



Review

Riding the Waves of Artificial Intelligence in Advancing Accounting and Its Implications for Sustainable Development Goals

Yixuan Peng ¹, Sayed Fayaz Ahmad ²,*, Ahmad Y. A. Bani Ahmad ³, Mustafa S. Al Shaikh ⁴, Mohammad Khalaf Daoud ⁵ and Fuad Mohammed Hussein Alhamdi ⁶

- School of Law, Huazhong University of Science and Technology, Wuhan 430074, China; d202081276@hust.edu.cn
- Department of Engineering Management, Institute of Business Management, Karachi 74000, Pakistan
- Department of Financial and Accounting Science, Middle East University, Amman 11121, Jordan; aahmad@meu.edu.jo
- ⁴ College of Business, Zarqa University, Zarqa 11512, Jordan
- Department of Marketing, Applied Science Private University, Amman 11121, Jordan; mo_daoud@asu.edu.jo
- Department of Business Administration, College of Sciences and Humanities-Aflaj, Prince Sattan Bin Abdulaziz University, Al-Aflaj 16828, Saudi Arabia; f.alhamdi@psau.edu.sa
- * Correspondence: fayaz.ahmed@iobm.edu.pk

Abstract: Artificial intelligence (AI) is emerging as a disruptive force in many sectors, and using it in accounting isn't an exception. This conceptual paper explores the role of AI in accounting, for financial reporting, auditing, and financial decision-making and provides accountants an opportunity to improve efficiency, accuracy, and decision support. AI, through data analytics, algorithms, automation, etc. has an important role in the field of accounting with some challenges also. The study also highlights the implications of AI in accounting for achieving several Sustainable Development Goals (SDGs). Firstly, AI-driven automation can restructure financial activities, reducing time and resource consumption, and contributing to SDG 8 (Decent Work and Economic Growth). In addition, by providing real-time data analysis, AI empowers businesses to make sustainable decisions based on real-time data, aligning with SDG 9 (Industry, Innovation, and Infrastructure) and SDG-16 (Peace, Justice, and Strong Institutions) and SDG 17 (Partnerships for the Goals). The paper has implications for policy makers, technology developers, financial institutions and business firms.

Keywords: artificial intelligence; accounting; sustainability; automation; accountant's efficiency; decision making; sustainable development goals



Citation: Peng, Y.; Ahmad, S.F.; Ahmad, A.Y.A.B.; Al Shaikh, M.S.; Daoud, M.K.; Alhamdi, F.M.H. Riding the Waves of Artificial Intelligence in Advancing Accounting and Its Implications for Sustainable Development Goals. Sustainability 2023, 15, 14165. https://doi.org/10.3390/ su151914165

Academic Editors: Zhenzhong Ma and Kun Li

Received: 20 August 2023 Revised: 12 September 2023 Accepted: 18 September 2023 Published: 25 September 2023



Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction

Accounting is one of the basic functions of an organization, assists financial management, decision-making, tax compliance, budgeting, performance evaluation, and corporate governance [1]. It is not just simple record-keeping but serves organisations to grow and compete in today's dynamic market. Efficient accounting leads to the foundation of a financially stable and responsible firm and helps organisations to make well-informed decisions and achieve a competitive position [2,3]. As accounting is a very dynamic and complex function, its professionals are facing some serious challenges these days; and the solution of which are very necessary for business firms to remain competitive, and profitable and ensure sustainable economic growth [4]. For example, financial regulations are always developing and may differ from country to country and it is very challenging for accountants and businesses to comply with. Another challenge is how to deal with a variety of financial reporting requirements, taxes restrictions, and currency issues when an organisation expands its business abroad. Talent shortages are another potential problem in the accounting sector. The need for experienced accountants is greater than the available

Sustainability **2023**, 15, 14165 2 of 12

professionals. Another potential challenge comes from clients. In today's competitive market, clients want their accountants to provide real-time financial analytics, personalised services, and proactive counsel, and it's very difficult for the accountants to do so due to the complexity and variety of their jobs, which ultimately results in low economic growth and poses a threat to sustainable development. Another problem in the accounting industry is related to data analytics as it requires advanced tools and techniques and it's very challenging for business organizations to find such experts. Perhaps the most important challenge, that businesses and accounting are facing is the increasing dependency of accounting professionals on interdisciplinary skills. Collaboration with specialists from multiple sectors such as marketing, technology, and law has become critical for addressing complex business issues that are beyond conventional accounting tasks. Last but not least, accounting is known for its hard workload, especially during the fiscal season and it's very difficult for professionals to maintain their work-life balance. One way to address these issues is to adopt new technology and innovations and luckily Artificial Intelligence (AI: "is the ability of machines to perform tasks that are typically associated with human intelligence" [5]) has the potential to address these challenges to a greater extent [6,7]. Like education, supply chain management [8,9] etc., accounting has begun to embrace AI because of its revolutionary influence on numerous aspects of accounting management. The use of AI technology in accounting procedures combats many key challenges while also providing various benefits to both businesses and accounting specialists [10]. It is crucial for organisations and accountants due to its capacity to automate operations, analyse, data, identify fraud, allow predictive analytics, and provide personalised financial advice [11]. The accounting sector may gain more accuracy, efficiency, and strategic decision-making by incorporating AI, to ensure sustainable growth and business development [12]. At current, digital era of 4.0 and 5.0, technology and accounting sectors are getting closer and has attracted researchers to investigates their possible opportunities and threats for financial and accounting sectors [13], especially for sustainability [14], and banking [15] as industry 4.0 and 5.0 have brought a significant impact in supply chain management [16] in the form of digital twins [17]. All of these challenges have connections to the SDGs for excellent education, employment, industry, innovation, economic growth, infrastructure, strong institutions, and employee well-being [18]. By tackling these issues, the accounting profession can make a substantial contribution to sustainable development while contributing to the achievement of SDGs [19]. The study bridges the gaps in our knowledge regarding the integration of artificial intelligence, the accounting processes, and sustainability. And provide a guideline for the development of AI tools for beneficial and effective integration of the AI, accounting and sustainability. It also assists in finding the necessary factors for AI to make its adoption successful in the accounting sector. The study leads to better understanding regarding the AI role in accounting including its significance for establishing sustainable business processes by filling these gaps.

This study aims to answer the following questions:

- 1. What is the role of AI in accounting?
- 2. What are the problems/challenges, AI can resolve/address in accounting?
- 3. Does AI benefit accountants and businesses?

The study is intended to provide insights regarding the adoption of AI in business organizations or accounting professions. Further, it explores the role of AI in accounting with a focus of its potential to address the concerns, traditional accounting is facing. As the future is more dependent on technological advancement and there is a need to study what AI can bring to accounting.

2. Literature Review

2.1. Artificial Intelligence in Accounting

AI is having a great impact on accounting practises, transforming traditional methods and improving overall accuracy and effectiveness [20]. For example, AI has enabled data entry and filtering in an automated way [21]. It enhances bank reconciliations, reducing

Sustainability **2023**, 15, 14165 3 of 12

errors and enabling accountants to focus on analytical and value-added tasks in their job. AIpowered data analysis enables accountants to effectively handle large volumes of financial data and determine useful insights, which enhances taking decisions and enables them to give clients accurate and strategic financial advice [22]. Another possible application for AI in accounting is fraud detection, as it continuously examines financial transactions and detects suspicious activity instantaneously. Early identification of fraudulent activity helps to avert major monetary damages and protects firms' financial integrity [23]. AI also makes financial reporting easier through standardised and accurate reports procedures that ensure adherence to accounting laws and regulations and decreases the effort of manual reporting activities while improving financial statement reliability [24,25]. AI's predictive powers play an important role in forecasting and budgeting and empower firms to generate realistic financial estimates and effectively plan for the future [26,27]. In addition, AI also improves the audit process by automating the process of data verification and validation, resulting in more effective and correct audits [28]. The use of AI in accounting has resulted in substantial advances in data analysis, decision-making, automation, fraud detection, etc. In today's dynamic and data-driven business market, adopting AI technology has become critical for firms to remain competitive and to provide better financial services [29,30]. In short, the role of AI in accounting is significant and huge. The traditional procedures and activities of accounting functions can be made more effective and efficient through the adoption of innovative AI solutions. From doing automated tasks to fraud detection, from recording data to analyzing for better decisions; all can be done through the use of AI technology in accounting. The adoption of AI in accounting not only makes accounting firms and accountants, more effective and efficient but enhances their productivity and economic growth which also contributes to the attainment of SDGs [18,19].

2.2. Automation

AI automation ("the technique of making an apparatus, a process, or a system operate automatically") [31] has various benefits, including increased accuracy, faster operations, real-time reporting, identification of fraud, and better financial analysis in accounting [32]. Businesses that embrace AI technology may improve their accounting activities, take more informed decisions, and obtain a competitive advantage in the current data-driven economy [33]. For example, one of the major benefits of AI is automated data entry in accounting. With the help of Optical Character Recognition technology, AI-powered systems retrieve information from bills, receipts, and other documents, decreasing the requirement for manually entering information and minimising mistakes. The whole process is done automatically [34]. AI can also be used to identify transactions automatically based on established criteria and previous data patterns which simplifies the process of categorising financial transactions, reducing time while insuring correct financial records [11]. This is also helpful to reduce human efforts and to enhance accuracy in transactions. In addition, AI-driven systems make bank reconciliation more efficient; and match statement transactions with matching accounting system entries, facilitating the reconciliation procedure and decreasing inconsistencies [35]. AI is also helpful to automate the processing of invoices; validate invoice information, update records, and start payment processing, removing the need for user involvement and accelerating the payment cycle [36].

AI automation also facilitates real-time reporting related to financial matters. It automatically generates and provides financial reports available and gives real-time insight for making decisions [37]. AI also automates tax calculations, applies the most recent tax regulations, and creates accurate tax reports, minimising the possibility of mistakes in filing taxes and improving tax planning [38,39]. It has a critical role in identifying fraudulent activity by constantly analysing financial transactions and protecting firms from financial and reputational losses [40]. AI predicts future financial patterns, monetary flows, and performance measures, facilitating data-driven financial choices and strategic planning through predictive financial analysis [41].

Sustainability **2023**, 15, 14165 4 of 12

AI-backed automation has enormous advantages in accounting. From performing routine tasks to analyzing and providing data for decision-making, it also saves time and cost, the need for experts, and allows accounting professionals to concentrate on strategic activities. AI-based automation is the need of present-day accounting as the needs of clients and businesses are changing very rapidly. It ensures economic growth by analyzing the data according to the market needs.

2.3. AI Algorithms and Analysis

Accounting has been profoundly affected by AI algorithms, which have revolutionised old practises and enabled accountants and financial professionals to perform more effectively [42]. Machine learning and natural language processing, for example, can alter multiple components of accounting, such as entering data, financial analysis, identifying fraud, and processes for making decisions [43,44]. With the help of AI algorithms, the extraction of pertinent information from documents such as bills, receipts, and financial statements can be made automated which reduces errors, save time, and improves data accuracy [45]. AI algorithms are capable of analysing massive volumes of financial data to identify patterns, trends, and irregularities [46]. This helps in more accurate financial analysis and forecasting, allowing firms to make better decisions and detect possible risks and opportunities. AI systems generate alarms when suspicious behaviours are detected by continually analysing transaction patterns and financial data assisting businesses in mitigating fraud risks and inefficiencies [47]. It also detects possible non-compliance concerns and gives insights to assist businesses comply with regulatory obligations by monitoring financial activities and data [23]. Last but not least AI virtual assistants give real-time help to accountants and customers by answering questions and delivering financial insights on required [48]. Accounting AI algorithms offer the ability to expedite operations, enhance accuracy, and give accountants time to concentrate on other responsibilities. As innovation takes place in AI technology and it gets advancements, its incorporation with accounting practises is likely to grow [49]. Its applications and benefits will be changing the accounting profession's future and so accountants and businesses must adopt AI in accounting. It is also necessary to adopt adequate measures regarding the security and privacy of data, training of accountants, etc. for the efficient use of AI algorithms in accounting activities.

2.4. AI and Accountant's Efficiency

AI has a significant influence on the efficiency of accountants. AI enables accountants to concentrate on better planning and valuable tasks by automating repetitive processes such as entering data, reconciliation, and report-making [50]. It will decrease the requirement for manual labor and enable accountants to concentrate on more value-added operations [51]. Furthermore, the ability of AI to handle large volumes of data allows accountants to obtain a greater understanding of financial performance while making decisions based on data. AI-powered technologies may detect inconsistencies, unexpected transactions, and possible fraud, hence improving the quality of financial audits [52]. AI-powered predictive analytics also helps accountants with planning and financial forecasting, enabling them to develop realistic budgets and adopt proactive financial plans [53].

The capacity of AI to analyse individual customers' financial data enables accountants to deliver personalised financial advice and solutions, leading to happier customers and improved client-accountant relations [54]. Despite these advantages, concerns related to the security of data, human control, and moral issues need to be resolved to ensure that AI is used responsibly and effectively in accounting [29]. As dependency on AI-based systems grows, ensuring data privacy and security becomes increasingly vital. Comprehensive security measures are essential to safeguard critical financial data from unauthorised access, among other things. Another critical problem is the ethical difficulties that occur as a result of the use of AI in accounting. Accountants and businesses must take proactive steps to guarantee that AI-powered operations are transparent, fair, and ethical. Furthermore, as

Sustainability **2023**, 15, 14165 5 of 12

AI becomes more integrated into the accounting system, accountants must learn how to connect with AI systems, optimise their use, and assess their outputs.

Accountants' roles will continue to change as AI evolves, with a higher focus on technological skills, data analysis, and innovative thinking [55]. While AI will automate many activities, human accountants will be necessary for AI-generated understandings, making technical judgments, and preserving accounting ethics. Accountants' collaboration with AI technology provides a future in which accounting is more dynamic, and data-driven [56]. Accounting performance is considerably enhanced through AI by automating difficult jobs, improving accuracy, offering real-time insights, accelerating reconciliation procedures, and supporting fraud detection. Accountants may more effectively manage their time and expertise, improving resource utilisation and leading to improved financial results for businesses.

2.5. AI-Driven Decision and Regulatory Standards

AI has also a positive role in accounting decision-making according to regulatory standards [46]. Its innovative capabilities provide several benefits that help accountants and organisations make better financial decisions while complying with regulatory regulations [57]. AI improves reliability and accuracy in accounting records by analysing and organising data in real-time, minimising the probability of mistakes in reporting and decision-making [58]. As it can analyze huge data, it has also the ability to extract useful and required information for better decisions according to market demands [59]. This responsiveness coincides with the regulatory bodies' requirement for timely and accurate financial reporting. It is important to highlight that accounting decisions should follow regulatory standards for which the role of AI cannot be ignored [60]. For example, it improves the procedures of data validation, verification, and reporting and automates these steps that assist accountants in meeting regulatory requirements while reducing errors. Moreover, the pattern and anomaly recognition capabilities of AI help in accounting fraud detection and assists accountants in taking preventative steps for mitigating fraud risks [39]. Adherence to fraud prevention rules is critical for sustaining trust and integrity, making AI a significant partner in fraud detection and decision-making. AI-powered systems perform data validation and verification steps in an automated manner and make the audit process simple. This saves auditors time while ensuring transparency and fulfillment of regulatory audit standards, and strengthens the credibility and reliability of financial data to be used in decision-making [61]. Furthermore, AI's predictive analytics plays a vital role in budgeting and forecasting and helps accountants to make effective and efficient data-based projections. This ability is also critical for meeting regulatory planning and reporting obligations, as well as facilitating sound decisions for sustainable financial growth [62].

AI considerably enhances accounting decision-making while complying with regulations. Its abilities for data analysis, accuracy, real-time insights, identifying fraud, compliance automation, and ethical decision-making help accelerate monetary operations and assure regulatory compliance. AI enables accountants to handle financial data more effectively, and increase transparency according to the regulations; which contribute to better financial governance and trust among stakeholders [63]. As AI advances, its function in accounting decisions will become even more critical in managing a more complicated and regulated financial industry.

3. Discussion

Accounting is going through an evolution due to the adoption of AI [64]. AI is transforming the profession by radically enhancing its efficiency and capabilities. Data entry, billing, and handling payroll can all be done with enhanced speed and accuracy due to AI's automated capabilities, while significantly minimizing the risk of errors. And allows the accountants to spend more time on strategic planning, financial analysis, client management, etc. [62]. In addition, AI's exceptional data processing abilities have taken accounting to new heights. AI's algorithms analyse massive amounts of financial data in

Sustainability **2023**, 15, 14165 6 of 12

record time with more accuracy. AI's analytical ability is critical in the identification of fraud, assessing risk, and financial projections. Organisations can make sound decisions with real-time insights based on data, encouraging increased agility and competitiveness according to the market demand [46]. The role of AI in accounting goes beyond improving the procedure for reporting finances. AI improves monthly and yearly closing operations by quickly collecting data from multiple sources and merging it to create coherent financial reports [65].

AI-based systems can also undertake in-depth audits of financial information, spotting inconsistencies and threats with greater accuracy; and increases audit quality, lowering the likelihood of fraud, and boosting the financial statement's credibility. The impact of AI goes beyond business contexts to individual financial management [66]. For instance, individuals may now obtain personalised financial and budgeting guidance from AI's financial apps that use AI algorithms in analysing individual spending trends, find opportunities for investing and saving, and offering personalised financial plans to help people attain their financial objectives [67].

Despite all of the advantages AI also brings some challenges to accounting, that need to be addressed carefully. Ensuring data privacy and security becomes more critical when dependency increases on AI-based systems. To protect important financial data from unauthorised access etc., adequate security measures are required. Another important issue is regarding the ethical issues which arise after the adoption of AI in accounting. Accountants and businesses require proactive measures to ensure that AI-driven operations are transparent, fair, and ethical. Moreover, as AI becomes more integrated into the accounting system, accounts professionals must learn how to interact with AI systems, optimise their use, and evaluate their outputs [29].

It is clear that the role of AI in accounting is significant and it has the potential to address many modern-day challenges, that accountants and businesses are facing [68]. The adoption of AI is an innovative and exploratory journey in accounting. When accountants use AI-based systems, they have to manage ethical issues, data protection concerns, and their evolving role. Accepting AI necessitates ongoing development and adaptation as accountants explore new methods to responsibly, ethically, and effectively, utilise AI-powered systems, developing a new era of accounting in a constantly evolving digital environment [30,69].

We need to answer the questions we have raised in the introduction under the umbrella of the discussion above.

What is the role of AI in accounting?

AI technology has brought significant advances in the area of accounting, revolutionizing the governance, analysis, and use of financial data. AI has grown into a vital tool due to its capacity to analyse enormous volumes of data, notice patterns, and provide exact predictions. through automation, AI contributes to reducing laborious tasks like entering data, reconciling, categorizing a transaction, eliminating mistakes, and liberating accountants to concentrate on strategic elements.

Furthermore, AI improves the analysis of data in real-time, identifying anomalies, patterns, and possible risks, contributing to better decision-making and optimised financial and business strategies. It helps in the identification of fraud, the monitoring of transaction patterns to avoid fraudulent actions, and enhancing of data security. Furthermore, AI's predictive abilities improve financial forecasting by integrating past data with market patterns to provide reliable forecasts, enabling businesses to foresee opportunities as well as challenges. AI maintains legal compliance by monitoring events and modifying financial activities accordingly.

AI can be used to provide personalised accounting services that are customised according to every individual's requirements and interests. Machine learning provides constant learning to accounting systems, ensuring accurate practises. The innovative impact of AI in finance includes task automation, analysis, identification of fraud, forecasting, regulatory compliance, and customised services. In short, the relationship between AI and account-

Sustainability **2023**, 15, 14165 7 of 12

ing remains to evolve, making human skills and judgment challenging and critical for evaluating AI-generated insights while making cautious financial decisions.

What problems and challenges, AI can resolve in accounting?

There are many challenges and problems in accounting, which can be addressed by the use of AI technology. Some of them are discussed in the following lines.

Errors in Manual Data Entry: There is a high risk of errors in the manual entry of data that can be resolved through the use of AI. AI automation removes the need for human data entry, decreasing errors in data entry while providing reliable information.

- 1. Time and resources: It is a fact that most of the tasks in accounting are repetitive which consumes resources and time. AI can be used to perform those repetitive tasks and free account professionals for nonrepetitive work. Moreover, it is also helpful in optimizing the resource and saving costs through automating tasks, and enhanced resource allocations.
- 2. Data Handling and Analysis: It is very difficult in traditional accounting to handle and analyse a huge amount of financial data. This issue can also be resolved by AI, which can handle and analyze huge volumes of data in real time for better financial and strategic decisions according to the demand of the market.
- 3. Challenging Regulatory Standards: It is very challenging for organizations to comply with the evolving regulations of today's business environment but the issue can be addressed by AI which ensures to follow regulatory standards, reporting, etc.
- 4. Identification of Fraud: Fraud is one of the most important challenges, accounting is facing. Pattern and anomaly detection algorithms in AI can identify suspicious transactions, assisting in the prompt detection and avoidance of fraud.
- 5. Issue of accounting experts: Many accounting activities need advanced expertise that can't be easily available inside a business. AI can provide personalised financial guidance and information, and assistance in making decisions in challenging financial situations.

AI addresses many accounting issues and challenges, including entering data mistakes and manual work to fraudulent activity detection, compliance, and allocation of resources challenges. Accounting professionals can address these problems, improve their capacity for decision-making, and provide more accurate and significant financial insights to firms by adopting AI technology.

Does AI benefit Accounting?

Without a doubt, AI has numerous benefits in accounting. Its impact on both accountants and businesses seems to be positive and significant. Accounting benefits substantially from AI by automating activities, enhancing accuracy, giving immediate insights, better fraud detection, assisting with financial analysis, assuring compliance, expediting audits, providing personalised advice, and optimising expenditures. Its adoption in accounting activities enables accountants to deliver better financial information, make better decisions, and spend more time to higher-value activities. With the advancement in AI technology, its potential to further revolutionize accounting practises will also increase and will bring more benefits and applications.

4. Implications and Contribution to SDGs

The paper emphasizes AI's revolutionary role in accounting and its ability to disrupt existing practices. Accountants should take the lead in appropriately adopting AI, resolving ethical problems, and exploiting AI insights to provide value-added solutions for organisations. While AI advances, so will its application in accounting, providing accountants with both opportunities and issues in pursuit of business success. Some of the important implications and their contribution to the attainment of several SDGs are:

1. Technology Innovation: This paper emphasizes the significance of integrating innovations in technology such as AI in accounting. Accountants and companies have to acknowledge the benefits of AI in optimising operations, improving accuracy and

Sustainability **2023**, 15, 14165 8 of 12

decision-making. This also aligns with the SGD-9 (Industry, Innovation, and Infrastructure), which highlights the significance of technological innovation, and non-stop learning to ensure innovation and sustainable industries [70].

- 2. Quality Education: Accountants have to adjust to this change and learn innovative abilities to remain competitive in an increasingly technologically driven market. This also aligns with the SGD-9 (Industry, Innovation, and Infrastructure), which highlights the significance of non-stop learning to ensure innovation and sustainable industries. Furthermore, it is also in line with SGD-4 (Quality Education), which focuses on lifelong learning to equip individuals according to the need of changing environment. In addition, it also supports SDG-8 (Decent Work and Economic Growth), which focuses on the requirement for the creation of jobs and the advancement of knowledge and abilities which satisfy market requirements, encouraging economic growth and minimising unemployment [70].
- 3. Strengthening Financial Governance: Businesses may increase stakeholder trust by using AI to assure conformity to accounting regulations and standards. This is also in line with SDG-16 (Peace, Justice, and Strong Institutions), dedicated to enhancing financial governance. While SDG 16 covers many concepts, its Target 16.6 tackles financial governance specifically and strives to "develop effective, accountable, and transparent institutions at all levels" [70].
- 4. Ethical Concerns: Accountants need to manage AI adoption properly, guaranteeing ethical data usage and increasing trust among customers.
- 5. Decision Making: Accountants perform a critical role in advising organisations to successfully harness AI for enhanced financial performance and planning. They can also get better client relationships through the use of AI.
- 6. Collaborations: AI adoption in accounting also encourages and promotes collaborations among individuals, businesses, and governments which is aligned with SDG 17 (Partnerships for the Goals) [70].

5. Value Addition

The review makes an important contribution by analysing the evolving relationship between AI, and accounting practises, and their substantial implications towards the accomplishment of SDGs. And presents novel insights demonstrating the disruptive potential AI has in the field of accountancy and its association towards the goal of sustainable development by synthesising and examining a broad spectrum of research papers. The following are the main value addition of the review.

1. A Paradigm Shift: Bridging AI and Accounting

The study combines accounting with artificial intelligence. The inclusion to investigate these topics' symbiotic connection has frequently been missed in the literature that has already been written about these topics. The study also shows how AI-driven technologies are changing accounting processes and improving efficiency, accuracy, and decision-making by using data analysis, predictive modelling, and pattern recognition. Moreover, the paper provides an integrated approach how financial data is handled, reported, processed and interpreted by linking these technological innovations with principles of accounting.

2. Finding Synergies for SDGs

The compatibility between AI-backed accounting practises and SDGs is explored in further detail in the study and critically examines how organisations can assess, monitor, and report their achievements towards specific SDGs. This paper draws a clear link between advances in technology and goals for international development by highlighting specific situations where AI-driven accounting promotes accountability, transparency, and decision-making towards SDGs.

3. Regulatory Frameworks and Ethical Considerations

The study extends the verdicts to include the ethical implications of AI in accounting in an attempt to add value. It reveals the moral issues raised by AI use, including potential job loss, privacy problems, and biases. This paper adds to a deeper awareness of AI's use

Sustainability **2023**, 15, 14165 9 of 12

in accounting by outlining the ethical environment, paving the path for ethical adoption. It also looks at the growing legal frameworks required to regulate various practices in Aldriven accounting, ensuring conformity with global standards whilst enhancing benefits.

4. Research Directions

The study appears with an appeal for actions that serves as inspiration for future studies and guide practical implications. This analysis provides a road map for academics, professionals, and decision-makers by highlighting areas that need for further research on the relationships among accounting, AI, and sustainable development. It also highlights the necessity of multidisciplinary approaches, innovative techniques, and thorough case studies to fully realize the role of AI in accounting and its potential towards sustainable development. The literature analysis broadens the boundaries of knowledge by illustrating AI-driven accounting an innovative tool in improving SDGs and lays a strong basis towards a more unified, integrated, trustworthy, and significant future by clarifying the connections between these domains, clarifying ethical issues, and establishing a future direction.

6. Conclusions

The role of AI in accounting is revolutionary, and simplifies accounting processes, improves accuracy, and equip the accounting and accountants with automation, better data analysis, and predictive abilities. AI also poses some significant ethical issues, regarding data like bias and privacy, that must be addressed responsibly. Accountants and businesses must adopt AI and obtain the necessary skills to use it effectively. The integration of AI in businesses and accounting still needs further exploration to ensure its responsible use.

Limitations and Direction for Future Research

The study has some limitations which need to be explored in future studies.

- 1. This study is not based on a proper quantitative or qualitative (systematic review) methodology which is also one of its main limitations. Yet, it opens directions for such researches.
- 2. Technology adoption is often accompanied by ethical issues. Research is also needed on the ethical adoption of AI in accounting.
- 3. The role of AI in small and large business accounting needs exploration.
- 4. AI is an advanced technology and it is important to explore it in the context of the digital divide.
- 5. Research should be conducted on the successful adoption of AI in accounting firms.

Author Contributions: Conceptualization, Y.P. and S.F.A.; methodology, A.Y.A.B.A. and M.S.A.S.; resources, M.K.D. and F.M.H.A.; data curation, A.Y.A.B.A. and M.S.A.S.; writing—original draft preparation, M.K.D. and F.M.H.A.; writing—review and editing, M.K.D. and F.M.H.A.; supervision, S.F.A.; project administration, Y.P.; funding acquisition, Y.P. and A.Y.A.B.A. All authors have read and agreed to the published version of the manuscript.

Funding: The research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable. **Data Availability Statement:** Not applicable.

Acknowledgments: We acknowledge our universities of supporting us.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Carnegie, G.; Parker, L.; Tsahuridu, E. It's 2020: What is Accounting Today? Aust. Account. Rev. 2021, 31, 65–73. [CrossRef]

2. Oyewo, B. Contextual factors moderating the impact of strategic management accounting on competitive advantage. *J. Appl. Account. Res.* **2022**, 23, 921–949. [CrossRef]

Sustainability **2023**, 15, 14165 10 of 12

3. Coelho, R.; Jayantilal, S.; Ferreira, J.J. The impact of social responsibility on corporate financial performance: A systematic literature review. *Corp. Soc. Responsib. Environ. Manag.* **2023**, *30*, 1535–1560. [CrossRef]

- 4. Conway, E.; Byrne, D. (Eds.) Contemporary Issues in Accounting; Springer International Publishing: Cham, Switzerland, 2018.
- 5. IBM. What Is Artificial Intelligence (AI)? Available online: https://www.ibm.com/topics/artificial-intelligence (accessed on 12 September 2023).
- 6. Leitner-Hanetseder, S.; Lehner, O.M.; Eisl, C.; Forstenlechner, C. A profession in transition: Actors, tasks and roles in AI-based accounting. *J. Appl. Account. Res.* **2021**, 22, 539–556. [CrossRef]
- 7. Kokina, J.; Davenport, T.H. The Emergence of Artificial Intelligence: How Automation is Changing Auditing. *J. Emerg. Technol. Account.* **2017**, *14*, 115–122. [CrossRef]
- 8. Ahmad, S.F.; Rahmat, M.K.; Mubarik, M.S.; Alam, M.M.; Hyder, S.I. Artificial Intelligence and Its Role in Education. *Sustainability* **2021**, *13*, 12902. [CrossRef]
- 9. Khan, Y.; Su'ud, M.B.M.; Alam, M.M.; Ahmad, S.F.; Ahmad, A.Y.B.; Khan, N. Application of Internet of Things (IoT) in Sustainable Supply Chain Management. *Sustainability* **2022**, *15*, 694. [CrossRef]
- 10. Crookes, L.; Conway, E. Technology Challenges in Accounting and Finance. In *Contemporary Issues in Accounting*; Springer International Publishing: Cham, Switzerland, 2018; pp. 61–83.
- 11. Han, H.; Shiwakoti, R.K.; Jarvis, R.; Mordi, C.; Botchie, D. Accounting and auditing with blockchain technology and artificial Intelligence: A literature review. *Int. J. Account. Inf. Syst.* **2023**, *48*, 100598. [CrossRef]
- 12. Lehner, O.M.; Ittonen, K.; Silvola, H.; Ström, E.; Wührleitner, A. Artificial intelligence based decision-making in accounting and auditing: Ethical challenges and normative thinking. *Account. Audit. Account. J.* 2022, *35*, 109–135. [CrossRef]
- 13. Machkour, B.; Abriane, A. Industry 4.0 and its Implications for the Financial Sector. *Procedia Comput. Sci.* **2020**, 177, 496–502. [CrossRef]
- 14. Tiwari, K.; Khan, M.S. Sustainability accounting and reporting in the industry 4.0. J. Clean. Prod. 2020, 258, 120783. [CrossRef]
- 15. Gupta, R. Industry 4.0 Adaption in Indian Banking Sector—A Review and Agenda for Future Research. *Vis. J. Bus. Perspect.* **2023**, 27, 24–32. [CrossRef]
- 16. Raja Santhi, A.; Muthuswamy, P. Pandemic, War, Natural Calamities, and Sustainability: Industry 4.0 Technologies to Overcome Traditional and Contemporary Supply Chain Challenges. *Logistics* **2022**, *6*, 81. [CrossRef]
- Muthuswamy, P.; K, S. Artificial intelligence based tool condition monitoring for digital twins and industry 4.0 applications. *Int. J. Interact. Des. Manuf.* 2023, 17, 1067–1087. [CrossRef]
- 18. Ziesche, S.; Agarwal, S.; Nagaraju, U.; Prestes, E.; Singha, N. Role of Artificial Intelligence in Advancing Sustainable Development Goals in the Agriculture Sector. In *The Ethics of Artificial Intelligence for the Sustainable Development Goals*; Springer: Cham, Switzerland, 2023; pp. 379–397.
- 19. Putri, R.; Werastuti, D.N.S.; Astuty, E.D.; Khairunnisa, A.F.; Wahyono, E.; Apriani, N.L. Ni Luh Apriani Integrated Reporting: Corporate Strategy Towards Achieving Sustainable Development SDGs. *Apollo J. Tour. Bus.* **2023**, *1*, 64–71. [CrossRef]
- 20. Agustí, M.A.; Orta-Pérez, M. Big data and artificial intelligence in the fields of accounting and auditing: A bibliometric analysis. *Span. J. Financ. Account./Rev. Española Financ. Contab.* **2023**, 52, 412–438. [CrossRef]
- 21. Marthen, C. Impact of Artificial Intelligence (AI) Technology on Accounting. SSRN Electron. J. 2023. [CrossRef]
- 22. Ibrahim, M.; Abdullah, A.; Khairudin, N.; Salleh, M.S.M. Artificial intelligence diffusion among accountants in Malaysian listed companies. In *AIP Conference Proceedings*; AIP Publishing: Long Island, NY, USA, 2023; p. 020054. [CrossRef]
- 23. Rahman, M.J.; Zhu, H. Predicting accounting fraud using imbalanced ensemble learning classifiers—Evidence from China. *Account. Financ.* **2023**, *63*, 3455–3486. [CrossRef]
- 24. Crona, B.; Sundström, E. Sweet Spots or Dark Corners? An Environmental Sustainability View of Big Data and Artificial Intelligence in ESG. In *Handbook of Big Data and Analytics in Accounting and Auditing*; Springer: Singapore, 2023; pp. 105–131.
- 25. Alshurafat, H. The Usefulness and Challenges of Chatbots for Accounting Professionals: Application On ChatGPT. SSRN Electron. J. 2023. [CrossRef]
- 26. Rawashdeh, A.; Bakhit, M.; Al-Okdeh, S. The Mediating Role of Control Risk in the Relationship between Technological Factors and AI-Based Predictive Analytics Adoption: Evidence from Audit Firms in the US. In Proceedings of the 2023 International Conference on Business Analytics for Technology and Security (ICBATS), Dubai, United Arab Emirates, 7–8 March 2023; pp. 1–7. [CrossRef]
- 27. Prokofieva, M. Integrating data analytics in teaching audit with machine learning and artificial intelligence. *Educ. Inf. Technol.* **2023**, *28*, 7317–7353. [CrossRef]
- 28. Obaydin, I.; Troshani, I.; Zurbruegg, R. AI capability and internal control effectiveness. SSRN Electron. J. 2023. [CrossRef]
- 29. Zhang, C.; Zhu, W.; Dai, J.; Wu, Y.; Chen, X. Ethical impact of artificial intelligence in managerial accounting. *Int. J. Account. Inf. Syst.* **2023**, *49*, 100619. [CrossRef]
- 30. Jackson, D.; Michelson, G.; Munir, R. Developing accountants for the future: New technology, skills, and the role of stakeholders. *Account. Educ.* **2023**, 32, 150–177. [CrossRef]
- 31. ISA. What Is Automation? Available online: https://www.isa.org/about-isa/what-is-automation (accessed on 12 September 2023).
- 32. Bavaresco, R.S.; Nesi, L.C.; Victória Barbosa, J.L.; Antunes, R.S.; da Rosa Righi, R.; da Costa, C.A.; Vanzin, M.; Dornelles, D.; Junior, S.C.; Gatti, C.; et al. Machine learning-based automation of accounting services: An exploratory case study. *Int. J. Account. Inf. Syst.* 2023, 49, 100618. [CrossRef]

Sustainability **2023**, 15, 14165 11 of 12

33. Makarova, E.N.; Skachkova, R.V.; Takhtomysova, D.A.; Fedotova, E.S.; Aukina, A.I. Automation of Accounting and Settlement Operations as a Form of Digital Transformation of the Cooperative Sector of the Economy. In *Big Data in Information Society and Digital Economy*; Springer: Cham, Switzerland, 2023; pp. 207–213.

- 34. Tsoraya, N.D.; Asbari, M.; Novitasari, D. The Role of Accounting Information Systems in the Industrial Revolution 4.0. *J. Inf. Syst. Manag.* **2022**, *2*, 44–47.
- 35. Kumar, A.; Patel, N. The Impact of AI Technology on the Financial Sector and How AI Is Modifying the State of Modern-Day Financial Institutions by Banking 4.0. 2022. Available online: https://www.eurchembull.com/uploads/paper/38e148daa207bf1 b60e581bbf7590e6e.pdf (accessed on 3 March 2023).
- 36. Ma, K.W.F.; Dhot, T.; Raza, M. Considerations for Using Artificial Intelligence to Manage Authorized Push Payment (APP) Scams. *IEEE Eng. Manag. Rev.* **2023**, *51*, 166–179. [CrossRef]
- 37. Dumitru, V.F.; Ionescu, B.-Ş.; Rîndaşu, S.-M.; Barna, L.-E.-L.; Crîjman, A.-M. Implications for Sustainability Accounting and Reporting in the Context of the Automation-Driven Evolution of ERP Systems. *Electronics* **2023**, *12*, 1819. [CrossRef]
- 38. European Union. Directive 2022/2464/EU of the European Parliament and of the Council of 14 December 2022 Amending Regulation (EU) No 537/2014, Directive 2004/109/EC, Directive 2006/43/EC and Directive 2013/34/EU, as Regards Corporate Sustainability Reporting. 2022. Available online: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32022L2 464&from=EN (accessed on 1 August 2023).
- 39. Hu, B.; Wu, Y. AI-based Compliance Automation in Commercial Bank: How the Silicon Valley Bank Provided a Cautionary Tale for Future Integration. *Int. Res. Econ. Financ.* **2023**, *7*, 13–15. [CrossRef]
- 40. Brusseau, J. AI human impact: Toward a model for ethical investing in AI-intensive companies. *J. Sustain. Financ. Investig.* **2023**, 13, 1030–1057. [CrossRef]
- 41. Schmitt, M. Automated machine learning: AI-driven decision making in business analytics. *Intell. Syst. Appl.* **2023**, *18*, 200188. [CrossRef]
- 42. Zhang, M. Problems and countermeasures of accounting informatization construction in colleges and universities under the background of big data and artificial intelligence. *J. Comput. Methods Sci. Eng.* **2023**, 23, 747–757. [CrossRef]
- 43. Bochkay, K.; Brown, S.V.; Leone, A.J.; Tucker, J.W. Textual Analysis in Accounting: What's Next? *Contemp. Account. Res.* **2023**, 40, 765–805. [CrossRef]
- 44. Duan, H.K.; Vasarhelyi, M.A.; Codesso, M.; Alzamil, Z. Enhancing the government accounting information systems using social media information: An application of text mining and machine learning. *Int. J. Account. Inf. Syst.* **2023**, *48*, 100600. [CrossRef]
- 45. Dandale, M.N.; Mazharunnisa; Daniel, D.J.J.D.; Priya, R.S.; Walid, M.A.A.; Thulasimani, T. Business Process Automation using Robotic Process Automation (RPA) and AI Algorithm's on Various Tasks. In Proceedings of the 2023 8th International Conference on Communication and Electronics Systems (ICCES), Coimbatore, India, 1–3 June 2023; pp. 821–827. [CrossRef]
- 46. Paurav Thakker, G.J. Emerging Technologies in Accountancy and Finance: A Comprehensive Review. *Eur. Econ. Lett.* **2023**, 13, 993–1011.
- 47. Dayyabu, Y.Y.; Arumugam, D.; Balasingam, S. The application of artificial intelligence techniques in credit card fraud detection: A quantitative study. *E3S Web Conf.* **2023**, 389, 07023. [CrossRef]
- 48. Kamoonpuri, S.Z.; Sengar, A. Hi, May AI help you? An analysis of the barriers impeding the implementation and use of artificial intelligence-enabled virtual assistants in retail. *J. Retail. Consum. Serv.* **2023**, 72, 103258. [CrossRef]
- 49. Cho, S.; Vasarhelyi, M.A.; Sun, T.; Zhang, C. Learning from Machine Learning in Accounting and Assurance. *J. Emerg. Technol. Account.* **2020**, 17, 1–10. [CrossRef]
- 50. Damerji, H.; Salimi, A. Mediating effect of use perceptions on technology readiness and adoption of artificial intelligence in accounting. *Account. Educ.* **2021**, *30*, 107–130. [CrossRef]
- 51. Danimir Gulin, C. Digitalization and the Challenges for the Accounting Profession. Entren.-Enterp. Res. Innov. 2019, 2, 428–437.
- 52. Yoon, S. A Study on the Transformation of Accounting Based on New Technologies: Evidence from Korea. *Sustainability* **2020**, 12, 8669. [CrossRef]
- 53. Kaya, C.T.; Turkyilmaz, M.; Birol, B. RPA Teknolojilerinin Muhasebe Sistemleri Üzerindeki Etkisi. *Muhasebe Finans. Derg.* **2019**, 82, 235–250. [CrossRef]
- 54. Boustani, N.M. Artificial intelligence impact on banks clients and employees in an Asian developing country. *J. Asia Bus. Stud.* **2022**, *16*, 267–278. [CrossRef]
- 55. Qasim, A.; Kharbat, F.F. Blockchain Technology, Business Data Analytics, and Artificial Intelligence: Use in the Accounting Profession and Ideas for Inclusion into the Accounting Curriculum. *J. Emerg. Technol. Account.* **2020**, *17*, 107–117. [CrossRef]
- 56. Luo, J.; Meng, Q.; Cai, Y. Analysis of the Impact of Artificial Intelligence Application on the Development of Accounting Industry. Open J. Bus. Manag. 2018, 6, 850–856. [CrossRef]
- 57. Issa, H.; Sun, T.; Vasarhelyi, M.A. Research Ideas for Artificial Intelligence in Auditing: The Formalization of Audit and Workforce Supplementation. *J. Emerg. Technol. Account.* **2016**, *13*, 1–20. [CrossRef]
- 58. Lehner, O.M.; Knoll, C. Artificial Intelligence in Accounting; Routledge: London, UK, 2022.
- 59. Hoogendoorn, M. International Accounting Regulation and IFRS Implementation in Europe and Beyond—Experiences with First-time Adoption in Europe. *Account. Eur.* **2006**, *3*, 23–26. [CrossRef]
- 60. Needles, B.E. Accounting Education: The Impact of Globalization. Account. Educ. 2010, 19, 601–605. [CrossRef]

Sustainability **2023**, 15, 14165 12 of 12

61. Barth, M.E.; Landsman, W.R. How did Financial Reporting Contribute to the Financial Crisis? *Eur. Account. Rev.* **2010**, *19*, 399–423. [CrossRef]

- 62. Kommunuri, J. Artificial intelligence and the changing landscape of accounting: A viewpoint. *Pac. Account. Rev.* **2022**, *34*, 585–594. [CrossRef]
- 63. Morais, A.I. Are changes in international accounting standards making them more complex? *Account. Forum* **2020**, *44*, 35–63. [CrossRef]
- 64. Lehner, O.M.; Leitner-Hanetseder, S.; Eisl, C.; Knoll, C. Artificial Intelligence-driven Accounting (AIDA). In *Artificial Intelligence in Accounting*; Routledge: London, UK, 2022; pp. 6–34.
- 65. Moll, J.; Yigitbasioglu, O. The role of internet-related technologies in shaping the work of accountants: New directions for accounting research. *Br. Account. Rev.* **2019**, *51*, 100833. [CrossRef]
- 66. Mancini, D.; Lombardi, R.; Tavana, M. Four research pathways for understanding the role of smart technologies in accounting. *Meditari Account. Res.* **2021**, 29, 1041–1062. [CrossRef]
- 67. Zakaria, H. The Use of Artificial Intelligence in E-Accounting Audit. In *The Fourth Industrial Revolution: Implementation of Artificial Intelligence for Growing Business Success*; Springer: Berlin/Heidelberg, Germany, 2021; pp. 341–356.
- 68. Yigitbasioglu, O.; Green, P.; Cheung, M.-Y.D. Digital transformation and accountants as advisors. *Account. Audit. Account. J.* **2023**, 36, 209–237. [CrossRef]
- 69. James, J. Confronting the scarcity of digital skills among the poor in developing countries. *Dev. Policy Rev.* **2021**, *39*, 324–339. [CrossRef]
- 70. United Nations THE 17 GOALS. Available online: https://sdgs.un.org/goals (accessed on 23 July 2023).

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.