Human
versus Machine

**Accounting, Auditing and Education
in the Era of Artificial Intelligence**

Human
versus # Machine

Accounting, Auditing and Education
in the Era of Artificial Intelligence

edited by Joanna Dyczkowska

Reviewer
Ewa Wanda Maruszewska

Copy-editing and proof-reading
Aleksandra Śliwka

Typesetting
Małgorzata Myszkowska

Cover design
Beata Dębska

The book uses images from Adobe Stock

Quote as: Dyczkowska, J. (Ed.). (2024). *Human versus Machine: Accounting, Auditing and Education in the Era of Artificial Intelligence*. Publishing House of Wroclaw University of Economics and Business.

Printing: TOTEM

Contents

Preface

The latest artificial intelligence (AI) developments have started reshaping the world we know. Accounting and auditing professionals' future tasks and skills have also become subject to many changes (ICAEW, 2018; Leitner-Hanetseder et al., 2021). As Hassan (2022, p. 444) emphasises, "AI, according to most definitions, is hardware and software that can learn, reason, adapt, analyse, make judgments, and execute complicated and judgment-based activities in the same way as the human brain can." The new AI-based accounting tools and software enhance their outcomes through learning and become closer to humans' cognitive abilities in performing specific tasks (Lehner et al., 2022; Munoko et al., 2020). Thus, the accountancy profession is undergoing a kind of revolution reflected in automating monotonous and repetitive operations (Kommunuri, 2022), reducing the possibility of fraud and discrepancies in accounting data (Chukwuani and Egiyi, 2020) and improving the quality of managerial accounting (Chen et al., 2021) due to provision of real-time data analytics to boost corporate performance (Appelbaum et al., 2017).

However, the growing importance of AI-based accounting tools and software caused accounting and auditing professionals, researchers and educators to raise challenging questions on whether it would be possible to have AI solutions that mirror human intelligence in the accounting domain (Weber, 2023) or whether it would be possible to perform human-machine hybrid work (Mollick, 2022) particularly when the autonomy of AI-based solutions (Rieder et al., 2020) may shift decision-making from humans to technical systems (Heyder et al., 2023). These problems drive another issue (Heyder et al., 2023): How can we understand and explain the ethical management of human-AI interaction? Zhang et al. (2023) address some ethical concerns related to applying AI systems in managerial accounting, indicating that risks of de-professionalisation, data breaches, and isolation among accountants may occur. Other ethical implications may also appear, such as whether AI technologies will consider justice and fairness with regard to vulnerable groups (Villegas-Galaviz and Martin, 2022) or whether too much trust in AI will not get rid of managerial accountants from professional judgement (Sutton et al., 2023). Considering the latest AI developments and other burning issues, such as climate change and increasing societal demands for business transparency and accountability, Carnegie et al. (2020) attempted to redefine accounting, arguing that the conventional understanding of accounting inaccurately portrays the profession, as it dates back to when it was still in its early stages of professionalisation and fails to acknowledge the progress

made in scholarship and practice. In a given context, they put forward a novel potential definition: "*Accounting is a technical, social, and moral practice concerned with the sustainable utilization of resources and proper accountability to stakeholders to enable the flourishing of organisations, people and nature.*" (Carnegie et al., 2020, p. 69). It should be noted that moving beyond an obsolete, restricted and technical way of thinking about accounting may re-image the perception of this field and instil interdisciplinary cooperation with experts in other disciplines, generating a synergistic value for the future of the accounting profession.

This monograph addresses the broad aspects of human-AI interaction in accounting, auditing, and reporting practices, as well as the effects of using AI applications in the area of education. It includes eight chapters written by authors from various countries, including Croatia, Italy, Lithuania, Moldova, Poland, Romania, Slovenia and Spain. The international context of the book, reference to the latest literature on AI applications in business accounting, and presented research study can make this work valuable and interesting for those interested in the opportunities and threats that AI may bring into the professional lives of many.

The rapidly approaching fifth industrial revolution environment is causing most business professions to undergo profound change, and the accountancy profession is no exception. In the first chapter, **Mirjana Hladika, Petra Halar,** and **Dubravka Kopun** provide a comparative review of the literature and present a critical reflection on the state and perspectives of the accountancy profession and the required competencies of accountants in the age of the fifth industrial revolution, as well as indicate the scope of accounting operations and processes that AI could take over in the (near) future.

The second chapter, written by **Paweł Miszczuk and Piotr Bednarek**, delves into integrating AI within auditing, encompassing external and internal processes. The authors emphasise that auditing can particularly use data analytics and AI applications since analyses of vast volumes of structured and unstructured data to gain insight into companies' financial and non-financial performance have become much more challenging recently. By investigating recent research studies, the authors try to find out how and to what extent AI technology (i.e. machine learning (ML), deep learning (DL), natural language processing (NLP), and robotic process automation (RPA)) can be applied in external and internal audit processes.

The third chapter investigates the issues regarding the impact of AI applications on auditing by reviewing research papers published mainly between 2021 and 2023. **Piotr Bednarek** and **Paweł Miszczuk** discuss the major AI applications in auditing and explore the benefits of AI use in increasing auditing work's effectiveness, efficiency, and quality. They further address the significant challenges of the auditing profession due to AI investments by pointing out the problem of human auditors' displacement by AI solutions, potential biases in judgment due to AI use, the importance of auditors' judgment in automated processes, and the challenges of integrating emerging technologies into professional practice and education, i.e. the need for continuous acquiring new skills and updating curriculums.

In the fourth chapter, **Assunta Di Vaio, Anum Zaffar, and Daniel Balsalobre--Lorente** discuss the relationship between AI and the attestation of sustainability reports as the firms face institutional pressures exerted by regulatory bodies, society, corporate governance codes, standard-setting bodies and industry norms to present a clear picture of their sustainable performance without harming nature. The authors refer to such AI tools as ChatGPT, ChatReport, Natural Language Processing (NLP), Machine Learning (ML) and Latent Dirichlet Allocation (LDA) and discuss their opportunities for the assurance process of sustainability reports.

The fifth chapter examines what internal audit will look like in the future, how many internal audit tasks will be taken over by AI in the next ten years, and whether an internal audit profession will still exist then or an AI solution will replace it. The author of this chapter – **Iztok Kolar** – collected data through a questionnaire sent to all internal auditors at the Slovenian Institute of Auditing and all members of the Slovenian IIA Chapter and gathered 91 completed and usable fillings. The questionnaire was active between 25 February 2024 and 15 March 2024. As was emphasised in the study, the future of internal audit and the internal audit profession is a hot topic of research at the moment since, to some extent, internal auditing is losing attention and relevance in its operating environment, and stakeholders currently notice less and less added value in internal auditors' job. Therefore, there are claims that the internal audit profession is at a critical juncture (Lenz and Jeppesen, 2022).

The next chapter highlights how AI can support and optimise integrated reporting processes, providing a detailed perspective on its potential to transform how organisations manage and communicate their financial and non-financial performance. The research study developed by **Ana-Carolina Cojocaru, Svetlana Mihăilă, Veronica Grosu**, and **Ludmila Frumusachi** addresses how AI technologies can be understood and applied to collect, analyse, and disclose important data about company outcomes. The authors applied various research methods, including bibliometric analysis, comparison of previous studies, and the induction and deduction of significant ideas based on literature findings.

Rapid technological progress and the introduction of diverse AI tools have changed several domains, such as accounting business and education. AI is transforming conventional methods, enhancing data management and increasing the precision and effectiveness of financial decision-making. In addition to changing business procedures, AI also influences changes in teaching and learning strategies. In the seventh chapter, **Rasa Subačienė** and **Daiva Tamulevičienė** investigate recent research studies on AI in accounting business and education included in the Web of Science database. They used *VOSviewer* and *RAYYAN* tools to analyse the literature and applied traditional information systematisation and generalisation methods.

The importance of AI in the teaching and learning process is becoming indisputable. Universities should support students and academics in using AI tools. The last chapter analyses regulations concerning the use of generative AI in teaching and learning at selected Polish universities. **Angelika Kaczmarczyk** speaks in

a discussion on the changes that are taking place in universities concerning the use of AI tools. The author emphasises the need to raise awareness about the opportunities, potential benefits, and threats of using these technologies and highlights the role of openness and critical thinking in applying generative AI in higher education.

In conclusion, the monograph offers insight into the results of the latest research studies on the application of AI tools in accounting and education. It presents various perspectives and indicates the possibilities of using AI in accounting practices, internal and external audits, and reporting processes. With this focus and scope, this publication may be intriguing and absorbing for accounting scholars, doctoral and master's students, and business practitioners. The book can also be used as supplementary material for accounting, auditing and reporting courses at the graduate and postgraduate levels.

References

Appelbaum, D., Kogan, A., Vasarhelyi, M., and Yan, Z. (2017). Impact of Business Analytics and Enterprise Systems on Managerial Accounting. *International Journal of Accounting Information Systems*, *25*, 29-44. https://doi.org/10.1016/j.accinf.2017.03.003

Carnegie, G., Parker, L., and Tsahurigu, E. (2021). It's 2020: What is Accounting Today? *Australian Accounting Review*, *96*(31), 65-73. https://doi.org/10.1111/auar.12325

Chen, C. X., Hudgins, R., and Wright, W. F. (2021). The Effect of Advice Valence on the Perceived Credibility of Data Analytics. *Journal of Management Accounting Research*, *34*(2), 97-116. https://doi.org/10.2308/JMAR-2020-015

Chukwuani, V. N., and Egiyi, M. A. (2020). Automation of Accounting Processes: Impact of Artificial Intelligence. *International Journal of Research and Innovation in Social Science*, *4*(8), 444-449.

Hasan, A. R. (2022). Artificial Intelligence (AI) in Accounting & Auditing: A Literature Review. *Open Journal of Business and Management*, *10*(1), 440-465. https://doi.org/10.4236/ojbm.2022.101026

Heyder, T., Passlack, N., and Posegga, O. (2023). Ethical Management of Human-AI Interaction: Theory Development Review. *Journal of Strategic Information Systems*, *32*(3), 101772. https://doi.org/10.1016/j.jsis.2023.101772

ICAEW. (2018). *Artificial Intelligence and the Future of Accountancy*. Retrieved March 25, 2024 from https://www.icaew.com/-/media/corporate/files/technical/technology/thought-leadership/artificial-intelligence-report.ashx. OpenDocument

Kommunuri, J. (2022). Artificial Intelligence and the Changing Landscape of Accounting: A Viewpoint. *Pacific Accounting Review*, *34*(4), 585-594. https://doi.org/10.1108/PAR-06-2021-0107

Lehner, O. M., Ittonen, K., Silvola, H. Ström, E., and Wűhrleitner, A. (2022). Artificial Intelligence Based Decision-Making in Accounting and Auditing: Ethical Challenges and Normative Thinking. *Accounting, Auditing & Accountability Journal*, *35*(9), 109-135. https://doi.org/10.1108/AAAJ-09-2020-4934

Leitner-Hanetseder, S., Lehner, O. M., Eisl, Ch., and Forstenlechner, C. (2021). A Profession in Transition: Actors, Tasks and Roles in AI-Based Accounting. *Journal of Applied Accounting Research*, *22*(3), 539-556. https://doi.org/10.1108/JAAR-10-2020-0201

Lenz, R., and Jeppesen, K. K. (2022). The Future of Internal Auditing: Gardener of Governance. *The EDP Audit, Control, and Security Newsletter*, *66*(5), 1-21. https://doi.org/10.1080/07366981.2022.2036314

Mollick, E. (2022, December 14). ChatGPT Is a Tipping Point for AI. *Harvard Business Review*. Retrieved from https://www.hbsp.harvard.edu/product/H07EWB-PDF-ENG

Munoko, I., Brown-Liburd, H. L., and Vasarhelyi, M. A. (2020). The Ethical Implications of Using Artificial Intelligence in Auditing. *Journal of Business Ethics*, *167*(2), 209-234. https://doi.org/10.1007/s10551--019-04407-1

Rieder, T. N., Hutler, B., and Mathews, D. (2020). Artificial Intelligence in Service of Human Needs: Pragmatic First Steps Toward an Ethics for Semi-Autonomous Agents. *AJOB Neuroscience*, *11*(2), 120-127. https://doi.org/10.1080/21507740.2020.1740354

Sutton, S. G., Arnold, V., and Holt, M. (2023). An Extension of the Theory of Technology Dominance: Capturing the Underlying Causal Complexity. *International Journal of Accounting Information Systems*, *50*, 10626. https://doi.org/10.1016/j.accinf.2023.100626

Villegas-Galaviz, C. (2022). Ethics of Care as Moral Grounding for AI. In K. Martin (Ed.), *Ethics of Data and Analytics*. *Concepts and Cases*. Taylor & Francis.

Weber, R. (2023). Some Prognostications: Artificial Intelligence and Accounting, *Australian Accounting Review*, *33*(104), 110-113. https://doi.org/10.1111/auar.12403

Zhang, C., Zhu, W., Dai, J., Wu, Y., and Chen, X. (2023). Ethical Impact of Artificial Intelligence in Managerial Accounting. *International Journal of Accounting Information Systems*, *49*(100619). https://doi.org/10.1016/j.accinf.2023.100619

Conclusions

Currently, the economic sectors and business functions in many organisations are changing due to the fast-paced technology development. Accounting, as a crucial back-office function, assists management by delivering pertinent data for proactive corporate decision-making. AI integration into accounting operations causes the accounting professions to discard old paradigms and spot exciting opportunities in the automation and digitalisation era. AI can help increase the efficacy and efficiency of many tasks, including financial planning, cost control, financial reporting, managing payables and receivables, and documenting repetitive transactions. There are several advantages related to integrating AI into accounting procedures and processes, including increased accuracy, time savings, better reporting and analysis, and increased compliance. However, drawbacks include implementation costs, specialised expertise requirements, data security threats, and problems with system dependability.

Mirjana Hladika, **Petra Halar** and **Dubravka Kopun** compared the accounting function to "the heart and a blood flow" of an organisation. This is reflected in the 'flow' of financial and other information into the accounting information system, where information is analysed and prepared in the form of annual reports and then 'flow' out to various internal and external stakeholders for their decision-making needs. The authors project that digital technology, particularly AI, will be a standard toolkit for future accountants, who will serve as strategic and dynamic value advisors to organisations' governance structures. **Mirjana Hladika**, **Petra Halar** and **Dubravka Kopun** point out that the accounting profession must adapt or draft entirely new accounting rules, policies and standards for the transformation driven by AI and human-technology interaction.

The changes affecting the accounting profession do not bypass the auditing profession either. The results of the literature review by **Piotr Bednarek** and **Paweł Miszczuk** suggest that AI applications affect both internal and external auditing, posing significant challenges but also providing some benefits. Regarding external auditing, most studies have evidenced that increased audit efficiency, effectiveness, and decision-making capabilities are the main benefits. The other advantages include increased knowledge, reduced manual work and better client-audit relationships. Regarding internal auditing, the authors remark that there is little empirical evidence about the use of AI in internal auditing. However, based on scant evidence, it can be stated that AI can help internal auditors improve the quality and efficiency of the

audit process, implementing analytical procedures to find and understand patterns and anomalies in the data sets as well as detecting subtle details that humans might miss. **Piotr Bednarek** and **Paweł Miszczuk** also highlight the role of ML and DL, which enable predictive analytics and anomaly detection, and NLP, which enhances compliance and risk assessment through text analysis, as well as RPA, which streamlines audit workflows and optimises efficiency. The authors claim that these new opportunities allow auditors to skillfully navigate complex financial landscapes and regulatory requirements, thereby enhancing the effectiveness and value of the profession.

Iztok Kolar delivers another interesting piece of evidence in this monograph. His survey results show that internal auditors in Slovenia estimate that there is a 75% probability that the profession of internal auditor will still exist in 2033. The author also examined the opinions of internal auditors on how many internal audit tasks AI will take over in 2033. The collected responses were not unequivocal, with 20% of respondents suggesting that AI will perform between 31% and 40% of internal audit tasks and 14% of respondents believing that AI will perform between 71% and 80% of internal audit tasks in 2033. Only 1% of the surveyees imply that AI will take over all the internal audit tasks in 2033. Based on these results, **Iztok Kolar** points out that AI will largely determine the future of internal audit; thus, it is high time to pay more attention to this area by internal auditors. He highlights that AI will give internal auditors more time to conduct in-depth interviews and participate in specific advisory assignments. **Iztok Kolar** remarks that the writers on the future of internal audit argue that internal auditing must change and that internal auditors should become "builders" of addressing ESG challenges in their organisations, who concentrate more on Planet, Public, Profession, Prosperity and People.

AI can also play a supportive role in reporting processes and reports' attestation. **Ana-Carolina Cojocaru (Bărbieru)**, **Svetlana Mihăilă**, **Veronica Grosu** and **Ludmila Frumusachi** claim that AI implementation in management systems can enhance and streamline the process of collecting, analysing, and reporting data related to ESG aspects. The authors have identified several advantages of implementing AI in integrated reporting through their research. These advantages include the capability to process and analyse substantial volumes of data in a timely and efficient manner, enhancing the accuracy and reliability of data, and streamlining processes through automation. On the one hand, the authors remark that the implementation of AI has the potential to enhance transparency and corporate accountability, which are crucial aspects amid growing stakeholder expectations and sustainability standards. On the other hand, they point out some data security and confidentiality challenges. They also address the issues associated with a bias risk in algorithms and the potential consequences of AI errors that necessitate stringent ethical standards and regulatory frameworks. **Assunta Di Vaio, Anum Zaffar** and **Daniel Balsalobre-Lorente** argue that advanced AI technology can help organisations report under ESG frameworks and assure and attest the sustainability reports for decarbonisation processes. For instance,

ChatReport can automate the analysis of corporate sustainability reports and retrieve relevant information about climate strategies. ChatGPT can assist organisations in revising decarbonisation strategies and improving their environmental performance. NLP may be useful for generating insights from unstructured data sources regarding sustainability reports, whereas the combination of NLP with ML has the potential to evaluate complex sustainability reporting data by proposing diverse methods to detect non-compliance with corporate social responsibility, thereby preventing greenwashing practices.

The literature review conducted by **Rasa Subačienė** and **Daiva Tamulevičienė** reveals the primary trend regarding the significance of AI or other technological advancements, their impact on business practices, and, most importantly, the necessity to modify educational curriculums to adapt to changing circumstances. The study's findings highlight AI's essential role in revolutionising business and accounting by delivering new opportunities, such as improved decision-making, predictive analytics, and operational efficiency. The authors purport that this paradigm shift means one thing for businesses and accountants – they must adopt AI-based technology to remain competitive and efficient. **Rasa Subačienė** and **Daiva Tamulevičienė** also argue for the urgent necessity to revise educational curriculums since incorporating AI into the accounting profession necessitates an education system which is responsive and adaptable to new conditions. This also requires setting the regulatory frameworks for students and academics to use generative AI. **Angelika Kaczmarczyk** analysed guidelines and recommendations for using AI in selected universities in Poland and identified two approaches in this regard – the critical and liberal ones. The critical approach points out explicitly what is allowed or not allowed and emphasises the importance of verification with content detectors and random checking. According to the author, this restrictive approach is represented by the universities in Warsaw. The liberal approach, mainly met in economic universities, addresses the openness and critical thinking of the students and relies on the autonomy of the lecturer. Most guidelines and recommendations jointly sensitise data security, privacy, and student autonomy and highlight the transparency and ethics of using AI tools. Existing regulations also draw attention to the potential threats related to the use of AI tools, including AI hallucinations, biases, and errors.

To sum up, the AI boom has already started and will last for the next few years. Since the start of the digital decade, businesses have demonstrated exponential development in their use of AI. However, to face digital ambitions successfully, business leaders will have to deal with many challenging issues, such as insufficient digital skills in the workforce, compliance and legal threats, lack of funding to digitalise businesses, and the necessity of increasing awareness of responsible AI use (Strand Partners, 2024). This book presents a critical reflection on the state and perspectives of the accountancy and auditors profession, addresses the AI technology's supportive role in accounting and auditing tasks, reporting processes

and reports' attestation, as well as stresses the necessity to modify educational curriculums in business accounting in response to changing circumstances, and set the regulatory frameworks regarding the use of generative AI by academics and students. The considerations covered in the book are timely and can be helpful for business practitioners, academics and students.

References

Strand Partners. (2024, February 2024). *Unlocking Europe's AI Potential in the Digital Decade*. Retrieved April 30, 2024 from https://www.unlockingeuropesaipotential.com/_files/ugd/c4ce6f_ecf071799e-4c4eba80113648d2b1090b.pdf

List of figures

List of tables