The Role of Green Transactions as a Mediator Between the Influence of Green Operations on the Performance of MSMES in Central Java

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Abstract. The purpose of this research is to test the role of green transaction mediation in the relationship between green operations and company performance in Micro, Small, and Medium Enterprises (MSMEs) in Central Java Province. In addition, this study explores the application of green operations and green transactions to the effectiveness of MSMEs performance. This study uses a quantitative, survey-based approach. The total number of SMEs in Central Java is 1,457,126. Data were collected through a structured questionnaire distributed to SME owners or managers who have implemented environmentally friendly operational practices. The sampling technique used is purposive sampling; this study has 200 SMEs respondents. The collected data will be analysed using Structural Equation Modelling (SEM) with a Partial Least Squares (PLS) approach. Research results show that, first, a significantly positive relationship was found between Green Operational and Green Transaction ($\beta = 0.310$; $p = 0.000$). Second, the researcher found a positive but not significant relationship between Green Operational and MSME Performance ($\beta = 0.108$; $p = 0.259$). Third, the researcher found a significant negative relationship between Green Transaction and MSME Performance ($\beta = -0.228$; $p = 0.009$). Fourth, the researcher found that green transactions are a significant mediator, with a significant negative relationship between Green Operational and SMEs performance ($\beta = 0.310$; $p = 0.000$). The application of RBV in the context of sustainability for MSMEs must consider the organisation's and its environment's readiness, so that the capabilities developed do not become an additional burden that reduces business performance. It is highly recommended that the implementation of the green transaction policy for MSMEs be gradual, based on technological readiness, digital literacy, and infrastructure support. Local governments and SMEs companion institutions. This study evaluates the performance of MSMEs in Central Java through the implementation of green operations and green transactions.

Keywords: Green Operations, Green Transactions, MSMEs Performance.

1 Introduction

Over the past few years, economists have consistently emphasized the importance of company performance, expanding their analysis beyond traditional determinants such as customer satisfaction, operational processes, and innovation. Amid an increasing focus on sustainability, companies' performance is increasingly

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shaped by their ability to embed sustainable practices into their value creation [1]. This dynamic is particularly relevant for Micro, Small and Medium Enterprises (MSMEs), which play an important role in driving value creation, especially in developing countries [2]. In this economy, MSMEs are recognized as important contributors to economic growth [3].

In fact, MSMEs are constrained by limited resources [4], necessitating a focus on core business functions at the expense of sustainability-related initiatives [5]. These operational limitations are reflected in their substantial contribution to greenhouse gas emissions [6]. A 2024 survey by the Institute for Essential Services Reform (IESR) found that 95 percent of MSME emissions come from burning fossil fuels. At the global level, the United Nations is responsible for 70% of pollution, posing a significant challenge to achieving sustainable development goals for a country [7]. This environmental impact significantly damages the overall performance of MSMEs. Despite the significant impact on labour absorption, MSMEs often receive limited attention in initiatives aimed at improving their performance [8]. Given this, it is important to explore how MSMEs can improve performance by considering the level of sustainability [9]. One of the main roles in improving MSME performance is the adoption of green operations. The important role of green energy involves integrating sustainable systems, such as eco-friendly design, cleaner production, waste management, and material recycling, into business operations [10]. The incorporation of environmental processes into business operations enables the development of green transaction capabilities, thereby improving MSME performance.

"Green transactions" refer to strategies businesses use to minimize transaction costs by prioritizing environmental protection across marketing, negotiation, shipping, and logistics. [11]. Therefore, given the resource constraints faced by UMKM, adopting green operations is proposed as a strategy to reduce environmental costs and promote more sustainable business practices, thereby improving performance. In addition, technology serves as an important facilitator in identifying sustainability-focused areas that require strategic attention to improve customer satisfaction.

In Indonesia, especially in Central Java, the performance of MSMEs is a strategic concern because this sector is the backbone of the regional economy, absorbs a large number of workers, and plays an active role in inclusive economic development. However, challenges such as limited capital, lack of innovation, low technology utilization, and market constraints remain obstacles to optimizing MSME performance in the region. In 2024, there will be 7.4-7.6 million QRIS users in Central Java, with 3.6 million merchants, around 98% of whom are MSMEs. Semarang, the capital city of Central Java, accounts for 73% of transaction volume, while rural areas lag. Although the distribution of green transaction adoption is high in quantity, it remains uneven, potentially creating performance inequality among MSMEs. Based on Kompas results (19/02/25), digital transaction value reached IDR 30.6 trillion (18% YoY), and QRIS transaction volume reached 411 million (up 385% YoY). Despite the rapid growth in transaction volume and value, many MSMEs reported considering cost and expense (MDR around 0.3%) and cash flow problems if settlement time was long, which resulted in less effective *green transactions* in encouraging MSME performance.

Based on the previous theoretical context, several relevant empirical studies have been conducted. Khan & Qianli (2017) used a structured questionnaire to collect data from 218 manufacturing companies in Pakistan. Exploratory factor analysis and

simultaneous regression analysis revealed that green manufacturing, green design, customer cooperation, and green information systems significantly influenced organizational performance. Afum et al., (2020) used a structured questionnaire to collect data from 178 Ghanaian manufacturing SMEs. Their PLS-SEM analysis underscores the significant and positive effects of green manufacturing on company performance. Similarly, Nugraha (2022) collected survey data from 394 customers in the Indonesian textile industry, with PLS SEM analysis showing a positive and significant relationship between eco-design and organizational performance. Furthermore, Borah et al., (2023) surveyed 259 manufacturing companies in Ghana using a structured questionnaire and found, through regression analysis, that green innovation capabilities mediated the relationship between green market orientation and the success of new products.

There are several key research gaps. First, most previous research has focused on large companies [12], [14]. Few have researched how sustainability practices affect the performance of MSMEs [10], [13]. Meanwhile, MSMEs contribute to greenhouse gas emissions and other forms of environmental degradation, which can negatively affect their performance. [15]. Second, a limited number of studies have focused on SMEs, and almost all discuss only specific components of *green operations.* [10], [13]. However, *green operations* encompass a variety of activities, including green purchasing, green manufacturing, green design, green marketing, customer cooperation, and green information systems, among others, that affect different parts of the organization. As a result, research that examines the comprehensive scope of green operations will make a valuable contribution to the sustainability of MSMEs.

The critical and contemporary challenge of business is investigating how MSMEs operating in a resource-constrained setting can improve their performance through the implementation of comprehensive operational green initiatives. The originality of this research lies in its focus on the synergistic influence of green transactions arising from the holistic implementation of green operations on improving the performance of SMEs operating under limited resources.

To achieve this goal, data were collected from MSMEs in Central Java through a structured questionnaire. The dataset is then evaluated for validity and reliability. Once this was confirmed, structural equation modelling was performed using Amos (version 23). The findings, which reveal the significant positive effects of *green operations* on SMEs' performance, and the role of partial green *transaction* mediation in the relationship between *green operations* and MSMEs' performance, are in line with previous research conducted in various contexts such as Pakistan, Indonesia and China [12]. This study confirms the important role of *green transactions* in the relationship between *green operations* and improved performance of MSMEs operating in resource-constrained settings, thereby enriching the existing literature on sustainable business practices for MSMEs in various settings.

2 Literature Review

2.1 Resource-Based View (RBV)

Resource-Based View (RBV) theory developed by Barney (1991) states that a company's competitive advantage is largely determined by its internal resources. These resources are valuable, rare, inimitable, and non-substitutable. In the context of micro, small, and medium enterprises (MSMEs), RBV provides a foundation for understanding that practices such as green operations and green transactions are not only responses to environmental issues but can also be strategic resources that improve business performance. Green operations, which include energy efficiency, waste management, and the use of environmentally friendly raw materials, reflect physical assets and business processes that are valuable and have not been widely adopted by other MSMEs. Meanwhile, green transactions, such as the use of paperless digital payment systems and electronic transaction technology, are intangible capabilities that demonstrate digital readiness and operational sustainability. RBV emphasizes that MSMEs that manage these two resources effectively will gain operational efficiency and a competitive advantage, which directly impacts performance, both financial and non-financial. A study by Hart & Dowell (2011) confirms that green initiatives can be a source of sustainable excellence if integrated into business strategies. At the local level, research by (2024) shows that the digitalization of operations and transactions in MSMEs in Indonesia significantly improves efficiency and customer satisfaction. Therefore, within the framework of RBV, green operations and green transactions are seen as key resources that can drive the competitiveness and performance of MSMEs, especially amid the challenges of the digital era and the demands of sustainable business.

2.2 Green Operational

Green operations are the company's ability to design and develop new products that reduce waste and environmental impact. [19]. Green operational activities, including environmentally friendly supply chain management such as green purchasing, eco-design, and green manufacturing, have been proven to have a significant impact on the company's environmental and economic performance, especially within the MSME constellation in Central Java. For example, Chalarhena & Hendayani (2022) research on food industry MSMEs in Wonosobo shows that internal green practices significantly improve economic and organizational performance, although external collaboration has not had a similar impact. The study focused on the city of Demak by Supriyanto et al., (2024) also emphasized the importance of waste supervision and the use of environmentally friendly packaging as part of the MSME green product development strategy. Furthermore, research in the city of Yogyakarta by [22] revealed that *government regulation* and *strategic orientation* significantly encourage the implementation of green supply chain management, which in turn affects the improvement of the environmental performance of MSMEs.

The phenomenon in Central Java shows that many MSME actors face challenges related to regulations and technological limitations in implementing green practices, as reflected in the administrative burden report of the provincial MSME

Cooperative Office, which states that bureaucracy and low IT adoption are obstacles. However, there are also positive initiatives, such as digitalization optimization and product certification in Demak, which are intended to improve market standards and business sustainability. In the tourism sector, Ferijani & Elyadi (2024) questioned the sustainability of green business implementation in Central Java ecotourism and found that local ecological management still needs to be improved.

Overall, the literature emphasizes that green operations for Central Java MSMEs can strengthen business performance through environmental commitment & green adaptability, green product innovation, environmental regulations, and lean production systems. [10]. However, challenges such as complex regulations, low adoption of digital technologies, and weak external collaboration continue to pose obstacles. [24]. Therefore, this research can establish green operations as the foundation for improving operational processes, which are then applied to green transaction innovation and to improving the performance of MSMEs.

2.3 Green Transaction

The implementation of green transactions, which are business transactions carried out in an environmentally friendly manner through payment digitization, the use of QRIS/cashless, and the reduction of paper use, has become an important instrument in supporting the sustainability strategy of MSMEs in Central Java. A study in Semarang City by Sari et al. (2022) shows that *the cashless* and green economy movements at the Grand Maerakaca tourist attraction encourage a culture of non-cash transactions and increase transparency and efficiency. However, education and participation among MSME actors still need improvement. Similar findings can also be seen in a study [26] that examined fintech payments and MSMEs in Semarang; the results show that although digital operations incur additional costs, the benefits of efficiency and ease of transactions can increase MSME income without imposing a significant burden. More broadly, a systematic review by Zusrony et al (2023) in Central Java found that perceived *ease of use* and relative risk to QRIS are key factors in the adoption of digital payments by MSME actors. Phenomena on the ground show that, although the supporting technology infrastructure is starting to develop, obstacles such as low digital literacy, high fintech transaction costs, and resistance to change remain the main challenges in Central Java. Therefore, green transactions have the potential to serve as a strategic bridge that integrates sustainability goals with improvements in the operational and economic performance of MSMEs.

2.4 Performance of MSMEs

The performance of MSMEs reflects the extent to which small and medium enterprises achieve their economic and non-economic goals through effective resource management, innovation, and adaptation to changes in the business environment. This performance is measured not only on financial metrics such as profit, sales growth, and productivity, but also on non-financial metrics such as customer satisfaction, business reputation, and long-term sustainability [28]. In the modern context, the performance of MSMEs must be seen as a result of a combination of internal efficiency and adaptability to external demands, such as digitalization and environmentally friendly practices [29].

Internal factors play an important role in determining MSME performance. Entrepreneurial orientation, managerial skills, and human resource competence have been proven to have a significant effect on the competitiveness and growth of MSMEs. Srimulyani et al (2023) explain that a high entrepreneurial orientation encourages product innovation and the courage to take risks, which directly improves business performance. In addition, good managerial and financial skills play a role in working capital management, cost control, and strategic decision-making. [30]. Meanwhile, mastery of digital technologies, such as management information systems, e-commerce, and social media, has become a determining factor in increasing the productivity and efficiency of MSMEs in the digital economy era [31].

In addition to internal factors, MSME performance is influenced by external factors such as government policy support, ease of access to financing, market conditions, and environmental regulatory pressures. A study by Pillai & Sastri (2024) found that government support and business networks play an important role in strengthening MSME resilience to global economic dynamics. On the other hand, market pressure and environmental policies encourage MSMEs to adapt by implementing sustainability *practices* such as energy efficiency, waste management, and the use of environmentally friendly raw materials. However, the direct impact of the implementation of environmentally friendly practices on the performance of MSMEs is often not immediately visible, due to the cost of initial adaptation and the immature market awareness of *green produce* [33].

Previous research shows that *green practices, such as green operations and green transactions,* can improve MSME performance. *Green operations* reflect the company's internal activities oriented towards resource efficiency and reduced environmental impact, while green transactions reflect the company's external interactions with customers and suppliers that prioritize sustainability [34]. According to Ardito et al (2019) It is emphasized that the economic benefits of green practices will be realized if these practices are accompanied by transformations in business transaction patterns, including supply chain transparency and a commitment to environmentally friendly partners. Therefore, *green transactions* can serve as a mediating variable, bridging the relationship between green operations and MSME performance, ensuring that the company's positive environmental impact also delivers measurable economic benefits.

Thus, *the performance of MSMEs* in the context of sustainability is not only measured by increases in profits but also by the extent to which they apply green values in their operations and business transactions. Strengthening *green transactions* as a connecting mechanism between environmentally friendly operations and economic performance is an important direction in today's MSME research, especially in areas such as Central Java, which have great potential for the development of a community-based green economy and small and medium enterprises.

2.5 Green Operational and Green Transaction

Green operations refer to a series of environmentally friendly management practices and production processes, such as energy efficiency, waste reduction, sustainable use of raw materials, and resource management that take ecological impact into account. This practice not only reflects compliance with environmental regulations

but also demonstrates organizational strategic awareness in implementing sustainability principles as a whole. At MSMEs, green operations can serve as a foundation for building sustainability-oriented business behaviour, which, in turn, will impact other aspects of business activities, including transactional systems. When an MSME starts implementing green operational practices, there will be internal and external pressure to embed these sustainability values into the transaction system, such as using e-invoices, digital payment systems (paperless), QR-based payments, or transaction methods that reduce the carbon footprint. In other words, green operations are a trigger (driver) towards the adoption of green transactions.

In theory, this relationship can be explained through *the Resource-Based View (RBV) framework.* This theory states that unique and valuable internal resources and capabilities can be the basis for sustainable competitive advantage [16]. Green operations can be seen as valuable and strategic capabilities, which encourage the creation of new capabilities, such as *green transactions*, to strengthen environmental values in business processes. When environmentally friendly operational practices have become a company culture, adopting a consistent transaction system becomes a logical and strategic next step. This is also consistent with the dynamic capabilities approach, which states that organizations that can adjust their resources (such as operational processes) are more likely to innovate in other systems, including transactions [35].

Empirical evidence from several research results shows that green operations and green transactions can dynamically improve the performance of MSMEs [36].

Research by Nusraningrum et al (2021) showed green operations positively affect businesses by enabling green transactions. Companies or MSMEs that implement green production and environmentally friendly processes are more likely to adopt digital payment technology as part of their green business strategy. Furthermore, the research on the influence of green operations on the implementation of green transactions as an effort to improve business emphasizes the importance of environmentally friendly practices and ways that can help companies in improving operational strategies to increase the Company's transactions, as well as the importance of conducting employee training that can increase awareness among employees. The implementation is expected to enable companies to obtain better results in business [38].

H1: *Green operations have a significant effect on green transactions*

2.6 Green Operational and MSMEs Performance

Green operations involve integrating sustainable practices such as eco-design, waste management, cleaner production, and material recycling into business processes [10]. Green operations aim to strike a balance between reducing environmental degradation and improving corporate performance, thereby reducing pollution while driving organizational growth [39]. Green operations emphasize mitigating environmental impacts by minimizing resource consumption and energy use and by utilizing waste. Operational green assessments based on shared value creation show that, in realizing overall shared value, supply chain management systems combine operational links through information integration capabilities to improve MSME performance. [40]. Green operating capabilities will allow companies to implement the operational changes necessary to achieve these goals, such as adopting cleaner production techniques or improving energy efficiency [41]. These operational

improvements create a foundation for developing more environmentally friendly products. From a theoretical perspective, green operations are driven by the need to meet stakeholder expectations, as the sustainability of MSMEs is an important concern for their survival [36]. Practical measures include investing in energy-efficient technologies, applying lean manufacturing principles, and optimizing supply chain processes to minimize environmental impact. This operational improvement also creates a foundation for sustainable product innovation by ensuring that green operational activities are aligned with the main goals of MSMEs [10].

Empirical evidence underlines a positive relationship between green operations and company performance. The willingness of MSMEs to implement an environmentally friendly system in their operations will improve their performance [34], [42], [43]. Similarly, [34] identified green supply chain management, a key aspect of green operations, to have a significant and positive impact on company performance.

H2: Green operations have a significant effect on the performance of MSMEs

2.7 Green Transaction and MSMEs Performance

Green transactions are an organisation's efforts to reduce transaction costs while maintaining environmental sustainability across business activities, including marketing, payments, negotiations, distribution, and logistics [36]. The main goal of green transactions is to improve the operational efficiency, sustainable competitiveness, and environmental reputation of small and medium-sized enterprises through environmentally friendly transaction practices [44]. Green transactions play a role in integrating sustainability principles into business processes, from raw material selection to digital payment systems that reduce paper use to energy-efficient logistics management. Creating cost efficiencies related to the production, use, distribution, and disposal of goods is the most important part of green transactions [39]. By using recycled materials and cost-efficiency strategies, eco-friendly operational practices help companies reduce spending on raw materials while contributing to environmental preservation [45]. This, in turn, improves the company's performance, which is greatly influenced by the implementation of green transactions, thereby reducing operational costs [46], [47]. The implementation of green transactions can create efficiency in business operations, significantly reducing costs, and can increase profitability and improve business performance [25], [45], [48].

The implementation of *green operations* in MSMEs reflects efforts to improve efficiency, reduce waste, and minimize negative environmental impacts across production activities and daily operations. This practice not only creates environmental benefits but can also improve the company's image and cost efficiency in the long run. However, the positive effects of *green operations* on MSME performance are not always immediately noticeable or significant. This is because *green operations* focus more on internal processes, whose effects on business output, such as increased sales, customer loyalty, or profitability, require *intermediaries* or *media* that bridge the value of sustainability towards the market and consumers.

This is where *green transactions* serve as a mediating variable. *Green transactions* are a form of digital transformation and sustainability in payment systems and business transactions that reduce paper use, energy consumption and support time and cost efficiency. In the logic of the relationship, when MSMEs have implemented

green operations, they have the cultural readiness and system to adopt *green transactions*. Furthermore, *green transactions* can accelerate service delivery, attract environmentally conscious consumers, and strengthen the company's reputation. Thus, *green transactions* function as a channel to transfer value from *green operational* practices to external stakeholders, which ultimately improves the performance of MSMEs both financially and non-financially.

In theory, this mediation relationship can be explained through the Resource-Based View (RBV) approach and Dynamic Capabilities Theory. RBV theory emphasizes that internal resources (such as *green operations*) must be developed into capabilities that produce competitive advantages [16]. However, these advantages can only be achieved if these resources are integrated into new capabilities that are dynamic and in accordance with external demands [10], [35]. This is where the role of *green transactions* as *a dynamic capability* emerges: connecting internal practices with external outcomes, namely business performance. In accordance with the results of research by [36] It shows that *green transactions* significantly mediate the relationship between operational efficiency and MSME business growth. Similar findings were also conveyed by Ariwangsa (2025), who found that *digital green practices*, including environmentally friendly transactions, can be a catalyst for sustainable operational systems and customer-based performance improvement. This means that without green transactions, the effect of green operations on performance may be weakened or significant.

H3: Green transaction has a significant effect on MSME performance.

H4: Green transaction significantly mediates the relationship between the efficiency of MSME performance.

3 Methodology

This study targets MSMEs in Central Java. This study uses a quantitative, survey-based approach to test the role of *green transaction* mediation in the relationship between *green operations* and company performance in Micro, Small, and Medium Enterprises (MSMEs) in Central Java Province. The total number of MSMEs in Central Java is 1,457,126. Data were collected through a structured questionnaire distributed to MSME owners or managers who have implemented environmentally friendly operational practices. The sampling technique used is *purposive sampling*. The respondents are MSMEs that have been active for at least the last two years, have documented operational activities, and have adopted at least one form of environmentally friendly transaction (e.g. digital payment or paperless transactions). A sample of 200 MSME respondents was collected. The collected data will be analyzed using Structural Equation Modelling (SEM) with the Partial Least Squares (PLS) approach to test the direct and indirect influence of green operational variables on company performance, with *green transactions* as a mediating variable.

4 Result

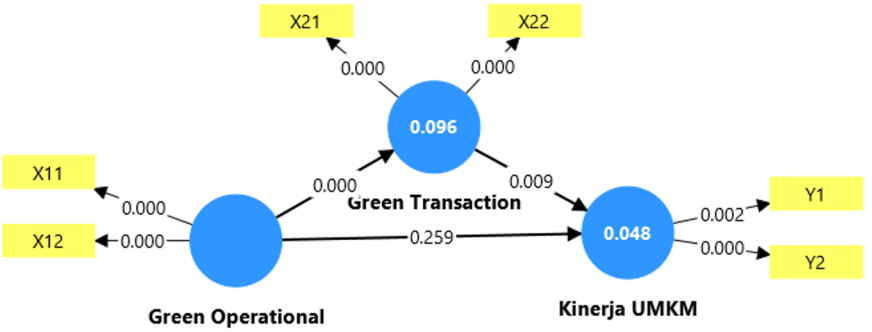

Figure 1. Research Model

The study adopts the items of each of these research variables [48]. Green operations in this study are explained in two ways: applying business practices to environmentally friendly design and applying clean business practices in the production process. Green transactions are measured by two indicators: reducing transaction costs by working with suppliers that address environmental issues and improving their products or services to meet customer needs after implementing the environmentally friendly concept. In the performance variable of MSMEs, it is explained that businesses apply the concept of environmental friendliness and have an impact on two aspects: profitability and product or service improvements. A more detailed explanation of the mean and standard deviation for each item is provided in Table 1.

Table 1. Summary of indicator items

Variabel	Item	Mean	Standard deviation	Range
Green Operational	Our business integrates eco-friendly design into its operational activities	4.255	0.663	1-5
	Our business integrates cleaner production into its operational activities	4.215	0.713	1-5
Green Transaction	Our business reduces transaction costs by considering suppliers who have environmental concerns	4.260	0.673	1-5
	Our business reduces transaction costs by outsourcing eco-friendly products	4.280	0.634	1-5
MSMEs Performance	Our business has increased its profitability since we adopted the eco-friendly concept	4.150	0.726	1-5
	Our business has improved its products or services to meet the needs of customers after the	4.210	0.697	1-5

	implementation of the eco-friendly concept

Based on Table 1 of the results of the study, which shows the mean value, standard deviation, and range of three variables, namely Green Operational, Green Transaction, and MSME Performance, it can be explained that, in general, respondents gave a high assessment of the implementation of environmentally friendly practices in MSMEs. In the *Green* Operational, the two main indicators had mean values of 4.255 and 4.215, with relatively small standard deviations of 0.663 and 0.713. This shows that most respondents agree that MSMEs have integrated eco-friendly design and implemented cleaner production practices in their operational activities. A high mean value close to the maximum scale (5) indicates that green operational practices have been well implemented and have received positive perceptions from business actors. In the *Green Transaction*, the first indicator had a mean of 4.260 and a standard deviation of 0.673, while the second indicator had the highest mean of 4.280 and a standard deviation of 0.634. These findings indicate that business actors tend to be consistent in conducting transactions by paying attention to costs and environmental impacts and by choosing suppliers or products that are environmentally friendly. The low standard deviation indicates that respondents' perceptions are quite uniform. The MSME Performance variable showed mean values of 4.150 and 4.210, respectively, with standard deviations of 0.726 and 0.697. This indicates that the application of the environmentally friendly concept contributes to increased profitability and product quality for MSMEs. Thus, it can be concluded that the application of *green business* principles, both in operational and transactional aspects, improves business performance.

Overall, the mean of 4.15–4.28 on a 1–5 scale indicates that respondents have a high level of approval for all research items. This emphasizes that efforts to implement environmentally friendly practices have become an important part of MSME business management strategy, which not only focuses on financial benefits but also on environmental sustainability.

Next, the researcher evaluated the structural model and tested the hypothetical relationships. First, the variance inflation factor (VIF) is used to test for multicollinearity among constructs. The VIF values, as shown in Table 2, are all below the threshold of no more than 5 [50], which indicates the absence of multicollinearity among the constructs present in the model. The absolute attribution of an indicator to the construct is considered to be defined by the outer loading or bivariate correlation between the indicator and its construct [51]. According to Hair et al (2019), indicators with insignificant weights should be eliminated if their loadings are also insignificant. The output of the data test shows that the outer loading value for each indicator is greater than 0.7, indicating that the indicator is acceptable and does not need to be eliminated.

Composite Reliability is used to assess reliability. According to Sarstedt et al (2014)A composite reliability measure of 0.70 or greater is acceptable. Table 2 shows that all constructs exhibit composite reliability greater than 0.70, indicating reliability. For example, the construct with the lowest composite reliability, namely MSME Performance, has a value of 0.77. Furthermore, when testing construct validity, the discriminant validity of the convergent validity needs to be checked. Average Variance

Extracted (AVE) is used in assessing convergent validity. The minimum threshold for AVE is0.50 [52]. The results in Table 2 show that all constructs meet the minimum threshold, with the lowest AVE reported being 0.64 for MSME Performance.

Table 2. Outer Loading, VIF, Composite Reliability, AVE, R-Square

Variable	Item	Outer Loading	VIF	Composite Reliability	AVE	R-Square
Green Operational	X.11	0.877	1.170	0.814	0.687	
	X.12	0.778	1.170			
Green Transaction	X.21	0.867	1.209	0.828	0.707	0.496
	X.22	0.813	1.209			
MSME Performance	Y.1	0.776	1.087	0.781	0.641	0.548
	Y.2	0.824	1.087			

The results of *Outer Loading* show that all indicators in the variables Green Operational (X.11 = 0.877 and X.12 = 0.778), Green Transaction (X.21 = 0.867 and X.22 =0.813), and MSME Performance (Y.1 = 0.776 and Y.2 = 0.824) have values above the minimum limit of 0.70. This indicates that each indicator has good convergent validity, so that it is able to reflect the latent constructs of each one strongly and significantly. The *VIF* values of all indicators in the range of 1.087–1.209 also indicate the absence of multicollinearity problems between indicators, which means that the measurement model is free from symptoms of data redundancy.

Furthermore, the *Composite Reliability* value for the three variables showed very good results, namely 0.814 for Green Operational, 0.828 for Green Transaction, and 0.781 for MSME Performance. All of these values are above the threshold of 0.70, so it can be concluded that the research instrument has high reliability and consistency in measuring the construct in question. In addition, *the Average Variance Extracted (AVE)* value is also above 0.50 (Green Operational = 0.687; Green Transaction = 0.707; and MSME Performance = 0.641), indicating that more than 50% of the variance of indicators can be explained by their respective constructs, so that the convergent validity is met.

Results in *R-Square*, it can be seen that the Green Transaction has a value of 0.4 96, which means that this variable can be explained by 49.6% by Green Operational, while other factors outside the model explain the remaining 50.4%. Meanwhile, MSME Performance has an R-Square value of 0.548, meaning that Green Operational and Green Transaction are simultaneously able to explain 54.8% variations in MSME Performance, with the remaining 45.2% influenced by other variables that are not measured in this study.

Overall, these results illustrate that the implementation of Green Operational has contributed to the increase in Green Transactions, and through these environmentally friendly transactions, it can support the improvement of MSME performance in Central Java. Although the contribution of influence is relatively low, these results confirm the importance of the role of green business practices as a first step in strengthening business sustainability. Thus, *Green Transaction* has proven to play a role as a partial mediation variable that bridges the influence of *Green Operations* on *MSME Performance*, even though the influence is not yet dominant.

Table 3. Hypothesis Results

Hypothesis	Path Coefficient	t-statistic	P-Value	Result
Green Operational -> Green Transaction	0.310	4.611	0.000	Significant
Green Operational -> MSME Performance	0.108	1.129	0.259	Not Significant
Green Transaction -> MSME Performance	-0.228	2.608	0.009	Significant
Green Operational -> Green Transaction -> MSME Performance	-0.071	2.021	0.043	Significant

Following the guidelines set by Sarstedt et al (2014)The researcher conducted a mediation analysis, and the results are presented in Table 3. In this model, the role of Green Transaction mediation in the relationship between Green Operational and MSME Performance is evaluated. The results of the study show that Green Operational significantly mediates the relationship between Green Operational and MSME Performance. The significant indirect relationship between the threat of Green Operational and MSME Performance through Green Transactional implies that MSME actors who have implemented environmentally friendly operations will increase their performance because more and more environmentally friendly transaction processes occur in MSMEs.

Based on Table 3 Hypothesis Results, research on the *role of Green Transaction as a mediator between the influence of Green Operations on MSME Performance in Central Java* shows several important findings that provide an overview of the relationship between variables in the research model. Based on the bootstrapping procedure in Smart PLS, this study evaluates the relationships between various constructs. The results are presented in Table 3. *First*, researchers found a significant positive relationship between *Green Operational and Green Transaction* (β = 0.310; p = 0.000). *Second*, the researcher found a positive but not significant relationship between Green Operational and MSME Performance (β = 0.108; p =0.259). *Third*, the researcher found a significant negative relationship between *Green Transaction and* MSME Performance (β = -0.228; p = 0.009). *Fourth*, the researcher found that green transactions were significantly mediated with a significant negative relationship between Green Operational and MSME performance (β = 0.310; p = 0.000).

First, the test results showed that Green Operational had a significant effect on Green Transactions with a *path coefficient* value of 0.310, *t-statistic* of 4.611, and *p-value* of 0.000(< 0.05). This indicates that the better the implementation of environmentally friendly operational practices, the higher the tendency of MSME actors to conduct transactions oriented towards environmental sustainability. This

means that the practice of energy efficiency, waste management, or the use of green raw materials in the production process encourages MSMEs to be involved in transactions that pay attention to environmental aspects.

Second, the relationship between Green Operational and MSME Performance showed a *path coefficient* of 0.108 with *a t-statistic* of 1.129 and *a p-value* of 0.259, which means that it was not significant. This shows that the direct implementation of green operations has not been able to have a real impact on improving the performance of MSMEs. In other words, although MSMEs have adopted environmentally friendly principles in their operations, they have not directly contributed to increasing profitability, productivity, or business competitiveness.

Furthermore, the results show that Green Transaction has a significant effect on MSME Performance, with *a path coefficient* of -0.228, *t-statistic* of 2.608, and *p-value* of0.009. This result means that environmentally friendly transaction practices have a significant relationship with the performance of MSMEs. However, the negative direction of the relationship indicates challenges in its implementation, such as increased initial costs, limitations of green markets, or adaptation of business processes that are not optimal.

Interestingly, when tested simultaneously, the Green Operational → Green Transaction → MSME Performance pathway produced a *path coefficient* of –0.071, *t-statistic* of 2.021, and *p-value* of 0.043, which is significant. This proves that Green Transaction plays a mediating variable in the relationship between Green Operational and MSME Performance. Thus, it can be concluded that the implementation of environmentally friendly operations will only have an impact on improving performance if MSMEs also integrate the aspect of green transactions in their business activities.

Discussion

The success of MSMEs in improving sustainable business performance depends not only on environmentally friendly operational efficiency but also on the ability to implement consistent green transactions. Thus, *Green Transaction* is an important bridge that connects Green Operational practices with MSME Performance achievements, which is oriented towards sustainability in Central Java. The results of the study show that there is a significant influence of green operations on green transactions in MSMEs in Central Java, with a value t calculated by 4.611 and a p-value of 0.000. Identifying that environmentally friendly business practices internally can drive the adoption of sustainable transactions externally. *Green operations. These include energy efficiency, waste reduction, the use of environmentally friendly materials, and the optimization of work processes, which indirectly create an organizational* culture that cares more about sustainability. This culture and system that has been built is what then encourages MSME actors to adopt green transactions, such as the use of paperless digital payment systems, application-based transactions, and digitalization of environmentally friendly financial systems. From the perspective of the Resource-Based View (RBV), green operations are a valuable internal capability (valuable) and difficult to imitate (inimitable), which, if managed properly, can give rise to additional capabilities in the form of the adoption of green transactions that are more efficient and relevant to market demands. This means that green operations act as a strategic foundation that allows the development of environmentally friendly

transactional practices. Research that supports these findings was conducted by Lestari and Hidayat (2022), who stated that the internal processes of environmentally oriented MSMEs significantly encourage the implementation of sustainability-based digital transaction systems. The same thing was also found by Putri dan Handayani (2023), who stated that green operations play a role as a trigger for organizational readiness to integrate environment-based digital transactions, especially for MSMEs that are starting to go digital. Therefore, it can be concluded that green operations not only affect internal efficiency, but also strategically encourage external capabilities in the *green transaction*, form of *green transaction*, in line with the RBV framework that places internal capabilities as a driver of sustainable excellence.

MSMEs in Central Java should be able to adopt green development strategies that are very important for companies' efforts to improve performance [53]. This is in line with the results of research that show that environmental sustainability often clashes with economic growth ambitions, which affects the Company's performance (Aboagye 2017). For example, the results of UMKM Ghana mainly contribute to environmental pollution, which negatively impacts its business performance [54]. To address this, the study examined the effects of green operations on the performance of Ghanaian SMEs, identifying significant and positive associations in line with existing empirical research. In the opinion of Khan & Qianli (2017) Green operations, collaboration with customers, and eco-friendly design have a positive impact on the performance of companies in Pakistan. Likewise, in accordance with the opinions of Agyabeng-Mensah et al (2020) and N. P. Sari (2020) It was found that green operations and eco-friendly design improve the performance of companies in Ghana and Indonesia, respectively. Green activities reduce environmental degradation and operational costs while driving organizational growth [53].

But in fact, the results of this study show that *green operations* do not have a significant effect on the performance of MSMEs in Central Java, with a t-value of 1.129 and an AP value of 0.259. First, many MSMEs still view *green operations* as an additional burden because they require relatively high initial investment, both in terms of technology, human resource training, and changes in production processes. In this context, green practices have not been considered an urgent need capable of driving direct profits. In addition, most MSME consumers in the regions have not made environmental issues the main consideration in purchasing decisions, so *green operations* have not had a real impact on increasing sales or profitability. Based on *the Resource-Based View* (RBV) theory, a new capability can produce a competitive advantage if it meets four criteria: *valuable, rare, inimitable,* and *non-substitutable*. However, in many cases, *green operations* do not meet the criteria of "*valuable*" because they have not been able to make a real contribution to business efficiency or performance. This is in line with the findings of Arfianti and Febrianti (2022), who stated that green operations in MSMEs are often only symbolic (*ceremonial*) without deep strategic integration, so they do not have a significant impact on performance. In addition, research by Nursyam dan Afiff (2020) also concluded that the awareness and capabilities of MSME actors towards green operations are still low, so their implementation has not been effective in encouraging the achievement of business performance. Thus, the insignificant results of the influence of green operations on the performance of MSMEs can be understood as a consequence of the low internal ability

of MSMEs to manage environmental practices strategically and integrally, so that they do not qualify as superior resources in the RBV framework.

The results of the study showed that there was a significant negative influence of green transactions on the performance of MSMEs in Central Java, with a t-value of2.608 and a p-value of 0.009. It can be said that the implementation of environmentally friendly transaction practices has not been fully a source of competitive advantage, especially in the early stages of adoption in the MSME sector. Although *green transactions, such as payment digitalization, the use of paperless systems, and the integration of information technology-based transactions, have the potential for long-term efficiency, in practice,* many MSMEs actually experience obstacles in implementation, such as limited digital infrastructure, a lack of technological literacy, and significant system transition costs. This leads to a decrease in short-term efficiency, an increase in operational burden, and a mismatch between new systems and customer consumption patterns that are not fully digital-ready. From the perspective of the *Resource-Based View* (RBV) theory, an internal resource or capability will have a positive impact on performance only if it meets the criteria of valuable, rare, inimitable, and non-substitutable. However, under certain conditions, *green transactions* have not become a "*valuable*" capability for MSMEs because they do not provide direct or rapid benefits to improving business performance and can even create internal disruptions and decreased productivity. These findings are in line with research by [57] which states that the adoption of green transactions by MSMEs in non-urban areas tends to face significant obstacles and actually negatively impacts operational efficiency and continuity. In addition, research from Setyaningrum et al (2023) also found that green transactions require high readiness of human resources and infrastructure, and if not accompanied by adequate technological capabilities, they can reduce the short-term performance of MSMEs. Therefore, the implementation of green transactions must be adjusted to the internal readiness and business ecosystem, so that it can truly become a strategic resource in the context of RBV, not a limiting factor for the performance of MSMEs.

This study also examines the role of mediation in green transactions in the relationship between green operations and SME performance. The results of the study show that indirectly, green transaction mediates a significant negative relationship between green operations and the performance of MSMEs in Central Java, with a value t calculated by 2.021and a p value of 0.043. It can be construed that there are real challenges in implementing sustainability initiatives in the MSME sector. Mediation Application *green operational, which includes energy efficiency, waste reduction, and environmentally friendly production processes, can form a strong internal sustainability foundation—efforts to continue it in the form of green transactions.* In fact, they have not been able to make a positive contribution to performance. This is most likely due to the limitations of digital infrastructure, lack of technological literacy among MSME actors, and customer resistance to environmentally friendly technology-based transaction systems. Teori *Resource-Based View* (RBV) Explain internal capabilities, such as green operations, should be developed into strategic resources that support competitive advantage if mediated by practices that are also valuable, rare, inimitable, and not easily replaced (*non-substitutable*). However, in the context of green transactions in MSMEs in Central Java, it seems that they have not met the characteristics of RBV because their implementation actually adds operational

complexity and reduces business efficiency in the short term. The results showed that green transactions partially mediated this relationship, consistent with Borah et al (2023), who found that green innovation capabilities mediate the relationship between green market orientation and the success of new products. Green operations improve performance by lowering operational costs, reducing the use of raw materials, and utilizing recycled resources, thereby supporting environmental preservation. This argument is reinforced by the findings of [59], [60], which revealed that transaction digitization has not had a significant positive impact on MSMEs in the region due to low technological readiness and market adoption. In addition, research by Mishra (2017) also found that green transactions require high initial investment and training, which, if not balanced with the readiness of human resources and support systems, actually decreases performance and hinders the achievement of business goals. Therefore, the role of mediation *green transaction* in a relationship *green operational* to the performance of MSMEs becomes less effective and even weakens the relationship, so it is necessary to carry out a strategy to increase digital capacity and engage the ecosystem as a whole so that green transactions can become strategic resources that are in line with the RBV framework [47].

5 Conclusion

Green operations have been proven to have a significant relationship with green transaction practices, which shows that the higher the implementation of environmentally friendly operational processes, the more likely MSMEs are to adopt a sustainability-based transaction system. However, the results show that green transactions actually have a significant negative influence on the performance of MSMEs. This means that although MSMEs have made efforts to integrate digital and environmentally friendly practices in transactional activities, these efforts have not been able to improve business performance and even tend to decrease it. This can be caused by low infrastructure readiness, limited digital competencies of business actors, and incompatibility with customer consumption patterns.

This research contributes to the development of *the Resource-Based View (RBV)* theory, especially in the context of MSMEs. Based on RBV, green operations and green transactions should be able to become valuable internal resources and support competitive advantage. However, the results of this study show that these resources do not fully meet the characteristics of *valuable*, *rare*, and *non-substitutable* if they are not supported by adequate technological and ecosystem readiness. Thus, the implementation of RBV in the context of MSME sustainability must consider the context of the organization's readiness and its environment so that the capabilities developed do not become an additional burden that reduces business performance.

It is highly recommended that the implementation of *the green transaction* policy for MSMEs should not be carried out simultaneously but must be gradual and based on technological readiness, digital literacy, and infrastructure support. Local governments and MSME companion institutions need to provide intensive training, technical support, and incentives that encourage the transition process to an effective green transaction. In addition, it is important to educate the market so that customers are also ready to accept an environmentally friendly digital-based transaction system.

If not, then the transformation that should support performance can actually become an obstacle in the short term.

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