------|---|
| Curriculum Adaptation | 6 | Dangi et al., 2023; McBride & Philippou, 2022; Tan et al., 2022; Andiola et al., 2020 |
| Research focus | 3 | Huang et al., 2022; Ashok et al., 2022; Troshani, 2021 |
| Skills and Competences | 6 | Li, 2022; Banasik & Jubb, 2021; Ranjan & Foropon, 2021; Kroon et al., 2021; Sihite et al., 2021 |
| Interdisciplinary collaboration | 3 | Twyford & Abbas, 2023; Junger da Silva et al., 2021; Woodside et al., 2020 |
| Career transformation | 3 | Leitner-Hanetseder et al., 2021; Alles, 2020; Moll & Yigitbasoglu, 2019 |

3.2. Questionnaire development

In this exploratory study, a questionnaire was designed to collect empirical data. The items used to measure the variables were extracted from the literature. Table 2 shows the sources used to measure curriculum adaptation, research focus, skills and competencies, interdisciplinary collaboration, and career transformation.

Three specialists in the BI and accounting areas were consulted to validate that the 21 questionnaire items reliably measured the five variables and to address any potential bias. Based on their comments, the items have been revised and enhanced. The final questionnaire items are presented in Table 3. A five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used to respond to each questionnaire item.

4. Results and discussion

To achieve the research objectives, the collected data were processed using STATA. In addition to identifying the sample characteristics, a two-sample t-test was used to identify any differences in opinion between academics and professionals regarding the use of business intelligence tools in accounting education.

Table 3 provides a comprehensive overview of participants' perceptions of the integration of Business Intelligence (BI) tools in accounting education. The survey collected data from diverse groups of participants, including academic staff and professionals. The table presents descriptive statistics, including means and standard deviations, for each item within key variables: Curriculum Adaptation (CA), Research Focus (RF), skills and competencies (SC), Interdisciplinary Collaboration (IC), and Career Transformation (CT). These variables aim to assess the various dimensions related to the incorporation of BI tools into the accounting field. The Table divides the data to provide insights into the perspectives of academic staff (n=107) and professionals (n=288) separately.

The overall mean for Curriculum Adaptation (CA) is 4.025, indicating positive sentiment. The Cronbach's alpha for the six items measuring CA was 0.921. Academics showed a slightly higher overall mean (4.100)

Table 3. Questionnaire and descriptive statistics.

| Variable | Item No | Item | Cronbach's alpha | All respondents | | Academic staff respondents | | Professional respondents | |
|----------|-----------|--|------------------|-----------------|-------------|----------------------------|----|--------------------------|----|
| | | | | n = 395 | | n = 107 | | n = 288 | |
| | | | | M | SD | M | SD | M | SD |
| CA | | Curriculum adaptation | | | | | | | |
| | CA1 | The integration of BI tools has necessitated a reevaluation of accounting curriculum to align with industry requirements. | | 4.132 0.985 | 4.184 0.971 | 4.108 0.989 | | | |
| | CA2 | Emphasizing practicality in education is critical for educating future accountants to meet the increasing demands of the industry. | | 3.982 0.956 | 4.078 0.918 | 3.944 0.967 | | | |
| | CA3 | The increased demand for BI tool-focused courses demonstrates attention to student and job market needs. | | 4.018 1.015 | 4.097 0.985 | 3.986 1.024 | | | |
| | CA4 | Adopting hands-on teaching approaches to equip students with practical skills is essential for their employment | | 4.025 1.058 | 4.058 1.083 | 4.007 1.047 | | | |
| | CA5 | In accounting education, increased participation in data-driven projects and case studies fills the gap between theory and practice | | 4.053 1.021 | 4.165 0.965 | 4.007 1.037 | | | |
| | CA6 | The incorporation of BI tools in accounting education and professional development demonstrates a commitment to remaining up-to-date with changing technologies | | 3.939 1.128 | 4.019 1.088 | 3.899 1.140 | | | |
| | CA | <i>Overall</i> | .921 | 4.025 1.027 | 4.100 1.002 | 3.992 1.034 | | | |
| RF | | Research focus | | | | | | | |
| | RF1 | The shift towards technology-related research underscores a commitment to tackling evolving accounting trends. | | 3.003 1.256 | 3.311 1.304 | 2.896 1.220 | | | |
| | RF2 | Recognizing the importance of investigating the influence of BI tools on financial reporting, data analytics, and ethics is critical for providing relevant research. | | 3.005 1.214 | 3.214 1.184 | 2.927 1.215 | | | |
| | RF3 | The incorporation of technology-focused sessions in conferences emphasizes the increasingly important role of technology in the accounting profession. | | 2.959 1.256 | 3.252 1.151 | 2.854 1.277 | | | |
| | RF | <i>Overall</i> | .893 | 2.989 1.242 | 3.259 1.213 | 2.892 1.238 | | | |
| SC | | Skills and competences | | | | | | | |
| | SC1 | The inclusion of BI tools has substantially decreased the time spent in accounting practice on manual tasks, allowing individuals to focus on higher-value activities. | | 4.089 0.729 | 4.019 0.735 | 4.108 0.726 | | | |
| | SC2 | Proficiency with BI tools is an important distinction in accounting careers. | | 4.372 0.898 | 4.350 0.880 | 4.375 0.904 | | | |
| | SC3 | In the context of BI tools, positions have shifted from data processing to data interpretation. | | 4.390 0.830 | 4.359 0.803 | 4.396 0.839 | | | |
| | SC4 | In response to the demands of the industry, there has been an observed rise in the demand for accountants with technologically advanced abilities. | | 4.033 0.777 | 3.961 0.772 | 4.059 0.777 | | | |
| | SC5 | Exploration of innovative assessment approaches, such as employing BI tools to address accounting problems, develops students' critical thinking and practical skills. | | 4.281 0.960 | 4.252 0.900 | 4.288 0.981 | | | |
| | SC6 | Continued learning and BI technology upskilling are significant components of professional progress. | | 4.101 0.786 | 4.058 0.830 | 4.118 0.768 | | | |
| | SC | <i>Overall</i> | .878 | 4.211 0.830 | 4.167 0.820 | 4.224 0.833 | | | |
| IC | | Interdisciplinary collaboration | | | | | | | |
| | IC1 | Collaborating with industry partners is a valuable outcome of incorporating BI tools into accounting education. | | 3.729 1.123 | 3.553 1.201 | 3.788 1.087 | | | |
| | IC2 | Collaborating with data science and information technology colleagues encourages an interdisciplinary approach to addressing technological issues and opportunities in accounting field. | | 3.835 1.065 | 3.864 1.077 | 3.823 1.061 | | | |
| | IC3 | Effective problem-solving in accounting requires cooperation among IT departments and data scientists within the organization. | | 3.815 1.060 | 3.689 1.109 | 3.851 1.038 | | | |
| | IC | <i>Overall</i> | .855 | 3.793 1.083 | 3.702 1.129 | 3.821 1.062 | | | |
| CT | | Career transformation | | | | | | | |
| | CT1 | BI tools have reshaped financial reporting, making information more dynamic and easily available for client and stakeholder communication. | | 4.278 0.879 | 4.214 0.827 | 4.295 0.897 | | | |
| | CT2 | Awareness of the relevance of data security and ethical issues when using BI tools in accounting practice is essential. | | 4.235 0.867 | 4.194 0.876 | 4.243 0.864 | | | |
| | CT3 | The usage of BI technologies has boosted the effectiveness of the financial analysis and decision-making process in accounting practice. | | 4.190 0.898 | 4.097 0.872 | 4.215 0.906 | | | |
| | CT | <i>Overall</i> | .788 | 4.23 0.88 | 4.17 0.86 | 4.25 0.89 | | | |

for CA, suggesting a particularly positive view. The highest-rated item is CA5 (in accounting education, increased participation in data-driven projects and case studies fill the gap between theory and practice), with a mean of 4.053. CA4 (Adopting hands-on teaching approaches to equip students with practical

skills is essential for their employment) is the most highly rated item among academics. Practitioners also had a positive perception of curriculum adaptation, with an overall mean of 3.992. These results align with those of Andiola et al. (2020), Tan et al. (2022), and Dangi et al. (2023), who argued that BI represents a significant change in designing accounting curricula to fulfil market demand. CA3 (the increased demand for BI tool-focused courses demonstrates attention to student and job market needs) received the highest rating among practitioners. Previous results are aligned with McBride and Philippou (2022), who assured the importance of incorporating the provision of data analytics skills in the accounting curriculum to improve accounting education. In addition, the results align with Hamad et al. (2023), who emphasized the importance of using BI tools to keep accounting education up-to-date with the ever-changing field.

The average value for the Research Focus (RF) was 2.989, suggesting a somewhat lower agreement compared to the other variables. RF1 (The shift towards technology-related research underscores a commitment to tackling evolving accounting trends) and RF2 (recognizing the importance of investigating the influence of BI tools on financial reporting, data analytics, and ethics is critical for providing relevant research) received higher ratings than RF3 (the incorporation of technology-focused sessions in conferences emphasizes the increasingly important role of technology in the accounting profession). Academic staff expressed stronger agreement with the research focus items, with an overall mean of 3.259. RF3 received a lower rating from academic staff. Professionals showed slightly lower agreement with the research focus, especially on RF3, with an overall mean of 2.892. Cronbach's alpha for the three items measuring RF was 0.893.

This lower average could be indicative of specific contextual factors or sample characteristics unique to the study population. For instance, it could reflect the particular demographics, experiences, or perceptions of the respondents involved in the study. In addition, the perceived impact of variables may vary depending on the specific focus and methodology of the study. Previous literature might have explored different aspects or dimensions of BI tools in accounting education, leading to varying conclusions or emphasis on particular variables. Nevertheless, the overall results of this variable correspond to the results of previous research, such as Moll and Yigitbasioglu (2019), who argued that accounting research should pay attention to the skills needed by accountants to adapt to evolving changes in the profession. Other studies have focused on BI technologies as an important factor in accounting research, as they affect financial reporting (Huang et al., 2022), data analytics (Bany Mohammad et al., 2022) and ethics (Ashok et al., 2022).

The perception gap between practitioners and educators regarding the impact of research focus on Business Intelligence (BI) tools in accounting education can be attributed to several factors. Practitioners, who are actively involved in real-world accounting practices, may prioritize practical applicability and immediate relevance over theoretical or research-oriented aspects. They might perceive the research focus as having less effect because they prioritize the direct utility of BI tools in addressing practical challenges within their professional settings. In contrast, educators, who are more immersed in the academic realm, may emphasize the theoretical underpinnings and research implications of BI tools in accounting education. They might perceive the research focus as crucial for shaping the academic discourse, influencing curriculum development, and advancing the theoretical understanding of BI tools in accounting education. Additionally, practitioners and educators may have different perspectives due to their distinct professional backgrounds, experiences, and objectives. Practitioners' perspectives might be influenced by their day-to-day challenges, industry demands, and pragmatic considerations, whereas educators' perspectives might be shaped by pedagogical principles, research agendas, and long-term educational goals.

The overall mean for Skills and Competences (SC) is 4.211, indicating a highly positive perception. SC2 (Proficiency with BI tools is an important distinction in accounting careers) and SC5 (exploration of innovative assessment approaches such as employing BI tools to address accounting problems and developing students' critical thinking and practical skills) received the highest ratings. Academic staff generally agreed with the positive impact of BI tools on skills and competencies, with an overall mean of 4.167. SC1 (the inclusion of BI tools substantially decreased the time spent in accounting practice on manual tasks, allowing individuals to focus on higher-value activities) received the highest rating among academic staff. Professionals showed a positive perception of skills and competencies, with an overall mean

of 4.224. SC5 (exploration of innovative assessment approaches, such as employing BI tools to address accounting problems and developing students' critical thinking and practical skills) received the highest rating among professionals. Cronbach's alpha for the six items measuring SC was 0.878.

This finding implies that respondents generally view the SC variable favorably, with an average score of 4.211 out of a possible maximum score. The positive perception suggests that respondents perceive skills and competencies related to BI tools in accounting education in a favorable light. They likely recognize the importance and value of possessing these skills and competencies for the effective utilization of BI tools in their educational or professional endeavors. However, These results are in accordance with those of Li (2022), who argued that accounting graduates are required to have data analysis and technological skills to succeed in the profession, and Sihite et al. (2021), who emphasized that accounting professionals are set apart based on their knowledge of BI tools.

Concerning Interdisciplinary Collaboration (IC), the overall mean was 3.793, indicating a moderately positive sentiment. IC2 (Collaborating with data science and information technology colleagues encourages an interdisciplinary approach to addressing technological issues and opportunities in the accounting field) received the highest rating. The academic staff expressed agreement with interdisciplinary collaboration, with an overall mean of 3.702. IC2 (Collaborating with data science and information technology colleagues encourages an interdisciplinary approach to address technological issues and opportunities in the accounting field) received the highest rating among the academic staff. Professionals also agreed with interdisciplinary collaboration, with an overall mean of 3.821. IC3 (effective problem-solving in accounting requires cooperation among IT departments and data scientists within the organization) received the highest rating among professionals. Cronbach's alpha for the three items measuring IC was 0.855. Previous results emphasized the results of Gulin et al. (2019), Moirano et al. (2020), and Twyford and Abbas (2023), who argued that interdisciplinary approaches are required to address complex issues in accounting and move beyond their conventional origins, especially in the technological era. In addition, Hamad et al. (2023) recommend that accounting curricula include topics that include BI tools in accounting procedures, which will open the doors for collaboration with other fields in this area.

For Career Transformation (CT), the average value was 4.23, indicating a highly positive perception. CT1 (BI tools that have reshaped financial reporting, making information more dynamic and easily available for client and stakeholder communication) received the highest rating. The academic staff expressed a positive view of career transformation, with an overall mean of 4.17. CT1 received the highest rating among the academic staff. Professionals also showed a positive perception of career transformation, with an overall mean score of 4.25. Similarly, CT1 received the highest rating among the professionals. Cronbach's alpha for the three items measuring CT was 0.788. These results are in line with Moll and Yigitbasioglu (2019), who focused on changes in tasks as well as the skills needed.

Table 4 presents the findings of independent samples t-tests for five variables: Curriculum Adaptation (CA), Research Focus (RF), Skills and Competences (SC), Interdisciplinary Collaboration (IC), and Career Transformation (CT). The assumption of homogeneity of variance was examined using Levene's test for equality variances. As illustrated in Table 4, the significance level of Levene's test is higher than 0.05 for all variables, which means that the assumption of equal variances was met and the independent-samples t-test with equal variance was conducted for all variables. However, the t-test findings suggest that there is no significant difference in the means between the groups for the CA variable. The mean difference was 0.1218 with a standard error difference of 0.0986. Conversely, the results revealed a significant difference in the means between the groups for the RF variable. The mean difference was 0.3568 with a standard error difference of 0.1266. This mean difference could be justified by the findings of Perkhofer et al. (2019), who suggested that many research questions related to BI have been introduced and researched. However, there has been little focus on the comparison between theory and market needs.

With equal variances assumed, the t-test result implied no significant difference in the means for the SC variable. The mean difference was -0.0479, with a standard error difference of 0.0745. Moreover, the t-test finding indicated no significant difference in the means of the IC variable. The mean difference was -0.1009, with a standard error difference of 0.1081. Finally, the t-test results indicated no significant difference in the means for CT. The mean difference was -0.0611, with a standard error difference of 0.0837.

These findings indicate that, apart from the RF variable, perceptions between academics and practitioners are quite similar concerning the use of business intelligence (BI) tools in accounting. This

Table 4. Independent samples *t*-test.

| Variable | | Levene's test for equality of variances | | t-test for equality of means | | | | Std. error difference |
|----------|------------------------|---|-------|------------------------------|-----|-----------------|-----------------|-----------------------|
| | | F | Sig. | t | df | sig. (2-tailed) | Mean difference | |
| CA | Equal variance assumed | 0.969 | 0.868 | 1.235 | 393 | 0.22 | 0.1218 | 0.0986 |
| RF | Equal variance assumed | 0.895 | 0.514 | 2.818 | 393 | 0.01 | 0.3568 | 0.1266 |
| SC | Equal variance assumed | 1.032 | 0.825 | -0.643 | 393 | 0.52 | -0.0479 | 0.0745 |
| IC | Equal variance assumed | 1.124 | 0.449 | -0.933 | 393 | 0.35 | -0.1009 | 0.1081 |
| CT | Equal variance assumed | 0.932 | 0.681 | -0.729 | 393 | 0.47 | -0.0611 | 0.0837 |

Table 5. Two-sample Wilcoxon rank-sum test.

| | Observations | Rank Sum | z | Prob > z |
|----------------|--------------|----------|--------|-----------|
| CA | | | | |
| Academic staff | 107 | 22341 | | |
| Professionals | 288 | 55869 | 1.166 | 0.244 |
| RF | | | | |
| Academic staff | 107 | 24007 | | |
| Professionals | 288 | 54203 | 2.817 | 0.005 |
| SC | | | | |
| Academic staff | 107 | 20494 | | |
| Professionals | 288 | 57716 | -0.700 | 0.484 |
| IC | | | | |
| Academic staff | 107 | 20365.5 | | |
| Professionals | 288 | 57844.5 | -0.825 | 0.409 |
| CT | | | | |
| Academic staff | 107 | 20286.5 | | |
| Professionals | 288 | 57923.5 | -0.910 | 0.363 |

similarity may be due to a shared understanding of the importance and potential benefits of BI tools, despite the different contexts in which they operate. Both groups recognize the transformative impact of BI on accounting practices, skills development, and career advancement.

The current research conducts robustness checks using the non-parametric two-sample Wilcoxon rank-sum test, which serves as an analog for an independent sample *t*-test. The Wilcoxon rank-sum test is an appropriate statistical technique when the assumptions of normality and equal variances are not completely satisfied. Nevertheless, [Table 5](#) shows that the Wilcoxon rank-sum test findings were consistent with the results of the independent samples *t*-test reported in [Table 4](#). This indicates that, by using different statistical techniques, the results of this study can be considered valid and robust.

5. Conclusion

Business Intelligence (BI) is an important component of the accounting profession. Many researchers believe that accounting educators are required to make radical curriculum changes to meet technological advancements and that different IT skills, such as BI tools, should be incorporated into accounting programs. In response to these calls, this study explored the benefits of incorporating BI tools into accounting education.

The extant literature confirms that most studies focus on one of the two directions. First, the role of technology in developing the accounting profession or the skills of accountants without explicitly delving into the role of business intelligence tools. Second, we present the point of view of one entity, such as academics, professionals, or students, without conducting studies to compare different points of views. Therefore, these gaps in the literature motivated this research to investigate the viewpoints of both academics and professionals towards incorporating BI tools in accounting education.

The results of our analysis reveal distinct insights into the perceptions of incorporating BI tools into accounting curricula. The integration of BI tools into accounting education assured the transformative effects of BI. This was highlighted through positive responses regarding curriculum adaptation, skills and competencies, and career transformation. While the variables SC and CT might seem to focus more on career impacts, they also reflect changes in educational outcomes by preparing students for the evolving demands of the profession. They also play a significant role in shaping the educational experience by

aligning it with industry requirements. Examining these variables, we can gain a comprehensive understanding of how BI tools influence not only career trajectories but also the educational processes that prepare students for these careers and evolving demands of the profession. Furthermore, the discrepancies between academics and professionals in research focus confirm the need for further research on BI-based accounting.

This study's theoretical implications appear in its contribution by filling the gaps in the literature. Displaying different perspectives for academics and professionals brings the viewpoints of education and industry, which contributes to bridging the gap between theory and practice. This study also paved the way for laying the foundation for building a theoretical framework for future studies in the field of BI-based accounting. Our study contributes to the intersection of education and industry perspectives on integrating BI tools in accounting education. We offer a nuanced understanding of the benefits, challenges, and implications of BI tool integration by presenting and analyzing data from both educational institutions and industry professionals. This comparative analysis helps identify common and differing viewpoints between education and industry, revealing how BI adoption is shaped in accounting education. Furthermore, our findings contribute to theoretical frameworks on technology adoption and educational innovation, providing valuable insights into the relationship between educational practices and industry demands. Our study advances theoretical discourse on the role of BI tools in transforming accounting education to meet industry needs by bridging the gap between academia and practice.

The practical implications of this research for academics are represented by emphasizing the role of BI tools in accounting, which requires keeping pace with accounting curricula for this development and the role played by this technology in transferring accounting to advanced stages. This should be reflected in the teaching approaches and course materials that enhance students' skills and leverage their employability.

The policy implications of this research for policymakers in education require regulators, in addition to professional bodies, to promote standards, laws, and regulations that incorporate BI tools in accounting education to align with industry requirements.

This study has some limitations that will provide a basis for future research. It is difficult to generalize the results of this study because it is constrained by a specific context in a specific region. Future research could be conducted in different accounting settings and contexts. Moreover, the population of this research was limited to academic staff in accounting departments in universities and accounting professionals. Further research could explore the perspectives of policymakers and students to obtain a comprehensive perception in this regard. In addition, this is an exploratory research, which probably ignores the various variables related to the incorporation of BI tools into accounting education. Further studies could explore different variables that add value to the BI-based accounting profession. Finally, incorporating student perspectives alongside a wider range of BI tools would be beneficial. This approach would enhance the study's relevance and depth, leading to a more comprehensive understanding of how BI tools can be integrated into accounting education.

Ethical approval

The study was approved by the research ethics committee of the authors' university. All procedures performed in this study involving human participants were in accordance with the ethical standards of the institution (IRB #1/04/2023-2024).

Informed consent

Participants were informed about the study's procedures, risks, benefits, and other aspects before their participation. Only those who explicitly provided their consent were allowed to participate in the study.

Authors' contributions

Mohammed M. Yassin: Contributed to the conception and design of the study and questionnaire, conducted data collection, drafted the initial version of the manuscript, and critically revised it for intellectual content. Provided final approval for publication and agrees to be accountable for all aspects of the work.

Ahmad A. ToumeH: Contributed to the conception and design of the study and questionnaire, conducted data analysis using Stata software, created tables to present the findings in the manuscript, and provided editing and proof-reading for language, grammar, and formatting. Agrees to be accountable for all aspects of the work.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported and funded by the Al-Zaytoonah University of Jordan in research project number 27/17/2022-2023.

About the authors

Mohammed M. Yassin is an associate professor in Accounting at Al-Zaytoonah University of Jordan. During his nineteen-year career in academia, Dr. Yassin filled many administrative positions in the university such as: deputy manager for training and consultations center, head of accounting program in English language, and quality assurance manager in the faculty. He published a number of research papers in reputable journals. In addition to his academic experience, Dr. Yassin is a training expert in the accounting and finance fields for more than fourteen years. He has also a professional experience for ten years parallel with the previous ones in huge companies and projects in Jordan. Dr. Yassin is a reviewer for a number of journals.

Ahmad A. ToumeH is 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 Business Information Systems*, *Future Business Journal*, *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.

ORCID

Ahmad A. ToumeH  <http://orcid.org/0000-0003-0641-4872>

Data availability statement

Data available on request due to privacy and ethical restrictions.

References

- Abu Afifa, M., Saleh, I., & Vo Van, H. (2023). Accounting information quality in the digital era—a perspective from ERP system adoption? *Global Knowledge, Memory and Communication*. <https://doi.org/10.1108/GKMC-03-2023-0101>
- Accounting Today. (2019). *PwC invests \$3B in “New World, New Skills” program*. Available at: <https://www.accountingtoday.com/news/pwc-invests-3b-in-new-world-new-skills-program>
- Alles, M. G, (2020). AIS-ethics as an ethical domain: a response to Guragai, Hunt, Neri and Taylor (2017) and Dillard and Yuthas (2002). *The International Journal of Digital Accounting Research*, 20, 1–29. https://doi.org/10.4192/1577-8517-v20_1
- American Institute of Certified Public Accountants (AICPA). (2020). *Beyond Excel: Technology skills that new accountants should know*. Available at: <https://www.thiswaytocpa.com/education/articles/make-the-most-of-your-education/technologies-accountingstudents-should-know/>
- Andiola, L. M., Masters, E., & Norman, C. (2020). Integrating technology and data analytic skills into the accounting curriculum: Accounting department leaders’ experiences and insights. *Journal of Accounting Education*, 50, 100655. <https://doi.org/10.1016/j.jaccedu.2020.100655>
- Appelbaum, D., Kogan, A., Vasarhelyi, M., & Yan, Z. (2017). Impact of business analytics and enterprise systems on managerial accounting. *International Journal of Accounting Information Systems*, 25, 29–44. <https://doi.org/10.1016/j.accinf.2017.03.003>

- Ashok, M., Madan, R., Joha, A., & Sivarajah, U. (2022). Ethical framework for artificial intelligence and digital technologies. *International Journal of Information Management*, 62, 102433. <https://doi.org/10.1016/j.ijinfomgt.2021.102433>
- Ayoush, M., Rabayah, H., Toumeh, A., Aboushi, A., & Alawneh, R. (2023). Circular economy practices in higher education institutions: Towards sustainable development. In *Conference on Sustainability and Cutting-Edge Business Technologies*. (pp. 291–300). Springer Nature Switzerland.
- Babalola, F. I., Orij, O., Oladayo, G. O., Abitoye, O., & Daraojimba, C. (2023). Integrating ethics and professionalism in accounting education for secondary school students. *International Journal of Management & Entrepreneurship Research*, 5(12), 863–878.
- Banasik, E., & Jubb, C. (2021). Are accounting programs future-ready? Employability skills. *Australian Accounting Review*, 31(3), 256–267. <https://doi.org/10.1111/auar.12337>
- Bany Mohammad, A., Al-Okaily, M., Al-Majali, M., & Masa'deh, R. E. (2022). Business intelligence and analytics (BIA) usage in the banking industry sector: an application of the TOE framework. *Journal of Open Innovation: Technology, Market, and Complexity*, 8(4), 189. <https://doi.org/10.3390/joitmc8040189>
- Bhimani, A., & Willcocks, L. (2014). Digitisation, 'Big Data' and the transformation of accounting information. *Accounting and Business Research*, 44(4), 469–490. <https://doi.org/10.1080/00014788.2014.910051>
- Brink, W. D., & Stoel, M. D. (2019). Analytics knowledge, skills, and abilities for accounting graduates. In *Advances in Accounting Education: Teaching and Curriculum Innovations*, 22, 23–43.
- Chan, N. K. (2019). Business intelligence for service parts logistics management. *International Journal of Internet Manufacturing and Services*, 6(3), 245–261. <https://doi.org/10.1504/IJIMS.2019.10022455>
- Chen, H., Chiang, R. H., & Storey, V. C. (2012). Business intelligence and analytics: From big data to big impact. *MIS Quarterly*, 4, 36, 1165–1188. <https://doi.org/10.2307/41703503>
- Chen, Y., & Lin, Z. (2021). Business intelligence capabilities and firm performance: A study in China. *International Journal of Information Management*, 57, 102232. <https://doi.org/10.1016/j.ijinfomgt.2020.102232>
- Chu, M. K., & Yong, K. O. (2021). Big data analytics for business intelligence in accounting and audit. *Open Journal of Social Sciences*, 09(09), 42–52. <https://doi.org/10.4236/jss.2021.99004>
- Daff, L. (2021). Employers' perspectives of accounting graduates and their world of work: Software use and ICT competencies. *Accounting Education*, 30(5), 495–524. <https://doi.org/10.1080/09639284.2021.1935282>
- Dangi, M. R. M., Saat, M. M., & Saad, S. (2022). Teaching and learning using 21st century educational technology in accounting education: Evidence and conceptualisation of usage behaviour. *Australasian Journal of Educational Technology*, 39(1), 19–38. <https://doi.org/10.14742/ajet.6630>
- Debreceeny, R. S., & Gray, G. L. (2010). Data mining journal entries for fraud detection: An exploratory study. *International Journal of Accounting Information Systems*, 11(3), 157–181. <https://doi.org/10.1016/j.accinf.2010.08.001>
- Dzurainin, A. C., Jones, J. R., & Olvera, R. M. (2018). Infusing data analytics into the accounting curriculum: A framework and insights from faculty. *Journal of Accounting Education*, 43, 24–39. <https://doi.org/10.1016/j.jaccedu.2018.03.004>
- Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency (TDC) framework. *Educational Technology Research and Development*, 68(5), 2449–2472. <https://doi.org/10.1007/s11423-020-09767-4>
- Fisher, I. E., Garnsey, M. R., Goel, S., & Tam, K. (2010). The role of text analytics and information retrieval in the accounting domain. *Journal of Emerging Technologies in Accounting*, 7(1), 1–24. <https://doi.org/10.2308/jeta.2010.7.1.1>
- Fu, C., Jiang, H., & Chen, X. (2021). Big data intelligence for smart educational management systems. *Journal of Intelligent & Fuzzy Systems*, 40(2), 2881–2890. <https://doi.org/10.3233/JIFS-189328>
- Gibson, M., Arnott, D., Jagielska, I., & Melbourne, A. (2004). Evaluating the Intangible Benefits of Business Intelligence: Review & Research Agenda. *Proceedings of the 2004 IFIP International Conference on Decision Support Systems (DSS2004): Decision Support in an Uncertain and Complex World, Prato, Italy*, pp. 295–305.
- Gioiosa, M. E., Meegan, C. M., & D'Aquila, J. M. (2024). Getting on board with certified public accountant evolution: Re-evaluating a financial statement analysis project in light of a changing profession. *Higher Education, Skills and Work-Based Learning*, 14(5), 1121–1134. <https://doi.org/10.1108/HESWBL-07-2023-0184>
- Gulin, D., Hladika, M., & Valenta, I. (2019). Digitalization and the challenges for the accounting profession. *ENTRENOVA-ENTerprise REsearch InNOVAtion*, 5(1), 428–437.
- Hamad, M. T. J., Yassin, M. M., Shaban, O. S., & Amoush, A. H. (2023). Using business intelligence tools in accounting education. In *Conference on Sustainability and Cutting-Edge Business Technologies* (pp. 163–177). Cham: Springer Nature Switzerland.
- Hannan, S. A. (2023). Development of digital transformation in higher education institutions. *Journal of Computer Science & Computational Mathematics*, 13(1), 1–8.
- Huang, P., Zeng, L., Chen, X., Luo, K., Zhou, Z., & Yu, S. (2022). Edge robotics: Edge-computing-accelerated multirobot simultaneous localization and mapping. *IEEE Internet of Things Journal*, 9(15), 14087–14102. <https://doi.org/10.1109/JIOT.2022.3146461>
- Huang, Z. X., Savita, K. S., & Zhong-Jie, J. (2022). The business intelligence impact on the financial performance of start-ups. *Information Processing & Management*, 59(1), 102761. <https://doi.org/10.1016/j.ipm.2021.102761>
- Junger da Silva, R., Tommasetti, R., Zaidan Gomes, M., & da Silva Macedo, M. A. (2021). Accountants' IT responsibilities and competencies from a student perspective. *Higher Education, Skills and Work-Based Learning*, 11(2), 471–486. <https://doi.org/10.1108/HESWBL-02-2020-0028>
- Keleko, A. T., Kamsu-Foguem, B., Ngouna, R. H., & Tongne, A. (2022). Artificial intelligence and real-time predictive maintenance in industry 4.0: A bibliometric analysis. *AI and Ethics*, 2(4), 553–577. <https://doi.org/10.1007/s43681-021-00132-6>

- Kestel, J. A. (2023). [A multi-method perspective on developing professional accounting graduates in a social constructivist learning context through self-authorship and career self-management]. [Doctoral dissertation].
- Kroon, N., do Céu Alves, M., & Martins, I. (2021). The impacts of emerging technologies on accountants' role and skills: Connecting to open innovation—a systematic literature review. *Journal of Open Innovation: Technology, Market, and Complexity*, 7(3), 163. <https://doi.org/10.3390/joitmc7030163>
- Lawson, R. A., Blocher, E. J., Brewer, P. C., Cokins, G., Sorensen, J. E., Stout, D. E., Sundem, G. L., Wolcott, S. K., & Wouters, M. J. F. (2014). Focusing accounting curricula on students' long-run careers: Recommendations for an integrated competency-based framework for accounting education. *Issues in Accounting Education*, 29(2), 295–317. <https://doi.org/10.2308/iace-50673>
- Leitner-Hanetseder, S., Lehner, O. M., Eisl, C., & Forstenlechner, C. (2021). A profession in transition: Actors, tasks and roles in AI-based accounting. *Journal of Applied Accounting Research*, 22(3), 539–556. <https://doi.org/10.1108/JAAR-10-2020-0201>
- Li, L. (2022). Reskilling and upskilling the future-ready workforce for industry 4.0 and beyond. *Information Systems Frontiers: a Journal of Research and Innovation*, 1–16. <https://doi.org/10.1007/s10796-022-10308-y>
- Losi, H. J., Isaacson, E. V., & Boyle, D. M. (2022). Integrating data analytics into the accounting curriculum: Faculty perceptions and insights. *Issues in Accounting Education*, 37(4), 1–23. <https://doi.org/10.2308/ISSUES-2021-086>
- Marshall, S. (2020). Understanding plurilingualism and developing pedagogy: Teaching in linguistically diverse classes across the disciplines at a Canadian university. *Language, Culture and Curriculum*, 33(2), 142–156. <https://doi.org/10.1080/07908318.2019.1676768>
- Martin, K. (2019). Ethical implications and accountability of algorithms. *Journal of Business Ethics*, 160(4), 835–850. <https://doi.org/10.1007/s10551-018-3921-3>
- Mcbride, K., & Philippou, C. (2022). 'Big results require big ambitions': big data, data analytics and accounting in masters courses. *Accounting Research Journal*, 35(1), 71–100. <https://doi.org/10.1108/ARJ-04-2020-0077>
- McKinney, E., Yoos, C., & Snead, K. (2017). The need for 'skeptical' accountants in the era of Big Data. *Journal of Accounting Education*, 38, 63–80. <https://doi.org/10.1016/j.jaccedu.2016.12.007>
- Moirano, R., Sánchez, M. A., & Štěpánek, L. (2020). Creative interdisciplinary collaboration: A systematic literature review. *Thinking Skills and Creativity*, 35, 100626. <https://doi.org/10.1016/j.tsc.2019.100626>
- Moll, J., & Yigitbasioglu, O. (2019). The role of internet-related technologies in shaping the work of accountants: new directions for accounting research. *The British Accounting Review*, 51(6), 100833. <https://doi.org/10.1016/j.bar.2019.04.002>
- Noordin, N. A., Hussainey, K., & Hayek, A. F. (2022). The use of artificial intelligence and audit quality: An analysis from the perspectives of external auditors in the UAE. *Journal of Risk and Financial Management*, 15(8), 339. <https://doi.org/10.3390/jrfm15080339>
- Palys, T. (2008). Purposive sampling. In L.M. Given (Ed.). *The Sage Encyclopedia of Qualitative Research Methods*. (Vol.2). Sage. pp. 697–698.
- Paul, J. A., & MacDonald, L. (2020). Analytics curriculum for undergraduate and graduate students. *Decision Sciences Journal of Innovative Education*, 18(1), 22–58. <https://doi.org/10.1111/dsji.12196>
- Perdana, A., Lee, W. E., & Kim, C. M. (2023). Prototyping and implementing robotic process automation in accounting firms: Benefits, challenges and opportunities to audit automation. *International Journal of Accounting Information Systems*, 51, 100641. <https://doi.org/10.1016/j.accinf.2023.100641>
- Perkhofer, L. M., Hofer, P., Walchshofer, C., Plank, T., & Jetter, H. C. (2019). Interactive visualization of big data in the field of accounting: A survey of current practice and potential barriers for adoption. *Journal of Applied Accounting Research*, 20(4), 497–525. <https://doi.org/10.1108/JAAR-10-2017-0114>
- Polimeni, R. S., & Burke, J. A. (2021). Integrating emerging accounting digital technologies and analytics into an undergraduate accounting curriculum—A case study. *Journal of Emerging Technologies in Accounting*, 18(1), 159–173. <https://doi.org/10.2308/JETA-2020-042>
- PricewaterhouseCoopers (PwC). (2018). *Workforce of the future*. Available at: <https://www.pwc.com/gx/en/services/people-organisation/workforce-of-the-future/workforce-of-the-future-the-competing-forces-shaping-2030-pwc.pdf>
- Ranjan, J., & Foropon, C. (2021). Big data analytics in building the competitive intelligence of organizations. *International Journal of Information Management*, 56, 102231. <https://doi.org/10.1016/j.ijinfomgt.2020.102231>
- Reinschmidt, J., & Francoise, A. (2000). *Business Intelligence Certification Guide*. IBM, International Technical Support Organization.
- Saleh, I., Marei, Y., Ayoush, M., & Afifa, M. M. A. (2022). Big data analytics and financial reporting quality: Qualitative evidence from Canada. *Journal of Financial Reporting and Accounting*, 21(1), 83–104. <https://doi.org/10.1108/JFRA-12-2021-0489>
- Sarigiannidis, C., Halkiopoulou, C., Giannopoulos, K., Giannopoulou, F., Politis, A. E., Boutsinas, B., & Kollias, K. (2021). Do hotels care? A proposed smart framework for the effectiveness of an environmental management accounting system based on business intelligence technologies. In *Culture and Tourism in a Smart, Globalized, and Sustainable World: 7th International Conference of IACuDiT, Hydra, Greece, 2020* (pp. 635–647). Cham: Springer International Publishing.
- Sarkar, S., Boss, S. R., & Gray, J. (2021). Pedagogical practices of accounting departments addressing AACSB technology requirements. *Issues in Accounting Education*, 36(4), 59–85. <https://doi.org/10.2308/ISSUES-19-082>

- Schneider, G. P., Dai, J., Janvrin, D. J., Ajayi, K., & Raschke, R. L. (2015). Infer, predict, and assure: Accounting opportunities in data analytics. *Accounting Horizons*, 29(3), 719–742. <https://doi.org/10.2308/acch-51140>
- Sidorova, M., Nazarov, D., & Vakhrushina, M. (2019). The Enlightenment as determinant of accounting change: The case of royal estate bookkeeping during the reign of Catherine II. *Accounting History*, 24(2), 185–211. <https://doi.org/10.1177/1032373218814269>
- Sihite, M., Manullang, S. O., & Nugroho, B. S. (2021). Relevance of mastery of information systems skills and success of business management in the digital age: a systematic review. *International Journal of Social Sciences and Humanities*, 5(2), 68–78. <https://doi.org/10.29332/ijssh.v5n2.1139>
- Stanciu, V., Pugna, I. B., & Gheorghe, M. (2020). New coordinates of accounting academic education. A Romanian insight. *Accounting and Management Information Systems*, 19(1), 158–178.
- Sutton, S. G., Holt, M., & Arnold, V. (2016). The reports of my death are greatly exaggerated—Artificial intelligence research in accounting. *International Journal of Accounting Information Systems*, 22, 60–73. <https://doi.org/10.1016/j.accinf.2016.07.005>
- Tallman, S., Luo, Y., & Buckley, P. J. (2018). Business models in global competition. *Global Strategy Journal*, 8(4), 517–535. <https://doi.org/10.1002/gsj.1165>
- Tan, L. M., Laswad, F., & Chua, F. (2022). Bridging the employability skills gap: going beyond classroom walls. *Pacific Accounting Review*, 34(2), 225–248. <https://doi.org/10.1108/PAR-04-2021-0050>
- Thomson, J. (2018). Accounting educators: A call to action. *Strategic Finance*, 100(3), 8.
- Tian, F., Lan, T., Chao, K.-M., Godwin, N., Zheng, Q., Shah, N., Zhang, F. (2016). Mining suspicious tax evasion groups in big data. *IEEE Transactions on Knowledge and Data Engineering*, 28, 2651–2664.
- Toumeh, A. A. (2022). The influence of enterprise resource planning system implementation on accrual-based earnings management: Empirical evidence from Jordan. *Global Business Review*, 0972150922111666. <https://doi.org/10.1177/09721509221116692>
- Toumeh, A. A. (2024). Assessing the potential integration of large language models in accounting practices: Evidence from an emerging economy. *Future Business Journal*, 10(1), 82–96. <https://doi.org/10.1186/s43093-024-00368-8>
- Toumeh, A. A. (in press). The Nexus of ERP system adoption and discretionary accruals: The moderator effect of big 4 audit firms. *International Journal of Business Information Systems*, in press. <https://doi.org/10.1504/IJBIS.2022.100470>
- Twyford, E. J., & Abbas, R. (2023). Broadening the boundaries of accounting: A call for interdisciplinarity in the calculative era. *Meditari Accountancy Research*, 31(1), 187–211. <https://doi.org/10.1108/MEDAR-06-2021-1338>
- Vasarhelyi, M. A., Kogan, A., & Tuttle, B. M. (2015). Big data in accounting: An overview. *Accounting Horizons*, 29(2), 381–396. <https://doi.org/10.2308/acch-51071>
- Woodside, J. M., Augustine, F. K., Chambers, V., & Mendoza, M. (2020). Integrative learning and interdisciplinary information systems curriculum development in accounting analytics. *Journal of Information Systems Education*, 31(2), 147.
- Yassin, M., El-Barghouthi, S., & Al-Khatib, I. (2012). XBRL: The future of financial reporting in Jordan. *International Conference on Knowledge, Economy & Management Journal of Advance Research in Science and Social Science*, 2(1), 43–1059.