



Digital Strategy and Green Strategy on Business Sustainability: Exploring the Moderating Role of Innovation

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ABSTRACT

The urgency of this study stems from the critical need to understand business sustainability among micro-enterprises in Surakarta, a city characterized by a relatively low density of such businesses within Central Java. Optimizing strategic practices is essential for maintaining competitiveness. This study aims to analyze the direct effects of digital and green strategies on business sustainability, as well as the moderating role of innovation in these relationships. Cross-sectional data were collected from 385 micro-enterprise owners and analyzed using the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach via SMART-PLS software. Empirical findings indicate that both green strategies ($\beta=0.342$, $p<0.001$) and digital strategies ($\beta=0.180$, $p=0.005$) have a statistically significant positive direct impact on business sustainability. Conversely, innovation exerts a negative effect on the relationship between green strategies and business sustainability ($\beta=-0.117$, $p<0.001$). This suggests that the intensity of innovation, when combined with the implementation of green strategies, imposes a temporary operational burden on enterprises due to resource constraints. These results offer valuable insights for policymakers and micro-enterprise owners regarding the need to balance eco-friendly innovation with available resources.

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1. Introduction

Micro, Small, and Medium Enterprises (MSMEs) are one of the largest contributors to Gross Domestic Product (GDP) in Indonesia (Badan Pusat Statistik(BPS), 2017). Based on data from the Ministry of Finance, the number of MSMEs has reached 65.5 million (Kementerian KUKM Republik Indonesia, 2019). This number has increased over time. Based on data from the Ministry of Cooperatives and Small and Medium Enterprises, MSMEs contributed to GDP reaching 61.07% or IDR 8,573.89 trillion in 2023 (Bappenas, 2016). MSMEs absorb around 117 million workers from the total workforce (Suhariyanto, 2017). Micro Enterprises in Indonesia have a very large role in economic growth, based on data from the Ministry of Finance, the number reaches 99% of all business units (Warta Fiskal, 2022). Reported from data from the Central Java Provincial Government, Surakarta is one of the cities in Central Java province with a total of 13,203 Micro Enterprises in 2023 (Dinas Koperasi, 2024). Micro Enterprises play an important role in the economy in the city of Surakarta.

Data from the Surakarta City Cooperatives and SMEs Service shows an increase in the number of MSMEs by 5% per year. Based on data from the Central Statistics Agency (BPS) in 2022, the number of MSME actors in Surakarta was 8,050. Meanwhile, the MSME workforce group in Surakarta is dominated by Micro Enterprises as many as 7,735 (Imk & Surakarta, 2022). Surakarta has the potential for a strong economic base because of the very large number of micro businesses and the very large absorption of labor. Digital developments have the potential to help Micro Enterprises develop their product marketing and sales. There are Micro Enterprises who have implemented digital technology developments, according to the Ministry of Cooperatives and Small and Medium Enterprises, almost 16 million Micro Enterprises have entered the digital platform to market their products. This makes digitalization in Micro Enterprises significant in developed countries. However, on the other hand, in developing countries the use of technology is still relatively low. As many as 60.1% of the population in Indonesia have accessed the internet (Angga Wahyudi et al., 2023). The digitalization era offers many opportunities for Micro Enterprises to develop and innovate.

Costs and finances by using the internet as a marketing medium do not cost relatively much money. Business innovation is no less important than digital marketing, which is a form of thought and ideas in developing the products offered. Several previous studies analyzed the benefits of digitalization for Micro Business actors, Micro Businesses that adopt digital technology such as increasing effective and efficient marketing and communication have the potential for higher revenue growth than those that do not. The use of technology and information helps achieve more efficient, effective, innovative and globally competitive growth. Digitalization allows for process optimization, increased productivity. Meanwhile, green strategy aims to minimize the environmental impact of business activities. However, the relationship between digital strategy and green strategy is still not fully understood. For micro-enterprises, business sustainability extends beyond the economic, social, and environmental criteria typical of large corporations; it encompasses long-term operational resilience, measured by cost efficiency, timeliness, and the quality and quantity of output. Given the constraints micro-enterprises face regarding managerial capacity and capital structure, business sustainability hinges on the flexible adoption of digital technologies and the implementation of green strategies. However, this relationship is not linear. Beyond acting as an intermediary, innovation conceptually serves as a moderator; it determines the boundary

conditions under which a micro-enterprise's innovation capacity either amplifies the positive impact of a green strategy or creates resource pressures that hinder business sustainability (Priya & Mathew, 2026). The research Andriyani et al (2023); Anggriani & Hanoum (2024) explains the impact of digital strategy on performance and of green strategy on business sustainability within large corporations or medium-scale industries (Dewi & Sudhiksa, 2022). These three studies assume that innovation has a positive impact. Although many studies have highlighted the benefits of green strategy for Micro Businesses, there is a gap in understanding innovation to help drive green strategy to improve business sustainability. Previous studies tend to separate the digital approach, environmentally friendly strategy, and innovation, without examining the synergy of the three simultaneously. In fact, in the context of the digital era and the current demands for sustainability, the integration of these three aspects is becoming increasingly relevant. This gap is an important foundation for this study, namely the need for an in-depth analysis of the mediating role of innovation in the relationship between green strategy and business sustainability, while considering the direct influence of digital strategy. The urgency of this research lies in the need to thoroughly understand how the synergy between digitalization, green strategies, and innovation can drive the sustainability of micro-enterprises. This research is important to answer the need for evidence-based policies, as well as to provide a strategic foundation for micro-entrepreneurs in formulating adaptive and innovative steps that are not only economically profitable but also environmentally oriented.

Thus, the novelty of this research lies in the development of a conceptual model that combines digital strategy, green strategy, innovation, and business sustainability in one analytical framework, which is still rarely raised in the context of micro-enterprises. This study also provides an applicative contribution for decision makers, especially MSMEs, in determining effective and sustainable strategies amidst digital transformation and environmentally friendly demands. Based on the background above, the following problems can be formulated: (1) How does digital strategy affect business sustainability? (2) How does green strategy affect business sustainability by exploring the mediating role of innovation?

2. Literature Review

Business sustainability incorporates a triple bottom line approach and examines the interests of several stakeholders, including the environment and society. This is crucial in supporting and enhancing corporate innovation for sustainability, can help integrate sustainability into business goals and processes, and serves to enhance competitive advantage. Sustainable business model innovation is necessary to create significant positive impacts and significantly minimize negative impacts on the environment and society by changing the way organizations and their value networks create, deliver, and capture value, or by transforming their value propositions (Sebrina et al., 2024).

A digital strategy is an ongoing plan that integrates digital technology to achieve business goals. It encompasses several aspects, such as online marketing, product development, and customer service enhancement, with the primary goal of increasing efficiency, customer satisfaction, and revenue (Simanjuntak et al., 2024). Digital strategy plays a key role in enhancing business and financial development toward sustainability in the digital era. The impact is not limited to technological aspects, but also influences business strategy and overall

economic transformation. Digital strategy is a driver of sustainability across various sectors. Implementing sustainability and digitalization in corporate strategy requires structural changes, commitment, and the resolution of financial and skills challenges. Digital innovation has the potential to positively impact organizational performance and promote businesses towards achieving sustainability (Togatorop et al., 2024).

A green strategy is not only a response to the impacts of regulations or consumer demands, but also an opportunity to enhance sustainable competitive advantage in the future. One of the main reasons why a green strategy is so important is that consumers are increasingly aware of environmental and social issues. This is leading companies to adopt greener practices, from the use of renewable energy to reducing carbon emissions (Ardi & Firdausy, 2022). The research of Sahaya (2024) findings indicate that a green strategy within a business plan is a comprehensive step that significantly impacts a company's performance and competitiveness in the global marketplace. This process involves a comprehensive and structured approach, starting with an internal assessment of the company's business practices and reviewing external factors such as government regulations and stakeholder pressure.

Innovation in business is the implementation of new ideas, concepts, or methods that add value to existing products, services, or business processes. Innovation can be something new or enhance the value of an existing product, and its goal is to increase competitive advantage, improve efficiency, or create new value for the product (Rashin & Ghina, 2018). According to the research of Chai & Handoyo (2024), innovation is key to business sustainability. The study revealed that innovation has a significant impact on the business sustainability of MSMEs in West Java. By continuously innovating, companies can improve their competitive advantage, operational efficiency, and ability to adapt to market changes, while contributing to a better environment. Continuous innovation enables companies not only to survive but also to thrive in the long term.

Furthermore, innovation through green strategies significantly impacts the Sustainability Performance of MSMEs. Green innovation can increase added value by protecting the environment, finance, and social aspects in the long term and sustainably. This means that innovation focused on environmental, financial, and social aspects can have a tangible impact on a company's efforts to achieve sustainable business goals (Febriyanto et al., 2024).

Existing literature on Febriyanto et al (2024); Sahaya (2024) indicates a linear relationship between innovation and green strategies. However, the majority of theoretical models in these studies still overlook the capacity constraints faced by micro-enterprises. Consequently, the implementation of green strategies requires substantial initial capital and continuous technical learning.

The hypothesis in this study can be formulated as follows:

- H1: Green strategy has a positive and significant influence on business sustainability among micro-enterprises in Surakarta.
- H2: Digital strategy has a positive and significant influence on business sustainability among micro-enterprises in Surakarta.
- H3: Innovations has a positive and significant influence on business sustainability among micro-enterprises in Surakarta.
- H4: Innovation moderates the relationship between green strategy and business sustainability.

In the context of micro-enterprises, the implementation of green strategies such as energy efficiency, the reduction of packaging waste, and the use of eco-friendly local raw materials directly lowers operational costs. Business sustainability is measured through efficiencies in cost, time, quality, and quantity, with green strategies reducing long-term variable costs. Furthermore, environmental awareness among the public boost's customer loyalty and the micro-enterprise's reputation, ultimately leading to sales stability (Nur et al., 2025).

Digital technologies such as the use of social media for marketing, cashless payment channels, and automated financial reporting are strategies employed to expand market reach and enhance the responsiveness of micro-enterprises. Digitalization allows micro-enterprises, which often face capital and labor constraints, to minimize transaction costs and accelerate processes. Furthermore, digitalization enables distribution channel efficiency, thereby allowing micro-enterprises to increase their sales volume (Pratama et al., 2024). Micro-enterprises that consistently innovate through product diversification, faster production processes, and service enhancements will possess greater competitiveness than stagnant rivals. Innovation enables businesses to adapt to shifting local consumer preferences, thereby ensuring long-term business viability (Fawaid et al., 2026).

Implementing a "green strategy" entails cost adjustments; however, when micro-enterprises are simultaneously encouraged to pursue green innovations, such as developing biodegradable packaging or purchasing high-tech, eco-friendly machinery they often face "financial overload." Unlike large corporations with reserve funds, micro-enterprises possess very limited financial and human resources. Integrating a green strategy with intensive innovation can divert a micro-enterprise's focus and core operating funds, thereby driving up initial production costs without yielding a quick return on investment. The target market for micro-enterprises in developing areas like Surakarta remains price sensitive. Costly green innovations raise product prices, which in turn reduces short-term sales volume and undermines cost-efficiency indicators (essential for business sustainability) (Liu et al., 2025).

3. Research Method

The purpose of this study is descriptive and causal. The purpose of descriptive research is to obtain an accurate picture of events, people, and situations (Boushnak et al., 2018). Descriptive research is conducted by describing the characteristics or functions of a research variable (Nurul et al., 2023). Causal research is conducted to understand which variables are the cause and which variables are the effect and to see the nature of the relationship between independent variables that influence the dependent variable. Causal research is conducted if the researcher has seen or read previous research that discusses the relationship between variables (Nurul et al., 2023). The research paradigm used in this study is the positivist paradigm. The positivist paradigm views reality or symptoms or phenomena that are classified as fixed, concrete, observable, measurable and the relationship between phenomena can be causal (Simamora, 2024). This study uses a deductive research theory approach. The deductive approach is a theory approach that begins with a general theory, then narrows the theory, so as to obtain a specific hypothesis that needs to be tested.

Table 1. Operational Variables

Variable	Definition	Variable Types	Code	Source
Digital Strategy	Digital Strategy is the process of converting information, processes, or services from analog to digital, including the use of technology to automate, store, and manage data in a more efficient manner.	Independent	DIG	questionnaire
Green Strategy	Green Strategy is a business approach that focuses on environmental sustainability by integrating environmentally friendly practices into operations and strategic decisions including waste reduction, energy efficiency, use of renewable resources, and development of environmentally friendly products.	Independent	GS	questionnaire
Business Continuity	Business sustainability is the ability of a company to continue operating and growing over the long term, while meeting its social, economic and environmental responsibilities. It includes managing resources efficiently, adapting to market changes and implementing practices that support sustainability.	Dependent	KB	questionnaire
Innovation	Innovation is the process of creating new ideas, products, or methods that provide better or more efficient solutions to existing problems, including technological developments, business process improvements, or changes in thinking that drive progress and value creation.	Moderation	IN	questionnaire

Source: data is processed from quistionare

This study uses quantitative research methods. Quantitative research is an approach used to test objective theories by testing the relationship between variables (Creswell & Creswell, 2018). This study uses SEM-PLS data analysis techniques. The data distribution technique uses nonprobability sampling with purposive judgment sampling. These specific criteria were selected to ensure that the chosen sample possessed relevant empirical experience regarding the variables under study. The criteria include: (1) owners or operators of micro-enterprises in the city of Surakarta; (2) businesses that have been in operation for at least one year; and (3) businesses that utilize digital platforms for marketing or operational activities and have implemented at least one form of environmental efficiency measure.

Since the size of the digitized micro-enterprise population is unknown, the sample size was determined using the Bernoulli formula, as shown in Equation (1). With a confidence level of 95% ($Z = 1.96$), a margin of error of 5%, and proportions of $p = q = 0.5$, a minimum value of 384.16 was obtained, which was then rounded up to 385 respondents. A sample size of 385 is robust for conducting analysis using the SEM-PLS method (Schäfle & Kautz, 2021). This study uses quantitative data with questionnaire distribution using Google Form.

$$n \geq \frac{Z_{\alpha/2}^2 \times p \times q}{e^2} \dots\dots\dots(1)$$

In the first stage, a pilot test was conducted using 30 random respondents to find out if there were problems related to the clarity of the research instrument, wording, and completion

time. Based on the results of the pilot test, minor changes were made, such as deleting irrelevant items, changing the wording, and improving the survey layout, resulting in a final questionnaire instrument that was appropriate.

In the second stage, the research instrument will be distributed during the collection period (cross sectional) until it meets the minimum number of respondents, namely 385. The survey is voluntary without providing any incentives. The research scale used is a Likert scale with a value range of 1 (strongly disagree) to 5 (strongly agree). The measurement items used consist of digitalization, green strategy, innovation, and business sustainability. Digitalization is reflected by seven indicators including resources (DIG1), business models (DIG2), employees (DIST3), managers (DIG4), automation (DIG5), organizational management (DIG6), training (DIG7) (Valdez-Juárez et al., 2023). Green strategy is reflected in four indicators, including: business sustainability (GS1), business strategy (GS2), promotion (GS3), steps without green strategy (GS4) (Lima et al., 2023). Business sustainability is reflected by four indicators of company effectiveness in terms of cost (KB1), time (KB2), quality (KB3), and quantity (KB4) (Naufal & Purwanto, 2022). Innovation is formed by three indicators, namely product innovation (IN1), process innovation (IN2), management system innovation (IN3) (Cuevas-Vargas et al., 2016).

4. Results and Discussion

Results

Outer Model Testing

Loading Factor

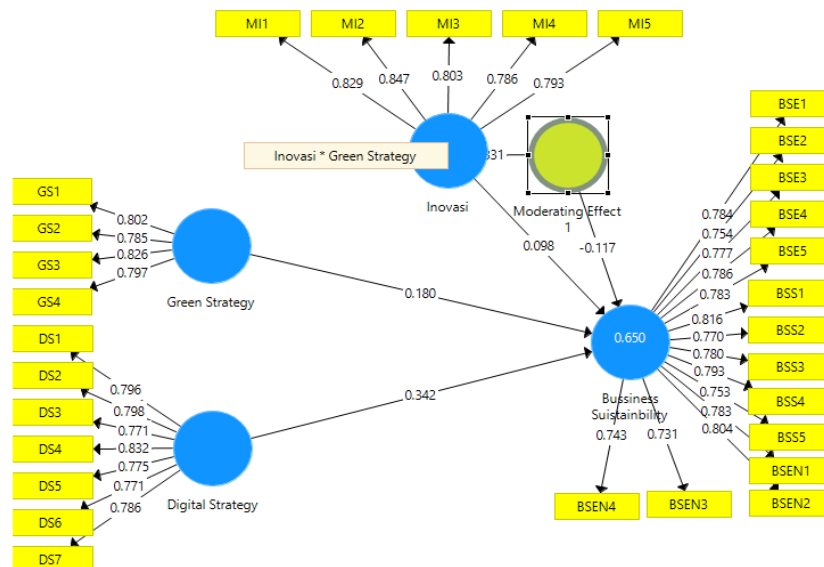


Figure 1. Outer Model Algorithm Results

Source: data is processed from quistionare

Based on Figure 1, it can be seen that the outer loading value on all indicators of the latent variables of business sustainability, innovation, green strategy and digital strategy is greater than 0.70 so it can be said to be valid.

Average Variance Extracted (AVE)

Average Variance Extracted (AVE) is a value used in testing convergent validity. In this study, all variables have values greater than 0.5, for more details can be seen in Table 2. So in this study there is no problem with convergent validity.

Table 2. AVE Output Results

Construct	AVE
Bussiness Suistainbility (Y)	0,602
Green Strategy (X1)	0,644
Digital Strategy (X2)	0,624
Innovation (X3)	0,659
Moderation (Innovation through Green Strategy)	1,000

Source: data is processed from quistionare

Discriminant Validity

Discriminant Validity

	Bussiness Suist...	Digital Strategy	Green Strategy	Inovasi	Moderating Eff...
Bussiness Suist...	0.776				
Digital Strategy	0.753	0.790			
Green Strategy	0.716	0.751	0.803		
Inovasi	0.648	0.710	0.691	0.812	
Moderating Eff...	-0.737	-0.759	-0.780	-0.673	1.000

Figure 2. Discriminant Validity Test Results

Source: Data is processed from quistionare

Figure 2. Shows that the variables Business Sustainability, Green Strategy, Digital Strategy, Innovation and moderation variables have a root value of Average Variance Extracted (AVE) greater than the root of the Average Variance Extracted (AVE) correlation with other variables so that the Discriminant Validity is met.

Reability Test

Table 3. Reliability Test Results

Variable	Cronbach Alpha	Composite Reability
Bussiness Suistainbility (Y)	0,949	0,955
Green Strategy (X1)	0,816	0,879
Digital Strategy (X2)	0,900	0,921
Innovation (X3)	0,871	0,906
Moderation (Innovation through Green Strategy)	1,000	1,000

Source: data is processed from quistionare

Table 3 shows that all latent variables measured in this study have Cronbach alpha and composite reliability values greater than 0.7, so it can be stated that all latent variables are reliable, thus in accordance with the statement of (Sarwono, Jonathan & Narimawati, 2015).

Evaluation Structural Model (Inner Model)

R² Test

Table 4. R-Square Test Results

	R square	R Square Adjusted
Business sustainability	0.650	0.646

Source: data is processed from quistionare

Table 4 shows that the R² value of 0.650 indicates that the independent and moderating variables can explain the variation in business sustainability by 65%. While the remaining 35% is influenced by other variables outside the study.

F Test

Based on Table 5, the f-square value of the green strategy variable towards Business Sustainability is moderate because its value is 0.108. The Digital strategy variable towards Business Sustainability is moderate because its value is 0.029. Furthermore, the Innovation variable through green strategy towards Business Sustainability is moderate because its value is 0.066.

Table 5. F Square Test

Correlation	f ² Value	Information
Green strategy for Business Sustainability	0.108	Moderate
Digital strategy for Business Sustainability	0.029	Moderate
Innovation through green strategy towards Business Sustainability	0.066	Moderate

Source: data is processed from quistionare

Tabel 6. t – statistic Results

Hipotesis	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	tStatistics (O/STDEV)	P Values
(GS) -> Y (BS)	0.342	0.357	0.083	4.121	0.000
(DS) -> Y (BS)	0.180	0.181	0.069	2.584	0.005
(IN) -> Y (BS)	0.098	0.088	0.075	1.297	0,098
(IN) ->(GS)-> Y (BS)	-0.117	-0.113	0.026	4.457	0.000

Source: data is processed from quistionare

Discussion

The exogenous construct of Green Strategy has a significant positive influence, it can be seen in table 5 that the path coefficient value of the exogenous variable green strategy is $O = 0.342$ with a p-value of 0.000 less than 0.05. So, the hypothesis value states that green strategy has a positive and significant influence on business sustainability is proven true. Thus, in this study the exogenous variable green strategy has a significant positive effect on business sustainability. The results of the study show that environmental based strategies are the main factor in the sustainability and competitiveness of companies in the long term. Implementing eco-friendly principles such as energy efficiency, waste reduction, and the use of sustainable raw materials can directly enhance a product's reputation and supply chain efficiency. Rising consumer awareness regarding environmental issues offers a competitive advantage for micro-enterprises. Evidence regarding the direct impact of "green strategies" indicates that environmentally oriented approaches are most effective for micro-enterprises when implemented through direct operational practices (e.g., utilizing reusable packaging and improving material efficiency). Practical eco-friendly measures can reduce operating costs

without requiring significant capital expenditure (Jin & Chorda, 2025). The implementation of green strategies such as energy efficiency, use of renewable resources and responsible waste management can reduce operational costs, increase efficiency, and reduce environmental risks that can hinder business operations. Innovation in business through green strategy, one of which is green finance, has a positive and significant impact on the performance of MSMEs in Malaysia and Indonesia (Abidin et al., 2024). This is in line with research conducted by Dewi & Sudhiksa (2022) which states that Green innovation has a significant positive influence on business sustainability at PT. Hatten Bali where green innovation has a t coefficient of 3.001, a regression coefficient of 0.351 and a significance of 0.004. This states that the better the implementation of green innovation, the more it will increase business sustainability at PT. Hatten Bali.

The exogenous construct of Digital Strategy has a significant positive influence, as can be seen in table 5 that the path coefficient value of the exogenous variable Digital Strategy is $O = 0.180$ with a p-value of 0.005 less than 0.05. This indicates that the strategic use of digital technology plays an important role in ensuring business sustainability in the digital economy era. Digital strategy, which includes digital transformation, the use of big data, artificial intelligence, and the integration of information technology-based systems, enables companies to improve operational efficiency, accelerate the decision-making process, and respond to market changes more adaptively. This strategy plays a vital role for micro-enterprises with limited financial and human resources; the integration of affordable digital technologies such as e-commerce platforms and social media has a direct impact on cost and time efficiency, ultimately enhancing business continuity (Hoang et al., 2025). This not only creates a competitive advantage, but also improves the company's ability to manage risk and create long-term value. However, this step must be balanced by a transformation of the business model or an enhancement of internal management capabilities. Without sound governance and capabilities, digitalization risks merely adding to the operational burden (Handaru et al., 2025). Digitalization strategy is the main driver of business sustainability in MSMEs in Bantul Yogyakarta which is shown in digital technology which has a significant influence on business sustainability (Andriyani et al., 2023). This is in accordance with the research of Anggriani & Hanoum (2024) which shows that the results of the hypothesis test, digital business transformation has a positive effect on business sustainability with a path coefficient of 0.280 and a p-value of 0.010. Thus, Hypothesis 3 is accepted. These results indicate that the higher the digital business transformation, the higher the business sustainability.

The exogenous construct of Innovation through Green Strategy has a significant negative effect, it can be seen in table 5 that the path coefficient value of the exogenous variable Innovation through Green Strategy is $O = -0.117$ with a p-value of 0.000 less than 0.05. Shows that innovative efforts in implementing environmentally friendly strategies have not been able to create value that supports business sustainability, in fact they burden the company. This can occur due to various factors, such as the high initial investment costs for green technology, the incompatibility of the strategy with the industrial context or business scale, and the immaturity of supporting infrastructure and environmental regulations. Green strategy-based innovations, such as machinery replacement, require substantial upfront capital. For micro-enterprises with limited access to finance, the costs associated with R&D or new equipment investments create a financial burden that disrupts operational cash flow. Furthermore, such innovations often

drive up selling prices; if consumers are unwilling to pay these higher prices, the result is a decline in both sales volume and margins (Adekunle, 2023). In such conditions, green innovation can disrupt operational efficiency, extend production cycles, or hinder business agility in responding to market dynamics. This is in accordance with research conducted by (Yusliza et al., 2019) which states that innovation in green technology has a negative and significant effect on business sustainability. On the other hand, Innovation has a positive significant influence on the performance of MSMEs so that MSMEs can develop sustainably (Mangifera et al., 2024).

Micro-enterprises must differentiate between implementing simple green practices (operational efficiency) and integrated green innovation. Simple green practices are proven to directly improve sustainability, while advanced green innovation requires capital and technical expertise to prevent backfires. The use of digitalization should not be limited to marketing channels (digital marketing) but should also consider internal efficiency (inventory management and financial governance) to maximize sustainability impact. Furthermore, local governments must provide technical assistance to ensure that adopted green innovations are practical, affordable, and aligned with local market demand.

5. Conclusion

The analysis from this study concludes that green and digital strategies play a crucial role and exert a direct positive influence on the business sustainability of micro-enterprises in Surakarta City. Implementing eco-friendly operational practices such as energy efficiency and packaging reuse has been proven to directly reduce operating costs while simultaneously enhancing business reputation and consumer loyalty. Meanwhile, the use of affordable digital technologies including social media marketing, cashless payment channels, and automated financial record-keeping effectively expands market reach and improves transaction efficiency. Conversely, innovation was found to have a negative moderating effect on the relationship between green strategy and business sustainability. This indicates that overly intensive green innovation can create operational and financial burdens for micro-enterprises due to their limited capital and capacity. This study enriches conventional assumptions from prior research, which often posited that innovation invariably yields positive outcomes. It demonstrates that resource constraints such as high innovation costs pose risks to cash flow stability for micro-enterprises if not aligned with their capital structure. The study implies that micro-enterprises must distinguish between implementing simple green practices (focused on operational efficiency) and adopting integrated green innovation. Simple green practices are proven to directly enhance sustainability, whereas advanced green innovation requires capital and technical expertise to avoid adverse consequences. Digitalization efforts should extend beyond marketing channels to encompass internal efficiencies such as inventory management and financial governance to maximize the impact on sustainability. Furthermore, local governments should provide technical assistance to ensure that adopted green innovations are practical, affordable, and aligned with local market demand. Methodological limitations must also be acknowledged; the use of cross-sectional data limits the study's ability to capture the long-term dynamic effects of green strategies and digitalization on business sustainability. Additionally, the geographic focus on Surakarta limits the generalizability of the findings to other regions.

Therefore, for future research, it is recommended to expand the geographical scope and compare different business scales to improve model generation.

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