

RESPONSIBILITY ACCOUNTING IN THE ERA OF ARTIFICIAL INTELLIGENCE AND BIG DATA



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Abstract

This study aims to examine the transformation of Responsibility Accounting (RA) in the era of Artificial Intelligence (AI) and Big Data Analytics (BDA). Using a literature review approach, the research explores how digital technologies enhance the function of RA as a management control tool and evidence-based decision-making system. The findings indicate that the integration of AI and BDA improves the efficiency, accuracy, and relevance of accounting information through automated reporting, anomaly detection, and predictive analysis. Furthermore, technologies such as machine learning, natural language processing, and blockchain strengthen organizational transparency and accountability. However, several challenges remain, including legacy system integration, data security and privacy issues, and regulatory uncertainty regarding AI. The success of digital RA implementation depends on organizational readiness in data governance, technological infrastructure, and human resource competency. Consequently, the future of RA is expected to evolve toward a more predictive, interactive, and transparent system driven by big data and intelligent algorithms.

Keywords: Responsibility Accounting, Artificial Intelligence, Big Data Analytics, Management Accounting, Data Governance

INTRODUCTION

Responsibility Accounting has long been regarded as one of the important pillars in management accounting systems, mainly due to its ability to systematically assess the performance of responsibility centers. This concept allows organizations to measure achievements based on cost centers, profit centers, and investment centers, while linking managerial performance to specific responsibilities (Quattrone, 2016). However, the increasingly complex dynamics of the business environment, the digitization of business processes, and demands for transparency and accountability - s have driven RA to transform. The era of Artificial Intelligence (AI) and Big Data Analytics (BDA) presents new opportunities to strengthen the function of Responsibility Accounting, but also poses new challenges that have never been faced before (Arnaboldi et al., 2017).

The role of Big Data in management accounting is becoming increasingly prominent, particularly due to its ability to process large volumes of data at high speeds and with wide diversity. Financial and non-financial data that were previously considered difficult to integrate can now be analyzed to support more evidence-based decision-making processes. Theodorakopoulos et al. (2024) assert that Big Data will change the way accounting is done, including in terms of accountability reporting and management control. Big Data Analytics can play an important role in providing information that can help improve the quality of financial information, transparency, and the development and accuracy of accounting standards (Younis, 2020). Thus, Responsibility Accounting is no longer just about recording and reporting, but also a strategic tool for creating value creation.

Meanwhile, the integration of AI in accounting opens up new dimensions for Responsibility Accounting. Technologies such as machine learning, natural language processing, and robotic process automation enable automated reporting, anomaly detection, and more accurate predictive analysis. Kokina and Davenport (2017) state that AI has the potential to reduce the administrative burden on accountants and shift their focus to value-added analysis. On the other hand, Rodrigues et al. (2023) warn that the use of AI in auditing and accounting must be balanced with strong governance, as the potential for algorithmic bias and the opacity of decision-making processes (black box problem) can reduce accountability and transparency.

The transformation of Responsibility Accounting in the digital era cannot be separated from ethical and governance implications. Richins et al. (2017) show that although Big Data provides opportunities for more accurate accounting, the risks of information overload and data misuse remain. Similarly, Sun and Vasarhelyi (2018) emphasize the importance of data literacy for managers to be able to interpret analysis results accurately. Therefore, even though AI and Big Data can strengthen Responsibility Accounting, organizations still need to design governance systems that can ensure fairness, transparency, and accountability.

Based on this explanation, this study aims to critically examine how Responsibility Accounting adapts in the era of AI and Big Data by reviewing the latest literature. This study is expected to provide a conceptual contribution in the form of a digital technology-based Responsibility Accounting framework, while also offering practical implications for managers, auditors, and regulators in managing organizational performance.

REVIEW OF LITERATURE

The Evolution and Function of Responsibility Accounting from Traditional to Digital

Responsibility Accounting was born as a managerial control mechanism that links targets, task distribution, and performance evaluation in organizational units such as cost centers, profit centers, and investment centers. Quattrone (2016) asserts that the traditional function of Responsibility Accounting centers on providing periodic financial information to assess managerial performance and link it to incentives. However, organizational transformation and environmental pressures have blurred the boundaries of performance measurement, making non-financial indicators, sustainability, and innovation an important part that was previously undercaptured by classical Responsibility Accounting. An important criticism of this literature is the tendency of traditional studies to focus on the bureaucratic architecture of Responsibility Accounting (responsibility center structure) without sufficiently exploring how information technology changes the nature of information available and relevant to managerial decision-making (Quattrone, 2016; Schaffer et al., 2015).

Responsibility Accounting should be re-examined not only as a reporting mechanism, but as a strategic platform for value creation (Theodorakopoulos et al., 2024). This means that Responsibility Accounting should capture broader outcomes including process effectiveness, customer experience, and innovation contributions, rather than simply the difference between budget and realization. Criticism of this shift arises because there is little empirical literature showing how organizations practically reorganize decision-making authority when Key Performance Indicators (KPIs) become more dynamic and integrated. In other words, although there is a strong theoretical narrative that Responsibility Accounting must evolve, detailed empirical evidence on effective new organizational designs remains relatively limited (Quattrone, 2016; Schaffer et al., 2015).

The Potential and Paradox of Big Data for Management Accounting

The literature on Big Data and accounting repeatedly emphasizes the promise of improved information (Theodorakopoulos et al., 2024). Big Data enables the combination of transaction data, operational sensors, social media, and non-financial metrics to create more granular and timely performance indicators. Conceptually, this is ideal for Responsibility Accounting as it provides a rich evidence base for near real-time assessment of responsible unit performance. Gepp et al. (2018) and Van der Aalst (2018) even demonstrate how techniques such as process mining and analytics can uncover process bottlenecks and performance deviations undetected by periodic reports.

However, the literature also presents the paradox that more data does not automatically mean better information for decision-making (Richins et al., 2017). Information overload, noise, and the difficulty of multi-source integration pose the risk of misinterpretation, especially if organizations do not have adequate data governance infrastructure. A substantial criticism of the optimistic claims of Big Data is that many studies are conceptual or casuistic. In addition, there is the aspect of benefit distribution, namely that large companies with strong information technology resources are more likely to reap the benefits than Micro, Small and Medium Enterprises (MSMEs), giving rise to concerns about capability gaps in the adaptation of digital Responsibility Accounting.

AI in Accounting and Its Impact on Responsibility Accounting

The combination of AI and automation (such as machine learning, natural language processing, and robotic process automation) offers companies new capabilities for accounting systems, from automation of recording to fraud detection and performance prediction (Kokina and Davenport, 2017). In the context of Responsibility Accounting, AI can accelerate the identification of anomalies in unit reports, predict deviations from targets, and generate proactive recommendations for action. Kokina and Davenport (2017) argue that AI redefines the work of accountants, shifting administrative tasks to systems, while humans focus more on strategic interpretation.

However, many studies highlight the dangers of black-box decision-making, where complex AI models often lack explainability, making them difficult to audit and account for (Rodrigues, et al., 2023; Sutton et al., 2016). This is a fundamental problem for Responsibility Accounting because accountability requires traceability and justification of decisions. A key criticism here is that the literature tends to discuss the technical capabilities of AI without paying sufficient attention to institutional consequences, such as how the roles of managers, data stewards, and auditors change when the source of truth shifts from accounting documents to predictive model outputs. There are also ethical concerns, namely that algorithms trained on historical data may replicate injustices in performance evaluations (Rodrigues et al., 2023).

Governance, Ethics, and Auditability: Key Challenges for Digital Responsibility Accounting

A number of studies place governance as an absolute requirement for the responsible use of AI/Big Data Analysis in accounting (Arnaboldi et al., 2017; Richins et al., 2017). Governance includes data policies, access controls, model validation, and algorithmic audit mechanisms. Sun and Vasarhelyi (2018) emphasize that data literacy at the managerial level is a prerequisite for translating analytics output into appropriate decisions. Without adequate governance, Responsibility Accounting risks becoming a tool for whitewashing rather than disclosure, for example, through KPI manipulation via model parameterization or data selection.

Criticism of the literature here relates to the fragmentation of solutions, such as many governance recommendations being high-level and lacking practical implementation blueprints that can be applied across organizations. In addition, there is research that tests the effectiveness of governance controls on specific issues such as fairness testing, model drift monitoring, or overfitting supervision in the context of Responsibility Accounting. In other words, the literature has been in identifying problems, but has not provided sufficient empirical and procedural instrumentation that can be directly adopted by practitioners (Arnaboldi et al., 2017; Sun and Vasarhelyi, 2018).

Changes in Organizational Roles and Human Resource Competencies

The transformation of Responsibility Accounting is not only technical but also institutional. Studies such as Moll and Yigitbasioglu (2019) and Schaffer et al. (2015) state that managers and accountants need to develop new skills, namely data literacy, model interpretation skills, and collaboration with data science teams. These role changes require

redesigning job descriptions, training, and possibly reengineering reward structures so that they do not merely punish/reward based on numbers but also on the wise use of analytics. A key criticism is that the literature tends to be idealistic about the transition of competencies, without discussing socio-organizational barriers such as resistance to technology, training budget gaps, and mismatches between leadership expectations and staff capabilities. Empirical research mapping organizational learning curves related to digital Responsibility Accounting is still scarce, resulting in weak evidence-based policy recommendations (Moll and Yigitbasioglu, 2019; Schaffer et al., 2015).

RESEARCH METHOD

This research method is qualitative descriptive and uses a literature review approach. The literature review is used to examine and integrate various theories, concepts, and empirical findings relevant to the topic of Responsibility Accounting in the context of AI and Big Data Analytics technology development. This approach was used because the issues raised are conceptual and multidisciplinary, involving the fields of management accounting, information systems, and digital technology.

RESULTS AND DISCUSSION

AI and Its Influence on Responsibility Accounting

AI has revolutionized the way companies manage and analyze data. In the context of responsibility accounting, AI can be used to improve the accuracy and speed of data analysis, enabling managers to make more informed decisions. For example, Kerr et al. (2025) mention that AI enables management accounting software to perform real-time analysis of operational and financial data, reducing human error and allowing for earlier identification of trends.

AI has been used to detect fraud and verify the accuracy of financial reports through machine learning techniques and big data analysis (Supriadi, 2024). Sibagariang (2025) shows that in the banking sector, AI improves the efficiency of financial reporting by automating routine tasks, detecting anomalies, and providing financial predictions that support strategic decision-making.

One application of AI in responsibility accounting is the use of machine learning algorithms to measure employee performance. Robert et al. (2020) explain that functions such as procedural fairness and fair distribution of workloads can be optimized with AI, enabling managers to evaluate their teams more objectively and based on historical data.

However, the application of AI in responsibility accounting also presents new challenges, such as the need for higher technical skills among accounting staff. Sofianti (2025) reveals that the application of AI requires precision in maintaining data privacy, algorithm transparency, and technical competency training so that accountants are able to understand the output generated by AI systems. In addition, Rajguru (2025) emphasizes that organizations must prepare clear control and accountability structures so that AI implementation does not cause distortions in reporting or performance measurement.

Overall, AI has great potential to improve the effectiveness of responsibility accounting by providing faster, more accurate, and predictive analysis. However, companies

must be prepared to face technical, ethical, and work culture challenges, as well as ensure that training and supporting resources are available so that the benefits of this technology can be maximized.

Challenges in Implementing Responsibility Accounting in the Digital Age

Although there are many benefits to implementing responsibility accounting in the era of AI and Big Data, challenges remain. One of the main challenges is the integration of existing systems with new technologies. Andhika and Supriyono (2025) reveal that many accounting firms have difficulty integrating AI into traditional accounting systems, particularly in terms of the compatibility of older systems and the need for significant resource investment.

In addition, data privacy and security issues are also a major concern. Sofianti (2025) mentions that privacy and security risks arise from black box algorithms, potential algorithm bias, and compliance with data regulations and customer information protection. Aisyah & Tjandrakirana (2024) show that in cloud-based and AI systems, even though financial reports become more accurate and fraud detection more efficient, cybersecurity threats and regulatory oversight pose major challenges.

Another challenge that needs to be considered is the uncertainty in regulations related to the use of AI and data. Alanoca et al. (2025) emphasize that AI regulations in many jurisdictions are still in the development stage, and the definitions related to AI rules and how they are supervised often change, making it difficult for companies to plan for long-term compliance. As a result, companies need to stay up to date with regulations in the regions where they operate and monitor policy developments to avoid penalties or reputational damage due to regulatory violations.

Overall, technical challenges such as system integration and interoperability, data security and privacy challenges, and regulatory uncertainty must be overcome in order to optimize the benefits of implementing responsibility accounting in the era of AI and Big Data. Companies need to invest in human resource training, strengthen technology governance, and build an internal regulatory framework that is responsive to external changes.

The Future of Responsibility Accounting in the Era of AI and Big Data

The future of responsibility accounting in the era of AI and Big Data looks promising, with various innovations and technological developments continuing to emerge. One trend that is likely to develop is the use of predictive analytics to help managers plan and manage performance proactively. Das et al. (2024) explain that the integration of AI-based predictive analytics increases the accuracy of financial forecasting by around 15% and reduces forecasting errors by 20%, which has a significant impact on corporate planning and risk management.

In addition, the use of interactive dashboards that utilize data visualization will become more common. Rieg (2025) found that the quality of information and the compatibility between tasks and technology influence the adoption of digital dashboards, and the use of these dashboards is associated with improved decision quality and managerial performance.

Furthermore, the implementation of blockchain technology can also influence responsibility accounting. Marselita (2024) shows that blockchain increases transparency, reduces information asymmetry, and strengthens stakeholder trust in the quality of financial reports. Handarini et al. (2025) argue that this technology enables immutable recording and automatically verifiable audit trails, strengthening corporate accountability.

However, companies must be prepared to invest in human resource training and technological infrastructure in order to optimize the potential of these technologies. This transformation requires a mature technology adoption strategy, regulatory adjustments, and strong data governance and security so that the benefits of predictive analytics, interactive dashboards, and blockchain are not just theory but also reliable practice.

CONCLUSION

This study concludes that Responsibility Accounting (RA) has undergone a major transformation in the era of Artificial Intelligence (AI) and Big Data Analytics (BDA). The integration of these technologies shifts RA from a traditional reporting and control mechanism into a strategic management tool that supports evidence-based decision-making and value creation. AI enhances efficiency, accuracy, and responsiveness through automated reporting, anomaly detection, and predictive analytics. Meanwhile, Big Data expands the informational scope by combining financial and non-financial data to produce real-time, comprehensive insights. However, the effectiveness of digital RA depends heavily on ethical data use, strong governance, and adequate digital literacy among accounting professionals.

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