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INTEGRATING PESTEL AND ENVIRONMENTAL MANAGEMENT ACCOUNTING IN GREEN MANUFACTURING STRATEGY

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Abstract

Sustainability transformation has become an increasingly important issue for manufacturing firms, particularly in response to growing environmental pressures and changing stakeholder expectations. While prior studies have widely examined sustainability practices and firm performance, relatively limited attention has been given to how external environmental pressures are translated into internal strategic actions. This study addresses that gap by proposing a conceptual framework that integrates PESTEL analysis and Environmental Management Accounting (EMA) in explaining the development of green manufacturing strategy and its implications for sustainable performance. Based on institutional theory and the resource-based view, this study adopts a conceptual approach based on a systematic literature review. The analysis suggests that PESTEL factors operate as multidimensional external pressures that encourage firms to pursue sustainability transformation. However, these pressures do not automatically lead to improved performance outcomes. Instead, firms require internal organizational capabilities that enable environmental information to be interpreted and incorporated into strategic decision-making processes. In this context, EMA is positioned as a mediating capability that supports the implementation of green manufacturing strategy.

Keywords: PESTEL; Environmental Management Accounting; Green Manufacturing Strategy; Sustainable Performance.

Abstrak

Transformasi keberlanjutan menjadi isu yang semakin penting bagi perusahaan manufaktur, terutama sebagai respons terhadap meningkatnya tekanan lingkungan dan perubahan ekspektasi pemangku kepentingan. Meskipun studi sebelumnya telah banyak mengkaji praktik keberlanjutan dan kinerja perusahaan, perhatian terhadap bagaimana tekanan lingkungan eksternal diterjemahkan menjadi tindakan strategis internal masih terbatas. Studi ini mengisi kesenjangan tersebut dengan mengusulkan kerangka konseptual yang mengintegrasikan analisis PESTEL dan Environmental Management Accounting (EMA) dalam menjelaskan pengembangan strategi manufaktur hijau dan implikasinya terhadap kinerja berkelanjutan. Berdasarkan teori institusional dan resource-based view, studi ini mengadopsi pendekatan konseptual melalui tinjauan literatur sistematis. Hasil analisis menunjukkan bahwa faktor-faktor PESTEL beroperasi sebagai tekanan eksternal multidimensi yang mendorong perusahaan melakukan transformasi keberlanjutan, namun tekanan tersebut tidak otomatis menghasilkan peningkatan kinerja. Perusahaan memerlukan kapabilitas organisasi internal agar informasi lingkungan dapat diinterpretasikan dan diintegrasikan ke dalam pengambilan keputusan strategis, dengan EMA diposisikan sebagai kapabilitas mediasi yang mendukung implementasi strategi manufaktur hijau.

Kata Kunci: PESTEL; Environmental Management Accounting; Green Manufacturing Strategy; Sustainable Performance.



INTRODUCTION

The Group of 20 countries, known as the G-20, are seriously discussing several important global issues, including sustainability. This issue has become a strategic focus for boards of directors, as society has become more informed by the Triple Bottom Line (TBL) concept. Concerns surrounding climate change, resource scarcity, environmental degradation, and shifting stakeholder expectations are no longer merely external pressures that companies must address. In many cases, these issues are beginning to influence how organizations think about operational efficiency, long-term competitiveness, and business sustainability. As environmental challenges become increasingly intertwined with economic and regulatory dynamics, manufacturing companies face increasing pressure to rethink how production systems are organized and managed.

The issue and implementation of TBL, introduced by John Elkington in 1997, has become an interesting topic. Entering the 21st century, companies need to generate profits while remaining responsible and positively impacting the surrounding ecosystem, while also being obligated to preserve the earth. This concept has become known as the concept of sustainability, which combines economic principles that view companies solely as profit-seeking business entities. Despite this emerging issue, companies' responses to the sustainability concept remain diverse. Some companies strive to integrate sustainability concepts into their business cycles, while others focus solely on compliance. This diversity of responses may help explain why sustainability initiatives often produce uneven outcomes across companies, even within the same industrial sector. In developing countries, the situation tends to be more complex due to differences in institutional readiness, technological capabilities, and organizational resources. In developing countries, sustainability transformations are often shaped by institutional and organizational constraints that differ from those found in developed countries. Limited technological readiness, uneven organizational capabilities, and institutional gaps often complicate the implementation of sustainability initiatives within companies (Yan, 2025; Van Hoang et al., 2025). This situation is particularly relevant in Indonesia, where manufacturing companies are highly expected to implement sustainability concepts while company management readiness remains highly heterogeneous.

As a developing country with a large market, the sustainability concept of the manufacturing industry in Indonesia has been promoted since the 1990s, with a focus on Environmental Impact Analysis (AMDAL), followed by the Corporate Performance Rating Program in Environmental Management (PROPER), and finally the enactment of Law No. 3 of 2014 concerning Industry, which requires efforts to ensure the efficiency and effectiveness of sustainable resource use. The Green Industry, regulated and required by the law, is promoted by the government to demonstrate that sustainability transformation is gradually becoming part of the broader industrial agenda. However, companies' ability and willingness to undertake this transformation remain uneven. In many cases, sustainability concepts are only implemented symbolically to comply with regulations. The Indonesia Stock Exchange Authority (IDX) implemented the SRI-KEHATI Index starting in June 2009 to measure the price performance of stocks with ESG ratings.

In 2021-2022, IDX launched the ESG Sector Leaders IDX KEHATI, ESG Quality 45 IDX KEHATI, and IDX LQ45 Low Carbon Leaders. IDX is pushing for ESG implementation due to shifting global capital market trends. Investment managers and foreign investors (especially large institutions) are now making ESG scores a mandatory requirement before investing in a company. Issuers with poor ESG scores or those who don't report them are starting to be abandoned by the modern capital market.

Despite these increasing pressures, firms' responses remain heterogeneous. Many organizations still adopt sustainability transformation in a compliance-oriented manner, focusing on meeting minimum regulatory requirements rather than embedding sustainability transformation into their strategic processes. This phenomenon reflects a gap between external expectations and internal organizational capabilities, where sustainability transformation is often implemented symbolically rather than substantively (Qian et al., 2018). From a theoretical perspective, this issue can be explained through the lens of institutional theory and the resource-based view. Institutional theory emphasizes how external pressures (namely coercive, normative, and mimetic) influence organizational behavior (Dacin et al., 2002), while the resource-based view highlights the role of internal capabilities in achieving sustained competitive advantage (Freeman et al., 2010). Nevertheless, existing studies often examine these perspectives separately, resulting in limited understanding of how external pressures are translated into internal strategic actions.

Previous research on sustainability and corporate performance has tended to focus on the direct relationship between environmental initiatives and performance outcomes. For example, studies such as Zhu et al. (2012) and Dubey et al. (2017) provide evidence of a link between sustainability initiatives and organizational performance, but most assume a direct relationship without explicitly explaining the internal mechanisms that enable such outcomes. Similarly, studies grounded in institutional theory (e.g., Dacin et al., 2002) emphasize the role of external pressures in shaping organizational behavior but often fail to explain how these pressures are operationalized within the firm. Consequently, these studies offer limited insight into the transformation processes that link external pressures to strategic outcomes. On the other hand, research on Environmental Management Accounting (EMA) has primarily focused on its technical dimensions, such as environmental cost measurement, reporting systems, and eco-efficiency applications (Christ & Burritt, 2013; Burritt et al., 2019). While these studies demonstrate the importance of EMA in improving environmental performance, they do not sufficiently position EMA as a strategic capability that responds to dynamic external environments. This indicates a specific limitation in the literature, where EMA is treated as an operational tool rather than a mechanism for translating environmental pressures into strategic action.

At the same time, the PESTEL framework is widely used to analyze external business environments, its application in sustainability research is often limited to environmental scanning rather than being integrated into internal organizational processes. Existing studies rarely connect PESTEL analysis with internal accounting capabilities such as EMA. Consequently, there is a lack of comprehensive understanding of how multidimensional external environmental pressures—captured through PESTEL—are internalized and transformed into strategic

initiatives within firms. This gap is particularly critical in emerging economies such as Indonesia, where institutional pressures for sustainability are increasing, but organizational capabilities remain uneven.

Viewed from this perspective, sustainability transformation may be better understood as a process shaped not only by external environmental pressures, but also by the organization's ability to interpret and operationalize environmental information. In manufacturing settings, EMA becomes relevant because it enables firms to connect environmental dynamics with managerial and operational decisions. Specifically, this study examines the relationship between PESTEL factors as multidimensional external pressures, EMA as a mediating strategic capability, and green manufacturing strategy as an implementation mechanism leading to sustainable performance. In this framework, EMA is positioned as the core internal mechanism that enables firms to interpret, process, and operationalize environmental information into strategic decision-making. Meanwhile, green manufacturing strategy is selected as the strategic mechanism because it directly represents the operationalization of sustainability transformation within production processes, including resource efficiency, waste reduction, and environmentally responsible manufacturing practices.

This study offers a distinct theoretical contribution by advancing a capability-based perspective of sustainability transformation that differs fundamentally from prior conceptual models. While existing sustainability research predominantly assumes a direct relationship between external environmental pressures and firm performance, this study introduces a mediated framework that explicitly incorporates internal organizational capabilities as the critical transformation mechanism. In particular, the integration of PESTEL analysis with EMA represents a novel approach, as prior studies have rarely connected macro-environmental dynamics with internal accounting systems within a unified framework.

Next, this study extends the role of EMA beyond its conventional function as a technical accounting tool by conceptualizing it as a strategic capability that enables firms to interpret and operationalize complex environmental pressures. This repositioning provides a deeper explanation of how sustainability transformation occurs in practice, particularly in emerging economies such as Indonesia, where external pressures are increasing but organizational capabilities remain uneven. By bridging institutional theory and the resource-based view through a capability-based mediation model, this study contributes a more comprehensive and process-oriented explanation of sustainability transformation that addresses inconsistencies in prior research findings.

This study contributes to the literature in two ways. First, it integrates institutional theory and the resource-based view to provide a more comprehensive explanation of sustainability transformation in manufacturing firms, bridging the gap between external pressures and internal capabilities. Second, it extends the role of EMA from a technical accounting tool to a strategic capability that links external environmental dynamics with internal decision-making processes. Practically, the findings provide insights for managers and policymakers in designing sustainability transformation that moves beyond compliance toward capability-driven transformation.

LITERATURE REVIEW

External Environmental Pressure: A PESTEL Perspective

The contemporary business environment is shaped by a wide range of interconnected pressures arising from political, economic, social, technological, environmental, and legal developments. These dynamics influence not only how firms operate, but also how they formulate strategic responses to sustainability-related challenges. In this context, the PESTEL framework offers a useful perspective for understanding how external environmental changes affect organizational behavior and strategic decision-making. From the standpoint of institutional theory, such pressures may take the form of coercive, normative, and mimetic influences that gradually shape the way organizations respond to sustainability expectations (Dacin et al., 2002).

In manufacturing industries, political and legal dimensions are often reflected in environmental regulations, industrial policies, and sustainability-related standards that firms are expected to follow. In Indonesia, for example, government initiatives promoting green industry and resource efficiency have increased regulatory expectations for manufacturing companies based on Law No. 3 of 2014 concerning Industry (Kementerian Perindustrian, n.d.). At the same time, economic developments such as the growth of ESG-oriented investment and changing market preferences have created stronger incentives for firms to adopt sustainability practices. Social factors also play an increasingly important role, particularly as consumers, investors, and other stakeholders become more concerned about environmental responsibility and ethical business conduct (Bangsa & Schlegelmilch, 2020). As these pressures continue to evolve, firms are required not only to comply with external expectations, but also to develop the internal capability needed to respond strategically and consistently.

The pressures are exacerbated also by technological developments, which bring with them new ways to increase production efficiency and monitor the environment. Digital technology advances (e.g., big data, real-time monitoring systems) enable a more efficient use of resources and track performance in the environment (Amirova et al., 2024). Environmental conditions, such as climate change and resource availability, are also direct operational threats to the firm that necessitate an adaptive response. And a national and international dual legal regime exists that shapes the behaviour of companies in sustainability transformation. Although the PESTEL analysis is relevant, previous studies tend to view such factors as direct predictors of firm performance. Such a perspective bypasses the internal dynamics of how external pressures are perceived and acted on strategically. Hence, it is necessary to adopt a multi-level perspective to understand how organizations internalize these pressures to organizational capabilities.

The widespread application of the PESTEL framework in analyzing external environmental pressures has not resulted in consistent findings regarding its impact on sustainability outcomes. While some studies report a positive influence of external pressures on sustainability adoption and performance, others indicate weak or context-dependent relationships. These inconsistencies suggest that external pressures alone are insufficient to explain organizational responses, as firms differ in their ability to interpret and internalize such pressures. Consequently,

relying solely on external environmental analysis may lead to an oversimplified understanding of sustainability transformation, as it neglects the internal mechanisms required to translate pressures into strategic action.

Environmental Management Accounting as a Strategic Capability

In some accounting fields, such as quality accounting or eco-costs, it is related to product quality and the environmental aspects of the processes of production in and between organizations. Environmental Management Accounting (EMA) is the part of accounting which addresses the impact of production processes on product quality and the environment. It is also common for environmental costs to be identified, measured and reported using EMA as a means. Management accounting developments indicate that strategic decision-making is supported to a larger extent by EMA through the integration of environmental information into managerial processes (Burritt and Saka, 2006). EMA allows organizations to reveal latent environmental costs, increase resource efficiency, and improve the quality of decisions. By giving them the information they need, EMA helps managers assess the economic impact of environmental actions and the alignment of sustainability goals with business goals. This role is even more critical in light of growing external pressures, as firms struggle to balance their need to meet compliance standards, with operational efficiency needs. From a RBV perspective, the EMA can be seen as an internal resource that can contribute to the competitive advantage. Companies that manage to successfully develop and implement EMA are in a stronger position to convert environmental threats into opportunities for innovation and efficiency. On the other hand, without any such mechanisms to guide the firms, the firms may take a more symbolic approach to the pressures and decouple sustainability reporting from actual work (Qian et al., 2018). Conversely, the absence of such systems may lead firms to respond to external pressures in a symbolic manner, resulting in decoupling between sustainability reporting and actual practices (Qian et al., 2018).

Decoupling refers to a condition in which organizations formally adopt sustainability policies or reporting practices to meet external expectations yet fail to substantively implement these practices within their core operational processes. In such situations, there is a misalignment between what firms communicate externally and what they actually perform internally, which ultimately weakens the effectiveness of sustainability transformation.

Despite its potential, the role of EMA in linking external environmental dynamics with strategic outcomes remains underexplored. Most studies focus on its technical aspects, such as cost measurement and reporting systems, without examining its strategic implications. This limitation highlights the need to reposition EMA as a mediating mechanism that translates external pressures into actionable strategies.

Although the existing literature acknowledges the importance of EMA in improving environmental performance, it remains largely confined to its technical and operational dimensions. Prior studies tend to emphasize cost measurement, reporting systems, and eco-efficiency applications, without adequately examining how EMA functions as a strategic capability in dynamic environments. This limitation creates a gap in understanding how environmental information is

transformed into strategic decisions, particularly under complex and multidimensional external pressures. Therefore, there is a need to reconceptualize EMA not merely as an accounting tool, but as an organizational capability that enables firms to respond proactively to sustainability challenges.

Green Manufacturing Strategy and Sustainable Performance

Green manufacturing strategy generally refers to the incorporation of environmental considerations into production activities in order to reduce resource consumption, minimize waste, and improve environmental performance (Dornfeld, 2013). In many manufacturing firms, this approach is closely related to eco-efficiency and circular economy practices, where operational improvement is expected to go hand in hand with environmental responsibility. A number of studies have shown that green manufacturing initiatives may help firms improve efficiency, reduce operational costs, and lower environmental impact through better resource utilization and waste management.

At the same time, the implementation of green manufacturing practices is not always straightforward. Some firms are able to integrate environmental objectives into managerial and operational decisions, while others struggle to move beyond symbolic or compliance-oriented initiatives. This may explain why the outcomes of green manufacturing strategies often differ across organizations. In this regard, supporting systems such as EMA become important because they help firms interpret environmental information and incorporate it into day-to-day decision-making processes.

The relevance of this issue becomes more pronounced in emerging economies such as Indonesia, where institutional pressures for sustainability are rapidly increasing, yet organizational capabilities remain unevenly distributed. In such contexts, firms often face multiple and sometimes conflicting demands from regulators, markets, and stakeholders, while lacking the internal systems necessary to effectively respond to these pressures. As a result, sustainability initiatives may be implemented in a fragmented or symbolic manner, limiting their impact on performance outcomes. This highlights the importance of developing integrated frameworks that account for both external pressures and internal capabilities in explaining sustainability transformation in emerging economy settings.

Linking PESTEL, EMA, and Green Manufacturing Strategy

By synthesizing the above discussions, this research posits that external environmental pressures as captured by PESTEL do not have a direct impact on sustainable performance but rather, their impact is through the mediation of internal organizational capabilities and strategies. Rather, their impacts are mediated by internal organizational capabilities and strategic execution.

Institutional theory describes the effect of external factors on organisational conduct, RBV highlights the importance of internal resources to superior performance. Drawing on these views, EMA can be viewed as the key vehicle through which external pressures become strategic actions. In particular, the PESTEL components result in pressures that drive firms toward sustainability transformation. It is in this way that EMA assists companies to understand these pressures and integrate them into their decision-making. This makes it easier to

implement green manufacturing strategy, which in turn can be the green sustainable performances. Based on the combination of PESTEL, EMA, and the green manufacturing strategy, the suggested conceptual framework is illustrated in Figure 1.

Figure 1. Conceptual Framework



Figure 1 illustrates the proposed conceptual framework in which PESTEL factors function as multidimensional external drivers influencing the adoption of EMA. EMA is positioned as a mediating strategic capability that enables firms to implement green manufacturing strategy as an operational mechanism. The implementation of this strategy subsequently leads to improved sustainable performance, reflecting both environmental and economic outcomes.

Proposition Development

Various research methods can be used to answer research questions and objectives. One such method is known as the Systematic Literature Review (SLR), a type of research that develops theoretically grounded arguments to explain the relationships between constructs. In SLR research, there is no hypothesis formulation; instead, it tests or answers the research objectives with research propositions. A proposition is a theoretical statement derived from existing literature and logical reasoning, describing the relationships between variables and serving as a basis for future empirical testing (Winarno et al., 2023). The formulation of this proposition aims to build a conceptual framework for solving a problem. In this study, the conceptual framework to be developed is the integration of external environmental pressures and internal organizational capabilities in explaining sustainability transformation. The propositions developed in this study emphasize theory development and offer structured explanations of how and why certain relationships occur.

Building upon institutional theory and the resource-based view, this study argues that sustainability transformation in manufacturing firms is driven by the interaction between external pressures and internal capabilities. The PESTEL framework captures multidimensional external pressures, while EMA represents an internal capability that enables firms to respond strategically to these pressures. Furthermore, the implementation of green manufacturing strategy acts as a critical mechanism that translates internal capabilities into sustainable performance outcomes.

Based on these arguments, the following propositions are developed:

Main Propositions

- P1 : PESTEL factors influence the adoption of EMA.
- P2 : EMA facilitates the implementation of green manufacturing strategy
- P3 : Green manufacturing strategy enhances sustainable performance

Mediating Propositions

- P4 : EMA mediates the relationship between PESTEL factors and green manufacturing strategy.
- P5 : Green manufacturing strategy mediates the relationship between EMA and sustainable performance.

RESEARCH METHODOLOGY

This study employs a qualitative approach using a conceptual research design based on a systematic literature review (SLR). The purpose of this approach is to develop a theoretical framework that explains the relationship between external environmental pressures, internal organizational capabilities, and sustainability outcomes in manufacturing firms. Unlike empirical studies that rely on primary or secondary quantitative data, this study synthesizes existing knowledge to construct a comprehensive conceptual model.

To ensure methodological rigor and transparency, this study adopts the systematic literature review framework proposed by Tranfield et al. (2003), which consists of three main stages: planning, conducting, and reporting the review. In addition, the review process follows the principles of the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol to ensure a systematic, transparent, and replicable screening process. The combination of these approaches strengthens the validity and reliability of the literature synthesis.

According to Winarno et al. (2023), a systematic literature review enables researchers to critically analyze previous studies, identify research gaps, and develop new theoretical insights based on accumulated knowledge. This approach is particularly suitable for studies aiming to integrate multiple theoretical perspectives, such as institutional theory and the resource-based view.

The data used in this study consist of secondary sources obtained from scientific journal articles, books, and relevant institutional reports related to PESTEL analysis, EMA, green manufacturing strategy, and sustainable performance. The literature search was conducted using major academic databases, including Scopus, Web of Science (WoS), and Google Scholar, to ensure comprehensive coverage. Priority was given to peer-reviewed journal articles indexed in Scopus and SINTA to ensure the credibility and relevance of the sources. In addition, policy documents and reports from international organizations and government institutions were included to provide contextual understanding, particularly in the Indonesian setting.

The literature selection process followed a systematic multi-stage procedure. First, an initial search was conducted using keywords such as “PESTEL analysis,” “environmental management accounting,” “green manufacturing,” and “sustainable performance,” resulting in an initial pool of approximately 120 articles. Second, the identified studies were screened based on predefined inclusion and exclusion criteria. The inclusion criteria included: (1) peer-reviewed journal articles, (2) relevance to sustainability, EMA, or environmental strategy, (3) publication within the period 2015–2025, except for seminal theoretical works, and (4) empirical or

conceptual relevance to manufacturing or sustainability contexts. The exclusion criteria included duplicate records, non-academic sources, and studies lacking clear theoretical or methodological contributions.

Third, the screening process was conducted through three stages: title screening, abstract review, and full-text evaluation, following PRISMA logic. After this process, a final sample of approximately 45 relevant articles was selected. Fourth, the selected studies were systematically categorized based on their theoretical perspectives, research focus, methodologies, and key findings. This structured classification enabled the identification of research patterns, inconsistencies, and gaps in the literature.

Data analysis in this study was conducted using a qualitative content analysis approach with a structured coding procedure. First, open coding was applied to identify key concepts and recurring themes related to external environmental pressures, internal organizational capabilities, and sustainability outcomes. Second, axial coding was used to group these concepts into broader analytical categories, including PESTEL factors, EMA, green manufacturing strategy, and sustainable performance. Third, selective coding was employed to integrate these categories into a coherent conceptual framework by identifying causal relationships and theoretical linkages among variables. Through this coding process, theoretical synthesis was developed by systematically comparing findings across studies to identify consistent patterns and contradictions. The relationships among variables were derived inductively from the literature and then aligned with the theoretical perspectives used in this study, particularly institutional theory and the resource-based view. This approach ensures that the proposed framework is both empirically grounded in prior research and theoretically robust.

To improve the study's rigor, we employ a theory-driven approach/analysis and draw upon institutional theory and the resource-based view as the primary theoretical lens. Using Institutional theory, the study accounts for the influence of external environment on organizational behaviour, whereas Resource-based view allow for an understanding of how internal competences impact on firm specific competitive advantage. The combination of these two theories leads to a more holistic representation of how manufacturing firms undergo sustainability transformation. Despite offering a solid conceptual framework, the present study is not without limitations. The results are derived from the literature reviewed and have not been tested. Accordingly, it is also suggested that future research could confirm the developed model through employing quantitative techniques such as panel data analysis or structural equation modeling. Notwithstanding these limitations, the study provides a number of interesting theoretical insights which may help to inform future empirical work.

RESULT AND DISCUSSIONS

Conceptual Model Interpretation

The proposed conceptual framework is presented in Figure 1. This framework integrates external environmental pressures and internal organizational capabilities to explain sustainability transformation in manufacturing firms. The

model positions PESTEL factors as multidimensional external drivers, EMA as an internal strategic capability, green manufacturing strategy as an implementation mechanism, and sustainable performance as the ultimate outcome.

Unlike conventional sustainability models that assume a direct relationship between external pressures and performance outcomes, this study proposes a mediated and capability-driven framework. In many prior studies (e.g., Zhu et al., 2012; Dubey et al., 2017), sustainability initiatives are directly linked to firm performance, implicitly assuming that external pressures automatically translate into improved outcomes. However, such assumptions overlook the internal organizational processes required to operationalize sustainability transformation.

This study addresses this limitation by explicitly incorporating EMA as a mediating mechanism. In doing so, the framework differs from prior models by emphasizing that external environmental pressures do not directly influence performance but must first be interpreted, internalized, and transformed into actionable strategies through internal capabilities.

This distinction is particularly important in explaining inconsistencies in previous empirical findings. While some studies report a positive relationship between sustainability initiatives and firm performance, others show weak or insignificant effects (Qian et al., 2018). These contradictions can be attributed to the omission of internal mechanisms that enable effective implementation. By introducing EMA as a strategic capability, this study provides a more nuanced explanation that reconciles these inconsistencies.

Furthermore, this framework extends beyond traditional institutional theory perspectives, which focus primarily on external pressures, by integrating insights from the resource-based view. While institutional theory explains why firms respond to sustainability pressures, it does not fully explain how these responses are translated into performance outcomes. The inclusion of EMA addresses this gap by linking external pressures with internal decision-making processes. The relevance of this framework is particularly significant in the Indonesian context, where manufacturing firms are increasingly exposed to sustainability-related regulations and global market pressures. However, the level of organizational readiness in adopting internal capabilities such as EMA remains uneven. This condition creates a gap between external expectations and actual implementation, often resulting in fragmented or symbolic sustainability practices. Therefore, the proposed framework provides a contextually relevant explanation of how Indonesian firms can bridge this gap by strengthening internal capabilities to support effective sustainability transformation.

Literature Synthesis and Conceptual Mapping

To strengthen the conceptual foundation of this study, a synthesis of prior literature is presented in Table 1. This synthesis highlights that prior studies have predominantly examined either external pressures or internal mechanisms in isolation. Few studies integrate both dimensions within a unified framework, and even fewer position EMA as a central strategic capability.

Tabel 1. Synthesis of Prior Literature

Study	Focus	Theoretical Lens	Key Findings	Limitations
Zhu et al. (2012)	Green supply chain & performance	Institutional	Sustainability improves performance	Direct relationship assumption
Dubey et al. (2017)	External pressure & sustainability systems	Institutional	External pressure influences sustainability systems	Limited internal capability explanation
Qian et al. (2018)	EMA & carbon management	EMA perspective	EMA improves environmental outcomes	No integration with macro environment
Burritt et al. (2019)	EMA diffusion	RBV	EMA enhances decision-making	Focus on technical aspects
Castro-Lopez et al. (2023)	Institutional pressure & capabilities	Institutional + RBV	Capability needed for sustainability adoption	No EMA integration

Although the systematic literature review initially identified approximately 120 articles and resulted in a final sample of 45 relevant studies after the screening process, only a subset of studies is presented in Table 1. The selection follows the principle of theoretical saturation, whereby additional literature no longer provides substantially new insights into the relationships among external environmental pressures, EMA, and sustainability outcomes. The five studies included in this table were deliberately selected because they represent distinct yet complementary theoretical positions that are central to the development of the proposed framework. Specifically, these studies capture: (1) the role of external pressures in shaping sustainability practices, (2) the influence of institutional mechanisms on organizational behavior, (3) the contribution of EMA to environmental and managerial outcomes, (4) the capability-based perspective underlying sustainability performance, and (5) the interaction between institutional pressures and organizational capabilities.

This selection ensures that the table reflects the core theoretical building blocks of the model, rather than merely summarizing the literature. In this sense, the table serves as a form of analytical generalization, highlighting the most conceptually relevant studies that collectively explain the mechanisms linking PESTEL factors, EMA, and sustainable performance. The full set of reviewed articles was systematically analyzed in the broader synthesis process to ensure the robustness and comprehensiveness of the conceptual model, while Table 1 provides a distilled representation of the most influential and theoretically informative contributions.

Green Manufacturing as a Strategic Implementation Mechanism

Green manufacturing strategy plays a central role in operationalizing sustainability within firms. It represents the practical implementation of sustainability principles through resource efficiency, waste reduction, and environmentally responsible production processes (Dornfeld, 2013). Recent studies further conceptualize green manufacturing as a systematic framework that integrates environmental objectives with operational processes and strategic decision-making (Bendig et al., 2023). Nevertheless, the effectiveness of green manufacturing strategy is not solely determined by technological adoption or operational improvements. Instead, it depends on the firm's ability to internalize external environmental pressures and translate them into actionable strategies through internal capabilities. This aligns with recent studies emphasizing that external pressures require organizational alignment and knowledge integration to generate meaningful strategic outcomes (Dubey et al., 2017; Pham et al., 2025). In addition, empirical evidence suggests that the successful implementation of green manufacturing is influenced by organizational readiness, contextual factors, and firm-specific capabilities, particularly in emerging economies (Primandaru et al., 2023).

In this context, EMA plays a critical role by providing relevant and reliable information that supports strategic decision-making. Without such information, sustainability initiatives may remain fragmented and fail to produce measurable outcomes. This reinforces the argument that internal capabilities are essential for translating environmental pressures into effective operational strategies. Furthermore, overcoming implementation barriers in green manufacturing requires an integrated strategic approach that aligns environmental goals with operational efficiency and organizational processes (Garza-Reyes et al., 2025). Moreover, green manufacturing strategy should not be viewed solely as an environmental initiative but as a strategic approach to enhancing competitiveness. By improving resource efficiency and reducing costs, firms can achieve both environmental and economic benefits. This dual impact aligns with the concept of eco-efficiency, where sustainability and profitability are mutually reinforcing rather than conflicting objectives.

Implications for Sustainable Performance

The final stage of the model highlights the impact of green manufacturing strategy on sustainable performance. Sustainable performance is widely recognized as a multidimensional construct that encompasses both financial and environmental outcomes (Schaltegger et al., 2008; Zhu et al., 2012). Firms that successfully implement green manufacturing strategies are likely to achieve cost efficiency, improved resource utilization, and enhanced environmental performance.

However, the relationship between sustainability practices and performance is not automatic. It depends on the firm's ability to integrate external pressures and internal capabilities into a coherent strategic framework. Prior studies have shown mixed empirical findings regarding the impact of sustainability initiatives on firm performance, indicating that such relationships are contingent upon internal organizational factors and contextual conditions (Dubey et al., 2017; Qian et al., 2018).

By introducing a mediated model, this study provides a more nuanced explanation of this relationship. It suggests that inconsistencies in prior research may stem from the omission of internal mechanisms, such as EMA, that play a critical role in shaping the effectiveness of sustainability strategies (Burritt et al., 2019; Castro-Lopez et al., 2023).

Theoretical and Practical Contributions

This study makes several important contributions to the literature by offering a distinct theoretical positioning compared to existing sustainability models. First, unlike prior studies that focus on either external pressures (institutional theory) or internal capabilities (resource-based view), this study integrates both perspectives within a single framework. This integration provides a more comprehensive explanation of sustainability transformation by linking why firms respond (external pressures) with how they respond (internal capabilities). Second, this study introduces a capability-based mediation model, which differs from conventional direct-effect models commonly used in sustainability research. While previous studies assume a direct link between sustainability practices and performance, this study demonstrates that such relationships are contingent upon the presence of internal mechanisms—specifically EMA. This represents a significant theoretical advancement by explaining the underlying process rather than merely observing outcomes.

Third, the study provides a novel positioning of EMA. Existing literature largely treats EMA as a technical accounting tool focused on cost measurement and reporting. In contrast, this study conceptualizes EMA as a strategic capability that enables firms to interpret external environmental dynamics and integrate them into decision-making processes. This repositioning extends the role of EMA within the broader sustainability and strategic management literature. Fourth, the study advances the application of the PESTEL framework by moving beyond its traditional role as a descriptive environmental analysis tool. Instead, PESTEL is integrated into a dynamic framework that explains how external environmental pressures interact with internal capabilities to produce strategic outcomes.

From a comparative perspective, the proposed framework differs from prior sustainability models in three key aspects:

1. Integration dimension, different by combines external (PESTEL) and internal (EMA) factors
2. Mechanism dimension, different by introduces mediation (EMA & green manufacturing)
3. Outcome dimension, different by explains sustainable performance as a process, not a direct result

From a practical perspective, these findings suggest that managers should focus not only on compliance with external regulations but also on developing internal capabilities that enable effective sustainability transformation. Companies that fail to develop such capabilities risk symbolic adoption, which limits the effectiveness of sustainability initiatives. Policymakers should also consider the diversity of organizational capacities to absorb or implement them when designing sustainability regulations. Policies that emphasize compliance without supporting capability development may result in minimal uptake of substantive transformation.

CONCLUSION

This study develops a conceptual framework that explains sustainability transformation as a process driven by the interaction between external environmental pressures and internal organizational capabilities. The findings highlight that PESTEL factors alone are insufficient to generate sustainable performance unless they are effectively translated into strategic actions through internal mechanisms such as Environmental Management Accounting (EMA).

By positioning EMA as a mediating capability and green manufacturing strategy as an implementation mechanism, this study provides a more comprehensive explanation of how sustainability transformation occurs in manufacturing firms. This framework also contributes to resolving inconsistencies in prior research by demonstrating that sustainability outcomes depend on the effectiveness of internal capabilities rather than external pressures alone.

From a practical perspective, the study suggests that firms should prioritize the development of internal systems such as EMA to support sustainability transformation. At the same time, policymakers should complement regulatory pressures with initiatives that strengthen organizational capabilities, particularly in emerging economies where such capabilities remain unevenly distributed.

For organizations, the findings imply that sustainability transformation should not be approached solely as a compliance requirement, but as a capability-building process. Firms need to invest in internal systems such as Environmental Management Accounting (EMA) to ensure that environmental information is effectively integrated into strategic decision-making. This includes developing data collection systems, enhancing managerial competencies, and aligning sustainability objectives with operational processes. Without such capability development, sustainability initiatives are likely to remain symbolic and fail to deliver meaningful performance improvements.

Future research should extend this conceptual framework by empirically testing the proposed relationships using quantitative approaches, such as panel data analysis or structural equation modeling. In addition, future studies may explore the role of contextual factors, such as firm size, industry characteristics, and regulatory intensity, in moderating the relationship between EMA and sustainable performance. Furthermore, comparative studies across different emerging economies would provide deeper insights into how institutional environments influence the effectiveness of sustainability transformation. Longitudinal research is also recommended to examine how firms develop internal capabilities over time in response to evolving environmental pressures.

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