International Journal of Social Science and Religion (IJSSR)
[P : 2723-5920, E : 2746-086X]
Volume 5, Issue 3, 2024
DOI: https://doi.org/10.53639/ijssr.v5i2.260

Published by: Indonesian Academy of Social and Religious Research

A Comparative Review of the Incorporation of AI Technology in Accounting Education: South Africa and Zimbabwe Perspective

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Article History:

Submitted:
2024-06-12

Accepted:
2024-08-12

Published:
2024-08-16

Abstract

The purpose of the study is to provide a comparative review of the incorporation of Artificial Intelligence (AI) in accounting education by the South African and Zimbabwean higher learning institutions. This was prompted by the fact that the extent to which AI has been integrated into education is not known with certainty. The study adopted a systematic literature review approach to systematically search and identify studies, extract, analyse and synthesise information guided by some pre-established guidelines (these could be design, year of publication or findings) or research protocol. To establish valid and reliable results, authors adopted seven steps recommended by the Cochrane Collaboration to conduct a systematic review. The paper findings revealed that the incorporation of AI in accounting education is at infancy phase. Both countries are currently developing an ethical AI framework aligned with their national policy strategies.

This implies that the policy on incorporating AI in accounting education is still in motion. In addition, other issues that have hampered the incorporation of AI include the unavailability of digital infrastructure, the digital divide and the lack of educators' and students' education and training on AI technology. This paper recommends collaboration between academic institutions and industry and research institutions to integrate AI education into the curriculum and implement training and development programs to enhance educators' AI literacy.

Keywords: Accounting education, South Africa, Zimbabwe, Artificial Intelligence, Higher learning institutions

1. Introduction

Artificial Intelligence technologies have existed since the 2nd Revolution, and their adoption was still in its infancy, and automation was limited to mechanical systems. During the 3rd Industrial Revolution, early research on AI began, and this was when concepts of neural networks and machine learning emerged, and expert systems were developed for specific tasks.[1] The emergence of the 21st century birthed the 4IR, and AI technologies driven by Big Data are at the forefront of this.[2] Through AI-powered innovations, the 4IR technologies have reshaped operations in manufacturing industries, transformed business activities by enhancing efficiency and changed how people live. Farayola, Abdul, Irabor and Okeleke portend that AI developments have changed business by fostering creativity, boosting output, and creating new value propositions.[3] AI technology has been making waves in the education sector over the years and gaining momentum during the COVID-19 pandemic. It has been adopted to facilitate administrative tasks, raise quality standards in education, individualise

1 David Mhlanga, "FinTech and Artificial Intelligence for Sustainable Development: The Role of Smart Technologies in Achieving Development Goals," in *FinTech and Artificial Intelligence for Sustainable Development: The Role of Smart Technologies in Achieving Development Goals* (Springer, 2023), 3–13.

2 Schwab, K. (2016). The fourth industrial Revolution. Crown Publishing

3 Oluwatoyin Ajoke Farayola et al., "Innovative Business Models Driven by Ai Technologies: A Review," *Computer Science & IT Research Journal* 4, no. 2 (2023): 85–110.

learning experiences, and enrich the educational process. In consensus, Newsday reports that, from a global perspective, artificial intelligence (AI) has advanced significantly in several domains, and education is no exception.[4] There must be a need to employ these technologies in the education system, particularly in accounting education.

Baldwin-Morgan points out that traditional accounting education focuses on technical proficiency, mastery of debits and credits,[5] spreadsheets, and financial formulas.[6] This remains the same today.[7] However, it is essential to note that although mastering the concepts mentioned above remains key, AI technologies are making them less central. This implies that the future accountant will need a new skill set, prioritising critical thinking, data analysis, problem-solving, and communication. Ali et al. attest that AI technology contributes immensely to the accounting profession's effectiveness and efficiency in performing tech-based activities.[8] It can be concluded that AI technologies play a pivotal role in the accounting field, including financial reporting and decision-making, among other things. Hence, it is against this background that this study seeks to conduct a comparative review of the extent to which AI technology has been incorporated into accounting education from a South African and Zimbabwean perspective. This has been prompted by these two countries' integration of Artificial Intelligence (AI) into accounting education is uncertain. Baldwin-Morgan states that the exposure of accounting students to AI remains almost non-existent, and this remains the same even in the 21st century.[9] This is despite AI having significant implications for the profession's future. In addition, from a global perspective, this technology is widely used in the accounting profession and industry level. In agreement, Ali et al. adduce that AI is reshaping the accounting profession, and its integration into education opens doors for innovation and improved practices.[10] As a result, educators

4 Problem Masau, "How the Usage of Artificial Intelligence Can Improve Education Area in Zimbabwe," newsday.co.zw, 2023.

5 Amelia A Baldwin-Morgan, "Integrating Artificial Intelligence into the Accounting Curriculum," *Accounting Education* 4, no. 3 (1995): 217–29.

6 Baldwin-Morgan.

7 Hamood Mohammed Al-Hattami, "University Accounting Curriculum, IT, and Job Market Demands: Evidence from Yemen," *Sage Open* 11, no. 2 (2021): 21582440211007110.

8 Sara Mohammed Ali et al., "Artificial Intelligence (AI) in the Education of Accounting and Auditing Profession," in *International Conference on Business and Technology* (Springer, 2022), 656–64.

9 Baldwin-Morgan, "Integrating Artificial Intelligence into the Accounting Curriculum."

10 Ali et al., "Artificial Intelligence (AI) in the Education of Accounting and Auditing Profession."

and students can harness AI's capabilities to enhance learning and adapt to the changing landscape. Today's society and accounting profession must embrace the inevitable change that is aligned with AI technologies. Supporting the assertion mentioned above, Shiohira, avers that through government bodies, people should be equipped with the skills and support them to ensure a fair transition, that is, to build human capacity and prepare them for labour market transformation.[11]

This study was conducted among two SADC countries, South Africa and Zimbabwe. The two nations have distinct higher education systems and share common goals of producing skilled professionals and contributing to regional and global knowledge. Their collaboration enhances educational opportunities and fosters academic growth in the accounting field. Researchers conducted this study because of scant literature on incorporating AI in accounting education.[12] Even though studies have begun to present the integration of AI in the education system,[13] it is noteworthy that majority of the studies were outside Africa continent and the results were context-dependent. This means the results from the abovementioned studies cannot be generalised and applied in countries such as Zimbabwe and South Africa. Hence, exploring other regions, such as Southern Africa, is imperative. A comparative study was considered significant in establishing trends and triangulating the results to establish similarities and differences in AI incorporation, challenges, and opportunities in AI implementation. These results will significantly impact the AI policy education framework for university teaching and learning practices.

2. Literature Review

Artificial Intelligence

Rossi defines AI as a "scientific discipline aimed at building machines that can perform many tasks that require human intelligence".[14] Chan,

[11] Kelly Shiohira, "Understanding the Impact of Artificial Intelligence on Skills Development. Education 2030.," *UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training*, 2021.

[12] Maria C Tavares et al., "Challenges of Education in the Accounting Profession in the Era 5.0: A Systematic Review," *Cogent Business & Management* 10, no. 2 (2023): 2220198.

[13] Leong Chan, Liliya Hogaboam, and Renzhi Cao, "Artificial Intelligence in Accounting and Auditing," in *Applied Artificial Intelligence in Business: Concepts and Cases* (Springer, 2022), 119–37.

[14] Francesca Rossi, "Building Trust in Artificial Intelligence," *Journal of International Affairs* 72, no. 1 (2018): 127–34.

Hogaboam and Cao adduce that AI encompasses the theory and development of information systems capable of executing activities that usually demand human cognitive abilities .[15] These activities include reasoning, discovering meaning, generalising, and learning from past experiences. These definitions signify that AI technologies play a significant role in performing human-like cognitive functions. It is a machine-based system that can, for a given set of human-defined objectives, make context-dependent predictions, recommendations, or decisions.[16] The scholars point out that AI technologies give computer systems human-like abilities to learn, reason, and make decisions. It can be concluded that AI performs tasks that humans can do efficiently and effectively. Zhong defines AI as "a branch of modern science and technology aiming at the exploration of the secrets of human intelligence on the one hand and the transplantation of human intelligence to machines as much as possible on the other hand so that machines would be able to perform functions as intelligently as they can".[17] This implies that AI is a powerful disruptive technology in the education system that can be harnessed to accelerate the achievement of SDG4: education 2030. Ali et al. attest that AI technology has a significant implication for the future of the accounting field.[18] This is because of AI's outstanding performance in achieving tech-based problems. As a result, it is imperative to integrate AI into the accounting education curriculum, as this will assist both educators and students to understand the features and potential of this technology in the learning and business context.

Nakano describes AI as a machine-based system that mimics human abilities such as reasoning, making predictions, analysing behaviour patterns, and making Nakano decisions.[19] This means that Al technologies can perform tasks assigned to humans using built-in intelligent systems that make them more innovative than people in learning and reasoning capacity. Damerji and Salimi adduce that AI is critical to bridging the gap between traditional education and

[15] Chan, Hogaboam, and Cao, "Artificial Intelligence in Accounting and Auditing."

[16] Stéphan Vincent-Lancrin and Reyer van der Vlies, "Trustworthy Artificial Intelligence (AI) in Education: Promises and Challenges. OECD Education Working Papers, No. 218.," *OECD Publishing*, 2020.

[17] Shaozhuo Zhong et al., "A Bibliometric Review on Natural Resource Accounting during 1995–2014," *Journal of Cleaner Production* 139 (2016): 122–32.

[18] Ali et al., "Artificial Intelligence (AI) in the Education of Accounting and Auditing Profession."

[19] Masafumi Nakano, "Artificial Intelligence and Robotic Process Automation for Accounting and Auditing in Society 5.0," *Journal of Social Science*, no. 89 (2022): 51–61.

the tech-driven future.[20] This is achieved through transforming information systems to intelligent systems that enhance automation and optimisation of information systems. In conclusion, for AI technologies to perform human tasks, it is imperative to have built-in intelligence systems. Lastly, Zakaria defines Artificial intellect (AI) as a collection of technologies that allow computers to mimic human sense-perception-action skills and act at higher intellect levels.[21] The capacity to grow and change over time and learn from experience enhances these human capabilities. It can be inferred that artificial intelligence (AI) allows robots to see their surroundings and reason and, in certain situations, even learn how to respond to the conditions that shape them.

Given the above, various scholars have the similar definition of AI. There is a consensus on the meaning, and all cite that AI technologies are machine-based systems that perform the tasks assigned just like humans, though more innovatively. To incorporate AI technologies into the accounting curriculum, one needs to understand the definition and functions of AI. In consensus, UNESCO (2021) states that it will become more crucial for every citizen to have the chance to get a thorough grasp of AI if the world is to prevent AI from exacerbating already existing disparities. That's what it is, how it functions; that's how it might affect their lives (AI literacy). This implies that educators are crucial in this, and educational policies must change to promote lifelong learning to help students develop their agency, employability, and capacity to give back to society. Accordingly, global approaches to education and training must adopt a systemic approach to equip all individuals with the necessary skills to coexist peacefully in the AI era.

AI and the Evolution of the Required Accounting Skills in the Digital Era

Adopting AI is considered a critical evolvement in the auditing and accounting profession. The dynamic business environment forces will likely continue driving AI's need, acceptance and integration in auditing and accounting. As posited by the World Economic Forum (2015), 30% of company audits are envisaged to be conducted by AI in 2025. Therefore, to enhance

[20] Hassan Damerji and Anwar Salimi, "Mediating Effect of Use Perceptions on Technology Readiness and Adoption of Artificial Intelligence in Accounting," *Accounting Education* 30, no. 2 (2021): 107–30.

[21] Noor Hidayah Zakaria et al., "A Review on Classification of the Urban Poverty Using the Artificial Intelligence Method," *Journal of Asian Scientific Research* 7, no. 11 (2017): 450.

the employability of accounting and auditing graduates, higher education institutions need to reflect the contemporary developments in the business world and, in this case, digital technologies, including AI.

While focusing on adopting AI and the connected challenges in the accounting profession, Holmes and Douglas posit that accountants in the Big Four accounting firms argued that AI was likely to enhance their performance by reducing human error and automating repetitive tasks.[22] Participants also called for the urgent need for the accounting curriculum to be reviewed to incorporate specialised computer skills such as data cleaning, data management, and dealing with incomplete data. Holmes and Douglas further express that accounting programs must rise to the challenge of equipping students to be lifelong learners in accounting to grow the changes in the profession.[23] Discussion to include AI or Expert Systems in AE began around 1995, with White Jnr (1995) explaining that educators expressed varying opinions on whether AI or expert systems were more important to be included in the auditing and accounting practice. Baldwin-Morgan argues that the exposure of accounting students to AI remained invisible and advocates for incorporating AI in the accounting curriculum to adequately equip students and avoid them encountering AI in the workplace.[24] AI can be used in the different dimensions of accounting, such as financial management, cost and management accounting, auditing, taxation, and public sector accounting. This calls for the innovative application of AI technology in accounting courses, for example, requiring students to use or build expert systems or use machine learning to assess data trends. Universities need to prepare students to adopt AI. Accounting curriculum must reflect the evolution of the profession and the digital transformation of the environment within which the profession operates. Teaching and training programs must address the changing needs of the accounting job market in the digital era.

Modern accounting graduates need to possess an array of skills that include relevant subject matter knowledge, problem-solving and analytical skills, and digital literacy skills to bridge the skills gap raised by employers. Employers often point to a gap between what academia equips students and what the

[22] Amy Foshee Holmes and Ashley Douglass, "Artificial Intelligence: Reshaping the Accounting Profession and the Disruption to Accounting Education," *Journal of Emerging Technologies in Accounting* 19, no. 1 (2022): 53–68.

[23] Holmes and Douglass.

[24] Baldwin-Morgan, "Integrating Artificial Intelligence into the Accounting Curriculum."

industry expects from accounting graduates.[25] AI is reshaping accounting roles and widening the demands for critical thinking, digital, and commercial awareness skills. Table 1 summarises various skills accountants must possess in the digital era to embrace AI and other 4IR technologies effectively.

Table 1: Skills that Accountants Must Possess in the Digital Era

Yigitbasioglu et al. (2023)	Possible Skills Required for Accountants • Ability to assess and use new technologies and interpret AI and big data analytics data. • Comply with legal and ethical requirements around the application of new technologies and the accounting profession in general.
Pargmann et al. (2023)	• Have technical and professional competencies, including creativity, proactiveness, critical thinking interdisciplinary engagement skills
Tsiligiris and Bowyer (2021) Kroon et al. (2021)	• Possess business, digital, ethical and soft skills. • Acquire business modelling, business analytics, programming, and soft skills such as creativity, communication and intuition.
Pasewark (2021)	• Possess technological and analytical skills and competencies, business intelligence, diversity awareness, collaboration and leadership skills.
Li and Zheng (2018)	• Modern accountants must have interdisciplinary skills, big data and AI skills.
Stancu and Dutescu (2021)	• Professional skills, management skills, computer skills, analytical skills and decision-making skills.

Source: Researchers' Compilation

[25] Johanna Velander et al., "Artificial Intelligence in K-12 Education: Eliciting and Reflecting on Swedish Teachers' Understanding of AI and Its Implications for Teaching & Learning," *Education and Information Technologies* 29, no. 4 (2024): 4085–4105.

AI in Accounting Education

With the advent of AI technologies, the future of accounting is tech-driven and brimming with opportunities. In affirmation, Dell, Akpan and Carr adduce that embracing AI, evolving its curriculum, and incorporating coding education, accounting schools can empower future professionals to survive and thrive in this exciting new landscape.[26] In addition, it is noteworthy that the evolution of accounting education is not a once-off event but an ongoing process. As a result, continuous assessment of industry needs, collaboration with AI experts, and fostering a culture of lifelong learning are vital to bridging the gap between traditional education and the tech-driven future. However, although AI has a significant implication in accounting education, many institutions have not integrated AI into their curriculums. This might be driven by the lack of skilled educators, the digital divide, fear of technology and the lack of resources required to employ AI technologies. Tavares et al. cite that accounting education still lags in incorporating 4IR technologies such as AI.[27]

On the other hand, vast sums of money are spent on investing in new technologies. Tavares et al. further state that institutions need to align their curricula with the needs of the industry.[28] This means adequate skills are required for successful accounting careers in the emergence of 4IR. According to Surianti, universities should engage the industry people to produce candidates that match the needs of the industry and society.[29] It can also be concluded that STEM-based subjects should be incorporated into the accounting education curriculum based on the features of AI technologies. This ensures that graduates are offloaded to the market with the relevant skills for harnessing 4IR. We should aim to enhance productivity rather than decrease due to redundancy. Adaptation is critical in the 4IR, which then leads to successful re-skilling and upskilling and promotes employability with sustainability.[30] Accordingly, Zin et

[26] Mfon Akpan, Scott Dell, and Abraham Carr, "Aligning Artificial Intelligence With Ethical Accountancy: A Global Perspective on Emerging Frameworks," *Dell, S., Akpan, M., & Carr, A.(2024). Aligning Artificial Intelligence with Ethical Accountancy: A Global Perspective on Emerging Frameworks. Corporate Ownership & Control* 21, no. 1 (2024): 47–54.

[27] Tavares et al., "Challenges of Education in the Accounting Profession in the Era 5.0: A Systematic Review."

[28] Tavares et al.

[29] Meily Surianti, "Development of Accounting Curriculum Model Based on Industrial Revolution Approach," *Development* 11, no. 2 (2020).

[30] Tavares et al., "Challenges of Education in the Accounting Profession in the Era 5.0: A Systematic Review."

al. state that the role of accounting education in the 4IR era remains almost non-existent because accounting education fails to employ the 4IR technologies in the accounting programs at the Higher and Tertiary levels.[31] In light of the above, there must be a partnership among the universities, industry players, and government and professional bodies to build an accounting education that equips students with tech-based skills. This implies that AI in accounting education should empower students and professionals to leverage technology for more efficient, accurate, and insightful financial management.

With the advent of the 4IR emerging technologies, embracing AI technology in accounting education allows educators to promote learning science and enhance critical thinking. Surianti asserts that by looking into the future of the accounting profession, employing AI technology will have a significant implication in terms of increased productivity and sustainability.[32] However, Sudibjo et al. argue that the emergence of 4IR poses some challenges in accounting education.[33] The challenges of the digital era include information gaps, lack of confidence and commitment, and poor infrastructure. As a result, educational institutions must harness ICT technologies and impart knowledge and relevant skills before incorporating new technologies such as AI. This practice will promote the seamless integration of AI in accounting education. However, AI-Hattami reveals that most educational institutions have neglected the inclusion of ICT programs in the accounting curricula, and those that have included it usually focus on the theoretical aspect and not the practical side. As a result, institutions fail to meet the ICT demands at the industry level.[34]

In conclusion, AI has been gradually introduced into the accounting industry, especially in financial and auditing reports. Effective computer-based operations have replaced traditional paper-based procedures thanks to AI tools. AI's objective is to perform activities that are at least as effective as humans in terms of effectiveness and efficiency. Therefore, educational institutions must

[31] Bilal Khalid Khalaf and Zuhana Bt Mohammed Zin, "Traditional and Inquiry-Based Learning Pedagogy: A Systematic Critical Review.," *International Journal of Instruction* 11, no. 4 (2018): 545–64.

[32] Surianti, "Development of Accounting Curriculum Model Based on Industrial Revolution Approach."

[33] Niko Sudibjo, Lusiana Idawati, and H G Retno Harsanti, "Characteristics of Learning in the Era of Industry 4.0 and Society 5.0," in *International Conference on Education Technology (ICoET 2019)* (Atlantis Press, 2019), 276–78.

[34] Al-Hattami, "University Accounting Curriculum, IT, and Job Market Demands: Evidence from Yemen."

work with AI software companies to provide courses that study the application of AI in accounting and equip students with the necessary abilities to match the features of AI. The abacus may be collecting dust, but the accounting industry is still changing, and artificial intelligence (AI) is leading this change. AI is changing the world by automating repetitive chores and revealing hidden data insights. Are accounting schools ready to meet this challenge, and to what extent have institutions incorporated AI technologies in accounting education?

Challenges and opportunities of incorporating AI in Accounting Education

Throughout the world's busy academic hallways, traditional accounting courses have remained a mainstay, shaping the careers of many professionals. However, as the modern world adopts technology almost daily, Artificial Intelligence (AI) is rising to prominence and leaving an indelible mark on various fields, including education. Okolo, Aruleba and Obaido states that AI's capabilities are driving changes in educational techniques that are changing how we approach learning. Yet again, there are thorns in every rose.[35] Okolo, Aruleba and Obaido further refers to the double consequences of incorporating AI into accounting instruction. While there is no denying that AI can improve education, teachers and students must be aware of its challenges.[36] Acknowledging the opportunities and obstacles associated with implementing AI in accounting education is essential.

Challenges of AI incorporation into AE curriculum

AI integration in accounting education presents both benefits and challenges. This section examines educational institutions' difficulties while incorporating AI into the AE curriculum. According to Ballantine et al., the main obstacles to integrating AI into AE are curriculum modification, evaluations, and enhancement of skills.[37] Technocrats are needed for this kind of endeavour because of the intricacy and nature of AI technology when it comes to changing

[35] Chinasa T Okolo, Kehinde Aruleba, and George Obaido, "Responsible AI in Africa Challenges and Opportunities," *Responsible AI in Africa: Challenges and Opportunities*, 2023, 35–64.

[36] Okolo, Aruleba, and Obaido.

[37] Joan Ballantine, Gordon Boyce, and Greg Stoner, "A Critical Review of AI in Accounting Education: Threat and Opportunity," *Critical Perspectives on Accounting* 99 (2024): 102711.

curricula. This is due to the difficulty in changing the curriculum to incorporate AI technology and its effects on accounting education. This also means that assessment-related concerns need to be closely watched since the capabilities of AI, such as generative AI, may require a re-evaluation of the conventional assessment methodologies. In addition, training and education initiatives ought to be carried out to provide teachers and students with the knowledge and skills necessary to comprehend and collaborate with AI in AE. In consensus, Mhlanga asserts that AI, with its intricate algorithms and advanced functionalities, brings a steep learning curve to the table.[38] Educators often grapple with mastering these tools efficiently, striving to present them seamlessly to their students without overwhelming them or themselves. There is an issue of ethical considerations, and it is essential to take ethical AI issues seriously. Chisom, Unachukwu and Osawaru emphasise the significance of assessing ethical considerations to ensure that the integration of AI aligns with ethical standards and promotes equitable access to educational opportunities.[39] When AI-powered solutions are not thoroughly tested, biases can occasionally be present. Because of this, educators now bear the additional duty of sorting among various answers to guarantee the learning process's integrity and fairness. Also, researchers argue that using AI techniques excessively can have drawbacks. Although they offer quick fixes, there is rising worry that students may rely too much on them and neglect their capacity for critical thought. As a result, to maintain and preserve academic integrity, educators need to create an atmosphere where AI complements vital thinking rather than takes its place.

Opportunities of incorporating AI into AE Curriculum

Considering the above challenges, adopting a more comprehensive approach to accounting education would radically alter how accounting education is applied. This section of the paper examines the opportunities and demands that AI may present for this kind of strategy. At the absolute least, it will bring about some change. Furthermore, AI offers enormous opportunities to

[38] David Mhlanga, "Exploring the Evolution of Artificial Intelligence and the Fourth Industrial Revolution an Overview," *FinTech and Artificial Intelligence for Sustainable Development: The Role of Smart Technologies in Achieving Development Goals*, 2023, 15–39.

[39] Onyebuchi Nneamaka Chisom, Chika Chioma Unachukwu, and Blessing Osawaru, "STEM Education Advancements in Nigeria: A Comprehensive Review," *International Journal of Applied Research in Social Sciences* 5, no. 10 (2023): 614–36.

design an accounting education that is more genuinely educational, considering the challenges mentioned above, given that many of the modifications needed to cope with AI are strongly related to the larger agenda for change that is required. The researchers summarise possible opportunities to incorporate AI into the accounting education curriculum. Okolo, Aruleba, Obaido adduce that AI has the potential to completely transform accounting education by processing enormous amounts of data, automating processes, and producing insights.[40]

On the other hand, through training programs to enhance their competencies towards AI, educators can improve the learning process by introducing AI technologies specifically designed for accounting, making learning more dynamic and applicable.[41] It can be deduced that AI is meant to enhance rather than replace, and its main contribution is to improve our comprehension and utilisation of fundamental accounting principles. Also, it's not a secret that Artificial Intelligence functions as a magnifier, making complicated topics more approachable without sacrificing the fundamentals by offering quick data analysis, immediate feedback, and simulation of sophisticated financial scenarios. Lastly, as we approach the dawn of a new education age, we must look forward. With AI expected to be a significant player, accounting education appears to be moving into a potential new phase. This entails a curriculum that is broad, flexible, and forward-thinking in the future, where AI-driven approaches blend in with conventional teaching methods. In conclusion, Chan portends that higher learning institutions must develop AI adoption policies and frameworks before incorporating AI into the education system.[42]

3. Method

This study adopted a qualitative systematic literature review methodology to prevent shortcuts and bias in conducting the review. This review follows an organised pathway to answer a specific research question. Snyder adduces that a systematic review aims to systematically search and identify studies, extract, analyse and synthesise information guided by some pre-established

[40] Okolo, Aruleba, and Obaido, "Responsible AI in Africa Challenges and Opportunities."
[41] Ballantine, Boyce, and Stoner, "A Critical Review of AI in Accounting Education: Threat and Opportunity."
[42] Cecilia Ka Yuk Chan, "A Comprehensive AI Policy Education Framework for University Teaching and Learning," *International Journal of Educational Technology in Higher Education* 20, no. 1 (2023): 38.

guidelines (these could be design, year of publication or findings) or research protocol.[43] To establish valid and reliable results, authors adopted seven steps recommended by the Cochrane Collaboration to conduct a systematic review (1) The authors started with a well-formulated research question: "To what extent have educational public and state-owned institutions both in South Africa and Zimbabwe incorporated AI technologies in the accounting education (2) Peer-reviewed articles and articles published in conference proceedings were retrieved through research databases such as Google Scholar search engine and Scopus. Chadegani et al.[44] adduce that scholars widely accept and validate the Scopus database. Despite its lack of authenticity, Google Scholar is also considered an important data source.[45] In addition, Accounting Sciences course outlines were retrieved from respective faculties. The course outlines are relevant in this study because they reflect the course content of accounting education and reveal whether AI courses have been adopted and implemented in accounting education. The following search terms were used: "AI in Accounting education in South Africa and Zimbabwe", "opportunities and challenges encountered in employing AI technology", "Accounting education in the 4IR era", and "Artificial intelligence in the accounting profession". (3) A critical evaluation of studies was done, and only relevant studies based on the specific words, time frame, and geographical scope were selected. In addition, the study considered only published articles and course outlines written in English, and full texts were considered for review. (4) Only secondary data was utilised. It was obtained through desktop research (5). The thematic analysis process was employed during data analysis to identify critical themes essential to profoundly understanding the phenomenon. (6) established themes were interpreted and synthesised, leading to the production of the write-up/report (7) through peer reviews; the systematic review methodology utilised by the authors was refined and updated based on the recommendations.

[43] Hannah Snyder, "Literature Review as a Research Methodology: An Overview and Guidelines," *Journal of Business Research* 104 (2019): 333–39.

[44] Arezoo Aghaei Chadegani et al., "A Comparison between Two Main Academic Literature Collections: Web of Science and Scopus Databases," *ArXiv Preprint ArXiv:1305.0377*, 2013.

[45] Anne-Wil Harzing and Satu Alakangas, "Google Scholar, Scopus and the Web of Science: A Longitudinal and Cross-Disciplinary Comparison," *Scientometrics* 106 (2016): 787–804.

4. Result and Discussion

Current Status of AI Incorporation in South Africa

The recent publicly available data on the incorporation of AI in accounting education was retrieved from literature, authoritative reports, and public and state-owned universities' websites in the research and innovation and offered programmes sections. Researchers found out that overall adoption of AI in the education arena is non-existent, though institutions are aware of the need to incorporate it. Universities' workshops, webinars, seminars, and conferences on AI in education have evidenced this. Despite the fact that, there is still low uptake of AI in accounting education, Ade-Ibijola and Okonkwo (2023) cite that South Africa is among other countries in Africa that have embraced AI adoption in education. However, the level at which it has been incorporated into the education system remains unknown with certainty, and this is evidenced by university course outlines that lack contents related to AI. The Department of Communications and Digital Technologies [DCDT] (2024) affirm that once the national policy on AI is finalised, it will accelerate the incorporation of AI in higher learning institutions, and their goal will be to improve both the quality of instruction and operational effectiveness. Notably, incorporating AI into curricula and instructional strategies aims to improve operations, reporting, and decision-making processes in accounting disciplines and other related disciplines.[46] It also offers tools for data-led decision-making. For instance, ChatGPT and other AI-driven technologies are being investigated for their potential to improve efficiency, simplify workflows, and provide value-added services to the accounting industry. This is part of a more significant trend in which artificial intelligence is used in education across various subject areas, including accounting, to help with lesson content alignment and personalisation.

Currently, South Africa is working to create a thorough AI policy framework aligned with the national policy strategies. This implies that the policy on incorporating AI in education is still in motion. The DCDT (2024) attest that their department has started talks on creating a national AI strategy that will direct the use of AI, government-led AI projects, and a suggested regulatory framework for AI in South Africa. This policy is anticipated to address infrastructure

[46] Beryl Odonkor et al., "A Review of US Management Accounting Evolution: Investigating Shifts in Tools and Methodologies in Light of National Business Dynamics," *International Journal of Applied Research in Social Sciences* 6, no. 1 (2024): 51–72.

capacities and ethical issues while addressing essential areas like education. The South African Curriculum Assessment Policy Statements (CAPS) since 2023 has been seeking to incorporate AI into the curriculum, providing chances to revive conventional teaching approaches. The use of ChatGPT and other AI technologies to offer captivating lessons that align with the goals of the CAPS framework suggests a positive influence on educational quality. Even though the use of AI in accounting education is still developing, there is a discernible trend toward using AI to improve student outcomes and industry operations. Creating national AI policy plans and incorporating AI into the curriculum shows a dedication to educating students for an AI-driven future.

Researchers also found out that, in South Africa, there is commendable work that is being done around the talent development for the AI future, AI research and innovation and partnerships for AI development by the South African universities: (1) The Centre for Artificial Intelligence Research (CAIR) represents a South African national research network that conducts foundational, directed and applied research into various aspects of Artificial Intelligence. CAIR has nodes at five South African universities: the University of Cape Town, the University of KwaZulu-Natal, North-West University, the University of Pretoria, and Stellenbosch University. CAIR is primarily funded by the Department of Science and Technology (DST) as part of the implementation of South Africa's ICT Research, Development and Innovation (RDI) Roadmap (2) The African Institute for Mathematical Sciences (AIMS) of South Africa has partnered with DeepMind to implement AI for Science as its new stream for the master's degree in mathematical science. The program sits at the crossroads of AI and the Sciences. Applications are open to students from across Africa passionate about mathematics, artificial intelligence, and machine learning. A DeepMind donation will fund 40 scholars annually for the next four years. The program draws on DeepMind's world-leading expertise in AI for Science.

Current Status of AI Incorporation in Zimbabwe

Similarly to other countries, AI in education has the potential to improve teaching practices, increase student engagement, and enable personalised learning in Zimbabwe. According to Onesi-Ozigagun, Ololade, Eyo-Udo, & Ogundipe higher learning institutions should begin by incorporating AI technology in their curriculum, specifically accounting education, to yield these

compelling results such as professional development, improved assessment, real-time feedback and enhanced personalised learning.[47] The authors established that overall trends of higher learning institutions' incorporation in accounting education appear similar in Zimbabwe and South Africa. Regarding national AI policy strategies, Zimbabwe aims to establish a framework that encourages accountability, transparency, and equity in creating and applying AI systems.[48] This framework seeks to guarantee that AI is utilised responsibly and for everyone's benefit by addressing data privacy and security concerns. Policies are designed to advance e-governance, strengthen citizen participation, especially in underrepresented communities, and facilitate information access. In addition, there is a movement in Zimbabwe to integrate AI-related themes into mathematics, science, social studies, and language curricula and make AI literacy a cross-cutting issue. The government is also urged to train educators, assist them in incorporating AI into their teaching and learning, and employ AI resources and tools to improve the efficacy and efficiency of instruction.

In general, Zimbabwe is planning to implement AI in its educational system. Still, it is doing it strategically and comprehensively to ensure that inclusion, equity, and ethics are the guiding principles. This entails that, in Zimbabwe, the incorporation of AI in education is still nascent and non-existent in most higher learning institutions.

Comparison of AI Integration in South Africa and Zimbabwe

Researchers began by determining the present state of AI integration in Zimbabwe and South Africa before comparing the two nations' approaches to AI integration. As per discussion above, both countries are realising how crucial artificial intelligence (AI) is to change the educational landscape, with a focus on accounting education. Based on a literature, South Africa has made some progress in developing policies and strategies.[49] In contrast, Zimbabwe is

[47] Oseremi Onesi-Ozigagun et al., "Revolutionizing Education through AI: A Comprehensive Review of Enhancing Learning Experiences," *International Journal of Applied Research in Social Sciences* 6, no. 4 (2024): 589–607.

[48] Gloria Ndoro-mkombachoto, "AI: Benefits, Concerns in the Education Sector," newsday.co.zw, 2024, https://www.newsday.co.zw/theindependent/opinion/article/200024106/ai-benefits-concerns-in-the-education-sector.

[49] Damianu C Ukwandu, "South Africa as a Developmental State-Is It a Viable Idea?," *African Journal of Public Affairs* 11, no. 2 (2019): 41–62.

concentrating on creating a responsible AI framework.[50] The study also revealed that both nations face similar issues, emphasising the necessity for a balanced approach to AI integration. These issues include the need for comprehensive legislation, ethical considerations, and digital infrastructure development. It can be deduced that, curriculum integration is a shared goal between the two nations, as they seek to include AI knowledge and competencies into their educational frameworks. In addition, Zimbabwe and South Africa are moving toward incorporating AI within their respective educational frameworks, but with different approaches and emphasis areas. The advancements in these two nations indicate a broader African trend that sees AI being embraced as a tool for economic and educational growth. Their combined efforts indicate a bright future for artificial intelligence (AI) in education, with continuing curriculum, policy, and real-world application advancements. Following UNESCO's 2021 Recommendation on the Ethics of Artificial Intelligence, this first global guidance on AI in education recommends that governments regulate the use of generative AI in universities.

Impact of AI on Accounting Education in South Africa and Zimbabwe

AI has a vast and varied impact on accounting education in South Africa and Zimbabwe. AI is changing the accounting sector by improving financial reporting accuracy, which enables accountants to offer more thorough feedback and guidance for company expansion.[51] The operational parts of accounting are improving due to technological advancements, and educational curricula are also being impacted. According to The South African Institute of Professional Accountants [SAIPA] (2019) AI is transforming accountants into change agents in the field of education. Accountants in Southern Africa said that their investments in technology have allowed them to serve clients more quickly, which has improved their connections with them. A growing number of accountants, nearly one-third of them, have made varied degrees of investments in emerging technologies,[52] indicating a trend toward the use of AI in the field.

[50] Ndoro-mkombachoto, "AI: Benefits, Concerns in the Education Sector."

[51] Joseph Hlongwane et al., "Towards the Integration of Artificial Intelligence in Higher Education, Challenges and Opportunities: The African Context, a Case of Zimbabwe.," n.d.

[52] Nanja Kroon, Maria do Céu Alves, and Isabel Martins, "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, no. 3 (2021): 163.

AI allows teachers to interact with pupils more personally and effectively meet their learning needs.

Nonetheless, obstacles, including the need for technological know-how, resource limitations, and moral dilemmas, continue to exist. According to Kamalov, Santandreu and Gurrib,[53] these obstacles must be removed to achieve AI's full promise in the classroom and, consequently, in accounting education. The addition of AI to accounting curricula is a component of a more significant effort to prepare students for a time when AI tools will be ubiquitous in the workplace. To ensure that aspiring accountants are knowledgeable about AI applications and how they affect the accounting industry, the curriculum should incorporate AI literacy.[54] AI has a revolutionary effect on accounting education in South Africa and Zimbabwe, posing opportunities and difficulties. AI is projected to play a more significant part in accounting education as the nation develops its AI strategy and incorporates AI into the curriculum, preparing students for a world that is becoming more digital and data-driven.

The takeaway notes are that AI is having an impact on professional accounting education, transforming curricula and instructional strategies. It is anticipated that the application of AI in education will reduce an organisation's dependency on human accountants, potentially rendering them obsolete shortly. This shows that South African and Zimbabwean's educational institutions are putting their students in a position for a future in which artificial intelligence (AI) tools will play a significant role in the accounting industry. The use of AI in accounting education is consistent with the nationalities' more significant digital transformation trends. It highlights how important it is for accountants to be tech-savvy, comprehend AI applications, and be ready for how the accounting business is changing. In conclusion, artificial intelligence (AI) significantly influences how accounting education will develop in South Africa and Zimbabwe. It influences curriculum design, instructional strategies, and the general skill set needed for accounting professionals to succeed in a technologically sophisticated setting.

[53] Firuz Kamalov, David Santandreu Calonge, and Ikhlaas Gurrib, "New Era of Artificial Intelligence in Education: Towards a Sustainable Multifaceted Revolution," *Sustainability* 15, no. 16 (2023): 12451.

[54] John Kommunuri, "Artificial Intelligence and the Changing Landscape of Accounting: A Viewpoint," *Pacific Accounting Review* 34, no. 4 (2022): 585–94.

Challenges and Opportunities in AI Integration

Artificial Intelligence (AI) technologies need an excellent connection and significant effort. Regrettably, the African continent has inadequate energy and communication infrastructure.[55] Additionally, a skilled workforce is needed to operate AI systems. Still, the current educational system does not support the development of AI abilities, and there are not enough recent graduates with high AI competencies to fill the job market. Furthermore, financing and effective policies for AI innovation and research are in still in infancy stages. In consensus, Okolo, Aruleba and Obaido attest to the obstacles that low levels of digital literacy, poor infrastructure, and tight budgets present, all of which make it difficult for AI to be adopted relatively across a range of industries, including institutions of higher learning in many African nations.[56] They make the case that matching AI programs and the data used to train AI models with the unique requirements and features of regional communities in Africa and the larger Global South is essential. Nonetheless, programs are currently in place to support the advancement of AI across the continent. It can be concluded that for AI to be a necessary technology for Africa's sustainable development ultimately, we also suggest potential solutions, including financing for ecosystem construction, construction of infrastructure, educational reform, and the creation of national and regional strategies and policies

5. Conclusion

In conclusion, researchers emphasised inclusion and equality principles, and policymakers and educators should continue to delve into how AI can be used in the education system. This is because the application of AI should benefit everyone and encourage fair access. In addition, we further established that AI should uphold ethical standards and improve human-centred pedagogy. However, a global challenge is preparing people, particularly students, for AI's safety and efficacy. This paper concludes that all users of future learning systems must be equipped with fundamental AI skills, such as data manipulation and data security. This can be achieved through collaboration and cross-disciplinary interaction, which are necessary for effective AI and education strategies. Also,

[55] Kommununri.
[56] Okolo, Aruleba, and Obaido, "Responsible AI in Africa Challenges and Opportunities."

contextualised resources are adequate for AI implementation in higher learning institutions. This is because appropriate pedagogical approaches, sound instructional methods, materials, tools, and activities familiar to the student for instruction lead to effective learning. This paper recommends collaboration of academic institutions with industry and research institutions as well as integration of AI education in the curriculum and implementation of training and development programs to enhance educators AI literacy.

Conflicts of interest

The authors declare no conflict of interest

Acknowledgement:

There was no financial support for the study.

Co-authors Contribution:

Queen Mpofu focused on the introduction and methodology section, while Favourate Y. Mpofu delved into the literature review section. Both authors contributed to the discussion of the results section.

References

Akpan, Mfon, Scott Dell, and Abraham Carr. "Aligning Artificial Intelligence With Ethical Accountancy: A Global Perspective on Emerging Frameworks." *Dell, S., Akpan, M., & Carr, A.(2024). Aligning Artificial Intelligence with Ethical Accountancy: A Global Perspective on Emerging Frameworks. Corporate Ownership & Control* 21, no. 1 (2024): 47–54.

Al-Hattami, Hamood Mohammed. "University Accounting Curriculum, IT, and Job Market Demands: Evidence from Yemen." *Sage Open* 11, no. 2 (2021): 21582440211007110.

Ali, Sara Mohammed, Zainab Jawad Hasan, Allam Hamdan, and Mohammed Al-Mekhlaf. "Artificial Intelligence (AI) in the Education of Accounting and Auditing Profession." In *International Conference on Business and Technology*, 656–64. Springer, 2022.

Baldwin-Morgan, Amelia A. "Integrating Artificial Intelligence into the Accounting Curriculum." *Accounting Education* 4, no. 3 (1995): 217–29.

Ballantine, Joan, Gordon Boyce, and Greg Stoner. "A Critical Review of AI in Accounting Education: Threat and Opportunity." *Critical Perspectives on Accounting* 99 (2024): 102711.

Chadegani, Arezoo Aghaei, Hadi Salehi, Melor Md Yunus, Hadi Farhadi, Masood Fooladi, Maryam Farhadi, and Nader Ale Ebrahim. "A Comparison between Two Main Academic Literature Collections: Web of Science and Scopus Databases." *ArXiv Preprint ArXiv:1305.0377*, 2013.

Chan, Cecilia Ka Yuk. "A Comprehensive AI Policy Education Framework for University Teaching and Learning." *International Journal of Educational Technology in Higher Education* 20, no. 1 (2023): 38.

Chan, Leong, Liliya Hogaboam, and Renzhi Cao. "Artificial Intelligence in Accounting and Auditing." In *Applied Artificial Intelligence in Business: Concepts and Cases*, 119–37. Springer, 2022.

Chisom, Onyebuchi Nneamaka, Chika Chioma Unachukwu, and Blessing Osawaru. "STEM Education Advancements in Nigeria: A Comprehensive Review." *International Journal of Applied Research in Social Sciences* 5, no. 10 (2023): 614–36.

Damerji, Hassan, and Anwar Salimi. "Mediating Effect of Use Perceptions on Technology Readiness and Adoption of Artificial Intelligence in Accounting." *Accounting Education* 30, no. 2 (2021): 107–30.

Farayola, Oluwatoyin Ajoke, Adekunle Abiola Abdul, Blessing Otohan Irabor, and Evelyn Chinedu Okeleke. "Innovative Business Models Driven by Ai Technologies: A Review." *Computer Science & IT Research Journal* 4, no. 2 (2023): 85–110.

Harzing, Anne-Wil, and Satu Alakangas. "Google Scholar, Scopus and the Web of Science: A Longitudinal and Cross-Disciplinary Comparison." *Scientometrics* 106 (2016): 787–804.

Hlongwane, Joseph, George N Shava, Andrew Mangena, and Tapiwa Muzari. "Towards the Integration of Artificial Intelligence in Higher Education, Challenges and Opportunities: The African Context, a Case of Zimbabwe.," n.d.

Holmes, Amy Foshee, and Ashley Douglass. "Artificial Intelligence: Reshaping the Accounting Profession and the Disruption to Accounting Education." *Journal of Emerging Technologies in Accounting* 19, no. 1 (2022): 53–68.

Kamalov, Firuz, David Santandreu Calonge, and Ikhlaas Gurrib. "New Era of Artificial Intelligence in Education: Towards a Sustainable Multifaceted Revolution." *Sustainability* 15, no. 16 (2023): 12451.

Khalaf, Bilal Khalid, and Zuhana Bt Mohammed Zin. "Traditional and Inquiry-Based Learning Pedagogy: A Systematic Critical Review." *International Journal of Instruction* 11, no. 4 (2018): 545–64.

Kommunuri, John. "Artificial Intelligence and the Changing Landscape of Accounting: A Viewpoint." *Pacific Accounting Review* 34, no. 4 (2022): 585–94.

Kroon, Nanja, Maria do Céu Alves, and Isabel Martins. "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, no. 3 (2021): 163.

Masau, Problem. "How the Usage of Artificial Intelligence Can Improve Education Area in Zimbabwe." newsday.co.zw, 2023.

Mhlanga, David. "Exploring the Evolution of Artificial Intelligence and the Fourth Industrial Revolution an Overview." *FinTech and Artificial Intelligence for Sustainable Development: The Role of Smart Technologies in Achieving Development Goals*, 2023, 15–39.

———. "FinTech and Artificial Intelligence for Sustainable Development: The Role of Smart Technologies in Achieving Development Goals." In *FinTech and Artificial Intelligence for Sustainable Development: The Role of Smart Technologies in Achieving Development Goals*, 3–13. Springer, 2023.

Nakano, Masafumi. "Artificial Intelligence and Robotic Process Automation for Accounting and Auditing in Society 5.0." *Journal of Social Science*, no. 89 (2022): 51–61.

Ndoro-mkombachoto, Gloria. "AI: Benefits, Concerns in the Education Sector." newsday.co.zw, 2024. https://www.newsday.co.zw/theindependent/opinion/article/200024106/ai-benefits-concerns-in-the-education-sector.

Odonkor, Beryl, Simon Kaggwa, Prisca Ugomma Uwaoma, Azeez Olanipekun Hassan, and Oluwatoyin Ajoke Farayola. "A Review of US Management Accounting Evolution: Investigating Shifts in Tools and Methodologies in Light of National Business Dynamics." *International Journal of Applied Research in Social Sciences* 6, no. 1 (2024): 51–72.

Okolo, Chinasa T, Kehinde Aruleba, and George Obaido. "Responsible AI in Africa Challenges and Opportunities." *Responsible AI in Africa: Challenges and Opportunities*, 2023, 35–64.

Onesi-Ozigagun, Oseremi, Yinka James Ololade, Nsisong Louis Eyo-Udo, and Damilola Oluwaseun Ogundipe. "Revolutionizing Education through AI: A Comprehensive Review of Enhancing Learning Experiences." *International Journal of Applied Research in Social Sciences* 6, no. 4 (2024): 589–607.

Rossi, Francesca. "Building Trust in Artificial Intelligence." *Journal of International Affairs* 72, no. 1 (2018): 127–34.

Shiohira, Kelly. "Understanding the Impact of Artificial Intelligence on Skills Development. Education 2030." *UNESCO-UNEVOC International Centre for Technical and Vocational Education and Training*, 2021.

Snyder, Hannah. "Literature Review as a Research Methodology: An Overview and Guidelines." *Journal of Business Research* 104 (2019): 333–39.

Sudibjo, Niko, Lusiana Idawati, and H G Retno Harsanti. "Characteristics of Learning in the Era of Industry 4.0 and Society 5.0." In *International Conference on Education Technology (ICoET 2019)*, 276–78. Atlantis Press, 2019.

Surianti, Meily. "Development of Accounting Curriculum Model Based on Industrial Revolution Approach." *Development* 11, no. 2 (2020).

Tavares, Maria C, Graça Azevedo, Rui P Marques, and Maria Anunciação Bastos. "Challenges of Education in the Accounting Profession in the Era 5.0: A Systematic Review." *Cogent Business & Management* 10, no. 2 (2023): 2220198.

Ukwandu, Damianu C. "South Africa as a Developmental State-Is It a Viable Idea?" *African Journal of Public Affairs* 11, no. 2 (2019): 41–62.

Velander, Johanna, Mohammed Ahmed Taiye, Nuno Otero, and Marcelo Milrad. "Artificial Intelligence in K-12 Education: Eliciting and Reflecting on

Swedish Teachers' Understanding of AI and Its Implications for Teaching & Learning." *Education and Information Technologies* 29, no. 4 (2024): 4085–4105.

Vincent-Lancrin, Stéphan, and Reyer van der Vlies. "Trustworthy Artificial Intelligence (AI) in Education: Promises and Challenges. OECD Education Working Papers, No. 218." *OECD Publishing*, 2020.

Zakaria, Noor Hidayah, Rohayanti Hassan, Muhamad Razib Othman, Zalmiyah Zakaria, and Shahreen Kasim. "A Review on Classification of the Urban Poverty Using the Artificial Intelligence Method." *Journal of Asian Scientific Research* 7, no. 11 (2017): 450.

Zhong, Shaozhuo, Yong Geng, Wenjing Liu, Cuixia Gao, and Wei Chen. "A Bibliometric Review on Natural Resource Accounting during 1995–2014." *Journal of Cleaner Production* 139 (2016): 122–32.