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SUSTAINABILITY PERFORMANCE IN SMES: THE ROLE OF EMA AND RESILIENCE

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Abstract
This paper examines how Environmental Management Accounting (EMA) can influence sustainability performance (SP), with strategic resilience (SR) serving as a mediating factor. Data were collected using a quantitative method, by surveying 127 small and medium-sized enterprises (SMEs) and focusing on the top management of the company that was involved in making strategic decisions. Partial Least Squares Structural Equation Modeling (PLS-SEM) was used to analyze the data. The results indicate that the positive and significant impact of EMA is on sustainability performance and strategic resilience. Moreover, strategic resilience has a positive impact on the sustainability performance and partially mediates the relationship between the EMA and SP. These findings show that although EMA can give the necessary environmental information, its ability to create sustainability performance relies on the ability of the organization to absorb, adapt, and transform the information into strategic action. This research is a contribution to the body of literature because it refutes the existing hypothesis that better sustainability performance is an automatic consequence of environmental information. Rather, it shows that the power of EMA is in its combination with the organizational capabilities, in particular, strategic resilience. The implications of the findings on SMEs are also practical in the sense that it is important that internal capabilities should be enhanced in order to maximize the utilization of environmental information in coming up with sustainable results.

Keywords: Environmental Management Accounting, Sustainability Performance, Strategic Resilience, SMEs

1. Introduction

Companies around the world are under growing pressure to enhance SP as a reaction to the climate change crisis, environmental degradation, and growing stakeholder demands to adopt responsible business practices (Gunarathne et al., 2021; Marrucci et al., 2022). Nevertheless, changing dynamics suggest that the sustainability commitment does not necessarily lead to the substantive implementation. Numerous organizations are still at the symbolic compliance level, with sustainability practices being present on paper but not entrenched within the operations and strategic decision-making processes (Swalih et al., 2024). This scenario is a key indication of the critical disconnect between normative desires and actuality of application in sustainability practices (Zatini et al., 2025).

Nevertheless, such extrinsic forces essentially require more than normative commitment. Organizations are challenged to seek internal capabilities that allow them to systematize the understanding, measurement, and management of environmental impacts (Appannan et al., 2023). In this respect, access to relevant, dependable and consolidated information is a key requirement of sustainability-based decision-making

(Zhen & Rahman, 2024). In the absence of the proper support of the information system, sustainability initiatives may end up being purely rhetoric, as they cannot be converted into any measurable and consistent operational response (Mukwarami et al., 2023; Swalih et al., 2024).

To help eliminate this gap, EMA can be offered as a tool that can offer information about the costs and impacts of the environment to be used in more sustainability-oriented decision-making (Alnaim & Metwally, 2024). In theory, EMA is perceived to be able to enhance resource effectiveness and enhance sustainability performance of an organization (Appannan et al., 2023). But in reality, EMA is frequently confined to administrative reporting tasks, meaning that it does not fully execute its capabilities as a strategic instrument that can create significant change in the behavior of the organization (Swalih et al., 2024). That is, the presence of information about the environment does not always mean that an organization can effectively use such information (Swalih et al., 2024).

In line with this, despite the fact that various studies have investigated the association between EMA and sustainability performance, the available literature still has conceptual weaknesses (Asiaei et al., 2022; Hasan et al., 2024; Thanh Thuy Ngoc, 2025). In particular, the majority of the research presupposes implicitly that the improved sustainability performance will be automatically stimulated by the presence of environmental information created by EMA (Appannan et al., 2023; Asiaei et al., 2022; Thanh Thuy Ngoc, 2025). It is an assumption that overlooks the major problem of organizations, which is the interpretation, integration and translation of this information into tangible strategic actions. So, the lack of consistency in the empirical findings is not the only issue, but the disconnect between the availability of information and strategic action that has not been adequately clarified in the theoretical literature (Gunarathne et al., 2021). Moreover, this assumption is linear and deterministic and may simplify the complexity of organizational decision making processes in a dynamic and uncertain sustainability context (Scarpellini et al., 2020).

This disconnects between the availability of information and strategic action implies that strategies that present accounting systems as direct determinants of performance cannot account for the complexity of sustainability practices within the organization (Zatini et al., 2025). What is required is a perspective that does not focus on availability of information alone, but on how organizations process, interpret and act on this information in a dynamic and uncertain environment (Scarpellini et al., 2020). Thus, the interpretation of the connection between EMA and sustainability performance must be informed by a theoretical framework that has the potential to reflect both processual and adaptive aspects of organizational decision-making (Marrucci et al., 2022).

Under the dynamic capabilities framework, the functionality of an information system is not only defined by the presence of information, but also by how well the organization can analyze, synthesize, and act in a responsive manner to the information (Scarpellini et al., 2020). In its turn, SR emerges as a significant variable, which demonstrates the ability of the organization in question to absorb shocks, adjust to the new circumstances, and transform environmental data into strategic actions enabling the organization to become sustainable (Acar et al., 2025). Without adequate resilience capability, the information that is present in the situation may not translate into actual performance. Therefore, strategic resilience can be viewed as an intermediate that clarifies the ways and conditions under which EMA can improve sustainability performance (Hasan et al., 2024).

The need to comprehend this mechanism is further intensified by the fact that it is more relevant to small-scale organizations, including MSMEs in Indonesia (Alnaim & Metwally, 2024; Eikelenboom & de Jong, 2019; Mukwarami et al., 2023). In this case, the organizations usually have few resources, managerial capacity, and environmental accounting infrastructure, which consequently affects the way they adopt and use EMA. In most situations, EMA is implemented incompletely and not fully integrated into the strategic decision-making (Scarpellini et al., 2020). Consequently, this context does not only imply implementation challenges but offers an analytical space with a lot of richness on how organizational mechanisms are functioning under these constrained conditions (Mukwarami et al., 2023). Also, this context is significant in that it questions the hidden assumption of prior studies that organizations have adequate capacity to be able to use environmental information in strategic decision-making (Gunarathne et al., 2021).

According to this description, this paper seeks to analyze the role that Environmental Management Accounting plays in the sustainability performance with the variable of strategic resilience as an intervening variable. In contrast to the past methods that focus on the direct relationship, this study aims at revealing organizational processes underlying the relationships. In particular, this study contributes to the literature in terms of redefining EMA as not merely an information-providing instrument, but as a process that relies on the organization's resilience capacity to absorb, adapt, and act upon environmental information. Therefore, the value of this research is its attempts to bring a better insight into how environmental information may be converted into actions that influence sustainability performance. The findings are hoped to have theoretical implications in that it will change the orientation of the information provision to information utilization and the practical implications to the organizations in the optimization of EMA as a strategic tool in the achievement of sustainability. Therefore, the study also contributes to the literature besides providing an alternative view in the interpretation of environmental accounting systems as a component within the dynamic capabilities of an organization.

2. Theoretical Background

2.1 Dynamic Capabilities

Dynamic capabilities theory underlines the idea that the excellence of an organization is not only defined by resource ownership, but also the capacity of the organization to combine, create and rearrange these resources flexibly to meet environmental changes (Helfat & Martin, 2015; Ozanne et al., 2022). This view was formed as a reaction to stagnant approaches that are more likely to regard the relationship between resources and performance as linear and deterministic (Ozanne et al., 2022). Within the context of an evolving business environment, which is also subject to sustainability pressure, organizations must not only have the information or resources, but also be capable of responding appropriately to these pressures in a dynamic process (Liang et al., 2022).

The applicability of the dynamic capabilities theory to the current study is that it can be used to define the disconnect between the availability of information and strategic action. As discovered in the existing literature, EMA gives data about environmental impacts and expenses. Nevertheless, having such information is not necessarily leading to better sustainability performance (Huliselan, 2025). What this implies is that the information can be transformed into strategically valuable actions based on the internal organization processes. In this connection, dynamic capabilities present a conceptual framework that allows defining how organizations use information based on the interpretation, integration, and response processes (Feroz et al., 2023).

More precisely, three main dimensions of dynamic capabilities can be identified: sensing, seizing and transforming. Within the context of this study, EMA is involved in the support of the sensing process, i.e., the potential of the organization to detect the opportunities and threats of the environment with the help of the provision of the relevant information (Huliselan, 2025; Mukwarami et al., 2023). To have this information influence performance, however, the organizations must have the competencies of seizing, i.e., making strategic decisions using the information available to them and transforming, i.e., engaging changes in organizational processes and practices. The three processes are operationally manifested in strategic response, which explains how an organization reacts to environmental information by taking specific actions (Ozanne et al., 2022).

Therefore, strategic response may be placed as an expression of dynamic capabilities within the framework of sustainability management. In the absence of relevant dynamic capabilities, EMA can serve as a passive information system that lacks any meaningful alterations to performance. In their turn, when an organization can react strategically to information, EMA can be a powerful tool of enhancing better sustainability performance (Huliselan, 2025).

Moreover, it is also important that the dynamic capabilities theory has been applied in this study to mitigate the weaknesses of the earlier research that usually presumes a direct correlation between accounting systems and performance. As such, by taking up this view, the research does not only provide an answer to the question of whether EMA affects sustainability performance, but also how and in what ways this relationship exists. Hence, dynamic capabilities offer an important theoretical input in uncovering the black box between environmental information and sustainability performance as well as bolstering the perspective of strategic response as a central mechanism in the relationship (Feroz et al., 2023).

2.2 Environmental Management Accounting (EMA)

EMA is a branch of environmental accounting that gathers, processes, and displays monetary and physical data (energy, water, materials, waste) of environmental impacts and expenses to aid internal decision-making (Huliselan, 2025; Nguyen, 2024). EMA assists in determining the concealed environmental expenses, resource optimization prospects, and cleaner technology/product alternatives thus supporting financial and environmental performance (Mukwarami et al., 2023).

The significance of EMA is that it brings environmental issues to the managerial decision-making systems. In the absence of systematic information support, organizations are likely to find it difficult to control environmental effects in a sustainable and quantifiable way (Huliselan, 2025). Nevertheless, EMA can be effective only if the information is available, as well as its usage as a part of organizational practice. EMA must, thus, be perceived as not just an information system, but a component of a larger managerial process (Mukwarami et al., 2023).

2.3 Sustainability Performance (SP)

The concept of SP indicates the capacity of an organization to balance between economic performance, environmental performance, and social performance (Liang et al., 2022). This idea highlights the importance of the fact that an organization can be evaluated based on its success in terms of profitability and its role in ensuring its survival in the long-term (Caiado et al., 2018). The SP is an important measure in the evaluation

of how much an organization can react to external forces and fulfill the expectations of the stakeholders (Yasmin et al., 2025).

Practically, SP involves the coordination of different organizational functions, such as strategy, operations and information systems. This proves that SP is not merely a final product, but it is the product of multifaceted organizational procedures. Thus, to identify determinants of SP, it is necessary to adopt a method where both inputs and internal processes between the inputs and performance are considered (Caiado et al., 2018; Hristov & Chirico, 2019).

2.4 Strategic Response (SR)

Strategic resilience (SR) can be defined as the ability of an organization to absorb the shock, respond to the changing environment, and convert the environmental pressures into strategic responses, which help the organization to sustain itself in the long term. Instead of being an active response, strategic resilience is a dynamic ability that helps organizations to reorganize resources and processes constantly under the influence of uncertainty (Ozanne et al., 2022). In this regard, SR is not just an effort to capture the manner in which organizations react to environmental issues, but in which they maintain and re-model the responses into dynamic and progressive strategies.

The strategic resilience plays a very important role especially when it comes to environmental information utilization. Even though Environmental Management Accounting (EMA) can provide organizations with the appropriate environmental information, this does not necessarily result in better sustainability performance. The only thing needed is the organizational ability to read, synthesize and translate this information into consistent strategic action. Thus, strategic resilience is an important process that provides a bridge between accessibility of environmental data and actualization of sustainability results.

2.5 Environmental Management Accounting (EMA) on sustainability performance

Environmental EMA is the system that provides information about environmental

impacts as well as expenditures of an organization. It is possible to utilize this data to develop a reporting tool and a strategic decision-making tool (Asa'd et al., 2024). In that, EMA allows organizations to have a better overall picture of risks and opportunities related to sustainability issues and, consequently, be able to respond more directly and precisely (Latifah & Soewarno, 2023; Nguyen & Huynh, 2025).

Regarding dynamic capabilities, the information developed by EMA can be considered as a part of the sensing process, i.e., the ability of the organization to detect opportunities and threats in its surroundings (Helfat & Martin, 2015). Relevant and structured information can assist organizations in developing strategies that can promote sustainability (Mat Yusoh et al., 2023). Therefore, the introduction of EMA is also going to contribute to the better sustainability performance in terms of the quality of the data-based and informed decision-making (Zhen & Rahman, 2024).

Empirically, a number of studies have indicated that the application of EMA is positively related to sustainability performance (Appannan et al., 2023; Asa'd et al., 2024; Latifah & Soewarno, 2023). It is probable that those organizations that are adopted by EMA will be more energy-efficient, waste management, and socially responsible. Moreover, the EMA also contributes to the improved transparency and responsibility of the organization to the stakeholders eventually improving the performance of the legitimacy and sustainability.

Nevertheless, the correlation between EMA and sustainability performance is not always direct and automatic. This information is critical in determining the success of EMA in organizational processes. Nevertheless, even in the situation when organizations can have adequate access to and utilization of environmental information, EMA can also play a positive role in sustainability performance. Based on this, hypothesis is as follows:
H1: Environmental Management Accounting has a positive effect on Sustainability Performance.

2.6 Environmental Management Accounting (EMA) on Strategic resilience.

Environmental Management Accounting (EMA) is a system that gives information on the effects of the environment and costs in an organization. In addition to its classical use as a reporting tool, EMA can be used as a strategy tool that contributes to sustainability-related decision-making (Swalih et al., 2024). EMA provides organizations with a more effective way to detect risks and opportunities related to sustainability issues by providing relevant and ordered environmental information (Hasan et al., 2024).

Applying the dynamic capabilities lens, it is possible to locate EMA at the sensing dimension, which indicates how an organization is able to perceive and detect changes in the external environment. Sensing is however not enough to create strategic value. Organizations should also learn to absorb, extract, and process this information into adaptation and progressive action. In this respect, EMA leads to the building of strategic resilience through the capacity of the organization to be able to constantly reconfigure its resources and strategies in reaction to environmental uncertainty.

Moreover, the information generated by EMA enhances the organizational sensemaking process, whereby environmental information is not passively gathered but proactively construed and aligned with the strategic goals (Hasan et al., 2024). The process will help organizations prioritize sustainability efforts, analyze alternative courses of action, and distribute resources more efficiently (Nguyen & Huynh, 2025). Consequently, EMA can enhance the quality of information, as well as promote the evolution of adaptive capabilities that are fundamental to the creation of strategic resilience (Swalih et al., 2024).

Empirical research proposes that companies with environmental accounting practices are more likely to be flexible and responsive in their approach to sustainability issues by innovating, making operational changes, and transforming their strategy (Hasan et al., 2024; Soewarno et al., 2022; Swalih et al., 2024). This implies that the availability of organized environmental data is very fundamental in enhancing the resilience capacity of an organization. Based on this, hypothesis is as follows:
H2: Environmental Management Accounting has a positive effect on Strategic resilience.

2.7 Strategic resilience on Sustainability Performance.

Strategic resilience (SR) is the ability of an organization to absorb and adapt to changing environmental conditions and constantly change its strategies and operations as a result of uncertainty (Appannan et al., 2023). As compared to a reactive posture, strategic resilience is a dynamic capability that allows organizations to maintain and rejuvenate their strategic direction in due course. SR, in relation to sustainability, is the capability of the organization to incorporate environmental, social, and economic concerns into current operational and strategic activities (Ortiz-Avram et al., 2024).

In the lens of dynamic capabilities, organizational performance is very reliant on the competence to incorporate, develop and re-pattern internal and external resources in

reaction to environmental fluctuations (Alkaraan et al., 2024). In this respect, strategic resilience has a leading position as it allows organizations to not only identify challenges related to sustainability, but also to adjust and change their processes. It guarantees the sustainability efforts are not limited to the strategic planning but is constantly adjusted and put into practice.

Moreover, strategic resilience enables successful implementation of sustainability strategies through the facilitation of adaptive resource management, consistent innovation, and alignment with changing stakeholder expectations. Strategic resilience has been found to place organizations in a better position to become operational stable, at the same time working towards long-term sustainability objectives. Such adaptive ability enables firms to react to environmental pressures in a more organized and futuristic way, which eventually results in enhanced sustainability performance.

Empirical data indicates that stronger adaptive and transformative capabilities are associated with greater sustainability performance rates in organizations because such organizations are more likely to be more adaptive to environmental needs and maintain these processes over time (Alkaraan et al., 2024; Appannan et al., 2023; Bari et al., 2022; Ortiz-Avram et al., 2024). Hence, strategic resilience may be regarded as a significant contributor to the sustainability results. Based on this, hypothesis is as follows:
H3: Strategic resilience has a positive effect on Sustainability Performance.

2.8 Environmental Management Accounting (EMA) on sustainability performance through Strategic resilience

Even though EMA offers useful data on the environmental issues and relative costs, the contribution to the SP cannot be presupposed to be direct and automatic. Previous literature has indicated that availability of information does not automatically translate to performance improvement because its usefulness is determined by the way the information is interpreted, integrated and utilized in the organizational processes. This means that there are underlying mechanisms through which the relationship between EMA and sustainability performance exists.

In the dynamic capabilities approach, the relationship between information systems and organizational performance is indirect in nature and requires how well the organization can convert information into strategic action. Here, EMA has a role to play in the sensing role by the creation of structured environmental data. But to achieve the sustainability outcomes, greater order capabilities are needed, which can translate this information into actionable strategies in organizations. Strategic resilience is one such capability because it shows the ability of the organization to keep changing and realigning its strategies as the environment changes.

The information produced by EMA without adequate strategic toughness cannot easily be converted into significant sustainability results. On the other hand, organizations that have a high level of resilience are at a better position to use environmental information to facilitate adaptive decision making and long-term strategic change. Thus, strategic resilience is not only an intervening variable but also a vital process that acts as a bridge between the availability of information and the actual performance.

Empirical research has demonstrated that process and capability-related variables, including the adaptability of the organization, strategic alignment, and the quality of decisions are mediating variables in the relationship between managerial information systems and organizational performance (Appannan et al., 2023; Hasan et al., 2024; Zhen & Rahman, 2024). This fact supports the thesis statement that the mediating effect of

organizational capabilities between EMA and sustainability performance should be understood. Based on this, hypothesis is as follows:
H4: Strategic resilience mediate the relationship between Environmental Management Accounting dan Sustainability Performance.

3. Methods

3.1 Research Design

This research employs a quantitative research design using primary data collected through a structured survey method. The quantitative approach was selected to enable statistical analysis of the relationships between environmental management accounting (EMA), organizational resilience (SR), and sustainability performance (SP) in small and medium enterprises (SMEs). This approach allows for objective measurement and testing of hypotheses regarding the causal relationships among the research variables.

3.2 Population and Sample

This study focuses on Small and Medium Enterprises (SMEs), as these entities play a significant role in economic development and sustainability practices, particularly in developing countries. SMEs often face resource constraints and environmental challenges, making them an appropriate context to examine the role of environmental EMA in enhancing SP through SR. The unit of analysis in this study is the organization, where each SME represents a single unit of analysis. The respondents consist of SME owners, managers, or individuals in charge of operational and strategic decision-making, as they possess relevant knowledge regarding environmental practices, resilience strategies, and sustainability performance.

The sampling technique used in this study is purposive sampling, targeting SMEs that have implemented or are aware of environmental management practices. Since the exact population size of SMEs is unknown, the sample size in this study was determined using the Lemeshow formula for an unknown population. With a confidence level of 95% ($Z = 1.96$), a proportion of 0.5, and a margin of error of 10%, the minimum required sample size was calculated to be approximately 100 respondents. To ensure sufficient data, the questionnaire was distributed online, resulting in a sample size exceeding the minimum requirement of 126 respondents.

3.3 Data Collection Techniques

Data were collected using a structured questionnaire distributed online to SME owners, managers, and decision-makers. The questionnaire was designed to measure three main constructs: environmental management accounting (EMA), organizational resilience (SR), and sustainability performance (SP). All items are measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The measurement items were adapted from prior validated studies and adjusted to fit the SME context.

Before the main data collection was conducted, the questionnaire was pre-tested (pilot test) to ensure clarity, validity, and reliability of the measurement items. The pilot test was administered to a small group of respondents to identify potential ambiguities, confusing wording, or technical issues. Feedback from the pilot test was used to refine the questionnaire before full-scale distribution.

3.4 Operational Definitions of Research Variables

Table 1. Operational Definitions and Measurements of Research Variables

Variable	Definition	Measurement	Scale
Environmental Management Accounting (EMA)	The identification, measurement, analysis, and reporting of environmental costs and performance information to support decision-making within the organization	Five-point Likert scale (1-5) measuring awareness and implementation of environmental accounting practices	Likert
Sustainability Performance (SP)	The organization's ability to achieve economic, environmental, and social goals while maintaining long-term viability	Five-point Likert scale (1-5) measuring economic, environmental, and social performance indicators	Likert
Organizational Resilience (SR)	The capacity of an organization to anticipate, prepare for, respond to, and adapt to incremental changes and sudden disruptions in order to survive and prosper	Five-point Likert scale (1-5) measuring adaptive capacity, flexibility, and recovery capability	Likert

Source: Various sources for this research (2025)

3.5 Data Analysis Techniques

Data analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS software. This method was selected due to its suitability for predictive analysis and its ability to handle complex models with relatively small sample sizes (Hair Jr et al., 2021). Additionally, PLS-SEM does not require strict assumptions of normal data distribution, making it appropriate for social science research where data may not follow normal distribution patterns.

Hypothesis testing was performed using t-statistics and p-values to examine both direct and indirect relationships among variables, including the mediating role of SR. A bootstrap resampling procedure with 5,000 subsamples was used to generate standard errors and t-statistics. Hypotheses were accepted if the t-statistic exceeded 1.96 ($p < 0.05$) for a 95% confidence level.

The structural equation model can be expressed as follows:

$$SP = \alpha + \beta_1 EMA + \beta_2 SR + \varepsilon$$

Where:

SP = Sustainability Performance
α = Constant
β_1, β_2 = Path coefficients

EMA = Environmental Management Accounting
SR = Organizational Resilience
ε = Error term

The mediating effect of SR on the relationship between EMA and SP was examined using the indirect effect calculation and significance testing through bootstrapping. All statistical analyses were conducted at a significance level of α = 0.05 (95% confidence level).

4. Results and Discussion

Table 2. Demographic Respondents

Characteristic	Description	Number	Percentage (%)
SMEs	Trade	95	75
	Service	23	18
	Manufacturing	8	6
	Total	126	100
Length of time the UKM has been operating	< 5 years	55	44
	5 - 10 years	55	44
	10 – 15 years	10	8
	>15 years	6	5
	Total	126	100
Location	Kalimantan	20	16
	Sumatra	15	12
	Java	78	62
	Nusa Tenggara Timur	4	3
	Maluku Utara	7	6
	Sulawesi Selatan	1	1
	Papua Barat	1	1
	Total	126	100
Sales Results/Year	< 300 Million	92	73
	300Juta – 2 Billion	31	25
	2– 15 Billion	2	2
	15– 50 Billion	1	1
	Total	126	100
Gender	Man	41	33
	Woman	85	67
	Total	126	100
Age	20 – 35 years	84	67
	36 - 50 years	34	27
	>50 years	8	6
	Total	126	100
Last education	Senior High School	57	45
	Bachelor	60	48
	Master's degree	9	7
	Total	126	100
Working Period at SMEs	< 1 years	10	8
	2- 5 years	55	44
	>5 years	61	48

Characteristic	Description	Number	Percentage (%)
	Total	126	100
Positions in SMEs	SMEs owners	112	89
	Management	14	11
	Total	126	100

According to Table 1, among the total 126 respondents, most of the SMEs are involved in the trade sector (75%), less than 10 years of business experience (88%), which are dominated by micro businesses with an annual turnover of below IDR 300 million (73%). The distribution of respondents is also rather wide with the highest concentration in West Java (27%), Jakarta, and East Kalimantan (10% each) which are also rather representative of the geographical scope in the national context.

The respondents were mostly female (67%), and aged (20-35 years 67%) with most having a bachelor's degree (48%), high school education (45%). The data acquired reflects the opinions of the decision-makers of the business development as most of them have been operating in their business over 5 years (48%) and are SME owners (89%).

Table 3. Statistic Descriptive

	N	Minimum	Maximum	Mean	Std. Deviation
EMA	126	1.20	5.00	4.4579	.60443
SP	126	1.10	5.00	4.5357	.57012
SR	126	1.60	5.00	4.4810	.58906
Valid N (listwise)	126				

Source: spss.v.31 Output (2026)

Table 2 presents the descriptive statistics of the main variables, namely Environmental Management Accounting (EMA), Sustainability Performance (SP), and Strategic Resilience (SR), based on 126 observations. Overall, the mean values of all variables are relatively high, indicating a strong positive perception among respondents. Among the three variables, SP exhibits the highest mean (4.5357), followed by SR (4.4810) and EMA (4.4579), suggesting that sustainability performance is perceived as the most prominent aspect among SMEs.

The minimum and maximum values for all variables span from low to high points on the Likert scale (EMA: 1.20–5.00; SP: 1.10–5.00; SR: 1.60–5.00), indicating that while most responses are concentrated at higher levels, some variability in perceptions still exists. However, the relatively low standard deviation values (EMA: 0.60443; SP: 0.57012; SR: 0.58906) suggest that the responses are fairly homogeneous, reflecting consistent perceptions across respondents. Overall, these findings indicate that SMEs demonstrate a high level of engagement in environmental management accounting practices, strong sustainability performance, and solid strategic resilience, with a stable and consistent pattern of responses.

Table 4. Outer Loading Test Results

Item	Indicator	Loading
Environmental Management Accounting (AVE = 0.700: CR = 0.972: CA = 0.969)		
EMA1	Environmental cost calculation	0.688
EMA2	Environmental cost integration	0.680
EMA3	Environmental cost recording	0.801
EMA4	Compliance with environmental regulations	0.868

Item	Indicator	Loading
EMA5	Monitoring the implementation of environmental regulations	0.839
EMA6	Environmental management policy	0.901
EMA7	Employee awareness of the environment	0.804
EMA8	Environmental safety standards compliance	0.884
EMA9	Work environment safety procedures	0.881
EMA10	Commitment to environmental programs	0.901
EMA11	Management support for the environment	0.831
EMA12	Leadership involvement in environmental decisions	0.852
EMA13	Concern for environmentally friendly customers	0.878
EMA14	Customer satisfaction through environmentally friendly products	0.854
EMA15	Added value through sustainable products	0.852
Strategic Resilience (AVE = 0.730: CR = 0.931: CA = 0.906)		
SR1	Core activity focus	0.852
SR2	Rapid change responsiveness	0.732
SR3	Strong future strategy	0.879
SR4	Market position awareness	0.908
SR5	Strategy–operations alignment	0.889
Sustainability Performance (AVE = 0.730: CR = 0.953: CA = 0.953)		
SP1	Reduction of business waste	0.821
SP2	Use of environmentally friendly materials	0.836
SP3	Energy efficiency	0.792
SP4	Fair treatment of employees	0.890
SP5	Support for community social activities	0.850
SP6	Safe and comfortable working environment	0.873
SP7	Long-term business stability	0.819
SP8	Sustainable profits	0.913
SP9	Efficient management of costs and revenues	0.885

Note* CA= convergent validity, AVE= Average Variance Extracted, CR=Composite Reability

Source: PLS Output (2026)

All indicators show outer loadings above 0.5, as shown in Table 3, indicating that they have met the general criteria for convergent validity (Hair et al., 2017). In addition, the Average Variance Extracted (AVE) value for all constructs is greater than 0.5, confirming that each construct has adequate convergent validity.

Table 5. Structural Model Assessment Result

Direct Relationship Code		T statistics	F Square	Conclusion
Direct effect				
Environmental Management Accounting -> Sustainability Performance	H1	5,236*	0,396	Supported
Environmental Management Accounting -> Strategic Resilience	H2	25,759*	2,990	Supported
Strategic Resilience -> Sustainability Performance	H3	4,897*	0,322	Supported
Indirect effect				

Environmental Management Accounting -> Strategic Resilience -> Sustainability Performance	H4	4,911*	Partial Mediation
SRMR		0.068	
R Square		SP: 0,872 SR: 0,749	

Note* *= Supported, Environmental Management Accounting (EMA), Entrepreneurial Orientation (EO), Sustainability Performance (SP), SRMR= Standardized Root Mean Square Residual.

Source: PLS Output (2026)

According to the findings of the analysis in Table 4, the empirical test of the research hypotheses (H1–H4) is positive. Environmental Management Accounting (EMA) positively and significantly influences sustainable performance (SP) as well as the Strategic Resilience (SR). Moreover, the positive and significant impact that SR produced on SP was also established T = 4.897; p = 0.000). According to the indirect effect test, the relationship between EMA and SP is partially mediated by (T = 4.911; p = 0.000), thus revealing that the impact of EMA on sustainable performance is both direct and indirect (via higher implementation of SR).

Considering the model quality, the R-square value of SP (0.872) indicates that EMA and SR jointly explain 87.2% of the variance in sustainability performance, while the R-square value of SR (0.749) shows that EMA explains 74.9% of the variance in strategic resilience. In addition, the Standardized Root Mean Square Residual (SRMR) value of 0.068 is lower than the value of 0.08 (Hair et al., 2014), thus, it may be concluded that the research model is well suited and has a high explanatory power.

Table 6. Prediction Results

	Q²predict	PLS-SEM_RMSE	PLS-SEM_MAE	LM_RMSE	LM_MAE
SR1	0.668	0.378	0.260	0.419	0.256
SR2	0.304	0.629	0.409	0.735	0.477
SR3	0.588	0.405	0.277	0.449	0.290
SR4	0.533	0.489	0.297	0.514	0.337
SR5	0.560	0.475	0.298	0.527	0.329
SP1	0.639	0.387	0.264	0.433	0.267
SP2	0.636	0.425	0.273	0.508	0.310
SP3	0.525	0.507	0.342	0.592	0.401
SP4	0.537	0.444	0.291	0.437	0.296
SP5	0.515	0.465	0.304	0.513	0.331
SP6	0.536	0.438	0.293	0.425	0.278
SP7	0.450	0.563	0.343	0.579	0.381
SP8	0.610	0.401	0.261	0.426	0.292
SP9	0.603	0.368	0.247	0.400	0.275

Source: PLS Output (2026)

In order to evaluate the predictive strength of the PLS-SEM model applied in this research, Q^2 predict and PLSpredict tests were conducted. The results in Table 5 show that all indicators of Strategic Resilience (SR) and Sustainability Performance (SP) have Q^2 predict values within the range of $0 < Q^2 < 1$, indicating that all indicators possess adequate predictive relevance (Hair et al., 2017; Shmueli et al., 2019). Among the SR

indicators, SR1 (0.668), SR3 (0.588), and SR5 (0.560) exhibit the highest Q^2 predict values, reflecting strong predictive capability. Meanwhile, for the SP variable, SP1 (0.639), SP2 (0.636), and SP8 (0.610) demonstrate the highest predictive relevance compared to other indicators.

Furthermore, based on the comparison between the predictive performance of the PLS-SEM model and the linear model (LM), most indicators show lower RMSE and MAE values in the PLS-SEM model than in the LM. This indicates that the PLS-SEM model generally provides more accurate predictions compared to the linear model. Although a few indicators (e.g., SR1, SP4, and SP6 in MAE values) show slightly similar or marginally higher error values compared to LM, the overall results suggest that the majority of indicators achieve better predictive accuracy under PLS-SEM. Referring to the predictive assessment guidelines proposed by (Shmueli et al., 2019), these findings indicate that the PLS-SEM model in this study demonstrates moderate to high predictive power, as it is capable of producing more accurate predictions than the benchmark linear model for most indicators.

The aim of this paper is to examine the connection between EMA and SP, with SR being put in the middle of this association (Appannan et al., 2023; Swalih et al., 2024). The results show that all hypotheses suggested are empirically valid, providing a more sophisticated insight into the role of environmental accounting systems in sustainability performance (Appannan et al., 2023; Swalih et al., 2024).

To begin with, the findings indicate that EMA positively impacts sustainability performance (Appannan et al., 2023; Hasan et al., 2024; Soewarno et al., 2022; Zhen & Rahman, 2024). This observation indicates that EMA is not confined to its conventional purpose as an administrative reporting instrument and could help to improve sustainability outcomes (Zhen & Rahman, 2024). In terms of dynamic capabilities, the EMA can be viewed as the element of the sensing process, which helps the organizations to obtain and organize the environmental information that helps to identify the opportunities and risks associated with sustainability (Hasan et al., 2024). Nevertheless, even with this direct effect, the results do not mean that the availability of information automatically results in better performance. Instead, they emphasize that the success of EMA is dependent on the processing and use of such information in the organization (Latifah & Soewarno, 2023; Swalih et al., 2024).

Second, the results indicate that EMA has a positive impact on strategic resilience (Hasan et al., 2024). This implies that the accessibility of the structured environmental information will improve the ability of the organization to absorb, interpret and adapt to the changes in the environment. Under the dynamic capabilities framework, EMA enhances the sensing role that consequently facilitates the development of higher-order capabilities related to resilience. Therefore, EMA does not just give information, it also helps in developing the organizational strength that is necessary to keep reorienting the strategies with the ever-changing challenges of sustainability.

Third, the findings indicate that strategic resilience affects sustainability performance in a positive way significantly. This observation underscores the fact that sustainability outcomes are not only based on the availability of information but also the capacity of the organization to change and evolve its strategies as time goes by. Strategic resilience helps organizations to consider the environment in the scope of current operations so that the sustainability initiatives are not just a part of the plan but they are also applied and developed. This meaning of resilience is the power of transformation that alters possible information into actual performance results.

Moreover, the results affirm the mediation of strategic resilience in the association amid EMA and sustainability performance. It implies that EMA effect on sustainability performance is indirect-process based. The efficiency of EMA relies on the ability of the organization to exploit the environmental information by using adaptive and transformative capabilities. These findings give empirical evidence to the argument that the association between environmental accounting systems and sustainability performance is more complicated than thought before. Significantly, these results defy the prevailing linear and deterministic supposition in the previous literature that environmental information necessarily results in enhanced performance. Rather, this paper shows that the transfer of information into performance needs internal organizational resources, especially strategic resilience. Thus, the usefulness of EMA does not consist solely in the provision of information but its application as a part of the active organizational processes.

This information is especially applicable to small and medium-sized enterprises (SMEs) where the inadequacy of resources and the lack of managerial capacity frequently disrupt the efficient use of environmental information. The existence of EMA in these environments is not enough to promote sustainability performance. Instead, it is the capability of creating and utilizing strategic resilience that emerges as a decisive factor in information conversion into practical strategies. This points out that in a resource-constrained environment, organizational capabilities are key in generating sustainability results. Generally, this study gives a more in-depth insight into how EMA can be used to achieve sustainability performance. It moves the emphasis of the pure information-based perspective to that of capability-based perspective where the use of environmental accounting systems is determined by the capacity of the organization to internalize, alter and convert the information into long-term strategic action.

5. Conclusion

This paper analyses how EMA can help enhance Sustainability Performance (SP) of SMEs, and the intermediary importance of SR in this context. The results indicate that EMA has a positive and significant direct impact on sustainability performance and strategic resilience. In addition, strategic resilience also contributes greatly to sustainability performance. Mediation analysis proves that SR partially mediates the relationship between EMA and SP, which means that EMA has a direct and indirect effect on sustainability performance by enhancing organizational resilience.

The findings provide evidence that EMA can be a significant managerial instrument to be used by SMEs to address sustainability challenges. Nevertheless, the findings also suggest that the introduction of EMA is not enough to complete the sustainability performance without the assistance of organizational capabilities like strategic resilience. Strategic resilience in this case is an important factor that helps SMEs to adapt, respond and convert environmental information into sustainable business practices. In this way, EMA can be better converted into long-term sustainability outcomes.

The research adds to the literature by providing the mechanism by which EMA promotes sustainability performance through strategic resilience as an organizational capability. It complements the knowledge on the interaction between internal managerial systems and adaptive capabilities to enhance sustainability performance, especially when dealing with SMEs in emerging economies. Although it was contributed to in this manner, there are a number of limitations in this study. To begin with, the cross-sectional research design restricts the possibility of dynamic changes with time. Second, the use of self-

reported survey data can cause possible response bias. Third, the research concentration on SMEs in a particular context can be a limitation to the generalizability of the results in other areas or industries. This research, moreover, takes into account only one mediating variable, which is unlikely to be the full complexity of the organizational processes affecting the sustainability performance.

It is suggested that future studies consider longitudinal designs that would help to appreciate the dynamism between EMA, strategic resilience, and sustainability performance. It is also recommended to use objective or secondary data in order to enhance the strength of findings. Moreover, future research can use more mediating or moderating factors, including green innovation capability, digital capability, or institutional pressure, to offer a better explanation of sustainability performance in SMEs. The external validity of the model would also be improved by extending the scope of the research to other industries as well as regions.

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