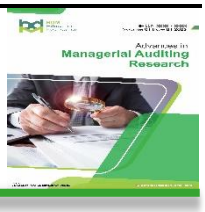
Advances in Managerial Auditing Research, 3(1), 2025. 1 -14
DOI: https://doi.org/10.60079/amar.v3i1.416

OPEN ACCESS
ISSN Online: 2985-7546

Advances in Managerial Auditing Research
https://advancesinresearch.id/index.php/AMAR



Challenges in Sustainability Auditing: Measuring Environmental and Social Impacts in Modern Enterprises

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Received: 2024, 12, 23 **Accepted:** 2025, 01, 30
Available online: 2025, 01, 31

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KEYWORDS

Keywords:

Sustainability Auditing, Environmental Impacts, Social Impacts, Stakeholder Trust.

Conflict of Interest Statement:

The author(s) declares that the research was conducted without any commercial or financial relationships that could be construed as a potential conflict of interest.

ABSTRACT

Purpose: This study explores the challenges and opportunities in sustainability auditing, explicitly focusing on measuring environmental and social impacts in modern enterprises. It seeks to address critical gaps in data consistency, standardized metrics, and the integration of advanced technologies and methodologies in sustainability practices.

Research Design and Methodology: The study employs a Systematic Literature Review (SLR) approach to analyze existing academic literature and synthesize theoretical and practical insights. This method enables a comprehensive evaluation of current frameworks, methodologies, and technological applications in sustainability auditing, focusing on their strengths and limitations.

Findings and Discussion: The research identifies significant barriers in sustainability auditing, including inconsistent data quality, a lack of global standards, and the qualitative complexities of measuring social impacts. Advanced methodologies such as Life Cycle Assessment (LCA) and Social Return on Investment (SROI) are highlighted as promising tools to address these challenges. Technologies like blockchain, artificial intelligence, and IoT are also emphasized for enhancing accuracy, transparency, and efficiency. The findings underscore the importance of integrating sustainability auditing into corporate strategies to foster stakeholder trust, improve accountability, and achieve competitive advantages.

Implications: This study contributes to the theoretical understanding of sustainability auditing by bridging methodological gaps and practical challenges. Its managerial implications encourage organizations to adopt innovative tools and align auditing practices with broader sustainability goals. Additionally, policymakers are urged to support these efforts through targeted incentives and the promotion of global standards. These findings provide actionable insights for practitioners, academics, and policymakers to advance sustainability practices.

Introduction

Sustainability has become a central tenet of contemporary enterprise, necessitated by the urgent need to address pressing environmental challenges and social inequities. The growing awareness of the interconnectedness between corporate activities and global well-being has elevated sustainability to a strategic imperative rather than a mere ethical consideration. International frameworks, such as the United Nations Sustainable Development Goals (SDGs), and mounting societal pressures have

compelled businesses to integrate sustainability into their operational and strategic agendas (Busco et al., 2018). Stakeholders, including investors, consumers, and regulators, now demand greater corporate accountability regarding their environmental and social footprints (Dathe et al., 2024). This paradigm shift has redefined corporate success, which is no longer measured solely by financial performance but also by contributions to long-term ecological balance and social equity. However, achieving sustainability objectives requires measuring and monitoring impacts systematically. Traditional auditing practices, primarily designed for financial reporting, often lack the tools and methodologies to effectively assess the multifaceted dimensions of sustainability (Hazaea et al., 2022). These limitations result in incomplete or inconsistent data that hinder transparency and accountability, particularly in industries with intricate supply chains and varying operational contexts. As a result, businesses frequently struggle to demonstrate tangible progress in sustainability, weakening stakeholder confidence and potentially compromising their competitive advantage in a world increasingly driven by ethical consumption and sustainable investments.

Amid this broader push for sustainability, significant challenges emerge within the specialized domain of sustainability auditing. The lack of standardized frameworks for evaluating environmental and social impacts poses a substantial hurdle to achieving consistency and comparability in sustainability reporting (Richter et al., 2023). These discrepancies are particularly evident across industries with unique operational characteristics, where a one-size-fits-all approach often fails to capture critical nuances (Brand et al., 2018). While advancements in technology—such as blockchain, artificial intelligence, and satellite imaging—offer transformative potential for improving the accuracy and efficiency of sustainability audits, their adoption remains uneven. Many organizations, especially those with limited resources, face difficulties implementing these technologies due to high costs and skill shortages (Charles et al., 2023). Additionally, the divergence between theoretical advancements and practical implementation further compounds these challenges, leaving many enterprises unable to align their sustainability goals with actionable and measurable outcomes. These issues are amplified by the absence of comprehensive, universally accepted auditing standards, which undermines the credibility of sustainability reports and reduces their utility for stakeholders. Such gaps in practice and theory highlight the complexities of sustainability auditing, reflecting an urgent need for innovative and integrative solutions that address these deficiencies while enhancing accountability and transparency in measuring environmental and social impacts.

Recent studies have underscored the challenges inherent in sustainability auditing and reporting for modern enterprises. According to Harrer & Lehner (2024), existing audit methodologies frequently fail to ensure the reliability of sustainability assessments. This insufficiency exacerbates the inherent tension between the aspirational goals of social and environmental responsibility and the economic realities businesses face. However, technological advancements have begun to present viable solutions to these challenges. Castka et al. (2020) demonstrate that technology-enhanced auditing tools, such as blockchain and satellite imaging, show immense potential for improving environmental and social audits' accuracy, transparency, and timeliness, particularly within complex supply chains. These innovations enable more precise data collection and analysis, addressing some of the deficiencies in traditional audit methods. The role of internal auditing in sustainability efforts has been explored, with Soh & Martinov – Bennie (2018) highlighting how management support and external reporting practices significantly influence the effectiveness of internal audit functions in sustainability contexts. Complementing this, Braig & Edinger-Schons (2020) examined the introduction of Impact Measurement and Valuation (IMV) methods as a cutting-edge strategy for quantifying non-financial impacts. Their findings emphasize the growing necessity for tools that can provide transparent and credible sustainability metrics. Ali Abdul Hussein Raj et al. (2024) further elaborate on the value of sustainable performance auditing, identifying its role in ensuring compliance with social and environmental regulations. Together, these studies establish a robust foundation for understanding contemporary sustainability auditing developments while emphasizing the need for more integrated and practical frameworks to address persisting challenges.

Despite the advancements in sustainability auditing documented in recent studies, significant gaps remain between theoretical progress and practical implementation. For instance, while methodologies like Impact Measurement and Valuation (IMV) (Braig & Edinger-Schons, 2020) and technology-driven

audits leveraging tools such as blockchain and satellite imaging (Castka et al., 2020) demonstrate considerable potential, their application across industries is constrained by resource limitations, varying organizational capacities, and the absence of universally accepted standards. These barriers hinder the widespread adoption of innovative auditing techniques and limit their ability to address industry-specific complexities. Harrer & Lehner (2024) have highlighted these methodological inadequacies but have left unexplored the practical strategies necessary to bridge these gaps and adapt theoretical frameworks to diverse industrial contexts. Much of the existing research focuses on discrete aspects of sustainability auditing. Soh & Martinov-Bennie (2018) examine the influence of internal audit functions, while Ali Abdul Hussein Raj et al. (2024) emphasize regulatory compliance benefits. However, these studies often lack a comprehensive perspective, failing to integrate various dimensions of sustainability auditing—such as technological advancements, organizational practices, and regulatory alignment—into a cohesive framework. This fragmentation underscores the need for more holistic approaches that unify theoretical advancements with practical applications to enhance the credibility and operational utility of sustainability auditing. Addressing these gaps is critical to ensuring sustainability auditing practices' broader adoption and effectiveness across industries and contexts.

This study aims to address the identified gaps by systematically reviewing the challenges and opportunities in sustainability auditing, focusing on measuring environmental and social impacts in modern enterprises. The novelty of this research lies in its comprehensive synthesis of existing knowledge, coupled with an exploration of innovative practices that have the potential to resolve current limitations. Utilizing the Systematic Literature Review (SLR) methodology, this study provides a structured analysis of the theoretical and empirical dimensions of sustainability auditing, bridging the disconnect between advancements in methods and their practical applications. This approach seeks to identify actionable solutions that enhance sustainability audits' credibility, accuracy, and utility across diverse industries and contexts. The primary research question driving this study is: What are the main challenges in sustainability auditing, particularly in measuring environmental and social impacts, and how can they be addressed through methodological and technological advancements? This question highlights the urgency of the issue, reflecting both the practical complexities enterprises face and the theoretical gaps in current research. The ultimate objective is to contribute to developing a robust, integrative framework that aligns theoretical advancements with practical needs. This framework aims to guide academics, practitioners, and policymakers in implementing effective sustainability auditing practices that meet stakeholders' expectations while supporting broader environmental and social goals in contemporary business landscapes.

Literature Review

Stakeholder Theory

Stakeholder Theory, introduced by Freeman (2010), offers a conceptual framework emphasizing the interconnected relationships between a business and its stakeholders, including employees, customers, suppliers, communities, investors, and regulators. Unlike the traditional shareholder-focused approach, which prioritizes financial returns for shareholders alone, Stakeholder Theory advocates a more inclusive model where a company's success is measured by its impact on all involved parties. As Valentinov (2023) notes, this shift is particularly relevant in addressing sustainability concerns, as businesses are increasingly pressured to align their actions with stakeholder expectations. The theory underscores the importance of transparency and accountability, mainly through mechanisms like sustainability auditing and non-financial reporting. Companies can build lasting, mutually beneficial relationships with stakeholders by providing credible information on social and environmental impacts. Yadav & Jain (2023) highlight that robust stakeholder engagement in sustainability disclosures strengthens corporate governance and enhances trust. Moreover, the theory helps organizations navigate diverse stakeholder priorities, often including compliance with environmental regulations and ethical labor practices (Jeremiah & Beta, 2023). Stakeholder Theory also plays a critical role in enhancing corporate legitimacy. Rendtorff (2020) explains that companies mitigate reputational risks and contribute to broader societal goals by demonstrating accountability through sustainability practices. This dual focus on stakeholder engagement and sustainability

solidifies Stakeholder Theory as a vital foundation for addressing modern challenges in corporate responsibility.

Stakeholder Theory provides a conceptual framework emphasizing the interconnected relationships between businesses and their diverse stakeholders, including employees, customers, suppliers, communities, and regulators. Unlike the traditional shareholder-focused approach, this theory advocates a more inclusive model where corporate success is evaluated by its broader societal and environmental impacts. Carlo (2020) underscores that Stakeholder Theory aligns with the complexities of sustainability challenges, as it integrates business purposes with legitimacy derived from societal expectations. Transparency and accountability are at the heart of Stakeholder Theory, particularly in sustainability auditing. Sustainability audits, grounded in this theory, enable businesses to provide credible and comprehensive data on their environmental and social impacts. As Kaur & Lodhia (2018) highlight, stakeholder engagement is essential in sustainability reporting, ensuring that diverse interests are reflected and addressed throughout the process. This engagement enhances the credibility of sustainability audits and fosters stronger stakeholder trust. Herremans et al. (2016) argue that companies with robust stakeholder relationships achieve better sustainability by aligning their operations with stakeholder needs. This alignment reduces reputational risks and strengthens the company's public legitimacy. Deegan (2019) further supports the importance of legitimacy, noting that organizations must continuously adapt their practices to meet evolving stakeholder expectations. These insights position Stakeholder Theory as a vital foundation for effective sustainability auditing, enabling companies to balance corporate responsibility with long-term profitability.

Sustainability Auditing

Sustainability auditing systematically assesses and verifies an organization's environmental and social performance against established standards. Unlike traditional financial audits focusing solely on monetary metrics, sustainability auditing encompasses broader dimensions, including carbon emissions, resource utilization, community engagement, and labor practices. Priyanka Aggarwal (2022) highlights that sustainability auditing enhances transparency and reinforces corporate accountability, addressing the increasing expectations of stakeholders in today's socially conscious environment. The role of sustainability auditing extends beyond compliance with regulations; it also enables organizations to align their operations with global initiatives such as the United Nations Sustainable Development Goals (SDGs). Eccles & Serafeim (2017) argue that integrating sustainability metrics into corporate reporting frameworks fosters greater accountability and provides stakeholders with actionable insights into a company's environmental and social impacts. Moreover, Osei et al. (2024) emphasize the importance of stakeholder pressure in driving the quality of sustainability audits, suggesting that external demands often catalyze companies to adopt more rigorous auditing practices. Challenges persist in the field, particularly regarding the development of standardized methodologies. Baumgartner & Rauter (2017) note that the lack of uniform guidelines complicates cross-industry comparability and diminishes the overall credibility of sustainability reporting. Despite these challenges, sustainability auditing remains crucial for fostering transparency, improving stakeholder trust, and contributing to a sustainable global economy. Companies can leverage sustainability auditing to create corporate and societal value by addressing these complexities.

Sustainability auditing has evolved significantly by incorporating modern technologies designed to improve accuracy and efficiency in assessing corporate environmental and social performance. Technologies such as artificial intelligence (AI), blockchain, and satellite imaging are increasingly utilized to manage complex data and enhance the precision of sustainability reports. Al-Raeei (2024) emphasizes the transformative potential of AI in advancing climate resilience and achieving Sustainable Development Goals (SDGs), particularly SDG 11 and SDG 13, by optimizing sustainable urban development initiatives and environmental monitoring practices. Despite these advancements, challenges remain in the effective implementation of sustainability auditing methodologies. Boiral et al. (2019) highlight the inconsistencies assurance providers face in applying frameworks like the Global Reporting Initiative (GRI), noting that data limitations and non-uniform practices often undermine the reliability of sustainability audits. The high cost of implementing such advanced technologies and the lack of skilled personnel complicate the process for organizations, especially those with limited

resources. Standardization of sustainability auditing remains a critical issue. According to Wijesinghe et al. (2023), new reporting frameworks have led to opportunities and challenges, with organizations struggling to adapt to evolving regulatory requirements and stakeholder demands. These challenges, coupled with a fragmented approach to sustainability reporting, can weaken the credibility and comparability of audit outcomes. Addressing these gaps through a comprehensive, technology-driven, and standardized approach is essential to ensure that sustainability auditing continues to foster transparency, enhance stakeholder trust, and contribute meaningfully to global sustainability objectives.

Environmental Impacts

Measuring environmental impacts encompasses carbon footprint analysis, water usage evaluation, energy efficiency assessments, and waste management strategies. These metrics are essential for understanding an organization's contribution to environmental degradation or conservation. Sharma & Gupta (2019) highlight that Life Cycle Assessment (LCA) has become a scientifically validated tool for evaluating environmental impacts across the product lifecycle, offering precise insights into production, usage, and disposal phases. This approach enables organizations to identify areas for improvement and reduce their environmental footprint. Satellite imaging has emerged as another transformative tool in environmental impact assessment. Abd-Elhamid et al. (2025) demonstrate that multitemporal satellite data analysis can effectively monitor ecosystems, particularly in coastal and related habitats. This technology allows organizations to assess environmental conditions holistically and in real-time, ensuring accurate monitoring of operational impacts. Hristov & Chirico (2019) emphasize the critical role of environmental Key Performance Indicators (KPIs) in sustainability reporting. They argue that selecting the right KPIs ensures comprehensive and transparent evaluations, aligning corporate actions with stakeholder expectations and regulatory standards. Despite these advancements, challenges persist, such as inconsistent data quality and the lack of standardized metrics. Alotaibi & Nassif (2024) suggest integrating advanced data analytics tools into environmental monitoring frameworks to address these issues. Their findings indicate that robust data processing can enhance decision-making and improve the reliability of environmental impact assessments. Together, these innovations and methodologies highlight the evolving landscape of environmental impact measurement in fostering sustainability.

Measuring environmental impacts has become critical to sustainability efforts, particularly in addressing challenges such as inconsistent data quality and the lack of globally standardized metrics. Industries with unique characteristics, such as heavy industries with high emissions and agriculture with intensive water usage, face additional complexities. Bonilla et al. (2018) emphasize that integrating Industry 4.0 technologies, such as blockchain and IoT, can revolutionize environmental assessments by ensuring data accuracy and improving traceability across supply chains. This integration enhances data transparency and supports real-time monitoring of environmental metrics. Mohammad et al. (2021) highlight the role of blockchain and IoT in water sustainability management, demonstrating how these technologies can optimize resource allocation and reduce waste. Their findings underscore the importance of technology-driven solutions in achieving environmental conservation goals. Sustainability reporting is also a key component of addressing environmental impacts. By fostering transparency through detailed reporting, organizations can align their operational goals with stakeholder expectations and global sustainability standards. IoT technology has been particularly transformative in environmental monitoring. Bibri (2018) notes that IoT-enabled sensors and analytics facilitate intelligent resource management, allowing organizations to reduce their environmental footprint while enhancing operational efficiency. These advancements collectively highlight modern technologies' potential to address environmental impact measurement challenges and promote sustainable industry practices.

Social Impacts

Social impact measurement is critical in assessing how corporate activities influence communities, employees, and stakeholders. This process evaluates key areas such as labor rights, workplace safety, diversity and inclusion, and contributions to local development. Unlike environmental impacts, which

can often be quantified, social impacts are inherently qualitative, requiring nuanced approaches. Scelles et al. (2024) emphasize the importance of frameworks like Social Return on Investment (SROI) in capturing the value of social initiatives. SROI translates qualitative outcomes into actionable metrics and provides insights into corporate activities' economic and social value. Kah & Akenroye (2020) highlight that challenges in social impact measurement often arise due to the lack of standardized methodologies, which complicates cross-industry comparability. The cultural and societal contexts in different regions add complexity, making organizations need to adopt adaptable and context-sensitive tools. Costa & Pesci (2016) suggest a systematic approach to social impact assessment can help organizations align their efforts with stakeholder expectations, fostering trust and accountability. Advanced methodologies such as stakeholder interviews and case studies remain integral to social impact analysis. However, Rawhouser et al. (2019) argue that integrating quantitative and qualitative methods is crucial for achieving a balanced understanding of social impacts. Together, these insights demonstrate the evolving landscape of social impact measurement and its significance in driving sustainability and corporate responsibility.

Measuring social impacts presents significant challenges, mainly due to variations in cultural and social contexts across regions. These differences make establishing universally applicable standards for evaluating social outcomes challenging. Poniachek (2021) notes that while the Sustainable Development Goals (SDG) Index has been adapted to assess corporate social responsibility (CSR), discrepancies in its application across industries reveal the complexity of standardizing social impact metrics. Such inconsistencies hinder the comparability of data and create gaps in understanding the full scope of corporate influence on communities. Integrating social impact assessments into broader business strategies remains a key hurdle for many organizations. Purbawangsa et al. (2020) highlight the role of corporate governance and profitability in driving CSR disclosures, emphasizing that embedding these assessments within governance structures strengthens transparency and supports sustainable value creation. By addressing these integration challenges, companies can better align their social initiatives with business goals. Social impact measurement also enables businesses to address stakeholder needs effectively, fostering stronger relationships and shared value creation. Camilleri (2017) argues that data-driven approaches to CSR can enhance corporate reputation and customer loyalty by demonstrating tangible commitments to societal well-being. Costa & Pesci (2016) further assert that systematic social impact evaluations help organizations meet stakeholder expectations while promoting accountability and mutual trust. Together, these approaches underscore the vital role of social impact measurement in advancing corporate sustainability and fostering community resilience.

Research Design and Methodology

Study Design

This research employs a qualitative approach through a systematic literature review (SLR) methodology. The SLR method was chosen to provide a comprehensive and structured synthesis of existing studies related to social and environmental impacts, focusing on challenges, processes, and applications in corporate sustainability. Following the guidelines established by Kitchenham & Charters (2007), the study systematically identifies, evaluates, and synthesizes relevant academic articles to address the research objectives. The design ensures transparency and replicability by adhering to a predefined protocol for selecting, categorizing, and analyzing literature.

The Sample Population or Subject of Research

The subject of this research comprises peer-reviewed academic articles published between 2015 and 2025. The inclusion criteria focus on studies on social and environmental impact assessment, corporate sustainability, and associated methodologies. Articles were sourced from reputable databases such as Elsevier, Emerald, Wiley, and Springer. The study excluded non-peer-reviewed content, gray literature, and articles lacking substantial empirical or theoretical contributions to ensure the credibility and relevance of the findings.

Data Collection Techniques and Instrument Development

Data collection involved a systematic search using predefined keywords, including "social impacts," "sustainability auditing," "environmental impacts," and "corporate social responsibility." Boolean operators were employed to refine the search and ensure comprehensive coverage. A detailed selection process was undertaken using inclusion and exclusion criteria based on the studies' relevance, publication date, and quality. Developing a coding framework facilitated the extraction of data from selected articles, focusing on key themes, methods, and findings.

Data Analysis Techniques

Thematic analysis was utilized to identify recurring patterns and themes within the selected studies. The extracted data were synthesized qualitatively to highlight key insights and gaps in the existing literature. Descriptive and comparative analysis was employed to evaluate the methodologies and findings across the studies, ensuring a robust and systematic integration of results to inform the research conclusions. This process provided actionable insights for advancing research and practice in social and environmental impact assessment.

Findings and Discussion

Findings

Sustainability auditing faces significant and multifaceted challenges, particularly in evaluating environmental impacts. A primary issue is data inconsistency, which undermines the reliability of comparisons across industries and regions (Hazaea et al., 2022). For instance, while certain sectors like manufacturing have adopted specific emissions or resource usage benchmarks, others remain devoid of such standards, leading to fragmented reporting practices (Braig & Edinger-Schons, 2020). The absence of globally standardized metrics also creates significant barriers to harmonizing sustainability auditing practices. This issue is especially prevalent in areas such as carbon emissions and water usage, where diverse regulatory requirements across regions further complicate reporting (Sharma & Gupta, 2019). The complexity increases when evaluating social impacts, which are inherently qualitative and require diverse methodologies to assess aspects like labor rights, diversity, inclusivity, and community well-being (Brand et al., 2018). Social outcomes vary significantly based on cultural and regional contexts, making it challenging to establish universally applicable standards. Organizations face practical constraints, including limited financial resources and a shortage of skilled professionals trained in advanced auditing techniques (Castka et al., 2020). Resistance to adopting innovative technologies, often due to high costs and perceived complexity, exacerbates these challenges. These barriers hinder organizations' ability to conduct comprehensive and reliable audits that align with stakeholder expectations and global sustainability goals. Without addressing these foundational issues, sustainability auditing will struggle to provide the transparency and accountability needed to drive meaningful progress.

Innovative methodologies have emerged as critical solutions to the challenges encountered in sustainability auditing. Life Cycle Assessment (LCA) has become a widely recognized approach for evaluating environmental impacts comprehensively across a product's lifecycle, from raw material extraction to disposal (Sharma & Gupta, 2019). This method allows organizations to identify inefficiencies, optimize resource use, and reduce environmental degradation. For instance, industries reliant on high resource consumption, such as manufacturing, have effectively used LCA to measure and mitigate their environmental footprints. Similarly, frameworks like Social Return on Investment (SROI) have gained prominence in addressing the complexities of social impact measurement. By converting qualitative outcomes, such as community engagement or employee well-being, into measurable financial metrics, SROI enables organizations to assess their social initiatives' tangible and intangible benefits (Scelles et al., 2024). Integrating sustainability Key Performance Indicators (KPIs) offers organizations a structured, consistent framework for tracking progress. KPIs tailored to environmental and social objectives ensure companies can benchmark their performance effectively and align their operations with stakeholder expectations (Hristov & Chirico, 2019). Applying such methodologies not only bridges the gap between theoretical advancements and practical implementation but also enhances the accountability of sustainability reporting. These innovations

provide organizations with actionable insights, enabling them to adapt strategies that address stakeholder needs and advance sustainability objectives.

Technology has revolutionized sustainability auditing, offering tools that significantly improve accuracy and efficiency. Blockchain technology, for instance, provides secure and transparent data storage, allowing organizations to trace the origins and impacts of their environmental practices with high precision (Charles et al., 2023). This is particularly valuable in industries with complex supply chains, where transparency is essential for tracking sustainability metrics. Similarly, artificial intelligence (AI) has become a transformative tool, enabling advanced analytics that help companies predict sustainability trends and identify operational inefficiencies (Alotaibi & Nassif, 2024). AI-driven solutions allow organizations to process large datasets efficiently, offering insights that would be unattainable through manual analysis. Satellite imaging has emerged as a powerful tool for monitoring large-scale environmental changes. Multi-temporal satellite data provides real-time insights into ecosystem dynamics, such as deforestation, coastal erosion, or urban expansion (Abd-Elhamid et al., 2025). The Internet of Things (IoT) complements these advancements by enabling real-time monitoring of operational metrics, such as energy consumption and waste production (Bibri, 2018). IoT sensors can provide instant feedback, allowing organizations to address inefficiencies promptly and adapt to changing conditions. Despite these advancements, challenges remain in implementing technology-driven solutions. High initial costs, limited expertise, and uneven adoption across industries hinder the widespread integration of these tools (Castka et al., 2020). Small and medium-sized enterprises, in particular, often lack the resources to invest in such technologies. Addressing these barriers requires financial support and capacity-building initiatives to equip organizations with the skills to leverage advanced auditing tools effectively.

To overcome the challenges outlined, strategic interventions are essential to enhance the effectiveness of sustainability auditing practices. Cross-sector collaboration is critical in developing globally standardized frameworks that address inconsistencies in environmental and social impact measurement (Harrer & Lehner, 2024). A unified framework that combines methodologies like Life Cycle Assessment (LCA) and Social Return on Investment (SROI) can provide a comprehensive approach, bridging the gap between theory and practice (Braig & Edinger-Schons, 2020). For instance, integrating these tools into a singular framework can ensure that organizations address both quantitative and qualitative aspects of sustainability auditing. Policymakers also play a pivotal role in incentivizing the adoption of advanced technologies. Subsidies, tax benefits, and public-private partnerships can reduce financial barriers, enabling organizations to invest in tools like blockchain and artificial intelligence (Dathe et al., 2024). Capacity-building initiatives are crucial for addressing skill shortages. Training programs tailored to sustainability auditing can equip professionals with the expertise to implement advanced methodologies effectively (Bonilla et al., 2018). Sustainability auditing should be reframed as a strategic instrument for value creation rather than merely a compliance tool. As Camilleri (2017) highlights, organizations prioritizing sustainability reporting can enhance their reputations, strengthen stakeholder trust, and achieve long-term competitive advantages. Aligning sustainability audits with broader business goals improves organizational transparency and positions companies as global environmental and social responsibility leaders. By implementing these strategic measures, sustainability auditing can become a powerful driver of meaningful change for businesses and society.

Discussion

The findings of this study highlight several significant challenges in sustainability auditing, particularly concerning the measurement of environmental impacts. One of the primary issues identified is the inconsistency of data across industries and regions, which is compounded by a lack of globally standardized metrics. This inconsistency creates barriers to comparability and hampers the development of cohesive sustainability strategies. For instance, while some industries, such as manufacturing, benefit from established benchmarks for measuring carbon emissions, others, like agriculture, often operate without standardized indicators for critical factors such as resource usage or water management. These discrepancies make it difficult for stakeholders to evaluate and compare sustainability performance effectively. The uneven adoption of advanced technologies, such as satellite imaging and real-time monitoring systems, further exacerbates these challenges. For

example, industries with limited financial or technical resources may struggle to implement these tools, creating gaps in the accuracy and timeliness of their sustainability audits. These findings underscore the need for globally recognized standards and frameworks to support consistent and actionable sustainability auditing practices. Addressing these issues would enhance the reliability of environmental impact assessments and provide enterprises with a more precise roadmap to achieve their sustainability goals. By leveraging innovative tools and adopting unified approaches, companies can better align their operational practices with the pressing demands of global environmental sustainability.

In the domain of social impact measurement, the findings reveal additional complexities that arise from the qualitative nature of social outcomes. Unlike environmental metrics, which are often more straightforward to quantify, social impacts such as community engagement, workforce inclusivity, and labor rights require nuanced and context-sensitive assessment methods. Companies usually rely on qualitative approaches like stakeholder interviews, focus groups, and case studies to capture the multifaceted nature of these impacts. However, the subjectivity inherent in these methods poses challenges regarding standardization and comparability. For example, a company operating across diverse cultural and regional contexts may encounter significant variations in stakeholder expectations and societal priorities, making it difficult to harmonize social impact assessments. The lack of standardized frameworks and metrics for evaluating social impacts further complicates this process, often leaving companies unable to draw actionable insights from their assessments. Tools such as Social Return on Investment (SROI) provide a promising avenue for addressing these challenges by translating qualitative outcomes into quantifiable metrics, enabling organizations to assess their social initiatives' tangible and intangible benefits. Despite its potential, the implementation of SROI and similar frameworks is hindered by resource constraints, a lack of technical expertise, and organizational resistance to change. These findings emphasize the need for capacity building, technical skills, and managerial support to enable businesses to integrate robust social impact assessments into their sustainability efforts.

Finally, the findings underscore the strategic importance of sustainability auditing for building stakeholder trust and legitimacy. Beyond fulfilling regulatory requirements, sustainability audits serve as a critical mechanism for enhancing transparency and accountability, which consumers, investors, and policymakers increasingly demand. Transparent reporting on environmental and social impacts allows companies to foster stronger relationships with key stakeholders, improving their reputation and positioning them as responsible corporate citizens. For example, organizations that effectively communicate their sustainability efforts are better equipped to attract socially conscious consumers and investors, thereby gaining a competitive advantage in the market. Moreover, sustainability audits can uncover operational inefficiencies and identify opportunities for improvement, such as reducing resource consumption or optimizing supply chain practices. This dual role of audits—ensuring compliance while driving operational excellence—reinforces their value as a business strategic asset. By aligning sustainability audits with broader organizational objectives, companies can create shared value that benefits their stakeholders and the environment. These findings highlight the transformative potential of sustainability audits when integrated into core business strategies, positioning companies to address global sustainability challenges and thrive in an increasingly competitive and accountability-focused marketplace.

The findings of this research are theoretically aligned with Stakeholder Theory, a concept introduced by Freeman (2010), which emphasizes the critical importance of the interconnected relationships between a company and its stakeholders, including employees, customers, suppliers, communities, and regulators. Stakeholder Theory underscores that a corporation's legitimacy is not solely determined by its financial profitability but also by its ability to meet the expectations and demands of its broader stakeholder network. This theoretical framework challenges the traditional shareholder-centric view, promoting a more inclusive model where the interests of all stakeholders are considered essential for long-term corporate success and sustainability. In sustainability auditing, Stakeholder Theory provides a valuable lens for understanding how transparency and accountability in reporting can enhance corporate-stakeholder relationships. Transparency in sustainability audits—such as the disclosure of environmental impacts, social contributions, and governance practices—can build

trust and credibility, fostering stronger connections with key stakeholders. As rooted in this theory, accountability ensures that organizations are responsive to stakeholder concerns, addressing issues such as resource management, community welfare, and ethical practices. By adopting the principles of Stakeholder Theory, companies can align their sustainability strategies with stakeholder expectations, thereby securing their social license to operate. This alignment enhances legitimacy and strengthens the company's ability to navigate and thrive in a complex, accountability-driven global business environment.

Compared to prior studies, the findings of this research demonstrate substantial alignment with existing literature while offering new insights into sustainability auditing. The survey by Braig and Edinger-Schons (2020) has emphasized the significance of methodologies like Life Cycle Assessment (LCA) and Social Return on Investment (SROI) for evaluating sustainability impacts. These tools provide a structured and measurable approach to assessing environmental and social outcomes, allowing organizations to quantify their contributions to sustainability. The current study corroborates this perspective, confirming that LCA and SROI methodologies deliver comprehensive insights into corporate sustainability practices, enabling deeper evaluations of both environmental footprints and social contributions. This alignment underscores the growing consensus around the utility of these advanced methodologies. The findings align with the study by Castka et al. (2020), which highlights the transformative role of technology in improving the accuracy and transparency of sustainability audits, particularly in global supply chains. This is particularly relevant in industries where data consistency and transparency are critical for achieving accountability. However, this research also identifies notable differences from previous studies. For instance, Hristov and Chirico (2019) primarily focused on the dominance of quantitative approaches, especially using key performance indicators (KPIs) as the primary mechanism for measuring sustainability. In contrast, the current study underscores the necessity of integrating qualitative approaches to capture better the nuanced and subjective nature of social impacts, such as community engagement and workforce inclusivity.

From a practical perspective, the findings of this research offer several actionable recommendations for companies aiming to enhance their sustainability auditing practices. First, businesses must invest in modern technologies such as blockchain and the Internet of Things (IoT) to improve the accuracy and efficiency of sustainability audits. Blockchain provides an immutable ledger that ensures data integrity and traceability, while IoT-enabled sensors facilitate real-time monitoring of environmental and social metrics. These technologies streamline the data collection process and enhance transparency and accountability in reporting, allowing stakeholders to access reliable and verifiable information. Such advancements can strengthen stakeholder trust and foster a better corporate reputation. Second, companies should adopt comprehensive methodologies like Life Cycle Assessment (LCA) and Social Return on Investment (SROI) to effectively integrate environmental and social dimensions into their sustainability strategies. LCA provides a holistic analysis of environmental impacts across the product lifecycle, enabling organizations to identify areas for improvement and minimize resource consumption. Similarly, SROI translates qualitative social outcomes into quantifiable metrics, helping businesses evaluate their initiatives' tangible and intangible benefits. By leveraging these methodologies, companies can go beyond mere regulatory compliance and actively create value for their stakeholders, aligning sustainability efforts with broader organizational goals. Third, governments and policymakers must play a proactive role in promoting the adoption of sustainability auditing through financial incentives such as subsidies or tax reductions. These measures can help alleviate cost-related barriers often hindering small and medium-sized enterprises (SMEs) from implementing robust auditing practices. Policy-driven support can encourage businesses to adopt innovative tools and methodologies, leveling the playing field across industries.

Conclusion

This study has systematically examined the challenges and opportunities in sustainability auditing, focusing specifically on measuring environmental and social impacts in modern enterprises. Through a structured analysis using the Systematic Literature Review (SLR) methodology, the research identified

key barriers such as inconsistent data, lack of standardized metrics, resource constraints, and the qualitative complexities of assessing social impacts. Moreover, the study highlighted the transformative potential of integrating advanced technologies and comprehensive methodologies like Life Cycle Assessment (LCA) and Social Return on Investment (SROI) into sustainability auditing. By addressing the research question, this study offers actionable insights into how companies can navigate these challenges to enhance the credibility and utility of their sustainability auditing practices.

The originality of this research lies in its dual contribution to theory and practice. Theoretically, it bridges the gap between methodological advancements and their practical applications, providing a nuanced understanding of sustainability auditing within the framework of Stakeholder Theory. Practically, the study emphasizes the strategic value of adopting innovative tools and approaches to enhance transparency, accountability, and stakeholder engagement. The findings have significant managerial implications, encouraging companies to align sustainability audits with broader business strategies, creating shared value, and fostering stakeholder trust. Policymakers, too, are urged to support these efforts through targeted incentives that lower adoption barriers for advanced auditing practices, ensuring equitable access across industries and regions.

Despite its contributions, this study has limitations that provide opportunities for future research. First, the reliance on secondary data from published literature restricts the analysis to existing frameworks and case studies, leaving room for empirical investigations that capture real-time challenges and applications. Second, while the study focuses on integrating technology and methodology, it does not explore industry-specific nuances in depth, which could be addressed in future research. To build on this work, future studies could explore the role of cultural and regional factors in shaping sustainability auditing practices and the long-term impacts of these practices on corporate performance and societal outcomes. Researchers are encouraged to develop and test innovative frameworks that address the identified gaps, advancing academic discourse and practical applications in sustainability auditing.

References

Abd-Elhamid, H. F., Abdelfattah, M., Zeleňáková, M., Kabeel, A. E., Barańczuk, J., Gharbia, S. S., & Mahdy, M. (2025). Monitoring coastal changes in Port Said, Egypt using multi-temporal satellite imagery and GIS-DSAS. *Modeling Earth Systems and Environment*, *11*(1), 56. https://doi.org/10.1007/s40808-024-02266-y

Al-Raeei, M. (2024). Artificial intelligence for climate resilience: advancing sustainable goals in SDGs 11 and 13 and its relationship to pandemics. *Discover Sustainability*, *5*(1), 513. https://doi.org/10.1007/s43621-024-00775-5

Alotaibi, E., & Nassif, N. (2024). Artificial intelligence in environmental monitoring: in-depth analysis. *Discover Artificial Intelligence*, *4*(1), 84. https://doi.org/10.1007/s44163-024-00198-1

Baumgartner, R. J., & Rauter, R. (2017). Strategic perspectives of corporate sustainability management to develop a sustainable organization. *Journal of Cleaner Production*, *140*, 81–92. https://doi.org/https://doi.org/10.1016/j.jclepro.2016.04.146

Bibri, S. E. (2018). The IoT for smart sustainable cities of the future: An analytical framework for sensor-based big data applications for environmental sustainability. *Sustainable Cities and Society*, *38*, 230–253. https://doi.org/https://doi.org/10.1016/j.scs.2017.12.034

Boiral, O., Heras-Saizarbitoria, I., & Brotherton, M.-C. (2019). Assessing and Improving the Quality of Sustainability Reports: The Auditors' Perspective. *Journal of Business Ethics*, *155*(3), 703–721. https://doi.org/10.1007/s10551-017-3516-4

Bonilla, S. H., Silva, H. R. O., Terra da Silva, M., Franco Gonçalves, R., & Sacomano, J. B. (2018). Industry 4.0 and sustainability implications: A scenario-based analysis of the impacts and challenges. *Sustainability*, *10*(10), 3740. https://doi.org/10.3390/su10103740

Braig, P., & Edinger-Schons, L. M. (2020). From Purpose to Impact - An Investigation of the Application of Impact Measurement and Valuation Methods for Quantifying Environmental and Social Impacts

of Businesses. *Sustainable Production and Consumption*, *23*, 189–197. https://doi.org/https://doi.org/10.1016/j.spc.2020.04.006

Brand, F. S., Berger, V., Hetze, K., Schmidt, J. E. U., Weber, M.-C., Winistörfer, H., & Daub, C.-H. (2018). Overcoming current practical challenges in sustainability and integrated reporting: insights from a Swiss field study. *NachhaltigkeitsManagementForum | Sustainability Management Forum*, *26*(1), 35–46. https://doi.org/10.1007/s00550-018-0474-y

Busco, C., Granà, F., & Izzo, M. F. (2018). *Sustainable development goals and integrated reporting*. Routledge.

Camilleri, M. A. (2017). Corporate sustainability, social responsibility and environmental management. *Cham, Switzerland: Springer International Publishing*. https://doi.org/10.1007/978-3-319-46849-5

Castka, P., Searcy, C., & Mohr, J. (2020). Technology-enhanced auditing: Improving veracity and timeliness in social and environmental audits of supply chains. *Journal of Cleaner Production*, *258*, 120773. https://doi.org/https://doi.org/10.1016/j.jclepro.2020.120773

Charles, V., Emrouznejad, A., & Gherman, T. (2023). A critical analysis of the integration of blockchain and artificial intelligence for supply chain. *Annals of Operations Research*, *327*(1), 7–47. https://doi.org/10.1007/s10479-023-05169-w

Costa, E., & Pesci, C. (2016). Social impact measurement: why do stakeholders matter? *Sustainability Accounting, Management and Policy Journal*, *7*(1), 99–124. https://doi.org/10.1108/SAMPJ-12-2014-0092

Dathe, T., Helmold, M., Dathe, R., & Dathe, I. (2024). *Introduction: ESG and Corporate Accountability BT - Implementing Environmental, Social and Governance (ESG) Principles for Sustainable Businesses: A Practical Guide in Sustainability Management* (T. Dathe, M. Helmold, R. Dathe, & I. Dathe (eds.); pp. 1–4). Springer International Publishing. https://doi.org/10.1007/978-3-031-52734-0_1

Deegan, C. M. (2019). Legitimacy theory: Despite its enduring popularity and contribution, time is right for a necessary makeover. *Accounting, Auditing & Accountability Journal*, *32*(8), 2307–2329. https://doi.org/https://doi.org/10.1108/AAAJ-08-2018-3638

Di Carlo, E. (2020). *The Real Entity Theory and the Primary Interest of the Firm: Equilibrium Theory, Stakeholder Theory and Common Good Theory BT - Accountability, Ethics and Sustainability of Organizations: New Theories, Strategies and Tools for Survival and Growth* (S. Brunelli & E. Di Carlo (eds.); pp. 3–21). Springer International Publishing. https://doi.org/10.1007/978-3-030-31193-3_1

Eccles, R. G., & Serafeim, G. (2017). Corporate and integrated reporting: A functional perspective. In *Corporate stewardship* (pp. 156–171). Routledge.

Freeman, R. E. (2010). *Strategic management: A stakeholder approach*. Cambridge university press.

Harrer, T., & Lehner, O. M. (2024). Assuring the unknowable: a reflection on the evolving landscape of sustainability assurance for financial auditors. *Current Opinion in Environmental Sustainability*, *67*, 101413. https://doi.org/https://doi.org/10.1016/j.cosust.2023.101413

Hazaea, S. A., Zhu, J., Khatib, S. F. A., Bazhair, A. H., & Elamer, A. A. (2022). Sustainability assurance practices: a systematic review and future research agenda. *Environmental Science and Pollution Research*, *29*(4), 4843–4864. https://doi.org/10.1007/s11356-021-17359-9

Herremans, I. M., Nazari, J. A., & Mahmoudian, F. (2016). Stakeholder Relationships, Engagement, and Sustainability Reporting. *Journal of Business Ethics*, *138*(3), 417–435. https://doi.org/10.1007/s10551-015-2634-0

Hristov, I., & Chirico, A. (2019). The role of sustainability key performance indicators (KPIs) in

implementing sustainable strategies. *Sustainability*, *11*(20), 5742. https://doi.org/10.3390/su11205742

Jeremiah, M. S., & Beta, K. W. (2023). *The Role of Accountability in Corporate Environmental Sustainability Framework BT - Corporate Sustainability in Africa: Responsible Leadership, Opportunities, and Challenges* (S. Adomako, A. Danso, & A. Boateng (eds.); pp. 349–374). Springer International Publishing. https://doi.org/10.1007/978-3-031-29273-6_16

Kah, S., & Akenroye, T. (2020). Evaluation of social impact measurement tools and techniques: a systematic review of the literature. *Social Enterprise Journal*, *16*(4), 381–402. https://doi.org/10.1108/SEJ-05-2020-0027

Kaur, A., & Lodhia, S. (2018). Stakeholder engagement in sustainability accounting and reporting. *Accounting, Auditing & Accountability Journal*, *31*(1), 338–368. https://doi.org/10.1108/AAAJ-12-2014-1901

Kitchenham, B., & Charters, S. (2007). *Guidelines for performing systematic literature reviews in software engineering*. UK.

Mohammad, A. S., Brohi, M. N., & Khan, I. A. (2021). *Integration of IoT and blockchain*.

Osei, V., Asante-Darko, D., & Quayson, M. (2024). Stakeholder Pressure, Circular Economy Practices, and Sustainability Performance: The Moderating Effect of Ecological Innovation Capabilities. *Circular Economy and Sustainability*, *4*(4), 3139–3170. https://doi.org/10.1007/s43615-024-00373-7

Poniachek, H. A. (2021). *Mergers and Acquisitions: Principles and Practices BT - Encyclopedia of Finance* (C.-F. Lee & A. C. Lee (eds.); pp. 1–44). Springer International Publishing. https://doi.org/10.1007/978-3-030-73443-5_105-1

Priyanka Aggarwal. (2022). Sustainability Reporting and its Impact on Corporate Financial Performance: A Literature Review. *Indian Journal of Commerce and Management Studies*, *4*(3 SE-Articles), 51–59. https://ijcms.in/index.php/ijcms/article/view/484

Purbawangsa, I. B. A., Solimun, S., Fernandes, A. A. R., & Mangesti Rahayu, S. (2020). Corporate governance, corporate profitability toward corporate social responsibility disclosure and corporate value (comparative study in Indonesia, China and India stock exchange in 2013-2016). *Social Responsibility Journal*, *16*(7), 983–999. https://doi.org/10.1108/SRJ-08-2017-0160

Raj, A. A. H., Union, A. H., & Shaker, A. S. (2024). Sustainable performance audits: Integrating environmental and social indicators. *International Journal of Financial Management and Economics*, *7*(2), 55–60. https://doi.org/10.33545/26179210.2024.v7.i2.338

Rawhouser, H., Cummings, M., & Newbert, S. L. (2019). Social impact measurement: Current approaches and future directions for social entrepreneurship research. *Entrepreneurship Theory and Practice*, *43*(1), 82–115. https://doi.org/10.1177/1042258717727718

Rendtorff, J. D. (2020). Corporate citizenship, stakeholder management and Sustainable Development Goals (SDGs) in financial institutions and capital markets. *Journal of Capital Markets Studies*, *4*(1), 47–59. https://doi.org/10.1108/JCMS-06-2020-0021

Richter, F., Gawenko, W., Götze, U., & Hinz, M. (2023). Toward a Methodology for Social Sustainability Assessment: a Review of Existing Frameworks and a Proposal for a Catalog of Criteria. *Schmalenbach Journal of Business Research*, *75*(4), 587–626. https://doi.org/10.1007/s41471-023-00174-y

Scelles, N., Inoue, Y., Perkin, S. J., & Valenti, M. (2024). Social Impact Assessment of Corporate Social Responsibility Initiatives: Evaluating the Social Return on Investment of an Inclusion Offer. *Journal of Business Ethics*. https://doi.org/10.1007/s10551-024-05786-w

Sharma, R., & Gupta, K. (2019). Life cycle modeling for environmental management: a review of

trends and linkages. *Environmental Monitoring and Assessment*, *192*(1), 51. https://doi.org/10.1007/s10661-019-8026-7

Soh, D. S. B., & Martinov-Bennie, N. (2018). Factors associated with internal audit's involvement in environmental and social assurance and consulting. *International Journal of Auditing*, *22*(3), 404–421. https://doi.org/10.1111/ijau.12125

Valentinov, V. (2023). Sustainability and stakeholder theory: a processual perspective. *Kybernetes*, *52*(13), 61–77. https://doi.org/10.1108/K-05-2023-0819

Wijesinghe, N., Abhayawansa, S., & Adams, C. (2023). *Reporting on Key Performance Indicators Related to Non-financial Capitals: Evidence from Sri Lankan Integrated Report Preparers BT - Integrated Reporting (IR) for Sustainability: Business Cases in South Asia* (K.-H. Lee, S. Senaratne, & N. Gunarathne (eds.); pp. 327–351). Springer Nature Switzerland. https://doi.org/10.1007/978-3-031-41833-4_14

Yadav, P., & Jain, A. (2023). Sustainability disclosures and corporate boards: a stakeholder approach to decision-making. *Journal of Applied Accounting Research*, *24*(5), 1027–1047. https://doi.org/10.1108/JAAR-10-2022-0279