

Management Accounting in the Age of AI: Data Transformation, Efficiency, and Modern Decision-Making

Sri Astuty Ratnasari Manggu

Universitas Sulawesi Barat, Majene, Indonesia

ARTICLE INFO

Article history:

Received Nov 25, 2023

Revised Des 14, 2023

Accepted Des 25, 2023

Keywords:

Artificial Intelligence

Decision

Digital Transformation

Management Accounting

Operational Efficiency

ABSTRACT

The development of artificial intelligence (AI) technology has brought significant changes in management accounting practices. AI not only speeds up the data processing process, but it also improves the accuracy of the information used in planning, control, and decision-making. This article aims to analyze how the integration of AI in management accounting can improve operational efficiency and provide a competitive advantage for organizations in the digital age. The method employed is a literature study, examining the latest research results and modern organizational practices that have adopted AI technology. The findings demonstrate that AI facilitates automated budgeting, data-driven predictive analysis, cost anomaly detection, and enhanced transparency in managerial reporting. However, the application of AI still faces obstacles in the form of a lack of competent human resources, technology investment costs, and data security risks. This article emphasizes the significance of strategic collaboration between technology and accounting in creating a flexible, efficient, and sustainable management system

This is an open access article under the [CC BY-NC](https://creativecommons.org/licenses/by-nc/4.0/) license.



Corresponding Author:

Sri Astuty Ratnasari Manggu

Universitas Sulawesi Barat, Majene, Indonesia

Email: sriastutyrm@unsulbar.ac.id

1. INTRODUCTION

The development of digital technology has brought about significant changes in the modern business environment, particularly with the emergence of artificial intelligence (AI). This transformation not only affects the company's operational model but also the way managers view information as the basis for decision-making. Management accounting, as an information system that provides data for planning, control, and evaluation of performance, is one of the fields most impacted by the advancement of AI. These changes necessitate that organizations adapt and integrate technology to remain competitive (Hand, 2020; Peng et al., 2023)

Traditional management accounting focuses on cost logging, budgeting, and variance analysis. However, the complexity of the current business environment makes this approach even less adequate. AI offers large-scale data analysis, process automation, and algorithm-based prediction capabilities that can improve accuracy in reporting and efficiency in cost control (Qiu, 2021; Rodgers et al., 2023). Thus, the combination of management accounting and AI becomes a crucial strategy for organizations seeking to expedite their decision-making processes.

The application of AI in management accounting brings opportunities to improve the quality of managerial information. Through technologies such as machine learning, natural language processing, and robotic process automation (RPA), managers can access real-time performance reports, quickly detect cost anomalies, and forecast more accurately than with manual methods. This helps organizations reduce risk, increase efficiency, and respond more rapidly to market changes (Hu et al., 2023; Jia et al., 2022).

In Indonesia, the adoption of AI in accounting functions is starting to grow, especially in large companies and the technology sector. However, its application has not been evenly distributed to MSMEs and public sector organizations. Most organizations still use conventional management accounting methods that are time-consuming and prone to human error. Challenges such as a lack of human resource competence, inadequate technology investment, and low digital literacy are the primary obstacles to this transformation (Duan et al., 2019; C. Zhang et al., 2023).

Global phenomena indicate that the use of AI in accounting can reduce operational costs by up to 30%, enhance data processing efficiency, and improve the quality of internal controls. This prompts the need for a deeper scientific study of how AI affects management accounting practices, especially in the context of organizations in developing countries such as Indonesia. This article aims to address this need through an analysis of the literature and the latest empirical findings (Abdullah & Almaqtari, 2023; Ren, 2021; Zeng, 2022).

While it offers a wide range of benefits, the integration of AI into management accounting also poses strategic challenges. Data security risks, reliance on automated systems, and ethical questions in the use of algorithms are issues that require serious attention. Therefore, organizations need to not only adopt technology but also ensure that digital governance runs well so that this transformation does not create new problems.

Based on these conditions, this study aims to provide a comprehensive overview of the role of AI in transforming management accounting, especially in the aspects of efficiency, cost analysis, and decision-making. Through a Systematic Literature Review (SLR) approach, this article identifies key findings from recent research to provide a new direction for practitioners, researchers, and policymakers in developing modern, adaptive, and technology-based management accounting.

2. RESEARCH METHOD

This study uses the Systematic Literature Review (SLR) approach to identify, evaluate, and synthesize research developments regarding the application of Artificial Intelligence (AI) in management accounting. The SLR approach was chosen because it provides a structured, transparent, and replicable literature search procedure, making it ideal for analyzing research trends, identifying research gaps, and tracking methodological evolutions on rapidly evolving topics, such as the integration of AI in management accounting processes. This study follows the guidelines of PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses), which divides the review process into four main stages: identification, screening, eligibility, and inclusion (Albaladejo-González et al., 2023; B. Kelly et al., 2020; Mäkitie et al., 2023).

The research data source was obtained from the Scopus international database, which was chosen because it has the widest coverage of reputable journals, provides complete metadata, and is often used in bibliometric and SLR research in the field of accounting. The search process is done using a string of keywords specifically designed to capture articles that are genuinely relevant to the research topic, namely: ("artificial intelligence" OR "machine learning" OR "deep learning") AND ("management accounting" OR "managerial accounting" OR "management accountant"). The keyword is applied to the TITLE-ABS-KEY column, ensuring that search results only include articles that discuss AI technology in the context of management accounting, encompassing aspects such as budgeting, cost control, forecasting, performance measurement, and managerial decision-making.

The first stage, namely identification, produced a total of 153 documents according to the Scopus dataset exported in the form of *Analyze Search Results (Publication Year)*. Furthermore, at the screening stage, all titles and abstracts are checked for duplication, articles that do not focus on management accounting, and publications that only discuss AI in general without managerial relevance. At the eligibility stage, the remaining articles are analyzed through more in-depth reading to ensure that their content is genuinely relevant to management accounting functions, such as cost control, budgeting, performance measurement, and decision-making support. The last stage, inclusion, yields a collection of articles that serve as the basis for both quantitative and qualitative analysis in this study.

The analysis was carried out through two approaches. The first is a descriptive bibliometric analysis, which includes the identification of the number of publications per year, the trend of increasing trends, and the dynamics of research development from 2003 to 2023. The year of

publication data is extracted from *Scopus-153-Analyze-Year.csv* files, then visualized in the form of trend graphs to provide a longitudinal overview of the development of AI research in management accounting.

The second is thematic analysis, which involves grouping articles into specific categories, such as the application of AI in budgeting, forecasting, and predictive analytics, fraud detection, performance measurement, and the integration of AI with Enterprise Resource Planning (ERP) systems. This approach enables researchers to understand how topics are evolving and the scientific contributions each category of research makes (Bahasoan et al., 2019; Cramarenco et al., 2023; Jacob Fernandes França et al., 2023; Patalas-Maliszewska et al., 2023).

To maintain the validity and replication of the research, the entire search, screening, and analysis process is systematically documented. The use of explicit keywords, data sources from Scopus, and PRISMA visualization ensures that other researchers can repeat the research steps with consistent results. Thus, this research method has met the SLR standards that are robust, accountable, and relevant to describe the development of AI research in management accounting (B. S. Kelly et al., 2022; Oldemeyer et al., 2023; Zabala-Vargas et al., 2023).

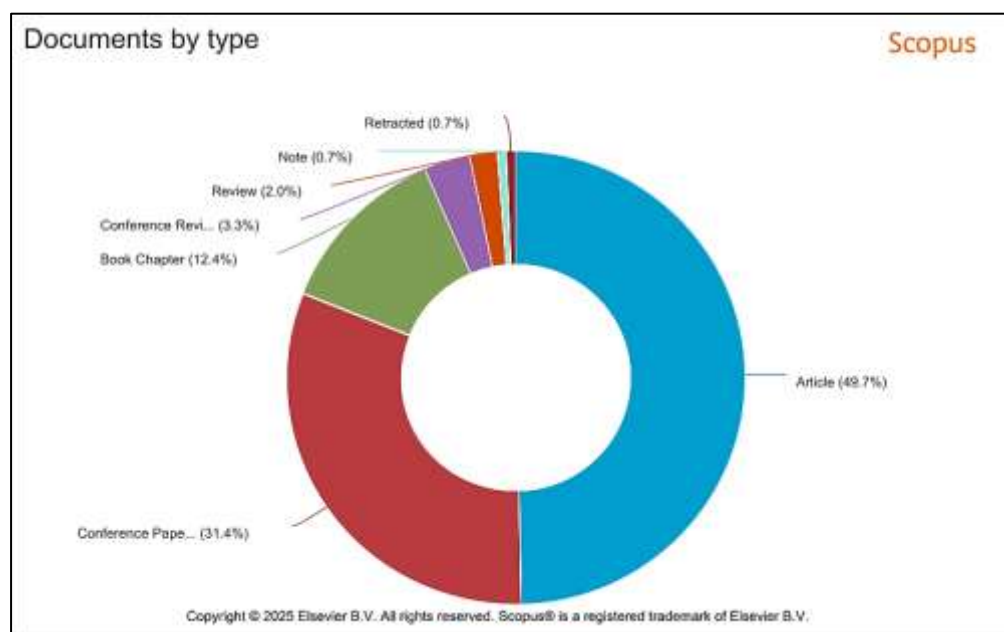
3. RESULTS AND DISCUSSIONS

Publication Trends and Characteristics of AI Research Documents in Management Accounting



Source: Scopus Database

Figure 1. Publication Trend Chart



Source: Scopus Database

Figure 2. Publication Trend Chart Based on Documents

The results of the literature search on the Scopus database, using the keywords "artificial intelligence", "machine learning", and "deep learning" combined with the terms "management accounting", "managerial accounting", and "management accountant", showed that there were 153 relevant documents to the research topic. The combined graph shown in Figure 1 presents two key pieces of information simultaneously: the growth in the number of annual publications from 2003 to 2023 and the distribution of the types of documents resulting from these searches. The combination of the two graphs provides a comprehensive overview of the dynamics, development directions, and forms of academic contribution to the AI domain in management accounting.

The trend of publications has shown a significant increase over the last two decades. Between 2003 and 2017, publication activity remained low, with only one to two articles published per year. This phase indicates that the application of artificial intelligence in the context of management accounting is still in its early stages, characterized by conceptual exploration and development. There have been few empirical studies that test the use of AI technology in planning, control, and managerial decision-making functions. However, the trend shifted after 2018, when the number of publications began to increase consistently, indicating a growing academic interest in integrating innovative technologies into managerial processes.

The acceleration of research was increasingly evident in 2020 and 2021, as graphs showed a sharp spike in publications. In 2020, the number of publications increased to nine articles, then jumped again to twenty-two articles in 2021. This increase is attributed to the impact of the COVID-19 pandemic, which prompted many organizations to adopt digital systems to enhance cost reporting, budget planning, performance monitoring, and risk prediction processes. In this phase, machine learning began to be used for operational cost forecasting, anomaly detection in cost control, and real-time data-based performance assessment.

Research developments from 2022 to 2023 show an increasingly mature pattern. The number of publications remains stable at high levels, reaching its peak in 2020 and 2023, with 31 and 34 publications, respectively. This surge aligns with the rapid development of generative AI technology, large language models, and AI-based decision support systems, which are being increasingly applied in business environments and public organizations. These findings suggest that the role of AI in management accounting is evolving from a mere automation tool to a strategic instrument that has a significant influence on managerial processes.

Analysis of the types of documents strengthens the understanding of the characteristics of research developments. The *"Documents by Type" graph indicates that nearly half of the total*

publications are journal articles, accounting for 49.6 percent of the total. The dominance of this journal article reflects that research on AI in management accounting has developed academically and gained serious attention in the global scientific community. In addition, conference papers account for a considerable proportion, at 31.4 percent, indicating that this topic is a dynamic area where various initial findings are often presented in scientific forums before being published in the form of journal articles.

In addition to journal articles and conference papers, there are also contributions from book chapters, review articles, conference reviews, notes, and even retracted papers. Book chapters with a portion of 12.4 percent generally contain conceptual descriptions, theoretical elaborations, or integration of new methodological approaches in the use of AI for management accounting functions. Meanwhile, other documents, such as reviews and notes, although small in proportion, still provide additional value in mapping analytical developments and future research directions.

If the trend of annual publication is combined with the distribution of document types, a clear and consistent pattern of development emerges. The increase in the number of publications since 2018 indicates that AI research in management accounting is entering a rapid growth phase, while the dominance of journal articles after 2020 suggests that the field has reached a stage of academic maturity. A significant portion of the conference paper demonstrates that technological innovation and methodological experimentation remain active areas of focus. Thus, these two graphs provide a complementary picture that AI research in management accounting is progressing from initial exploration to a strong scientific foundation.

Overall, the combination of publication trend graphs and document type distribution indicates that research on AI in management accounting has entered an era of accelerated growth, where the development of new technologies, such as generative AI, deep learning, and decision intelligence, plays a significant role in driving research innovation. These findings suggest that future research will increasingly focus on integrating AI with sustainability accounting, ESG reporting, risk analytics, and the automation of strategic decision-making. As such, AI is no longer just a tool, but has become an essential component in the transformation of modern management accounting.

Application of Artificial Intelligence in Management Accounting Functions

The application of Artificial Intelligence (AI) in management accounting is growing as organizations increasingly need to manage large amounts of data and make decisions quickly and accurately. The management accounting function, which has traditionally focused on budgeting, cost control, performance measurement, and providing managerial information, is now evolving into a more automated, predictive, and algorithm-based process. AI integration not only replaces routine activities but also improves the quality of data used by managers in strategic decision-making. This development is evident in the increasing number of publications on AI applications in the fields of budgeting, forecasting, cost control, and performance evaluation (Kureljusic & Karger, 2023; Qiu, 2021).

In the context of budgeting, AI plays a crucial role in rapidly processing historical data and operational variables to produce more accurate budget projections. Machine learning techniques can identify cost patterns that are difficult to recognize using traditional approaches. AI-based predictive models can forecast future funding needs by considering environmental variables, market changes, and the company's operational behavior. This makes the budgeting process more adaptive and dynamic, no longer relying entirely on manual assumptions that are prone to bias (Losbichler & Lehner, 2021; Yi et al., 2023).

In addition, AI makes a significant contribution to the forecasting and predictive analytics functions, which are among the most prominent areas of research. Algorithms such as random forest, gradient boosting, and neural networks are used to predict income, costs, demand levels, and labor needs. The primary advantage of AI is its ability to update predictive models in real-time, enabling managerial decisions to be made based on the latest conditions. Management accounting that was previously "reactive" is now shifting to a proactive approach, allowing organizations to respond to changes in the business environment more quickly and accurately (Fedyk et al., 2022; Ma, 2022).

In the cost control function, AI is used to detect cost anomalies and identify areas of waste that are not seen through conventional analysis. By utilizing anomaly detection and classification algorithms,

AI-based systems can automatically detect unreasonable costs, potential fraud, or budget irregularities. This significantly helps organizations minimize risks and improve operational efficiency. The application of AI in cost control has been proven to strengthen internal control systems and reduce human error in the cost reporting process (Melnychenko, 2019; Mishra et al., 2022).

In performance measurement, AI offers a new approach by integrating operational data with machine intelligence analysis. AI-based performance appraisal systems can conduct more objective evaluations because they process data automatically without human intervention. AI models also allow performance measurement to be carried out continuously (continuous monitoring) using real-time analytics dashboards. This changed the performance measurement paradigm from a periodic one to an always-on system, allowing managers to identify problems and make improvements more quickly (Fridgeirsson et al., 2021; Leitner-Hanetseder et al., 2021).

On the other hand, AI plays a crucial role in decision support systems (DSS) as a tool for managers in making informed strategic decisions. Through what-if analysis, AI can simulate various decisions and predict their impact on organizational performance. Technologies such as generative AI can facilitate faster data interpretation and yield more accurate policy recommendations. The integration of AI in DSS expands the management accounting function from a mere information provider to a strategic partner in the decision-making process.

The application of AI in management accounting is also supported by advances in Enterprise Resource Planning (ERP) technology, which have evolved towards an intelligent ERP model. The system integrates all business functions, including production, finance, operations, and marketing, into a single platform that can be analyzed using AI algorithms. Thus, AI exerts a direct influence on the quality and speed of information received by management accountants. This transformation is driving a shift in the accountant's role from an administrative function to a strategic analyst focused on data interpretation and informed decision-making (Lins et al., 2021; Raisch & Krakowski, 2020).

Overall, the application of AI in management accounting indicates a fundamental shift in the way information is generated, analyzed, and utilized by organizations. AI not only automates routine processes but also strengthens an organization's ability to deeply understand data, predict the future, control costs, and enhance the quality of decision-making. This development suggests that management accounting is entering a new era characterized by intelligence, adaptability, and a digital technology foundation. The integration of AI into management accounting functions will continue to evolve as organizations increase their need for efficiency, accuracy, and speed in an increasingly competitive global market.

The Impact of Artificial Intelligence on Operational Efficiency and Cost Control

The application of artificial intelligence (AI) has a significant impact on improving operational efficiency in modern organizations. AI enables management accounting processes to run faster, more accurately, and with less human error. This efficiency arises because AI can automate routine activities, such as data collection, transaction reconciliation, cost report input, and real-time budget monitoring. Thus, administrative work that would typically take a long time can be completed in seconds by automated systems. This change enables management accountants to concentrate their efforts on value-added activities, such as strategic analysis and guiding the direction of company policies.

Additionally, AI generates operational efficiencies by optimizing cost estimation and cost prediction processes. Machine learning algorithms can predict costs based on complex historical patterns and rapidly changing external variables, enabling more accurate forecasting. This reduces reliance on traditional methods that are manual and less adaptive. For example, AI models can predict production costs based on fluctuations in raw material prices, market demand conditions, or changes in machine capacity. The accuracy of cost prediction with AI enables organizations to plan resource allocation more effectively and avoid unnecessary waste (Alex Avelar & Jordão, 2023; Sohrabpour et al., 2021).

AI also plays a crucial role in enhancing the effectiveness of cost control. AI systems can detect unreasonable cost activities early by utilizing anomaly detection techniques. By comprehensively analyzing all transactions, AI can identify suspicious spending patterns, indicators of internal fraud, and budget deviations that were previously difficult to detect through manual review. This automatic detection helps organizations prevent potential losses and enhance their internal

control systems. Faster and more accurate cost control has a direct impact on the company's operational efficiency and financial sustainability (Dwivedi et al., 2023; Liu et al., 2022).

In addition to anomaly detection, AI also improves efficiency through process optimization. In manufacturing and logistics environments, for example, AI can identify inefficient processes, provide energy efficiency recommendations, and optimize distribution routes. This process optimization ultimately lowers operational costs and increases productivity. The integration between AI and the Internet of Things (IoT) expands that capability by providing real-time monitoring of assets, machinery, and production activities, allowing organizations to learn from data to reduce unexpected costs (Moll & Yigitbasioglu, 2019; Y. Zhang et al., 2020).

In the context of management accounting, AI also reduces costs related to human error. Record-keeping errors, miscalculations, or administrative omissions are often a source of unnecessary additional costs. AI-based automated systems have a very high level of accuracy, significantly reducing the risk of error. Additionally, AI helps organizations implement operational policies consistently and ensure compliance with established cost standards. The long-term impact is a more stable, consistent, and scalable operational process.

AI integration allows organizations to implement continuous monitoring of all operational activities. Previously, surveillance was carried out periodically at set intervals, but AI has transformed it into an always-on, continuous surveillance system. Predictive models can provide early warning signals about potential cost overruns or operational inefficiencies. With a faster response, managers can make corrections before the problem grows bigger. This continuous monitoring helps organizations maintain operational performance that is efficient, stable, and within budget targets.

Overall, the impact of AI on operational efficiency and cost control is significant. AI is not only able to reduce administrative costs and human error, but also provides organizations with the ability to perform precise cost predictions, optimize processes, and monitor performance in real-time. This transformation makes management accounting more adaptive and data-driven, enabling companies to maintain competitiveness in an increasingly complex business environment. Thus, AI is becoming a strategic component in the creation of long-term efficiencies and sustainable cost control for modern organizations.

Table 1. The Impact of AI on Operational Efficiency and Cost Control

Aspects	The Role of AI	Impact on Efficiency & Cost Control	Implications for Management Accounting
Accounting Process Automation	Automate logging, reconciliation, and data processing	Speed up processes, reduce labor costs, and reduce human error	The focus of accountants shifts from administrative to analytical
Cost Estimation & Prediction	Using machine learning to predict costs based on historical data & external variables	More accurate budget planning, avoiding waste	Improving the quality of budgeting and resource allocation
Anomaly Detection	Analyze the entire transaction to find unusual spending patterns	Early detection of fraud, cost deviations, and the risk of budget overruns	Strengthen internal controls and risk mitigation
Process Optimization	Optimize production, distribution, and supply chain workflows	Reduce bottlenecks, reduce operational costs	Management accounting obtains more granular efficiency data
Error Reduction	Eliminate manual input errors with automated algorithms	Reduce correction costs & operational inefficiencies	Cost report reliability has increased significantly
Real-Time Monitoring	Provide direct cost and performance analysis (continuous monitoring)	Quick response to potential waste	Management accounting plays a role in constant supervision

Decision Support System (DSS)	Simulate cost scenarios and provide policy recommendations	More precise and strategic cost decisions	Decision-making becomes data-driven, not intuition
-------------------------------	--	---	--

Challenges, Risks, and Limitations of Implementing Artificial Intelligence in Management Accounting

Although the application of Artificial Intelligence (AI) offers a wide range of efficiency opportunities for organizations, its implementation in management accounting is inseparable from significant challenges and risks. One of the main challenges is the limited readiness of the digital infrastructure. Many organizations, particularly in developing countries, lack an integrated, high-quality data system to support the development and implementation of AI algorithms. Scattered, non-standard, or incomplete data can reduce the accuracy of AI models and lead to errors in cost estimation, performance predictions, and budget planning. Without a solid data foundation, the potential of AI will not be fully realized.

In addition to data infrastructure problems, another challenge is the limited competence of human resources. AI implementation requires technical skills, including understanding algorithms, data analytics, and interpreting the results of predictive models. However, most management accountants are still familiar with both manual and traditional approaches. This digital competency gap can hinder AI adoption and even create resistance within organizations. The transition from administrative accountant to strategic analyst requires intensive training and a mindset transformation, so that AI is viewed as a support tool rather than a threat.

The next risk relates to **data security and information privacy**. The application of AI, which involves processing transaction data, operational costs, and internal organizational information, raises concerns regarding the potential for data misuse, information leakage, or cyberattacks. AI systems connected to ERP networks or enterprise databases are potential targets for various digital security threats. If not properly managed, these risks can lead to financial losses and erode stakeholder confidence.

Additionally, AI-powered decisions have the risk of algorithmic bias. AI models can produce biased predictions if historical datasets have imbalances or unrepresentative patterns. Bias in cost prediction or performance measurement can influence an organization's strategic decisions, for example, allocating inappropriate budgets or misprioritizing operational activities. This risk of bias makes periodic evaluation of AI models critical to ensure that the resulting decisions remain accurate and fair.

Another limitation that often arises is the high cost of implementation. The development of advanced AI models requires significant investments, including the cost of server infrastructure, software, data engineering, and employee training. For small and medium-sized organizations, these costs can be a significant barrier to the overall adoption of AI technology. Even for large organizations, the cost of maintaining and customizing AI models is substantial, as the model must be continually updated to remain relevant to evolving operational and market conditions.

Additionally, ethical challenges are a concern in the application of AI in management accounting. AI-based decision-making raises concerns about the transparency and accountability of algorithms. The inability to explain how the model produces a recommendation can undermine the legitimacy of managerial decisions. In some cases, managers have become overly reliant on AI, reducing the role of human judgment. This has the potential to lead to important decisions being made without considering contextual factors that are beyond the algorithm's reach.

Overall, the successful implementation of AI in management accounting relies heavily on the organization's readiness to address technical limitations, security risks, algorithmic bias, and ethical challenges. Organizations need to develop mitigation strategies that include improving data quality, providing digital competency training, enhancing cybersecurity, and conducting regular model evaluations to ensure effective risk management. Without adequate mitigation efforts, the implementation of AI can pose operational and financial risks that have the potential to hinder efficiency. By understanding these challenges and risks, organizations can design AI adoption strategies that are more thoughtful, responsible, and sustainable, supporting management accounting functions.

Strategic Implications and Future Research Directions in the Application of AI in Management Accounting

The development of artificial intelligence (AI) in management accounting has significant strategic implications for modern organizations. AI integration is transforming the role of management accounting from traditional cost reporting and analysis functions to a more strategic and future-oriented one. With AI's ability to process large datasets and provide predictive recommendations, organizations can develop more accurate, responsive, and adaptable business strategies in response to changes in the external environment. This transformation marks the shift from management accounting serving as a decision supporter to being a primary driver in the design of data-driven strategies.

In addition to changing strategic roles, the application of AI also affects the structure and culture of the organization. The implementation of AI encourages organizations to build a *data-driven culture* that emphasizes the importance of data transparency, speed of information, and collaboration between work units. Management accountants are required to master new skills, including data analytics, model interpretation, and information visualization. This shift in competencies confirms that the future of the accounting profession will be significantly influenced by the synergy between technical and analytical skills, so educational institutions and organizations must formulate appropriate talent development strategies.

On the other hand, the development of AI in management accounting opens up wider research opportunities. One of the future research directions is the integration of AI with **sustainability management, accounting, and Environmental, Social, and Governance (ESG)**. AI has great potential in helping organizations measure environmental impact, predict sustainability risks, and optimize strategic decisions related to energy efficiency and carbon footprint reduction. Research on how AI supports sustainable management is scarce, yet it has enormous potential for significant contributions.

Another important research direction is the use of **Generative AI and large language models (LLMs)** in management accounting. This technology has the potential to revolutionize the way management reports are compiled, the analysis of performance data, and the provision of strategic recommendations to top management. Future research can explore the potential of generative AI in building automated analytics dashboards, creating real-time decision scenarios, and generating predictive insights that were previously inaccessible using traditional methods. This topic is particularly relevant given that the adoption of generative AI has increased globally since 2023.

In addition to opportunities, future research also needs to consider the ethical, governance, and security aspects of algorithms. The use of AI in cost control and performance measurement carries the risk of algorithmic bias that can affect the fairness of managerial decisions. Therefore, research on **AI governance**, algorithm transparency, and algorithmic audit mechanisms is needed to ensure that AI implementation remains accountable and ethical. This topic is increasingly important as organizations begin to rely on AI predictions in strategic decisions such as budget allocation, capacity planning, and managerial evaluations.

Overall, the application of AI in management accounting brings not only technical changes, but also profound strategic and conceptual changes. The role of management accounting is now evolving to become the main link between data, analytics, and organizational strategy. The future of AI research in management accounting is expected to focus on integrating advanced technologies, algorithmic governance, sustainability, and enhancing human resource competencies. Thus, AI is a key driver of management accounting transformation towards a more intelligent, more adaptive, and evidence-based digital era

4. CONCLUSION

This study confirms that the application of Artificial Intelligence (AI) in management accounting has undergone rapid development over the last two decades. Based on Scopus data, the trend of publications shows a significant increase, particularly since 2018, with a peak reached in 2020–2023. This surge in research indicates that the integration of AI in management accounting is no longer just an experimental concept but has become a significant focus in the development of modern data-driven accounting and automation. This reflects the paradigm shift that management accounting is now entering a new era marked by the use of innovative technology in decision-making.

The application of AI has been proven to have a positive impact on the primary functions of management accounting, including budgeting, forecasting, cost control, performance measurement, and decision support. With the ability to process data quickly and accurately, AI enables organizations to improve operational efficiency, reduce administrative costs, and minimize human error. Additionally, machine learning-based predictive technology offers advantages in accurately estimating and simulating business scenarios. This reinforces the role of the management accountant as a strategic analyst focused on providing high-quality information.

Despite its great potential, AI implementation still faces some critical challenges. Limited data infrastructure, low digital literacy of human resources, information security risks, and algorithmic bias are the main obstacles to the practical application of AI. These challenges show that digital transformation in management accounting is not only technology-dependent but also requires organizational readiness, human resource capacity, and strong data governance. Without proper risk mitigation, the use of AI can lead to information inaccuracies and compromise the quality of managerial decisions.

The study's findings also reveal that the changing role of management accountants is a strategic implication of AI adoption. Management accountants are now required to master new skills, including data analytics, predictive modeling, algorithm interpretation, and the use of intelligent dashboards. This shift in competencies suggests that the future of the accounting profession will increasingly depend on the integration of technical expertise and analytical capabilities. With the development of generative AI and other intelligent systems, management accounting has the potential to transform into a more strategic function in planning and evaluating organizational performance.

Overall, the study concludes that AI is a key driver of the transformation of management accounting towards a more responsive, efficient, and evidence-based digital era. In the future, research direction should focus on integrating AI with sustainability accounting, ESG reporting, intelligent ERP systems, and algorithmic governance to ensure the ethical and accountable use of AI. With organizational readiness and enhanced human resource competencies, AI can provide significant added value to management accounting, helping organizations achieve superior and sustainable performance.

REFERENCES

- Abdullah, A. A. H., & Almaqtari, F. A. (2023). The impact of artificial intelligence and Industry 4.0 on transforming accounting and auditing practices. *Journal of Open Innovation: Technology, Market, and Complexity*, 10(1), 100218. <https://doi.org/10.1016/j.joitmc.2023.100218>
- Albaladejo-González, M., Ruipérez-Valiente, J. A., & Gmez Marmol, F. (2023). Artificial Intelligence to Support the Training and Assessment of Professionals: A Systematic Literature Review. *ACM Computing Surveys*, 57(3), 1–29. <https://doi.org/10.1145/3699712>
- Alex Avelar, E., & Jordão, R. V. D. (2023). The role of artificial intelligence in the decision-making process: a study on the financial analysis and movement forecasting of the world's largest stock exchanges. *Management Decision*. <https://doi.org/10.1108/MD-09-2023-1625>
- Bahasoan, A. N., Anwar, C., Khaldun, R. I., & Tahawa, T. H. B. (2019). The influence of economic growth on manpower absorption in Central Sulawesi. *IOP Conference Series: Earth and Environmental Science*, 343(1), 012253. <https://doi.org/10.1088/1755-1315/343/1/012253>
- Cramarenco, R. E., Burcă-Voicu, M. I., & Dabija, D. C. (2023). The impact of artificial intelligence (AI) on employees' skills and well-being in global labor markets: A systematic review. *Oeconomia Copernicana*, 14(3), 731–767. <https://doi.org/10.24136/oc.2023.022>
- Duan, Y., Edwards, J. S., & Dwivedi, Y. K. (2019). Artificial intelligence for decision making in the era of Big Data – evolution, challenges and research agenda. *International Journal of Information Management*, 48, 63–71. <https://doi.org/10.1016/j.ijinfomgt.2019.01.021>
- Dwivedi, Y. K., Sharma, A., Rana, N. P., Giannakis, M., Goel, P., & Dutot, V. (2023). Evolution of artificial intelligence research in Technological Forecasting and Social Change: Research topics, trends, and future directions. *Technological Forecasting and Social Change*, 192, 122579. <https://doi.org/10.1016/j.techfore.2023.122579>
- Fedyk, A., Hodson, J., Khimich, N., & Fedyk, T. (2022). Is artificial intelligence improving the audit process? *Review of Accounting Studies*, 27(3), 938–985. <https://doi.org/10.1007/s11142-022-09697-x>
- Fridgeirsson, T. V., Ingason, H. T., Jonasson, H. I., & Jonsdottir, H. (2021). An Authoritative Study on the Near Future Effect of Artificial Intelligence on Project Management Knowledge Areas. *Sustainability*, 13(4), 2345. <https://doi.org/10.3390/su13042345>

- Hand, C. (2020). Biology and being green: The effect of prenatal testosterone exposure on pro-environmental consumption behaviour. *Journal of Business Research*, 120, 619–626. <https://doi.org/10.1016/j.jbusres.2019.02.034>
- Hu, K.-H., Chen, F.-H., Hsu, M.-F., & Tzeng, G.-H. (2023). Governance of artificial intelligence applications in a business audit via a fusion fuzzy multiple rule-based decision-making model. *Financial Innovation*, 9(1), 117. <https://doi.org/10.1186/s40854-022-00436-4>
- Jacob Fernandes França, T., São Mamede, H., Pereira Barroso, J. M., & Pereira Duarte dos Santos, V. M. (2023). Artificial intelligence applied to potential assessment and talent identification in an organisational context. *Heliyon*, 9(4), e14694. <https://doi.org/10.1016/j.heliyon.2023.e14694>
- Jia, T., Wang, C., Tian, Z., Wang, B., & Tian, F. (2022). Design of Digital and Intelligent Financial Decision Support System Based on Artificial Intelligence. *Computational Intelligence and Neuroscience*, 2022, 1–7. <https://doi.org/10.1155/2022/1962937>
- Kelly, B., Judge, C., Bollard, S. M., Clifford, S. M., Healy, G. M., Yeom, K. W., Lawlor, A., & Killeen, R. P. (2020). Radiology artificial intelligence, a systematic evaluation of methods (RAISE): a systematic review protocol. *Insights into Imaging*, 11(1), 133. <https://doi.org/10.1186/s13244-020-00929-9>
- Kelly, B. S., Judge, C., Bollard, S. M., Clifford, S. M., Healy, G. M., Aziz, A., Mathur, P., Islam, S., Yeom, K. W., Lawlor, A., & Killeen, R. P. (2022). Radiology artificial intelligence: a systematic review and evaluation of methods (RAISE). *European Radiology*, 32(11), 7998–8007. <https://doi.org/10.1007/s00330-022-08784-6>
- Kureljusic, M., & Karger, E. (2023). Forecasting in financial accounting with artificial intelligence – A systematic literature review and future research agenda. *Journal of Applied Accounting Research*, 25(1), 81–104. <https://doi.org/10.1108/JAAR-06-2022-0146>
- Leitner-Hanetseder, S., Lehner, O. M., Eisl, C., & Forstenlechner, C. (2021). A profession in transition: actors, tasks and roles in AI-based accounting. *Journal of Applied Accounting Research*, 22(3), 539–556. <https://doi.org/10.1108/JAAR-10-2020-0201>
- Lins, S., Pandl, K. D., Teigeler, H., Thiebes, S., Bayer, C., & Sunyaev, A. (2021). Artificial Intelligence as a Service. *Business & Information Systems Engineering*, 63(4), 441–456. <https://doi.org/10.1007/s12599-021-00708-w>
- Liu, R., Wang, Y., & Zou, J. (2022). Research on the Transformation from Financial Accounting to Management Accounting Based on Drools Rule Engine. *Computational Intelligence and Neuroscience*, 2022, 1–8. <https://doi.org/10.1155/2022/9445776>
- Losbichler, H., & Lehner, O. M. (2021). Limits of artificial intelligence in controlling and the ways forward: a call for future accounting research. *Journal of Applied Accounting Research*, 22(2), 365–382. <https://doi.org/10.1108/JAAR-10-2020-0207>
- Ma, M. (2022). Research on the Development of Hospital Intelligent Finance Based on Artificial Intelligence. *Computational Intelligence and Neuroscience*, 2022, 1–6. <https://doi.org/10.1155/2022/6549766>
- Mäkitie, A. A., Alabi, R. O., Ng, S. P., Takes, R. P., Robbins, K. T., Ronen, O., Shaha, A. R., Bradley, P. J., Saba, N. F., Nuyts, S., Triantafyllou, A., Piazza, C., Rinaldo, A., & Ferlito, A. (2023). Artificial Intelligence in Head and Neck Cancer: A Systematic Review of Systematic Reviews. *Advances in Therapy*, 40(8), 3360–3380. <https://doi.org/10.1007/s12325-023-02527-9>
- Melnychenko, O. (2019). Application of artificial intelligence in control systems of economic activity. *Virtual Economics*, 2(3), 30–40. [https://doi.org/10.34021/ve.2019.02.03\(3\)](https://doi.org/10.34021/ve.2019.02.03(3))
- Mishra, S., Ewing, M. T., & Cooper, H. B. (2022). Artificial intelligence focus and firm performance. *Journal of the Academy of Marketing Science*, 50(6), 1176–1197. <https://doi.org/10.1007/s11747-022-00876-5>
- Moll, J., & Yigitbasioglu, O. (2019). The role of internet-related technologies in shaping the work of accountants: New directions for accounting research. *The British Accounting Review*, 51(6), 100833. <https://doi.org/10.1016/j.bar.2019.04.002>
- Oldemeyer, L., Jede, A., & Teuteberg, F. (2023). Investigation of artificial intelligence in SMEs: a systematic review of the state of the art and the main implementation challenges. *Management Review Quarterly*, 75(2), 1185–1227. <https://doi.org/10.1007/s11301-024-00405-4>
- Patalas-Maliszewska, J., Szmolda, M., & Łosyk, H. (2023). Integrating Artificial Intelligence into the Supply Chain in Order to Enhance Sustainable Production—A Systematic Literature Review. *Sustainability*, 16(16), 7110. <https://doi.org/10.3390/su16167110>
- Peng, Y., Ahmad, S. F., Ahmad, A. Y. A. B., Al Shaikh, M. S., Daoud, M. K., & Alhamdi, F. M. H. (2023). Riding the Waves of Artificial Intelligence in Advancing Accounting and Its Implications for Sustainable Development Goals. *Sustainability*, 15(19), 14165. <https://doi.org/10.3390/su151914165>
- Qiu, J. (2021). Analysis of Human Interactive Accounting Management Information Systems Based on Artificial Intelligence. *Journal of Global Information Management*, 30(7), 1–13. <https://doi.org/10.4018/JGIM.294905>
- Raisch, S., & Krakowski, S. (2020). Artificial Intelligence and Management: The Automation-Augmentation Paradox. *Academy of Management Review*, 2018.0072. <https://doi.org/10.5465/2018.0072>
- Ren, J. (2021). Research on Financial Investment Decision Based on Artificial Intelligence Algorithm. *IEEE*

- Sensors Journal*, 21(22), 25190–25197. <https://doi.org/10.1109/JSEN.2021.3104038>
- Rodgers, W., Murray, J. M., Stefanidis, A., Degbey, W. Y., & Tarba, S. Y. (2023). An artificial intelligence algorithmic approach to ethical decision-making in human resource management processes. *Human Resource Management Review*, 33(1), 100925. <https://doi.org/10.1016/j.hrmmr.2022.100925>
- Sohrabbour, V., Oghazi, P., Toorajipour, R., & Nazarpour, A. (2021). Export sales forecasting using artificial intelligence. *Technological Forecasting and Social Change*, 163, 120480. <https://doi.org/10.1016/j.techfore.2020.120480>
- Yi, Z., Cao, X., Chen, Z., & Li, S. (2023). Artificial Intelligence in Accounting and Finance: Challenges and Opportunities. *IEEE Access*, 11, 129100–129123. <https://doi.org/10.1109/ACCESS.2023.3333389>
- Zabala-Vargas, S., Jaimes-Quintanilla, M., & Jimenez-Barrera, M. H. (2023). Big Data, Data Science, and Artificial Intelligence for Project Management in the Architecture, Engineering, and Construction Industry: A Systematic Review. *Buildings*, 13(12), 2944. <https://doi.org/10.3390/buildings13122944>
- Zeng, Y. (2022). Neural Network Technology-Based Optimization Framework of Financial and Management Accounting Model. *Computational Intelligence and Neuroscience*, 2022, 1–9. <https://doi.org/10.1155/2022/4991244>
- Zhang, C., Zhu, W., Dai, J., Wu, Y., & 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>
- Zhang, Y., Xiong, F., Xie, Y., Fan, X., & Gu, H. (2020). The Impact of Artificial Intelligence and Blockchain on the Accounting Profession. *IEEE Access*, 8, 110461–110477. <https://doi.org/10.1109/ACCESS.2020.3000505>