International Journal of Environmental Impacts
Vol. 8, No. 3, June, 2025, pp. 575-582
Journal homepage: http://iieta.org/journals/ijei

Managing Environment-Prospective Accounting for Sustainable Development in Operation Management Practices Systems: A Review

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https://doi.org/10.18280/ijei.080315

Received: 30 January 2025
Revised: 12 March 2025
Accepted: 16 April 2025
Available online: 30 June 2025

Keywords:
Environmental Management Accounting, Environmental Management Accounting Practices, sustainable development, sustainable manufacturing practices

ABSTRACT

This paper examines the obstacles to implementing Environmental Management Accounting (EMA) procedures in manufacturing enterprises in emerging economies, highlighting their importance for sustainable development. The study reveals significant barriers, including inadequate institutional support, fragile regulatory frameworks, and resistance stemming from conventional organizational cultures. It emphasizes the necessity of improving environmental awareness among stakeholders to enable the incorporation of EMA practices. This study utilizes a qualitative technique based on an extensive literature analysis to create a conceptual framework that identifies the various obstacles to EMA implementation, including regulatory inconsistencies, insufficient managerial commitment, and operational inefficiencies. The results indicate that effective implementation of EMA can enhance environmental performance and financial results, promoting collaboration among government, companies, and educational institutions to foster a culture of sustainability. The research concludes with recommendations for future studies, emphasizing the need for quantitative methods to further investigate the correlation between EMA implementation challenges and organizational performance metrics, thus enhancing the broader discussion on sustainable manufacturing practices.

1. INTRODUCTION

The implementation of Environmental Management Accounting (EMA) in emerging economies faces several challenges that must be addressed to foster sustainable development. These challenges are multifaceted, encompassing institutional, organizational, and cultural dimensions that hinder effective EMA adoption. Furthermore, enhancing environmental awareness is crucial in these regions as it directly influences the successful integration of EMA practices.

One of the primary challenges to implementing EMA in emerging economies is the lack of institutional support and regulatory frameworks that promote environmental accountability. Many organizations operate in environments where environmental regulations are either weak or poorly enforced, leading to a lack of motivation to adopt EMA practices [1, 2]. Gunarathne et al. [1] highlighted that institutional pressures significantly influence the adoption of environmental management strategies, including EMA, suggesting that stronger regulatory frameworks could enhance organizational performance in environmental management. Mukwarami et al. emphasized that the absence of clear guidelines and standards for EMA implementation in the supply chain exacerbates these challenges, making it difficult for companies to adopt effective environmental practices [2].

Moreover, organizational culture plays a critical role in the successful implementation of EMA. Traditional accounting practices dominate many emerging economies, and there is often resistance to change among management and employees [4]. This resistance can stem from a lack of understanding of the benefits of EMA, as well as the perception that environmental initiatives may conflict with short-term financial goals [4]. For example, Appiah et al. [4] discussed how top management commitment is essential for fostering an organizational culture that prioritizes environmental performance, indicating that without leadership support, EMA initiatives may struggle to gain traction.

Furthermore, environmental awareness among stakeholders, including employees, management, and consumers, is vital for the successful implementation of EMA. In many emerging economies, there is a general lack of awareness regarding environmental issues and the potential benefits of sustainable practices [5]. This knowledge gap can lead to insufficient pressure on organizations to adopt EMA practices, as stakeholders may not fully understand the implications of environmental mismanagement [6]. As highlighted by Nyahuna and Doorasamy [7], increasing awareness of Environmental Management Accounting can empower accountants and managers to advocate for better environmental practices within their organizations.

The aims of this study are to identify and to evaluate the challenges of implementing EMA in manufacturing firms and its role in fostering sustainable development.

To address these challenges, it is essential to develop comprehensive training and educational programs that enhance stakeholders' environmental awareness and understanding of EMA [8]. Additionally, fostering collaboration among government agencies, businesses, and educational institutions can create a supportive ecosystem that encourages the adoption of EMA practices [9]. By establishing clear regulatory frameworks and promoting a culture of sustainability, emerging economies can better integrate EMA into their business practices, ultimately contributing to their development goals.

2. LITERATURE REVIEW

2.1 Obstacles to the implementation of EMA practices in manufacturing

The implementation of specific EMA methods in manufacturing poses various problems that may impede successful execution and overall organizational performance. These problems can be classified as regulatory, organizational, or operational problems.

The regulatory landscape is a major challenge. Numerous manufacturing companies have encountered pressure to adhere to environmental rules, which can differ significantly by area. Jamil et al. [10] asserted that coercive pressures from governmental regulations are essential for the adoption of EMA practices, indicating that in the absence of such forces, firms may exhibit a diminished propensity to implement these practices. Zhu et al. [11] examined the differing degrees of regulatory awareness among manufacturers in countries such as China and Japan, which influences their environmental management methods. The inconsistency in legal frameworks may result in misunderstandings and hesitance among manufacturers to embrace EMA practices, as they can view the costs of compliance as exceeding their advantages.

Organizational culture and managerial commitment are essential to the implementation of EMA practices. Green et al. [12] assert that senior management engagement is crucial for cultivating a culture that values environmental sustainability. However, many businesses encounter difficulties owing to poor commitment from leadership, leading to inadequate budget allocation for EMA projects [13]. Moreover, incorporating EMA into current management systems frequently necessitates a transformation in the organizational mindset, which may encounter opposition from staff familiar with the conventional accounting methods. This resistance may be intensified by insufficient training and awareness of the advantages of EMA, as indicated by Nzama et al. [13], who identified inadequate administrative training as an impediment to efficient EMA implementation [13].

Operational challenges considerably affect the implementation of EMA procedures. Numerous manufacturing companies continue to depend on traditional accounting methods that inadequately account for environmental expenses, resulting in underappreciation of the financial consequences of environmental management [14]. Fuzi et al. [15] contend that the constraints of conventional management accounting systems impede the efficient gathering and analysis of data essential for informed decision-making concerning environmental practices. The incorporation of EMA into current operational procedures can burden businesses, especially small and medium enterprises (SMEs), which may be deficient in the requisite resources and experience [15].

In summary, the obstacles to implementing particular EMA practices in manufacturing are complex and involve legislative, organizational, and operational impediments. Overcoming these issues necessitates a collaborative endeavor between government bodies and company leaders to establish a conducive climate for EMA implementation. By cultivating a culture of sustainability and augmenting the functionalities of accounting systems, industrial enterprises can effectively manage the intricacies of environmental stewardship and enhance their overall performance [16].

2.2. The operation of EMA in supporting sustainable manufacturing

The EMA plays a pivotal role in promoting sustainable manufacturing by integrating environmental considerations into financial decision making. This integration not only enhances the environmental performance of manufacturing firms but also supports their long-term economic viability. The significance of the EMA can be understood through its contributions to sustainable practices, regulatory compliance, and overall organizational performance.

One of the primary functions of the EMA is to provide relevant data that helps organizations identify and manage environmental costs effectively. By employing tools such as Material Flow Cost Accounting (MFCA), companies can track the flow of materials and associated costs throughout the production process, thereby identifying areas for waste reduction and resource optimization [17]. This approach aligns with the principles of the circular economy, which emphasizes resource recovery and waste avoidance, ultimately contributing to sustainable development [18]. For instance, Kurniawan et al. [18] illustrated how the effective management of municipal solid waste systems can lead to significant reductions in greenhouse gas emissions while promoting resource recovery, demonstrating the broader applicability of EMA principles in various contexts.

Moreover, the EMA facilitates compliance with environmental regulations, which is increasingly becoming a critical factor for manufacturers. Zhu et al. [11] highlight that manufacturers who are aware of and comply with environmental regulations are more likely to implement eco-design practices, which not only enhance their sustainability profile but also improve their market competitiveness. This regulatory awareness is crucial, as it drives organizations to adopt sustainable practices that align with legal requirements, thereby reducing the risk of penalties and enhancing their reputation among stakeholders [10].

The integration of EMA into organizational strategies fosters a culture of sustainability within manufacturing firms. As noted by Nartey and van der Poll [19], innovative management accounting practices can inspire small and medium enterprises (SMEs) to adopt sustainable practices that yield both environmental and social benefits. This cultural shift is essential for long-term sustainability, as it encourages employees at all levels to prioritize environmental considerations in their daily operations. Furthermore, top management's commitment to integrating EMA into the organizational framework is vital for ensuring that sustainability becomes a core aspect of business strategy [20].

In addition to enhancing environmental performance, EMA has been linked to improved financial outcomes. Research

indicates that companies that adopt EMA practices often experience cost savings by increasing efficiency and reducing waste [21]. By aligning environmental goals with financial performance, organizations can achieve the dual benefits of sustainability and profitability. This relationship is supported by Lee's findings, which suggest that effective environmental management can reduce operational costs while simultaneously enhancing environmental performance [14].

Finally, the roles of digital transformation and business intelligence systems in enhancing EMA practices cannot be overlooked. As highlighted by Latif et al. [22], the integration of advanced technologies into EMA processes enables organizations to make informed decisions that support sustainable performance. This technological advancement allows for the real-time monitoring and reporting of environmental impacts, thereby facilitating the proactive management of sustainability initiatives.

The EMA serves as a crucial tool for promoting sustainable manufacturing by integrating environmental considerations into financial decision making, ensuring regulatory compliance, fostering a culture of sustainability, and enhancing both environmental and financial performance. As manufacturers increasingly recognize the importance of sustainability, the adoption of EMA practices is essential for achieving long-term success in a competitive and environmentally conscious market.

2.3. The function of EMA in natural resource utilization

The EMA is essential for the sustainable utilization of natural resources because it incorporates environmental factors into conventional accounting methodologies. EMA includes both monetary and physical aspects, aiding organizations in the tracking, analysis, and reporting of environmental costs and impacts. This integration enhances corporate environmental performance and supports financial decision making, promoting a more sustainable approach to resource utilization [23-25].

Institutional pressure and regulatory frameworks frequently influence the adoption of EMA. Organizations may be required to adopt the EMA in response to government regulations that enforce environmental accountability [10, 26].

Coercive pressure can result in substantial alterations in accounting practices, allowing firms to manage their environmental impacts more effectively and align operations with sustainability objectives [27]. Collaboration between environmental managers and accountants is crucial for promoting a culture of environmental awareness within organizations, potentially enhancing environmental performance [28].

Additionally, EMA aids in identifying and quantifying environmental costs, which are often overlooked in traditional accounting frameworks [14]. EMA enhances managerial decision-making by elucidating the financial consequences of environmental actions, thereby facilitating a balance between economic and ecological factors [25, 29]. This dual focus facilitates compliance with environmental regulations and improves organizations' overall sustainability performance [30].

The EMA's implementation is associated with innovation and the advancement of environmentally focused management practices. Organizations increasingly recognize their environmental impacts, leading to greater investment in innovative solutions aimed at reducing resource consumption and waste generation [31]. This proactive strategy enhances environmental sustainability while potentially yielding cost savings and a stronger competitive position in the market [32].

EMA is essential for organizations seeking to enhance their utilization of natural resources. Integrating environmental considerations into accounting practices enhances transparency, supports regulatory compliance, and fosters a culture of sustainability within organizations. As businesses acknowledge the significance of environmental stewardship, the EMA's role will expand, thus enhancing both environmental and economic outcomes.

3. MATERIAL AND METHODS

The research methodology is based on the onion framework established by Saunders et al. [33]. The research onion offers a structured framework for determining the research design. This study identifies interpretivism as the appropriate philosophical approach for the following reasons: researchers primarily seek to gain a more profound understanding [34]. Figure 1 illustrates the layers of onions. Interpretivist approaches emphasize human intentionality as a crucial factor influencing behavior, alongside various internal and external causal elements [35]. Consequently, concepts derived from the literature review were analyzed and interpreted. This study employs an inductive approach to enhance knowledge and formulate new theories, specifically aiming to develop a conceptual framework based on the relevant literature.

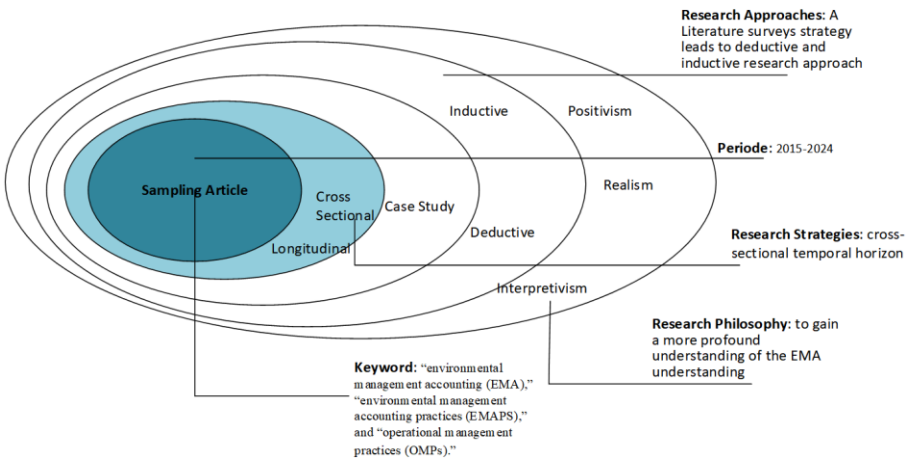

Figure 1. Studies onions [33]

The application of a qualitative design through a thorough literature review has been well established, with numerous studies relying on comprehensive literature reviews [34]. Various strategies can be used to guide researchers in selecting primary data collection methods [36].

To find the content, we utilized keywords including "Environmental Management Accounting (EMA)," "Environmental Management Accounting Practices (EMAPS)," and "operational management practices (OMPs)."

Scopus was selected because it stands as the largest abstract and citation repository of peer-reviewed materials recognized and utilized by the global academic community [37, 38].

This study employed a cross-sectional temporal horizon conducted at a specific moment in time. As the introduction of EMA in developing nations remains an ongoing endeavor, the research data lacked a specific time span, owing to the scarcity of EMA studies in these regions. The most pertinent studies were examined and the results formed the foundation for making suggestions. Three assertions from literature were used to construct the conceptual framework.

4. FINDINGS

Qualitative propositions were constructed based on a literature review, suggesting a relationship between EMAPs and OMSs. The proposed propositions include content, associations, and general propositions. Figure 2 summarizes these propositions. This study sought to identify the problems of EMA implementation in OMSs, and an extensive literature review served as a basis for formulating the propositions. Consequently, the formulated propositions encapsulated overarching assertions, reflecting the overall perspective of the findings derived from an extensive literature review.

Figure 2 the diverse areas where EMA can be applied, from managing water and waste to accounting for carbon emissions and biodiversity. Figure 2 serves as a concise overview of the complexities and considerations involved in integrating EMA into operational management. It emphasizes the challenges associated with implementing each type of EMA, including data limitations, regulatory hurdles, technological constraints, and organizational factors. It also points to the measures and strategies that can be employed to address these challenges, such as establishing national standards, developing performance indicators, and providing training.

The conceptual framework for future research is illustrated in Figure 3, derived from propositions identified in the literature review, and summarized in Figure 2. Figure 3 contains content propositions, whereas association propositions link these blocks. Figure 3 clearly shows how EMA, through its various components, leads to a sustainable operation management system. This system, in turn, positively impacts on the company's overall performance, specifically in terms of environmental and financial aspects. The diagram emphasizes the comprehensive nature of EMA, covering multiple environmental aspects. It highlights the interconnectedness between different components of EMA and their collective impact on company performance. The diagram also underscores the importance of sustainability as a core objective of EMA. It demonstrates how EMA can create value for the company by improving both environmental and sustainable financial performance.

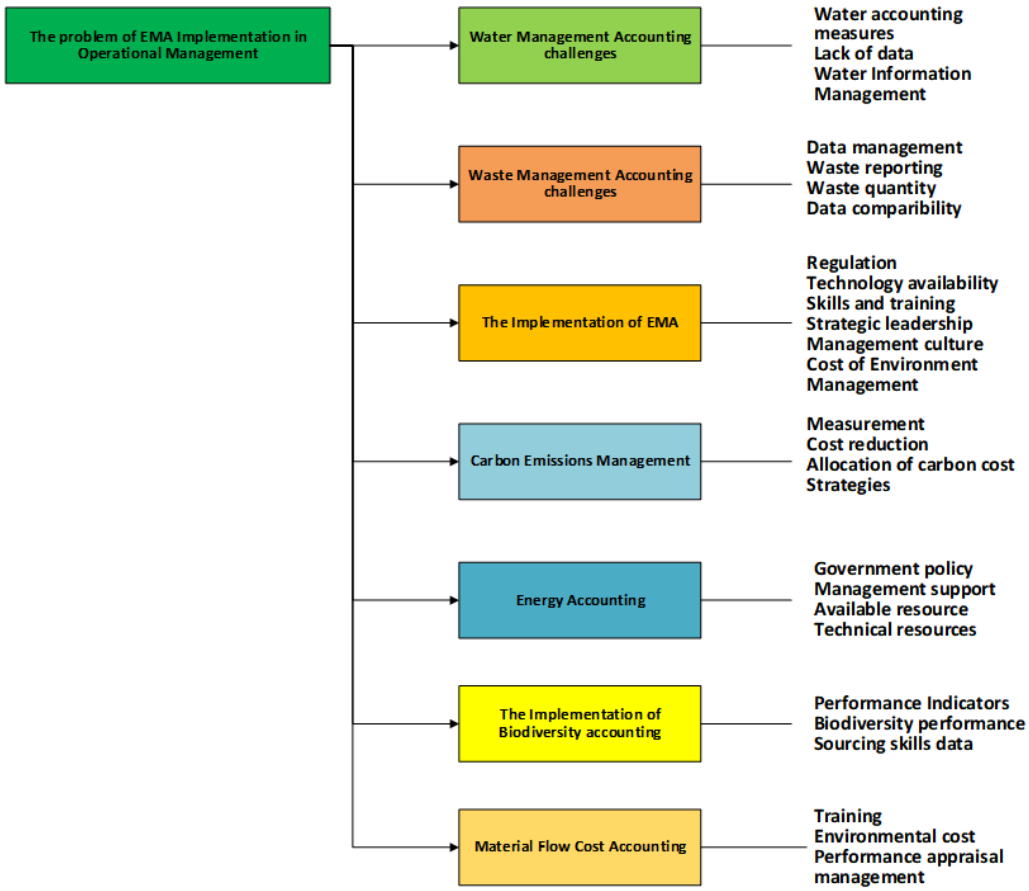

Figure 2. Summary of the propositions

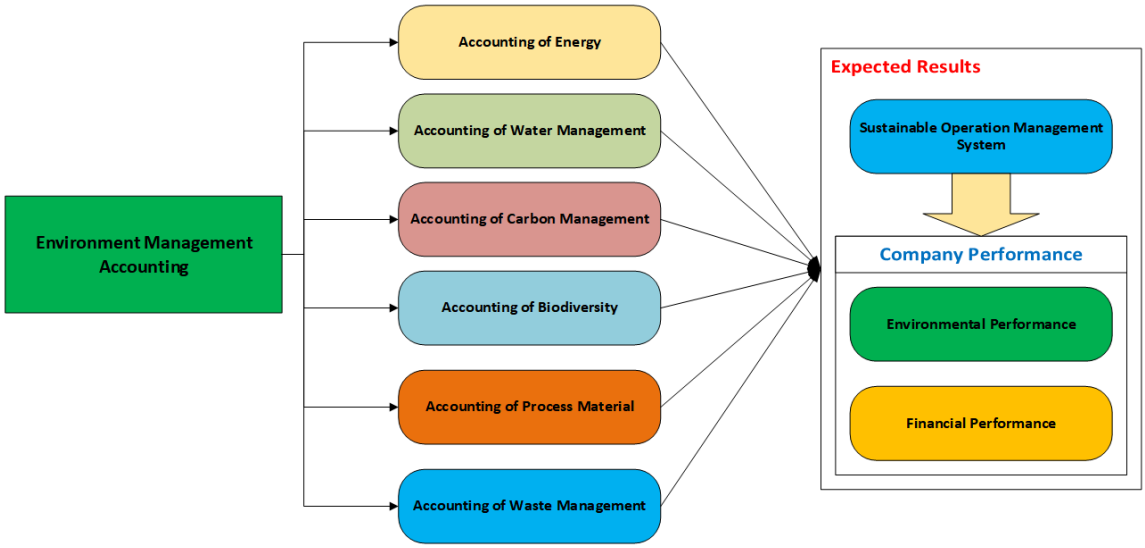

Figure 3. EMAP implementation issues in operation management conceptual framework

5. VALIDATION OF THE FRAMEWORK

Figure 3 presents the conceptual framework for addressing challenges in EMAP implementation. The primary assertion suggests that adopting and implementing EMA is crucial for achieving sustainable operational management practice systems. The implementation of EMAPs in production relies heavily on the progress and accessibility of new technologies, as contemporary machinery typically enhances material and energy efficiency. Supply chain network management necessitates intellectual capacity to develop, innovate, and execute EMAPs. The organization's environmentally sustainable initiatives that affect operational management practices are guided by strategic leadership. In manufacturing supply chain systems, effective EMAP implementation hinges on proper management of environmental costs. As shown in Figure 2, the successful adoption and implementation of EMAPs in the manufacturing sector depend on the handling of the aforementioned elements.

This structure illustrates that the implementation of various EMAPs faces several obstacles. Managerial backing for energy-efficiency policy development is essential for achieving energy conservation. The presence of technical know-how and training within the organization facilitates effective energy accounting (EA), while resource availability ensures the necessary physical capacity to handle EA strategies for enhanced operational management practice systems (OMPs).

Water management accounting (WMA), a key element of EMAP, improves the water efficiency in operational processes. The application of this concept in operational management practices is primarily influenced by the management of water-related information and data, absence of supply chain-related data, and water accounting data. WMA constraints result in varied viewpoints on water usage reporting, posing challenges to operational system management.

The implementation of carbon management accounting (CMA) strategies is essential for decreasing carbon emissions in eco-friendly production. The model emphasizes that quantifying and evaluating carbon emissions remains problematic for manufacturing firms in their operational system management. An additional hurdle in reducing environmental costs is the allocation of carbon expenses within the operational management systems.

Biodiversity accounting offers companies an opportunity to protect their natural habitats. However, effective biodiversity accounting has been hindered by conflicts between biodiversity performance metrics and reporting methods. Material flow cost accounting (MFCA) boosts waste minimization and enhances the material usage efficiency. Addressing unsustainable production practices involves training staff to assign environmental costs to process operations effectively. Performance appraisal management is used to ensure that employees successfully implement MFCA, thereby enhancing the contributions of all individuals within operational management systems.

Obstacles to waste accounting, data management, and reporting significantly impede the adoption of cleaner production methods. To enhance the comparability and quantification of data within operational management systems, it is vital to establish national standards. It is crucial to address the specific hurdles manufacturing companies face when implementing Environmental Management Accounting Practices (EMAPs), particularly in achieving cleaner production.

Additionally, overcoming the challenges of implementing EMAPs in operational management systems can help manufacturing companies attain cleaner production, which is characterized by a decreased consumption of energy, water, and materials. Improved efficiency in operational management systems also leads to reduced levels of toxic substances and wastes. However, the implementation of EMAPs requires careful consideration. Despite the acknowledged benefits of EMAPs in management systems, companies continue to experience improvements in both their financial and environmental performance. The adoption of EMAPs is crucial to sustainable development.

6. CONCLUSIONS AND FUTURE RESEARCH

This study investigates obstacles encountered when implementing Environmental Management Accounting Practices (EMAPs) in manufacturing companies, particularly in developing countries. The research focuses on exploring the difficulties associated with integrating EMAPs into the

operational management systems of manufacturing firms, with the objective of enhancing both environmental and financial performance.

The findings demonstrate that adopting sustainable operational management practices can lead to improved environmental and financial outcomes through reduced consumption of water, energy, and materials. Furthermore, organizations can enhance supply chain efficiency, resulting in decreased waste production.

Although Environmental Management Accounting Practices (EMAPs) offer advantages, companies in developing countries encounter several obstacles when implementing them. A survey of current research indicates that multiple elements affect the integration of Environmental Management Accounting (EMA) into operations management. These elements include technological prowess, strategic guidance, governmental rules and regulations, mindsets, and organizational culture. To establish sustainable operational management methods, businesses must navigate through the adoption and execution of EMA.

The literature highlights that various EMAPs, including Environmental Accounting (EA), Cost Management Accounting (CMA), material accounting, waste management accounting, and Water Management Accounting (WMA), are linked to numerous challenges. Key factors include government policies and regulations, access to resources, education and skill development, allocation of environmental costs, and environmental disclosure. Studies suggest that addressing these issues enables manufacturing enterprises to manage environmental concerns related to their operational management frameworks effectively.

The concepts were formulated through a synthesis of the existing literature and are crucial for establishing a theoretical framework to address the implementation hurdles of EMAPs in sustainable operations management systems. These results are significant for various stakeholder groups. Manufacturing sector executives must evaluate the effects of improving EMAP implementation within OMPs, particularly by ensuring leadership engagement in strategic environmental choices to achieve better environmental and financial results. Regulatory bodies should enact the necessary changes in regulatory structures and create policies to oversee and evaluate environmental compliance within operational management systems in developing countries. Finally, the engagement of diverse stakeholders, including communities and NGOs, in collaborative reporting and exposing manufacturing companies that improperly dispose of waste has resulted in the recognition of their concerns and promotion of cleaner production methods.

The research objective was achieved; however, the study's limitations are associated with the selection of a restricted number of EMA studies conducted in Indonesia. The findings were derived from a literature review utilizing secondary qualitative data, which are inherently subjective and may introduce interpretive bias.

Based on the conceptual framework presented in Figure 3, future research could employ a quantitative approach to examine management perspectives on the challenges encountered in implementing EMAPs in manufacturing companies. Researchers may also focus on longitudinal data from firms to empirically assess the relationship between the identified challenges in EMA implementation and the environmental and financial performance of manufacturing enterprises.

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