

Determinant Material Flow Cost Accounting (MFCA) in Maximizing Sustainability Performance

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Abstract

Information System (IS), Business Strategy (BS), and Business Process (BP) on Sustainability Performance (SPf), with Material Flow Cost Accounting (MFCA) as a mediating variable in the hospitality industry in West Java. The study used a quantitative approach with an explanatory design. There were 215 respondents, consisting of managers and owners of star-rated and non-star-rated hotels in 27 districts/cities. Data analysis was performed using Structural Equation Modeling (SEM-AMOS), based on Legitimacy Theory and Stakeholder Theory. The results show that EMA ($p = 0.007$), IS ($p = 0.004$), BS ($p = 0.002$), and BP ($p = 0.001$) have a significant effect on the implementation of MFCA, with BP as the dominant factor ($R^2=0.516$). However, only EMA ($p = 0.007$) and BS ($p=0.042$) had a significant direct effect on SPf, while IS ($p=0.061$) and BP ($p = 0.901$) had no effect. MFCA itself proved to be significant ($p = 0.001$) in increasing SPf, as well as mediating the influence of EMA, IS, BS, and BP. The strongest mediating effect occurred in BP, which initially had no direct effect but became significant through MFCA. This shows that efficient business processes only have an impact on sustainability when managed through MFCA. In IS, the impact on SPf is also significant when data is used in MFCA to identify waste. Meanwhile, EMA and BS have partial mediating effects. Overall, MFCA effectively improves material efficiency, reduces hidden waste, and strengthens economic, social, and environmental sustainability performance. These findings support the importance of integrating sustainability principles through EMA, IS, strategy, and business processes with MFCA as the main link.

Keywords: *Environmental Management Accounting, Information System, Business Strategy, Business Process, MFCA, Sustainability Performance.*

INTRODUCTION

The world today faces an increasingly complex and urgent environmental crisis. Climate change triggered by greenhouse gas emissions, air and water pollution, and industrial waste accumulation has had a serious impact on human health and the sustainability of global ecosystems (Werastuti et al., 2023). According to reports by the

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IPCC (2021) and the World Meteorological Organization (2020), the frequency of disasters caused by extreme weather has increased significantly in the last two decades. This phenomenon has prompted various industrial sectors, including hospitality, to adopt more sustainable practices in response to environmental and social demands. In the context of the hospitality industry, environmental challenges have become increasingly crucial. Hotel operations generate significant liquid and solid waste and gas emissions, mainly due to energy and water consumption and the use of chemicals. Many hotels, especially in developing countries, have not yet implemented adequate waste management systems. This risks causing environmental pollution that has a long-term impact on public health and the carrying capacity of the surrounding environment (Khan et al., 2020).

To address these challenges, the Environmental Management Accounting (EMA) approach is essential. EMA enables the integration of environmental aspects into internal accounting management systems, promotes resource efficiency, and facilitates more environmentally friendly decision-making (Nyide, 2019). In practice, EMA can be used to measure hidden costs related to pollution or inefficiency, as well as a basis for planning sustainability-oriented business strategies (Janković & Krivačić, 2014). However, EMA cannot stand alone. Its implementation requires the support of a reliable information system (IS). Information systems play a role in collecting, managing, and presenting environmental data in real-time, enabling companies to respond to operational dynamics more quickly and accurately. In a recent study, the integration of technologies such as the Internet of Things (IoT) and big data analytics with EMA has been shown to improve reporting accuracy and effectiveness in identifying waste (Saputra et al., 2024).

Business strategy also plays an important role in driving sustainability performance (Wijethilake et al., 2023). Environmentally friendly strategies encourage green innovation, process efficiency, and the development of long-term competitive advantages (Abdelfattah et al., 2024). However, in practice, not all sustainable strategies have a direct impact on a company's sustainability performance. Several studies show that without adequate control systems and the internalization of a culture of sustainability, these strategies become ineffective (Golinska-Dawson et al., 2024; Jukka, 2023). Another crucial aspect is Business Processes (BP). Efficient business processes can be the foundation for sustainability success (Eikebrokk et al., 2024; Prajapati et al., 2024). Efficiency alone is not enough; managerial tools are needed to transform process efficiency into measurable and documented sustainability performance. This is where Material Flow Cost Accounting (MFCA) comes in as a strategic mediating variable. MFCA is a managerial accounting method that focuses on the flow of materials and energy in operational processes, with the aim of identifying waste and optimizing resource utilization (Putri et al., 2024). MFCA provides physical and monetary quantitative data, which is highly relevant in measuring operational

efficiency and supporting transparent sustainability reporting (Dierkes & Siepelmeyer, 2019; Usul & Olgun, 2025).

In Indonesia, sustainability issues remain a challenge. Data from the Ministry of Environment and Forestry and the Environmental Agency show that more than 50% of rivers in Indonesia do not meet water quality standards. Major cities such as Jakarta and Bandung face a heavy environmental burden due to urbanization, population growth, and uncontrolled industrialization. Particularly in West Java Province, as the province with the largest population in Indonesia, the pressure on natural resources is very high. The Citarum River, a vital water source, has been heavily polluted by domestic and industrial waste. Urbanization has also led to an increase in the number of hotels and accommodation facilities, which, if not managed sustainably, will exacerbate the existing environmental crisis. Statistics from the West Java Central Statistics Agency (2021) show that there are more than 3,000 accommodation businesses in this province, consisting of 521 star-rated hotels and more than 2,500 non-star-rated hotels. The high level of activity in the hospitality sector has a direct impact on energy and water consumption and waste production (Li et al., 2024). However, many hotels have not yet adopted Green Hotel principles, either due to limited knowledge, costs, or low stakeholder participation. Green Hotel practices are the hospitality industry's response to sustainability demands. This concept not only covers energy efficiency and waste management, but also includes the use of local resources, guest education, and community involvement (Ferreira et al., 2023; Setiadi et al., 2025 ; Senoane & Mkhize, 2025). Certifications such as LEED, Green Globe, and ISO 14001 are important tools for legitimizing a commitment to environmentally friendly practices. However, studies show that many hotels engage in greenwashing, which is claiming environmentally friendly practices without any real evidence of implementation. Therefore, data-driven approaches such as MFCA are essential to avoid symbolic practices that have no impact.

In the last five years, there has been a positive decline in *sustainability* performance in West Java's hospitality industry. This can be seen in its achievements, which continued to increase for four consecutive years from 2015 to 2018, but collapsed within two years since the initial decline in 2019 and continued in 2020. This decline was drastic, falling by 79% (from 11.1 million) compared to the baseline in 2015. Despite an increase from 2021 to 2023, *Sustainability Performance* (SPf) is still far behind its peak, only reaching 68% (9.5 million) of the 2015 baseline. This phenomenon indicates a gap in the approaches adopted by companies to restore or maintain stable and sustainable SPf. One factor that may contribute to companies' inability to achieve full recovery is the lack of integration between *Environmental Management Accounting* (EMA), information systems (IS), business strategy (BS), and business processes (BP) in sustainability efforts mediated by *Material Flow Cost Accounting* (MFCA). This indicates a deep need to explore how a more integrated and strategic approach can help companies achieve

optimal sustainability performance and be more resilient to future performance fluctuations.

Several studies have found that EMA, information systems, business strategies, and MFCA have a positive effect on sustainable performance, but other studies show inconsistent effects across industries. This indicates an opportunity for research to examine the relationship between EMA, information systems, business strategies, business processes, and MFCA on sustainable performance in the context of green digital transformation and moderating factors such as technological readiness, organizational culture, and environmental policies. Environmental Management Accounting (EMA) is a strategic approach that integrates environmental issues into managerial accounting. Several studies confirm the positive impact of EMA, such as the research by Hourneaux et al. (2018), which shows its contribution to cost efficiency, waste management, and corporate reputation. Similar findings in the hospitality, SME, and agriculture sectors show increased productivity through energy efficiency (Hermundsdottir & Aspelund, 2022; Kukreti & Ganguly, 2024). However, other studies reveal different results. Fuzi et al. (2022) found that Sustainability Management Accounting indirectly improves performance without EMS as a mediator, while Rizky & Winarso (2025) assert that green accounting and carbon emissions disclosure do not significantly affect company value.

Information systems (IS) also show varied results. Studies (Purnamasari & Umiyati, 2024; Jutidharabongse et al. (2024) emphasize the role of IS in reporting accuracy, efficiency, and transparency, especially during the pandemic. Djalic et al. (2021) add that IS supports environmental compliance and competitiveness. However, (Park & Yoon, 2022) found that IS does not automatically improve performance without supportive governance and organizational culture. In the hospitality sector, similar results emerged, where Rahman et al. (2024); Truong & Le (2020) confirmed that infrastructure constraints and low environmental awareness limit the effectiveness of IS. Business strategy also plays an important role. Arsawan et al. (2025) and Baquero (2024) prove that green innovation and local value strategies support sustainability. However, Wijethilake et al. (2023); Mulet-Forteza et al. (2024) highlight that proactive or hotel expansion strategies are not always successful without control systems and contextual suitability. On the Business Processes side, studies by Klessascheck et al. (2024) and Gonzalez Moyano et al. (2024) emphasize the importance of sustainable redesign. MFCA has been proven to consistently support cost efficiency and waste reduction, although its effectiveness remains dependent on optimal implementation (Weyand et al., 2021; Zhou et al., 2017).

This research has a strong element of *novelty* by applying the Material Flow Cost Accounting (MFCA) approach in a relatively unexplored context, namely the hospitality industry in West Java Province, Indonesia. MFCA is a method in *Environmental Management Accounting* (EMA) that has been proven effective in identifying material and energy inefficiencies, as well as in improving operational efficiency

and sustainability in the manufacturing sector. However, its application in the service sector, particularly hospitality, is still very limited. Although there have been several previous studies examining sustainability or energy efficiency in hotels, most of these studies use conventional approaches such as energy audits, general environmental cost analysis, or green marketing approaches. Most of the research has been conducted in the manufacturing sector. To date, there has been no study that explicitly integrates the MFCA framework into hotel management accounting systems to identify and manage material and energy flows in a measurable and strategic manner. Based on the above description, the purpose of this study is to analyze the influence of Environmental Management Accounting (EMA), Information System (IS), Business Strategy (BS), and Business Process (BP) on Sustainability Performance (SPf), with Material Flow Cost Accounting (MFCA) as a mediating variable in the hospitality industry in West Java.

LITERATURE REVIEW

Legitimacy Theory and Stakeholder Theory

This study combines Legitimacy Theory and Stakeholder Theory as a conceptual basis for understanding the role of Material Flow Cost Accounting (MFCA) in improving *Sustainability Performance* (SPf) in the hospitality sector. Both theories agree that organizations cannot be separated from their environment. Legitimacy Theory emphasizes the importance of a "social license to operate," in which MFCA serves as proof of accountability by providing quantitative data related to material, energy, and waste flows (Chi et al., 2023; Krell et al., 2016). This data supports transparency through sustainability reporting based on global standards such as GRI, thereby strengthening moral, pragmatic, and cognitive legitimacy. Organizations that are able to demonstrate environmental accountability find it easier to gain acceptance from the public, investors, and regulators. Meanwhile, Stakeholder Theory emphasizes the active involvement of stakeholders, such as customers, employees, suppliers, and regulators, in promoting the implementation of MFCA (Gamble et al., 2021; Harini et al., 2018; Mahajan et al., 2023).

The success of implementation is determined by dialogue, transparency, and collaboration with stakeholders. MFCA not only serves as an internal management tool but also as a means of building trust through the disclosure of energy use and production waste. This provides direct value to internal stakeholders through cost efficiency, while strengthening external support. However, challenges arise when stakeholder expectations cannot be fully met, which risks affecting the company's reputation. Thus, MFCA serves as a bridge that unites the legitimate demand for accountability with stakeholders' need for efficiency. Its implementation provides concrete data that strengthens transparency, supports decision-making, and mediates external and internal relationships in an effort to improve sustainability performance.

Environmental Management Accounting

Environmental Management Accounting (EMA) is a framework that integrates environmental information into management accounting systems. Its main purpose is to identify the environmental costs of each activity, distinguish them from non-environmental costs, and present more accurate data for managerial analysis (Liem & Hien, 2024; Islam et al., 2015). The Environmental Accounting Guidelines (2002) emphasize its role in supporting sustainable development through efficient environmental management while maintaining harmonious relations with the community. Environmental accounting procedures help companies track conservation costs, assess the benefits of activities, provide objective quantitative measures, and facilitate transparent communication of results (Gerged et al., 2024).

According to the US Environmental Protection Agency (1995) in Tulve et al (2024), Environmental Accounting has a diverse scope: at the national level, it is related to natural resource accounting, while in financial accounting, it is related to the preparation of reports based on accounting standards for shareholders and stakeholders (Iversen et al., 2024). From a management perspective, Environmental Accounting is a tool for managers in strategic decision-making, including investment, cost setting, product design, performance evaluation, and future business planning (Varriale et al., 2024).

Information System

According to Wijayanti et al (2024), an information system is a set of interconnected components for collecting, processing, storing, and disseminating information to support organizational decision-making and oversight. Technically, this system functions as an integrated mechanism for managing information (Piccoli & Pigni, 2018). In addition, information systems play an important role for managers and employees in analyzing problems, simplifying complexity, and encouraging the creation of new products and innovations (Mwambe, 2024).

The information managed includes data about individuals, locations, and other important factors related to the organization and its environment (León-Romero et al., 2024). According to Alter (2013), information systems can be viewed as a specific form of work system, namely a mechanism in which humans or machines use resources to produce services or products (Hunter-Hüsselmann et al., 2023). Information systems focus on the activities of capturing, storing, manipulating, and presenting information (Shimels & Lessa, 2023). Thus, these systems connect data and activities, functioning as a medium of communication that represents social memory while supporting the decision-making process (Denis et al., 2024).

Business Strategy

Strategy is a key factor for the survival of companies in achieving their goals effectively and efficiently. Companies are required to be able to face challenges and obstacles that arise from both internal and

external environments (Lopes & Guerreiro, 2023). As a tool for achieving goals, the concept of strategy continues to evolve and has various definitions according to the perspectives of experts (Yusuf et al., 2024). In a business context, strategy is very important for realizing the vision and mission of an organization, as well as supporting the achievement of short-term and long-term targets (Jonsdottir et al., 2024).

According to Gangata et al (2024), strategy is a means to achieve long-term goals that can include geographic expansion, diversification, acquisitions, product development, market penetration, divestitures, and joint ventures. Strategy requires the involvement of top management and the allocation of significant resources (Cirone et al., 2023). Furthermore, business strategy serves as the basis for developing information technology strategy because it encompasses the organization's vision, mission, and performance targets (Handoyo et al., 2023). Business strategy is ultimately a series of integrated commitments and actions designed to create value for customers while gaining competitive advantage through the utilization of core competencies (Rehman et al., 2023).

Business Process

According to Gross et al (2020), a business process is a series of activities carried out by organizational units, either manually or automatically, which are described through a logical and chronological sequence in a process diagram. A business process can be defined as a collection of activities with one or more inputs that produce valuable outputs for customers (Zebec & Indihar Štemberger, 2024). Business process analysis enables organizations to be customer-oriented while paying attention to internal functions (Di Toma & Ghinoi, 2020).

Lara Machado et al (2023) emphasize that business processes include activities ranging from acquiring and producing to selling goods and services. This is supported by the flow of materials, information, and knowledge between participants (Wang et al., 2024). Sohail et al. (2023) divide business processes into two categories: core processes that are directly related to the creation of products or services for external customers, and support processes that facilitate the smooth running of main activities to meet internal needs. Thus, business processes are a fundamental element of an organization in achieving its goals, as they integrate a series of activities that collectively create value for both internal and external customers.

Sustainability Performance

Performance describes the level of achievement in implementing an activity, program, or policy in realizing the vision, mission, goals, and objectives of the organization as outlined in strategic planning (Kantabutra, 2024). This term is often understood as the achievement or level of success of individuals or groups in achieving predetermined targets (Salehe et al., 2024). Without goals, standards, or indicators of success, performance achievements are difficult to measure because

there are no clear benchmarks. To support the achievement of these goals, organizations are usually structured into work units with a division of tasks, systems, and mechanisms (Savari et al., 2024).

Performance is also understood as the ability of individuals or groups to carry out their responsibilities so as to produce the expected output (Wen et al., 2024). Thus, performance reflects the work results achieved in accordance with authority, responsibility, law, morals, and ethics, which serve as the basis for evaluating the success of an organization (Machingura & Muyavu, 2024).

Material Flow Cost Accounting (MFCA)

Material Flow Cost Accounting (MFCA) is a management tool that aims to support better environmental management, increase competitiveness, and encourage the application of modern manufacturing techniques (Nishimura et al., 2021). Through this approach, waste and emissions from each process can be measured and analyzed in the context of cost reduction (Christ & Burritt, 2016).

MFCA plays a role in highlighting material losses by identifying waste and material losses, both physical and monetary, which are then converted into positive and negative product costs (Yagi & Kokubu, 2019). The application of MFCA on production lines provides transparent information about problems in the factory, enabling companies to reduce waste while increasing material productivity (Weyand et al., 2021). Thus, MFCA becomes a management tool that links environmental aspects with economic interests (Malega et al., 2024). This system focuses on tracking material flows and related costs and is influenced by the concepts of residue, flow, and resource management accounting (Wagner, 2015).

Environmental Management Accounting (EMA) on Sustainability Performance

Environmental Management Accounting (EMA) is an accounting approach that incorporates environmental aspects into business decision-making. Its main objectives are to improve resource efficiency, reduce negative impacts on the environment, and support the achievement of sustainability performance (Malega et al., 2024). Meanwhile, Sustainability Performance (SPf) measures an organization's ability to maintain environmentally, socially, and economically sustainable practices, including contributions to society and long-term economic sustainability (Oppon et al., 2024).

EMA plays an important role in improving SPf because it encourages the adoption of sustainable strategies, reduces ecological impacts, and improves overall performance (Scarpellini et al., 2020; Phan et al., 2018). Based on Legitimacy Theory, organizations seek social acceptance by demonstrating concern for environmental issues. The implementation of EMA supports transparency and accountability in environmental management, thereby strengthening positive image and increasing stakeholder trust. Ultimately, this contributes to improving the organization's sustainability performance.

H1: *Environmental Management Accounting* has a significant effect on *Sustainability Performance*

Information System on Sustainability Performance

An Information System is a series of integrated components, including people, procedures, software, hardware, and data, that work together to collect, store, process, and distribute information relevant to the organization (Chen & Laokhongthavorn, 2024). This system functions in data management, supports decision-making processes, monitors performance, and optimizes business activities (Kantabutra, 2024).

Sustainability Performance (SPf) measures an organization's ability to maintain sustainable business practices that are environmentally, socially, and economically friendly (Vidè et al., 2024; Fiorillo & Santilli, 2024). This includes efforts to reduce negative environmental impacts, contribute to society, and ensure long-term economic sustainability (Rojas-Ospina et al., 2024). The relationship between IS and SPf can be seen in the role of effective information systems in improving data collection and analysis to measure and improve sustainability (Ferradás-González et al., 2024). Based on Stakeholder Theory, a reliable IS helps organizations meet stakeholder information needs, strengthen transparency, and increase responsiveness to external pressures.

H2: *Information Systems* have a significant effect on *Sustainability Performance Business Strategy* on *Sustainability Performance*

Business Strategy on Sustainability Performance

Business Strategy is a plan and steps taken by an organization to achieve its long-term goals. Business strategy includes how organizations utilize resources, competitive advantages, and market opportunities to create value for stakeholders and achieve sustainable performance (Hervé Legenvre et al., 2014). *Sustainability Performance* is a measure of an organization's performance in maintaining environmentally, socially, and economically sustainable business practices (Marie et al., 2024). Sustainability performance includes an organization's efforts to reduce negative environmental impacts, contribute to society and the community, and ensure long-term economic sustainability (Chourasiya et al., 2024).

The relationship between *Business Strategy* and *Sustainability Performance* is that business strategies focused on sustainability principles can have a positive impact on an organization's sustainability performance (Kantabutra, 2024). Within the framework of Legitimacy Theory, sustainable business strategies reflect a company's adaptation to prevailing social and environmental norms. This strategy is designed not only to pursue profits but also to maintain long-term sustainability. Business strategies that integrate environmental and social principles tend to be more publicly accepted and support the acquisition of social legitimacy.

H3: *Business Strategy* has a significant effect on *Sustainability Performance* *Business Process* has a significant effect on *Sustainability Performance*

Business Process on Sustainability Performance

Business Processes are a series of steps or activities carried out by an organization to create, produce, or deliver products or services to customers (Rosado et al., 2024). Business processes include a structured sequence of tasks or activities to achieve organizational goals with high efficiency and quality (Rainer Löw, 2013). *Sustainability Performance* is a measure of an organization's performance in maintaining environmentally, socially, and economically sustainable business practices (Fiorillo & Santilli, 2024).

Sustainability performance encompasses an organization's efforts to reduce negative environmental impacts, contribute to society and the community, and ensure long-term economic sustainability (Oppon et al., 2024). The relationship between *Business Process* and *Sustainability Performance* is that efficient, innovative, and sustainable business processes can contribute positively to an organization's sustainability performance (Sohns et al., 2023). Stakeholder Theory explains that business processes designed with efficiency and environmental sustainability in mind can address the needs of both internal and external stakeholders. Sustainability-oriented business processes demonstrate the integration of environmental values into company operations.

H4: *Business Process* significantly affects *Sustainability Performance* *Environmental Management Accounting*

Environmental Management Accounting, Information System, Business Strategy, and Business Process on Material Flow Cost Accounting (MFCA)

Environmental Management Accounting (EMA) is an accounting approach that incorporates environmental aspects into business decision-making to improve resource efficiency, reduce negative impacts, and promote sustainability (Tweedie, 2024; Tseng et al., 2020). Material Flow Cost Accounting (MFCA) focuses on analyzing material flows and related costs to identify waste and improve efficiency (Kitada et al., 2022). EMA and MFCA are interrelated because both highlight environmental costs and material efficiency, where their integration supports waste reduction and improved sustainable performance (Latifah & Soewarno, 2023; Behnami et al., 2019).

Information systems play an important role in the implementation of MFCA by providing accurate data on material flows, thereby supporting cost analysis, waste reduction, and resource efficiency (Nishimura et al., 2021). Sustainability-oriented business strategies also strengthen MFCA implementation by focusing on waste reduction, raw material efficiency, and product life cycles (Tu & Huang, 2019; Werastuti et al., 2024). Additionally, efficient business processes facilitate the

identification of material flows and MFCA integration, ultimately helping organizations achieve sustainable environmental and economic performance (Trisnaningsih et al., 2024). Based on the above, the following hypothesis is formulated:

H5: Environmental Management Accounting has a significant effect on MFCA

H6: Information Systems significantly influence MFCA

H7: Business Strategy significantly influences MFCA

H8: Business of Process has a significant effect on MFCA

Material Flow Cost Accounting (MFCA) on Sustainability Performance

The relationship between *Material Flow Cost Accounting* (MFCA) and *Sustainability Performance* is that the implementation of MFCA can contribute to improving the sustainability performance of organizations (Mulyani et al., 2024). By using MFCA, organizations can identify and reduce material waste, optimize resource use, and identify sources of material-related costs (Dekamin & Barmaki, 2019). By gaining a better understanding of material flows and related costs, organizations can adopt more sustainable business practices, such as more efficient use of raw materials, waste reduction, and production process efficiency (Trisnaningsih et al., 2024). This can have a positive impact on the organization's environmental impact and encourage the creation of more sustainable social and economic value (Al-Dhaimesh & Al Zobi, 2019). Based on the above, the following hypothesis is formulated:

H9: *Material Flow Cost Accounting* has a significant effect on *Sustainability Performance*

Material Flow Cost Accounting (MFCA) as a Mediating Variable for Sustainability Performance

Material Flow Cost Accounting (MFCA) functions as a system that bridges managerial practices with the achievement of sustainability performance. In this context, MFCA is positioned as a mediating variable that has a strategic role in connecting various organizational factors with the end result of increased sustainability. Theories underpinning the role of MFCA support its function as an instrument for managing environmental resources and information, capable of efficiently integrating cost and material flow data. With this approach, MFCA enables inputs such as Environmental Management Accounting (EMA), Information Systems (IS), Business Strategy (BS), and Business Processes (BP) to contribute optimally to Sustainability Performance (SPf).

H10: MFCA mediates the effect of EMA on *Sustainability Performance* (SPf).

H11: MFCA mediates the influence of IS on *Sustainability Performance* (SPf).

H12: MFCA mediates the influence of BS on *Sustainability Performance* (SPf).

H13: MFCA mediates the influence of BP on *Sustainability Performance* (SPf)

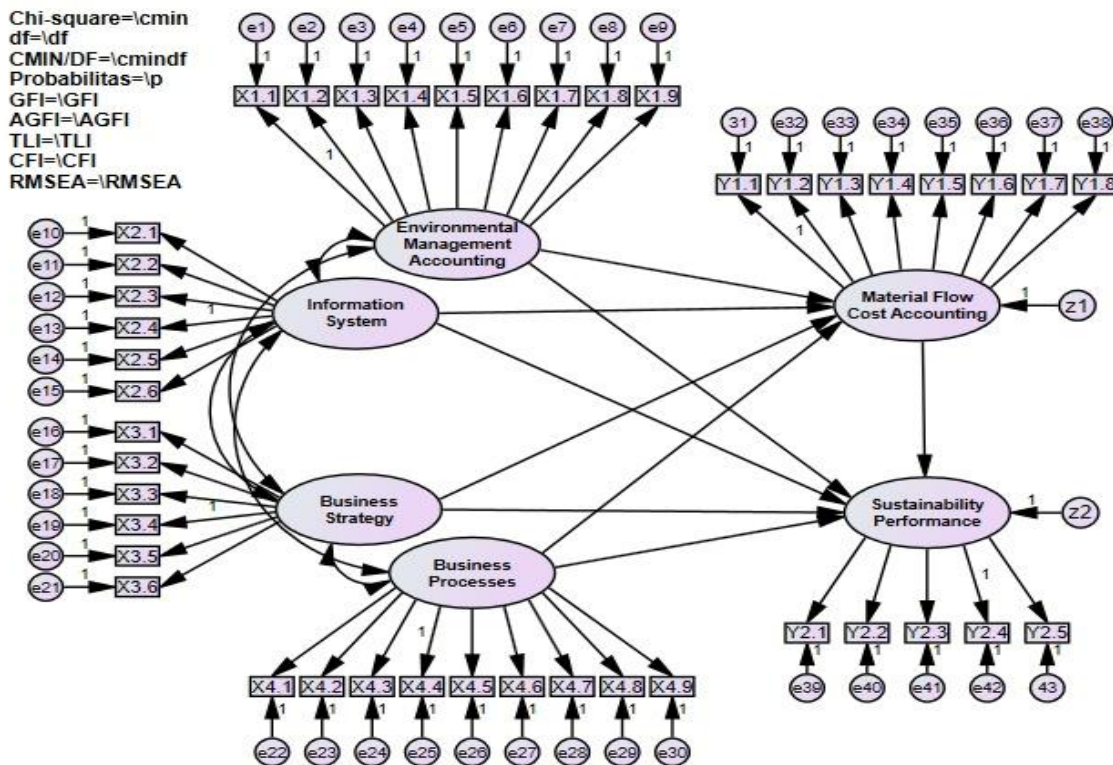


Figure 1. Research Model Framework

METHOD

This study uses an explanatory quantitative approach, which is a study that aims to test the causal relationship between the variables under study (Aityan, 2022). This study examines the relationship between environmental management accounting, information systems, business strategy, and business processes on sustainability performance, with material flow cost accounting (MFCA) as the intervening variable. The conceptual model of this study was designed based on relevant theories and previous studies that support the testing of relationships between variables (Sekaran & Bougie, 2016).

The data sources for this study were obtained through a survey using a questionnaire distributed to hospitality industry players in West Java. In addition, data from literature, journals, articles, and related institutional reports that support the research were used to strengthen the data obtained previously.

The population in this study was the entire hospitality industry, consisting of 512 star-rated hotels and 2,567 non-star-rated hotels spread across 27 cities/regencies in West Java. Meanwhile, the sample was taken using a *nonprobability sampling* method with a *purposive sampling* technique, in which the population was grouped based on categories. The characteristics of the respondents in this study included their position in the company, namely as owners, managers, or staff with authority in decision-making related to business strategy and sustainability performance. Furthermore, they had a minimum of 2 years

of work experience in the hospitality industry to ensure an understanding of company operations and strategies. The hotel categories of the respondents were from star-rated and non-star-rated hotels to obtain a broader perspective on the implementation of business strategies and sustainability performance. Thus, the appropriate sample that could be used as respondents was 215 star-rated and non-star-rated hotels, with the sample distribution per regency/city in West Java () determined proportionally based on the number of star-rated and non-star-rated hotels in each region.

This study uses two main methods of data collection, namely questionnaires as the main instrument in this study, which are questionnaires with a 1–7 Likert scale, distributed to hospitality industry players in West Java, both star-rated and non-star-rated hotels. This questionnaire was designed to measure respondents' perceptions of research variables, such as *environmental management accounting, information systems, business strategy, business processes, material flow cost accounting (MFCA), and sustainability performance*. Furthermore, a literature study was conducted using secondary data obtained from scientific journals, books, research reports, and official documents that support the development of research theories and conceptual models. The measurement indicators and research statements for each variable are as follows:

Table 1. Measurement Indicators

Indicators	Research Statement
<i>Environmental Management Accounting (EMA) (Hourneaux et al., 2018)</i>	
1. Material	Our hotel implements recording and monitoring of raw material usage to reduce environmental impact.
2. Energy	Energy usage at our hotel is monitored and reported to improve efficiency and reduce environmental impact without compromising guest comfort.
3. Water	The hotel has adopted environmentally friendly technologies to reduce water consumption in a sustainable manner.
4. Biodiversity	Our hotel is mindful of the operational impact on biodiversity in the surrounding area.
5. Emissions or waste	I contribute to the hotel's efforts to reduce carbon emissions and operational waste, where recycling and waste management programs are consistently implemented at this hotel.
6. Environmental aspects of products and services	We evaluate products and services to ensure sustainability and compliance with environmental policies.
7. Environmental compliance	Our hotel always ensures compliance with environmental regulations in all aspects of operations.
8. Transportation	The hotel works with suppliers who implement sustainable transportation practices.
9. Common Environmental Issues	Our hotel has a clear policy for addressing environmental issues that may arise.
<i>Information System (Hernández, 2023)</i>	
1. System Quality	The information system used in this hotel is easily accessible and has stable performance, and data security in the hotel's information system is guaranteed and reliable.

2. Information Quality	The system is capable of providing real-time information to support decision-making, and the hotel's information system presents relevant and easy-to-understand data.
3. System usage	I find the hotel information system easy to use and does not require much additional training, and it helps me improve work efficiency.
4. User satisfaction	The hotel information system meets my expectations in supporting my work, and I am satisfied with the ease of use of the hotel information system.
5. Individual impact	The hotel information system has improved my skills in managing data and information, and helps me complete my work more quickly and accurately.
6. Organizational impact	The implementation of the hotel information system has improved overall operational efficiency and helped improve the quality of customer service.
Business Strategy (Jukka, 2023)	
1. Revenue Growth	The business strategy implemented at this hotel contributes to sustainable revenue growth.
2. Return on Investment	I believe that the business strategy implemented can increase ROI in the long term.
3. Operational Efficiency	The management system used at the hotel allows for a reduction in operational costs without compromising service quality.
4. Innovation and development	This hotel actively develops new products and services to meet customer needs.
5. Employee involvement in sales	The hotel's business strategy involves employees in the promotion and sale of products and services.
6. Asset utilization rate	The business strategy implemented enables the hotel to manage assets efficiently and sustainably.
Business of Process (Gošnik & Stubelj, 2022)	
1. Vision and strategy development	I understand the hotel's vision and strategy and how to adapt business strategies to respond to market changes and achieve competitive advantage.
2. Product and service development	This hotel continuously innovates in developing products and services to meet customer needs, based on market research and customer feedback, and our hotel provides a better service experience than competitors.
3. Sales	Sales strategies utilizing various marketing channels and digital technologies implemented at this hotel are effective in increasing the number of customers.
4. Service Delivery	I feel that the procedures for service delivery have been optimized to improve efficiency and customer satisfaction. The service delivery process at this hotel runs smoothly and in accordance with operational standards.
5. Customer Service	The hotel regularly evaluates the quality of customer service to ensure that high standards are maintained.
6. Human Resource Development	The hotel's human resource management strategy enhances employee productivity and motivation.
7. Information Technology Management	I feel that the technology used at this hotel helps speed up and simplify work, as well as support accurate management decision-making.
8. Financial, Risk, and Relationship Management	The hotel has a clear strategy for managing business risks and establishing relationships with partners and customers, and asset management at this hotel is carried out optimally.

9. Business capability management	Hotel management proactively develops business capacity for long-term growth.
Material Flow Cost Accounting (MFCA) (ISO 14051, 2011; Weyand et al., 2021)	
1. Material consumption	Hotel management implements environmentally friendly and efficient material procurement strategies and has an effective monitoring system to manage material consumption efficiently.
2. Energy consumption	This hotel has a clear policy in controlling energy consumption to reduce operational costs, and the technology implemented in the hotel helps to significantly reduce energy consumption.
3. Production	I feel that the systems used at the hotel support more environmentally friendly service production, and hotel management regularly evaluates operational processes to reduce waste and increase productivity.
4. Product Loss	Hotel management has strategies and implements analysis methods to identify and reduce unused or wasted products during operations.
5. Material Loss	Management periodically reviews policies to reduce material waste in hotel operations, and the hotel has an accurate recording system to manage material usage and minimize waste.
6. Resource consumption	Our hotel implements sustainable practices in resource management to reduce environmental impact.
7. Cost	Hotel management actively monitors and evaluates costs related to material and energy consumption.
8. Global warming potential	The hotel actively implements environmentally friendly programs to reduce its carbon footprint and environmental impact. The hotel also has a policy to reduce the impact of global warming through material and energy efficiency.
Sustainability Performance (Allen et al., 2018; Waste, 2020; GRI 306)	
1. Quantity	Workload at this hotel is well managed so as not to cause excessive fatigue for employees, and it has a strategy to maintain high productivity in the long term.
2. Quality	Our hotel has a policy to maintain quality service standards on an ongoing basis.
3. Timeliness	The work system at this hotel helps ensure that all tasks are completed on time in the long term, and management provides solutions to improve time efficiency without compromising employee welfare.
4. Effectiveness	I feel that the work methods used at this hotel help to continuously improve operational efficiency, and the use of technology in the hotel helps to improve work effectiveness without disrupting the work environment balance.
5. Independence	I am able to work independently without compromising long-term team coordination and collaboration, and the hotel provides opportunities for employees to develop skills that support work independence.

The analysis technique using *Structural Equation Modeling (SEM)* is a statistical method used to test and develop complex conceptual models (Ferdinand, 2014). Data analysis in this study was carried out in several stages, starting with validity and reliability tests to ensure that the research instruments could measure variables accurately and consistently. Next, hypothesis testing was performed using the *Structural Equation Modeling (SEM)* method to test the causal relationships between the research variables, namely *environmental management accounting, information systems, business strategy, business processes, material flow cost accounting (MFCA)*, and *sustainability performance*. In addition,

Goodness of Fit Model evaluation was performed to assess the suitability of the research model with empirical data using various indicators, such as RMSEA (<0.08), CFI (>0.95), GFI (>0.90), AGFI (>0.90), and Chi-Square, to ensure that the tested model has a good level of fit (Hair et al., 2019). With this analysis technique, the study is expected to produce valid conclusions and provide insights that can be applied to improve *sustainability performance* in the hospitality industry.

RESULTS AND DISCUSSION

Full Model Feasibility Test

The full model feasibility test in Structural Equation Modeling (SEM) analysis aims to evaluate the extent to which the proposed model fits the observed data. This includes various goodness of fit tests that show whether the structural and measurement models fit the existing data. The results of the full model test are as follows:

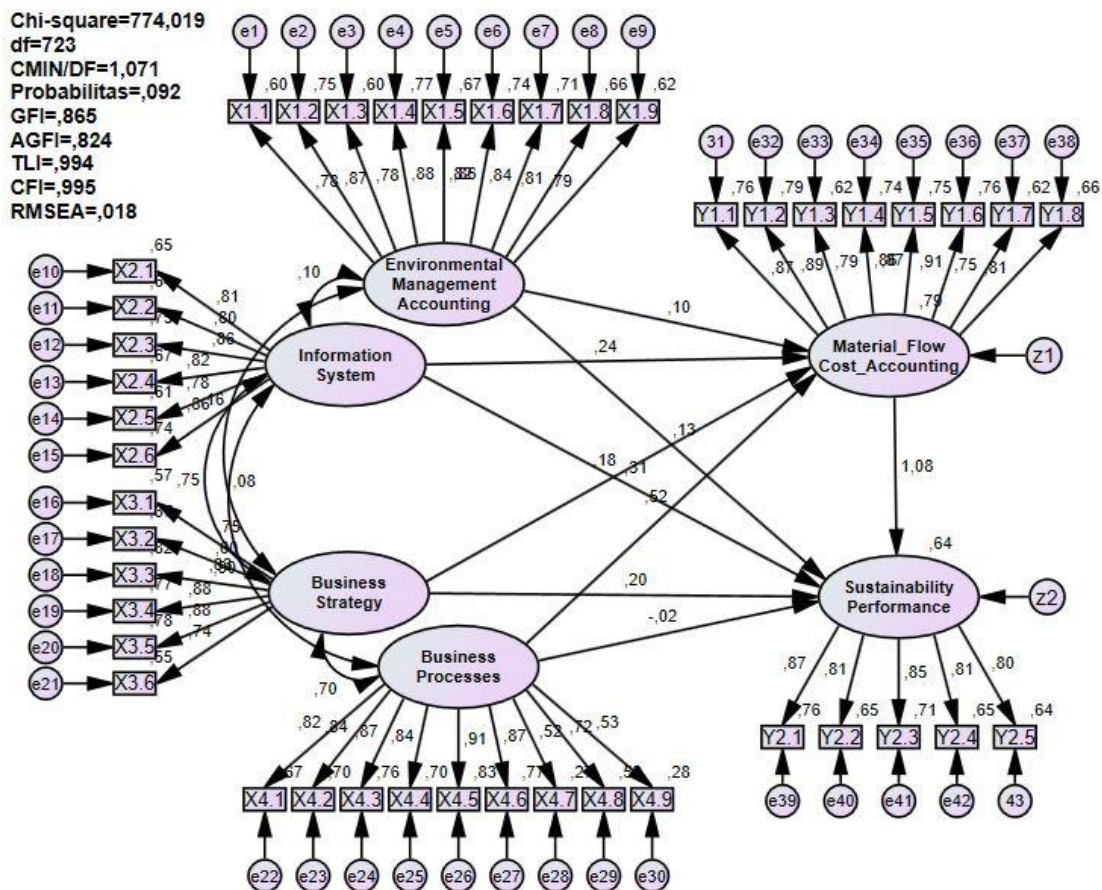


Figure 2. Full Model Test Research

In Figure 2 above, the *full model* feasibility test analysis can be seen, which is then summarized as follows:

Table 1. Full Model Feasibility Test Analysis Output

No	Goodness of Fit Index	Cut-off Value	Analysis Results	Description
1.	Chi-Square	< 786.663 (df: 723,	774.019	Fit
2.	CMIN/DF	< 2.00	1.071	Fit
3.	Probability	< 0.05	0.092	Fit

4.	GFI	< 0.90	0.865	Marginal
5.	AGFI	< 0.90	0.824	Marginal
6.	TLI	< 0.90	0.994	Fit
7.	CFI	< 0.95	0.995	Fit
8.	RMSEA	< 0.08	0.018	Fit

Source: primary data processed by the researcher, 2025

In Table 1 above, the *Goodness of Fit* test results show that the tested model has a good overall fit. The Chi-Square value obtained is 774.019, which is smaller than the cut-off value of 786.663 (df:723, α :0.05), indicating that the model fits the data well. The CMIN/DF value of 1.071 is also below the limit of 2.00, indicating that the model is not too complex and fits the available data. In addition, the probability value of 0.092, which is greater than 0.05, indicates that the model does not show a significant difference from the data, so this model is well accepted. However, the Goodness of Fit Index (GFI) value of 0.865 and the Adjusted Goodness of Fit Index (AGFI) value of 0.824 are slightly lower than the recommended thresholds (0.90 each), indicating that the model's fit on these indices is at a marginal level. Nevertheless, the Tucker-Lewis Index (TLI) value of 0.994 and the Comparative Fit Index (CFI) value of 0.995 show excellent results because both are well above the recommended cut-off values (0.90 and 0.95, respectively), indicating that the model has an excellent fit. Finally, the Root Mean Square Error of Approximation (RMSEA) value of 0.018, which is lower than 0.08, also indicates that the model has excellent fit. Overall, despite some marginal values on the GFI and AGFI, the test results show that this model is still valid for use with excellent fit on most relevant indices.

Next, to see each of the *p-values* in the *regression weight* table to determine the relationship between the variable constructs. Table 2 shows the *regression weight* full model as follows:

Table 2. Regression Weight Full Model

			Estimate	S.E.	C.R.	P	Label
Material Flow Cost Accounting	<--	Environmental Management Accounting	,119	,044	2,686	,007	par_20
Material Flow Cost Accounting	<--	Information System	,251	,087	2,884	,004	par_25
Material Flow Cost Accounting	<--	Business Strategy	,189	,062	3,051	,002	par_26
Material Flow Cost Accounting	<--	Business Processes	,571	,087	6,551	***	par_33
Sustainability Performance	<--	Business Processes	-,015	.121	-,125	,901	par_21
Sustainability Performance	<--	Business Strategy	,170	,084	2,030	,042	par_22
Sustainability Performance	<--	Information System	,269	,144	1,874	,061	par_23
Sustainability Performance	<--	Environmental Management Accounting	,130	,048	2,708	,007	par_24
Sustainability Performance	<--	Material Flow Cost Accounting	,894	,065	13,674	***	par_52

Source: Primary data processed by researcher, 2025

Table 2 *The regression weights* above form the basis for interpreting the hypothesis testing in this study.

1. Environmental Management Accounting (EMA) has a positive and significant effect on Material Flow Cost Accounting (MFCA)
Based on the results of hypothesis testing, the effect of Environmental Management Accounting on Material Flow Cost Accounting has a C.R. value of 2.686 > 1.96 with a p-value of 0.007 < 0.05, which indicates a positive and significant effect. This means that the better the implementation of EMA, the more effective MFCA will be. The estimate value of 0.119 indicates that a one-unit increase in EMA will increase MFCA by 11.9%.
2. Information System (IS) has a Positive and Significant Effect on Material Flow Cost Accounting (MFCA)
The test results show a C.R. value of 2.884 > 1.96 with a p-value of 0.004 < 0.05, which means that IS has a positive and significant effect on MFCA. The estimate value of 0.251 shows that a one-unit increase in IS will increase MFCA by 25.1%. This confirms that a good information system can support the efficiency of material flow and cost management in a company.
3. Business Strategy (BS) Has a Positive and Significant Effect on Material Flow Cost Accounting (MFCA)
Based on the test results, the effect of Business Strategy on MFCA has a C.R. value of 3.051 > 1.96 with a p-value of 0.002 < 0.05, which indicates a positive and significant effect. The estimate value of 0.189 indicates that a one-unit increase in business strategy will increase MFCA by 18.9%. This shows that a better business strategy encourages more effective MFCA implementation.
4. Business Processes (BP) Have a Positive and Significant Effect on Material Flow Cost Accounting (MFCA)
The test results show a C.R. of 6.551 > 1.96 with a p-value < 0.001, which means that BP has a very significant positive effect on MFCA. The estimate value of 0.571 indicates that a one-unit increase in BP will increase MFCA by 57.1%. This shows that efficient business processes have a strong impact on the effectiveness of MFCA.
5. Business Processes (BP) Do Not Have a Significant Effect on Sustainability Performance (SPf)
Based on the test results, the effect of BP on SPf has a C.R. value of -0.125 < 1.96 with a p-value of 0.901 > 0.05, which means it is not significant. The estimate value of -0.015 shows that a one-unit increase in BP actually slightly decreases SPf by 1.5%, but because it is not significant, this effect cannot be used as a basis for a strong conclusion.
6. Business Strategy (BS) has a Positive and Significant Effect on Sustainability Performance (SPf)
Based on the test results, the C.R. value of 2.030 > 1.96 with a p-value of 0.042 < 0.05 indicates that BS has a positive and significant effect on SPf. The estimate value of 0.170 shows that a one-unit increase in BS will increase SPf by 17%. This shows that

business strategies oriented towards sustainability contribute to improving a company's sustainability performance.

7. Information System (IS) Does Not Significantly Affect Sustainability Performance (SPf)

The test results show a C.R. value of $1.874 < 1.96$ with a p-value of $0.061 > 0.05$, which means that IS does not have a significant effect on SPf. The estimate value of 0.269 indicates that a one-unit increase in IS can increase SPf by 26.9%, but because it is not statistically significant, this effect cannot be used as a strong basis for conclusions.

8. Environmental Management Accounting (EMA) has a Positive and Significant Effect on Sustainability Performance (SPf)

Based on the test results, the C.R. value of $2.708 > 1.96$ with a p-value of $0.007 < 0.05$ indicates that EMA has a positive and significant effect on SPf. The estimate value of 0.130 indicates that a one-unit increase in EMA will increase SPf by 13%. This indicates that the implementation of good environmental management accounting supports the sustainability of company performance.

9. Material Flow Cost Accounting (MFCA) has a positive and highly significant effect on Sustainability Performance (SPf)

Based on the test results, the effect of MFCA on SPf has a C.R. value of $13.674 > 1.96$ with a p-value < 0.001 , which indicates a positive and highly significant effect. The estimate value of 0.894 indicates that a one-unit increase in MFCA will increase SPf by 89.4%. This is the largest effect in the model, confirming that the optimal application of MFCA plays a significant role in improving the sustainability performance of companies.

Research Hypothesis Test

This study has 9 hypotheses. To test the hypotheses, the *p-value* with a significance of 5% or < 0.05 and the *critical ratio* (CR) > 1.96 of a causal relationship can be considered. The conclusions of the hypotheses are presented in Table 3 below.

Table 3. Conclusions of Research Hypotheses

Research Hypothesis	Estimate	C.R.	P-Value	Hypothesis Conclusion
H1: Environmental Management Accounting has a partial effect on Sustainability Performance.	0.130	2.708	0.007	Accepted
H2: Information Systems partially influence Sustainability Performance.	0.269	1.874	0.061	Rejected
H3: Business Strategy partially influences Sustainability Performance.	0.170	2.030	0.042	Accepted
H4: Business Process partially influences Sustainability Performance.	-0.015	-0.125	0.901	Rejected
H5: Environmental Management Accounting partially affects Material Flow Cost Accounting.	0.119	2.686	0.007	Accepted
H6: Information System partially affects Material Flow Cost Accounting.	0.251	2.884	0.004	Accepted

H7: Business Strategy partially influences Material Flow Cost Accounting.	0.189	3.051	0.002	Accepted
H8: Business Process partially affects Material Flow Cost Accounting.	0.571	6.551	****	Accepted
H9: Material Flow Cost Accounting partially affects Sustainability Performance.	0.894	13.674	****	Accepted
H10: <i>Material Flow Cost Accounting</i> (MFCA) significantly mediates the effect of <i>Environmental Management Accounting</i> on <i>Sustainability Performance</i> .	-	2,653	0.0079	Accepted
H11: <i>Material Flow Cost Accounting</i> (MFCA) significantly mediates the effect of <i>Information System</i> on <i>Sustainability Performance</i> .	-	2.823	0.0047	Accepted
H12: Material Flow Cost Accounting (MFCA) significantly mediates the effect of Business Strategy on Sustainability Performance.	-	2.976	0.0029	Accepted
H13: Material Flow Cost Accounting (MFCA) significantly mediates the influence of Business Processes on Sustainability Performance.	-	5,923	0.000	Accepted

Source: Primary data processed by researchers, 2025

Referring to Table 3 above regarding the conclusions of the research hypothesis in accordance with the legitimacy and stakeholder theory used, it can be interpreted as follows:

1. H1: Environmental Management Accounting (EMA) on Sustainability Performance (SPf)

Result: Significant positive (CR = 2.708; p = 0.007)

Theoretical Interpretation:

This result supports Stakeholder Theory, which states that companies must demonstrate environmental responsibility to stakeholders. The implementation of EMA enables hotels to demonstrate transparency and accountability in environmental management, which directly improves SPf. At the same time, Legitimacy Theory explains that EMA is a means of strengthening the social position of companies in the eyes of the public and regulators.

Hypothesis accepted. Theory confirmation

2. H2: Information System (IS) on Sustainability Performance (SPf)

Results: Not significant (CR = 1.874; p = 0.061)

Theoretical interpretation:

These findings contradict expectations based on Stakeholder Theory, in which information systems are assumed to be capable of supporting sustainability reporting. However, in the context of the hospitality industry in West Java, existing information systems may not yet be effectively directed towards environmental and sustainability management.

The hypothesis is rejected. The theory is not yet reflected in field practice.

3. H3: Business Strategy (BS) on Sustainability Performance (SPf)

Results: Significant positive (CR = 2.030; $p = 0.042$)

Theoretical Interpretation:

Supporting Legitimacy Theory, sustainability-oriented business strategies send a strong signal to the public about the company's commitment. This theory states that legitimacy can be obtained if the strategy aligns itself with social norms regarding environmental responsibility.

Hypothesis accepted. Consistent with theory and previous literature.

4. H4: Business Process (BP) on Sustainability Performance (SPf)

Results: Not significant (CR = -0.125; $p = 0.901$)

Theoretical Interpretation:

Theoretically, business processes should enhance sustainability if they are designed to be efficient and environmentally friendly. However, in the context of this study, many hotels have not yet fully integrated sustainability into their operational processes due to investment constraints or low awareness.

The hypothesis is rejected. The theoretical potential has not been actualized in practice.

5. H5-H8: EMA, IS, BS, BP on MFCA

Results: All are significantly positive

- EMA on MFCA (CR = 2.686; $p = 0.007$)
- IS on MFCA (CR = 2.884; $p = 0.004$)
- BS on MFCA (CR = 3.051; $p = 0.002$)
- BP on MFCA (CR = 6.551; $p < 0.001$)

These results support Stakeholder Theory, in which the implementation of good internal systems and strategies, including EMA, IS, BS, and BP, provides the data and process foundation for implementing MFCA. MFCA functions as a system for operationalizing sustainability values in daily hotel practices. All hypotheses are accepted. Strong confirmation of the theory.

6. H9: Material Flow Cost Accounting (MFCA) on Sustainability Performance (SPf)

Results:

Highly significant (CR = 13.674; $p < 0.001$; estimate = 0.894)

Theoretical Interpretation:

MFCA is a concrete form of company to improve efficiency, reduce waste, and increase sustainable added value. This is in line with Legitimacy Theory, because companies prove efficiency and transparency to the public. MFCA also implements Stakeholder Theory by providing concrete environmental performance information to stakeholders.

The hypothesis is accepted. MFCA is proven to be a key factor in the model.

7. H10-H13: MFCA as a Mediator

Results: All mediations were significant

- EMA \rightarrow MFCA \rightarrow SPf (CR = 2.653; $p = 0.0079$)
- IS \rightarrow MFCA \rightarrow SPf (CR = 2.823; $p = 0.0047$)
- BS \rightarrow MFCA \rightarrow SPf (CR = 2.976; $p = 0.0029$)

- BP → MFCA → SPf (CR = 5.923; p = 0.000)

MFCA is empirically proven to be a bridge between strategic policies (EMA, IS, BS, BP) and the achievement of sustainability performance (SPf). MFCA becomes a medium for operationalizing stakeholder values (external pressures) into efficiency and real impact. The mediation hypothesis is accepted. This supports the integration of theory within the model framework.

Squared Multiple Correlations Determination (R²)

In the context of this study, Squared Multiple Correlations (R²) will be used to measure how much variation in the sustainability performance variable (SPf) can be explained by the combination of existing variables, namely EMA, IS, BS, BP, and MFCA. The results are presented below.

Table 4. Squared Multiple Correlations

	Estimate
Material Flow Cost Accounting	0.785
Sustainability Performance	0.637

Source: Primary data processed by researchers, 2025

From Table 4 above, the estimated value contribution of 0.785 shows a very strong and positive relationship between *Material Flow Cost Accounting* (MFCA) and the independent variables that influence it, including EMA, IS, BS, BP, and other factors in the model. This figure shows that MFCA is able to explain around 78.5% of the variation in the variables in the model. This is a fairly high value, which means that MFCA plays an important role in mediating the relationship between exogenous variables and sustainability performance. The estimated value of 0.637 for *Sustainability Performance* (SPf) indicates that the relationship between independent variables (EMA, IS, BS, BP) and dependent variables (SPf) is moderate, with a positive and fairly significant level of relationship. This means that approximately 63.7% of the variation in sustainability performance can be explained by the variables in the model. Overall, these results indicate that the model has fairly good predictive power. MFCA has a strong relationship with exogenous variables and plays a significant role in influencing sustainability performance (SPf), both directly and through mediation. The estimated value of 0.637 for SPf indicates that this model is quite good at explaining sustainability performance, although there is still potential variability that is not explained by the model (approximately 36.3%).

Direct, Indirect, and Total Influence Analysis

Direct effect analysis is the magnitude of the effect of exogenous variables on endogenous variables (without going through *intervening variables*). This is explained below:

Table 5. Direct Effect

	<i>Business Processes</i>	<i>Business Strategy</i>	<i>Information System</i>	<i>Environmental Management Accounting</i>	<i>Material Flow Cost Accounting</i>	<i>Sustainability Performance</i>
<i>Material Flow Cost Accounting</i>	,516	183	,241	,099	,000	,000
<i>Sustainability Performance</i>	-0.017	,200	,313	,131	1,083	,000

Source: Primary data processed by researchers, 2025

In Table 5 above, the *direct effect* of the *Business Processes* variable on *Material Flow Cost Accounting* is 0.516, then the *direct effect* of *Business Strategy* on *Material Flow Cost Accounting* is 0.183, and the *direct effect* of *Information System* on *Material Flow Cost Accounting* is 0.241. Meanwhile, the *direct effect* of *Environmental Management Accounting* on *Material Flow Cost Accounting* is 0.099. This indicates that *Business Processes* has the greatest *direct effect* on *Material Flow Cost Accounting* compared to other variables.

Furthermore, the *direct effect* of the *Business Processes* variable on *Sustainability Performance* is -0.017, which indicates no significant effect. Meanwhile, *Business Strategy* has a *direct effect* on *Sustainability Performance* of 0.200, followed by *Information System* with a *direct effect* of 0.313. *Environmental Management Accounting* has a *direct effect* on *Sustainability Performance* of 0.131. In addition, the *direct effect* of *Material Flow Cost Accounting* on *Sustainability Performance* reaches 1.083, which is the largest value among all variables. Thus, *Material Flow Cost Accounting* is the factor that most influences *Sustainability Performance* compared to other variables.

Next, the *indirect effects* are presented below:

Table 6. Standardized Indirect Effects

	<i>Business Processes</i>	<i>Business Strategy</i>	<i>Information System</i>	<i>Environmental Management Accounting</i>	<i>Material Flow Cost Accounting</i>	<i>Sustainability Performance</i>
<i>Material Flow Cost Accounting</i>	,000	,000	,000	,000	,000	,000
<i>Sustainability Performance</i>	,559	,198	,261	,107	,000	,000

Source: Primary data processed by researchers, 2025

In Table 6, the *indirect effect* of *Business Processes* on *Sustainability Performance* through *Material Flow Cost Accounting* is 0.559. The *indirect effect* of *Business Strategy* on *Sustainability Performance* through *Material Flow Cost Accounting* is 0.198. Meanwhile, the *indirect effect* of *Information System* on *Sustainability Performance* through *Material Flow Cost Accounting* is 0.261, and the *indirect effect* of *Environmental Management Accounting* on *Sustainability Performance* through *Material Flow Cost Accounting* is 0.107. These results show that *Business Processes* has the greatest *indirect effect* on *Sustainability Performance* through *Material Flow Cost Accounting* compared to other variables. Next, the total effects are explained as follows:

Table 7. Standardized Total Effects

	<i>Business Processes</i>	<i>Business Strategy</i>	<i>Information System</i>	<i>Environmental Management Accounting</i>	<i>Material Flow Cost Accounting</i>	<i>Sustainability Performance</i>
<i>Material Flow Cost Accounting</i>	,516	183	,241	,099	,000	,000
<i>Sustainability Performance</i>	,542	,398	,574	,238	1,083	,000

Source: Primary data processed by researcher, 2025

In Table 7, the total effect of the *Business Processes* variable on *Sustainability Performance* has a value of 0.542, consisting of a direct effect of -0.017 and an indirect effect of 0.559. Then, the total effect of *Business Strategy* on *Sustainability Performance* is 0.398, consisting of a direct effect of 0.200 and an indirect effect of 0.198. Meanwhile, the total effect of *Information System* on *Sustainability Performance* is 0.574, consisting of a direct effect of 0.313 and an indirect effect of 0.261. The total effect of *Environmental Management Accounting* on *Sustainability Performance* is 0.238, consisting of a direct effect of 0.131 and an indirect effect of 0.107. Finally, the total effect of *Material Flow Cost Accounting* on *Sustainability Performance* is 1.083, which is the highest value among all variables studied. From the results of this analysis, it can be concluded that in improving *Sustainability Performance*, the most influential factor is *Material Flow Cost Accounting*, both directly and in ly. In addition, *Business Processes* have the greatest indirect influence on *Sustainability Performance* through *Material Flow Cost Accounting*, even though their direct influence is not significant. *Information Systems* have a fairly large total influence, so they can be one of the factors that need to be considered in improving *Sustainability Performance*.

The Effect of Environmental Management Accounting (EMA) on Sustainability Performance

Statistical test results show that Environmental Management Accounting (EMA) has a positive and significant effect on Sustainability Performance (SPf) in the hospitality industry in West Java. These findings are consistent with various recent studies (2022–2025) that confirm the role of EMA not only as an environmental accounting instrument but also as a strategic tool in responding to stakeholder demands in accordance with Stakeholder Theory. The implementation of EMA has been proven to strengthen sustainability reputation and relationships with external stakeholders, in line with Legitimacy Theory, which emphasizes the importance of aligning business practices with social norms (Zahrani & Sari, 2025). The use of EMA for transparent energy and waste reporting increases public and regulatory trust (Rahmawati & Amri 2024). Furthermore, IoT-based EMA innovations facilitate real-time data collection, support green recovery strategies, and encourage the implementation of a circular economy. Thus, EMA serves as a strategic instrument that improves operational efficiency, environmental accountability, social legitimacy, and meets the sustainability expectations of stakeholders as a whole (Dekamin et al., 2025).

The Influence of Information Systems on Sustainability Performance

This study found that Information Systems (IS) do not significantly influence Sustainability Performance (SPf) in hotels in West Java. Within the framework of Stakeholder Theory, this condition reflects the weak ability of organizations to meet external expectations regarding environmental data transparency and social reporting. Studies by Silva (2021) and Squires & Elnahla (2020) show that information systems in the hospitality sector are often not integrated with sustainability reporting, thereby failing to strengthen relationships with stakeholders and social legitimacy. From the perspective of Legitimacy Theory, IS that is not utilized for carbon footprint reporting, energy monitoring, or social responsibility does not form a positive public perception. The findings of Truong et al. (2025) confirm that the use of IS is mostly limited to administrative functions, while other obstacles arise from low digital literacy and minimal staff training (Park, 2021). Therefore, the integration of IS into sustainability strategies and the improvement of human resource competencies are important priorities.

The Influence of Business Strategy on Sustainability Performance

Research findings indicate that business strategy significantly influences Sustainability Performance (SPf) in hotels in West Java. In line with Park et al. (2021) and Chen (2019), recent studies such as Das & Bocken (2024) and Wijethilake et al. (2023) confirm that the implementation of sustainability-based strategies can improve operational efficiency, customer satisfaction, and competitiveness. A differentiation approach through environmentally friendly practices, use of local materials, and green energy services has proven effective in increasing the loyalty of consumers who care about social and environmental issues. Meanwhile, cost leadership strategies based on energy efficiency and waste reduction also contribute to sustainability performance (Légeret et al., 2025). These findings reinforce Porter's (1985) view on the importance of innovation and resource efficiency. Furthermore, transformative leadership, organizational culture, and long-term policies are key to strengthening external legitimacy and sustainable brand image.

The Influence of Business Processes on Sustainability Performance

The research results indicate that business processes do not significantly influence Sustainability Performance (SPf) in hotels in West Java. This is in line with previous findings that emphasize that business processes only impact sustainability if they are strategically designed and integrated with sustainability values. Aravind & Christmann (2011) and Epstein & Buhovac (2014) emphasize that operational efficiency without sustainability indicators is not sufficient to drive SPf. Recent studies (Li et al., 2024; Sohns et al., 2023) highlight the importance of digitalization and green process innovation, while Rashid et al. (2024) found that many hotels in developing countries have not yet incorporated environmental

indicators into their operations. Fragmentation of initiatives, technological limitations, resistance to change, and budget constraints also pose challenges (Lopes & Guerreiro, 2023). Therefore, business processes need to be holistically integrated across the value chain to truly contribute to the achievement of sustainability performance.

The Influence of EMA, IS, BS, BP on MFCA

The results of the study indicate that EMA, IS, business strategy, and business processes simultaneously have a positive and significant effect on the implementation of MFCA in hotels in West Java. EMA plays a role in providing environmental and waste cost data as the main input for MFCA, helping to identify material flows that do not add value (Rahman et al., 2022). Meanwhile, cloud-based IS and IoT sensors support real-time tracking of waste and emissions (Lopes et al., 2024), in line with Laudon & Laudon's (2020) view on the importance of accurate environmental data. Sustainability-oriented business strategies also increase MFCA adoption readiness (Ferreira et al., 2023; Tuan & Tram, 2021). Digitized business processes strengthen control over material loss costs (Tran et al., 2024). Theoretically, these findings confirm the relevance of Stakeholder Theory that MFCA strengthens internal efficiency as well as the social legitimacy of the company. The success of MFCA is determined by managerial and technical synergy that is in line with sustainability values.

The Influence of Material Flow Cost Accounting on Sustainability Performance

The results of the study indicate that MFCA has a positive and significant effect on Sustainability Performance (SPf) in hotels in West Java, confirming its role as a strategic instrument in promoting sustainability performance. Weyanda et al. (2023) and (Nishitani et al., 2021) prove that MFCA supports resource efficiency, waste reduction, and increased profitability, in line with the economic, environmental, and social pillars. Cardenas et al. (2024) found that the application of MFCA improves sustainability footprints through emission reduction and reporting transparency. The integration of MFCA with digital technologies such as IoT and big data enables rapid identification of waste, while its contribution emphasizes building internal environmental awareness (Nguyen et al., 2021; Zhao et al., 2025). Furthermore, Rahman et al. (2024) showed that hotels that integrate MFCA into their business strategies are more responsive to market demands and regulations. Thus, MFCA becomes an important managerial tool for enhancing sustainable competitiveness.

The influence of EMA, IS, BS, BP on Sustainability Performance is mediated by MFCA

The results indicate that EMA, IS, Business Strategy (BS), and Business Process (BP) significantly influence Sustainability Performance (SPf) through MFCA as a mediating variable. These findings emphasize

the importance of a systemic approach in achieving organizational sustainability. Zhao et al. (2025) and Ferreira & Lima (2025) state that the success of MFCA is highly dependent on its integration with organizational strategy, information systems, and processes. EMA provides credible environmental cost data (Rahman et al., 2024), while IoT- and cloud-based IS strengthens MFCA's function in real-time tracking of materials and emissions (Lopes et al., 2024). Pro-sustainability business strategies encourage MFCA adoption (Nguyen et al., 2023), while documented business processes accelerate the conversion of data into sustainability metrics (Tran et al., 2024). MFCA also serves as a managerial bridge that integrates environmental, social, and economic aspects (Cardenas et al., 2024). Thus, this synergy strengthens the legitimacy, accountability, and competitiveness of hotels in sustainable practices.

CONCLUSION

Based on the results of research on factors influencing Material Flow Cost Accounting (MFCA) in maximizing Sustainability Performance (SPf), several important conclusions were obtained. First, Environmental Management Accounting (EMA) has been proven to have a significant positive effect on SPf. The implementation of EMA enables hotels to identify and manage resource use and environmental impacts, thereby promoting cost efficiency, emission reduction, and reporting transparency, which increases stakeholder trust. Second, Information Systems (IS) do not have a significant effect on SPf. This confirms that new information systems only impact sustainability if they are designed and integrated with sustainability strategies, accompanied by staff training, and equipped with features that support environmental and social performance. Third, Business Strategy (BS) has a significant positive influence, indicating that sustainability-oriented strategies can drive efficiency, social engagement, and responsible resource management. Fourth, Business Process (BP) has no significant effect, indicating the need to evaluate and redesign business processes to better support sustainability goals. Fifth, EMA, IS, BS, and BP together contribute positively to the implementation of MFCA. EMA provides environmental cost data, IS supports real-time material data integration, BS strengthens sustainability commitments, and BP facilitates operational efficiency. Sixth, MFCA itself has a significant positive effect on SPf because it can optimize material use, reduce waste, and support data-driven decision making. And research proves that EMA, IS, BS, and BP influence SPf through MFCA as a key mediator. With its role, MFCA integrates economic, social, and environmental dimensions, thereby increasing the legitimacy, efficiency, and competitiveness of hotels in sustainability practices.

This study has important theoretical, managerial, and further research implications. Theoretically, this study expands the study of Legitimacy and Stakeholder theory through the application of Material Flow Cost Accounting (MFCA) in improving Sustainability Performance

(SPf). The findings show that Environmental Management s Accounting (EMA), Information System (IS), Business Strategy (BS), and Business Process (BP) contribute directly and through MFCA, confirming the role of MFCA as a strategic mediating variable. This enriches the literature on sustainable management accounting, expands the context of MFCA application to the service sector, and encourages the development of an integrative, multidisciplinary theoretical model. From a managerial perspective, this study provides practical recommendations for hotels in West Java. Managers need to optimize the application of EMA as the main tool for resource efficiency and transparent reporting, as well as develop an integrated information system with sustainability objectives. Business strategies must be designed based on sustainability, including energy efficiency, waste management, and local community involvement. Business processes also need to be evaluated to be more environmentally friendly, while MFCA must be implemented across all operational lines to identify hidden costs and reduce waste. The integration of information technology with MFCA, budget allocation, and positive image communication based on sustainability will further strengthen the competitiveness of hotels. The future research agenda is directed at strengthening collaboration with hospitality stakeholders, utilizing secondary data, and using digital technology to improve data collection effectiveness. Additionally, development based on Artificial Intelligence (AI), the Internet of Things (IoT), and real-time smart meters is recommended to support material loss analysis, enrich operational data, and strengthen the application of MFCA in improving sustainability performance in an adaptive and responsive manner.

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