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RESEARCH ARTICLE

Implementation of Green Innovation, Supply Chain Management and Technology Capability on Business Performance of Micro, Small and Medium Enterprises

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Abstract: Entrepreneurship has been recognized as a mechanism for generating economic benefits. However, due to the emergence of the concept of business performance as a pressing issue affecting the global system today, it has been proposed that MSMEs, which stands for micro, small and medium enterprises, should also be given special attention. Therefore, this study intends to investigate the viewpoints of MSME entrepreneurs from green innovation, supply chain management, and technological capability to business performance in micro, small, and medium-sized enterprises (MSMEs). The study adopted a quantitative approach and involved multiple linear regression analysis tools. This study targets a population of 100 MSMEs operating in Surabaya City. Accidental sampling will be used for sampling. The study results indicate that green innovation has a significant positive impact on MSME business performance. This innovation involves the implementation of practices that support environmental sustainability, such as the utilization of environmentally friendly materials, effective waste management, and green measures. In addition, the study also shows that efficiency in supply chain management and a high level of technological capability also contribute significantly to MSME business performance.

Keywords: Micro, Small and Medium Enterprises; Business Performance; Green Innovation; Supply Chain Management; Technology Capability

1. INTRODUCTION

Micro, Small, and Medium Enterprises (MSMEs) play an important role in the global economy. They not only create jobs, but are also a source of innovation and sustainable economic growth (Mardikaningsih & Arifin, 2021; Putra et al., 2022; Sabando-Vera et al., 2022). MSMEs are often identified as business entities with a limited number of employees and relatively low revenues when compared to large firms (Armario et al., 2008; Kamunge et al., 2014; Mardikaningsih et al., 2022). However, despite their small size, their impact in creating economic value and providing opportunities to entrepreneurs is large. MSMEs also play a role in achieving various sustainable development goals, including addressing poverty, promoting inclusive growth and reducing environmental impacts (Abisuga-Oyekunle et al., 2020; Nuraini et al., 2022; Nurmalasari & Mardikaningsih, 2022). Through innovation and sustainable business practices, MSMEs can be a positive force in creating a better future for the whole society (Kohli & Jaworski, 1990; Pizzi et al., 2021).



MSMEs not only serve as drivers of local economies, but also as key pillars in creating dynamic and sustainable business ecosystems at the global level (Abor & Quartey, 2010; Sinambela et al., 2022). Despite limitations in terms of scale and resources, MSMEs hold the key to stimulating innovation, expanding market access, and creating much-needed jobs in various communities (Ernawati et al., 2022; Hariani, 2022; Mardikaningsih et al., 2022). The existence of MSMEs also promotes economic diversity, as they are often involved in specialized or niche sectors that may be overlooked by larger firms (Corbett & Claridge, 2002; Alam, 2010; Darmawan et al., 2022).

MSMEs also serve as positive agents in achieving various sustainable development targets that have been set by the international community (Darmawan, 2017). They contribute significantly to reduced poverty levels by creating employment opportunities, enabling individuals to achieve economic independence (Luliya et al., 2013; Nuraini et al., 2022). In addition, MSMEs extend the reach of inclusive growth by including different layers of society, including those who may be marginalized in the larger economic context (Cadogan et al., 2009; Zhou et al., 2009). MSME business performance management can also be helped by marketing new products to key market segments (Wahab et al., 2017; Darmawan & Gatheru, 2021). The performance management of MSMEs can be influenced by a number of factors derived from interactions with customers and marketing strategies (Mardikaningsih et al., 2018; Khayru, 2021; Essardi et al., 2022; Gardi & Darmawan, 2022). They must satisfy their customers in order to become a major source of business revenue from repeat purchases (Darmawan, 2019; Retnowati et al., 2021; Ali et al., 2022; Halizah et al., 2022; Putra et al., 2022). By understanding and managing these factors, MSMEs can improve their business performance and maintain customer satisfaction.

MSMEs also have great potential in reducing adverse environmental impacts (Ejrami et al., 2016; Parente et al., 2019). By implementing sustainable business practices, such as the use of renewable resources, wise waste management and adoption of green technologies, they can help reduce environmental burdens and create environmentally friendly business models (Khasanah et al., 2010; Nurmalasari & Mardikaningsih, 2022). Through these progressive measures, MSMEs are not just economic agents, but also positive forces that play a crucial role in the creation of a more sustainable and inclusive future for society, both locally and globally (Šályová et al., 2015; Infante, 2022).

Green innovation has become one of the key factors in transforming global business today (Maziti et al., 2018). In an era of increasing environmental concerns, companies around the world recognize the importance of integrating sustainable and green business practices into their operations (Paraschiv et al., 2012). Green innovation refers to the development and application of new or existing products, services, processes and technologies in a more efficient and sustainable way (Hidayat et al., 2015; Fernando et al., 2016). The main purpose of this innovation is to reduce the negative impact on the environment and create added value for the company (Lee & Min, 2015). Green innovation is becoming increasingly relevant due to the growing awareness of environmental issues. Green innovation often leads to better operational efficiency (Dong et al., 2022). This indicates green innovation as one of the important factors in modern business development that enables MSMEs to reduce negative impacts on the environment while identifying new opportunities for growth. For example, companies that can reduce their resource use or optimize their business processes can reduce production costs, which in turn can increase profitability (Nielsen et al., 2015). Moreover, innovation in this regard is not only a corporate social responsibility, but has also been shown to have a positive impact on their business performance (Cheng et al., 2014).

Supply chain management has become one of the most important aspects of managing business performance (Rosenzweig, 2003). Supply chain management refers to the set of activities and processes that link producers, suppliers, distributors and customers in a complex network (Lambert et al., 1998). This means that efficient supply chain management can help MSMEs optimize their business processes, reduce costs, and improve product or service quality (Jacobs & Mafini, 2019). Supply chain management is no longer just a

supporting function in an enterprise, but has become a strategic business core. In an ever-changing business environment, the ability to effectively manage supply chain management can be a determining factor in the success or failure of a company (Van Wassenhove, 2006; Ahmad et al., 2014).

In the era of globalization and advances in information technology, the role of technology in the business world is becoming increasingly significant. Technology not only affects how companies operate, but also how they compete in an increasingly competitive market. Technology capability refers to the ability of an organization to adopt, integrate, and utilize information and communication technology (ICT) to support their business objectives (Spanos et al., 2002; Kemarauwana & Darmawan, 2020). Along with the rapid development of technology, companies must be able to adapt to these changes to remain competitive (Jamaluddin et al., 2013). The ability to adopt new technologies and utilize them effectively can provide a significant competitive advantage (Shrivastava, 1995; Kiley et al., 2015). The inability to keep up with technological developments or the lack of technological capabilities can hinder business growth and performance (Lall, 1992). Appropriate technological capabilities can help companies reduce their environmental impact and enhance their social responsibility (Bhatt & Grover, 2005). This not only helps firms to achieve competitive advantage, but also contributes to sustainability goals and sustainable economic growth. For this reason, firms' technological capabilities play an important role in determining their business performance (Cao & Dowlatshahi, 2005).

Based on the previous description, the study will make an important contribution to the understanding of the role of MSMEs in achieving sustainable development goals. Through the integration of sustainable business practices, MSMEs are not only pillars of the local economy, but also agents of positive change in creating a better environment for society and the natural surroundings. By focusing on the key role of three main factors, namely Green Innovation, Supply Chain Management, and Technological Capability, in influencing MSME performance. This is the objective of the study on MSMEs. The findings from this study can provide practical guidance for MSME owners, practitioners, and policies in optimizing MSME operations and growth in the context of a changing global economy and increasingly pressing sustainability demands.

2. Research Method and Materials

This study will focus on MSME entrepreneurs operating in Surabaya City. This population is identified as the target group due to their relevance to the study topic, as well as the contribution they make to the local economy. The accidental sampling method will be used to select a sample from the population. This will allow the researcher to select respondents in a more spontaneous manner, while still maintaining the representativeness of the various MSME sectors. Considering the limited population size (100 MSME entrepreneurs), the study will strive to cover the entire population in the sample. This will minimize the risk of bias and ensure optimal representativeness. A structured questionnaire will be used as the main instrument to collect data from respondents. The questionnaire will be designed with questions related to the independent variables (green innovation, supply chain management, and technological capability) as well as the dependent variable (business performance).

Each variable will be measured using relevant indicators. Green innovation can be explained as the development, application or exploitation of new products, production processes, services, management or business methods by an organization. The innovation, throughout its lifetime, aims to reduce environmental impacts, risks, pollution, and other negative impacts associated with resource use, including energy use, when compared to existing alternatives (Kemp & Pearson, 2007). The four indicators as measurements of the green variable are (a) product; (b) process; (c) organizational; and (d) marketing (García-Granero et al., 2020).

Supply chain management is defined as a network of organizations involved in various processes and activities that generate value in the form of products and services delivered to end customers (Mentzer et al., 2001). There are four indicators for measuring supply chain management variables, namely (a) increasing the strategic role of operations and operations management; (b) increasing the level of coordination and integration of material processes; (c) process view getting more and more accepted and applied; (d) building stronger relationships between collaborating partners (Demeter & Gelei, 2003).

According to Kim et al. (2020), technological capability is defined as all activities and processes that create added value through the transfer, exchange, diffusion, and application of developed technology. In this case, there are three indicators used as measurements of technological capability variables, namely (a) the speed of commercialization; (b) market scope; and (c) technological breadth of the good product (Kim et al., 2020).

Business performance can be explained as the operational ability of an organization in meeting the expectations and satisfaction of the company's major shareholders and should be assessed for measures of organizational achievement (Smith & Reece, 1999). Indicators commonly used in measuring business performance are (a) profit; (b) return on investment; (c) turnover or number of customers (Wood, 2006).

Respondents were given a structured questionnaire. The questions in the questionnaire use a five-point Likert scale, which ranges from 1 (strongly disagree) to 5 (strongly agree). The data collected will be analyzed using quantitative statistical methods. This will include analytical techniques such as regression analysis to identify the relationship between the independent variable and the dependent variable. To ensure validity and reliability, the questionnaire instrument will be pretested through validity test and reliability test. This will ensure that the questionnaire can measure the variables accurately and consistently. Findings from the data analysis will be carefully evaluated to draw robust conclusions and identify practical implications and suggestions for MSME business development in Surabaya City. With a careful and planned methodological approach, this study is expected to provide valuable insights into the role of green innovation, supply chain management, and technological capabilities on the business performance of MSMEs in Surabaya City.

3. Results and Discussion

3.1. Results

The results of the validity test using the corrected item value show that in each study variable, the corrected item value exceeds 0.30. This indicates that all indicators or statements in the instrument used have an adequate relationship with the variable being measured. In other words, the statements are statistically related to the concept or variable being measured in an appropriate manner. As a result, it can be stated that all of the indicators for this study have been confirmed valid.

The results of reliability testing show that the variables of green innovation, supply chain management, technological capability, and business performance have Cronbach's alpha values that exceed 0.6. Therefore, these variables can be considered reliable. Similarly, the variables of green innovation, supply chain management, technological capability, and business performance are also considered reliable as they meet the required reliability criteria.

The normality test is carried out by observing the normal plot graph. This is indicated by the spread of points evenly around the diagonal line and following the diagonal line pattern, indicating that the normality assumption has been met. Figure 1 displays the distribution of points that follow the direction of the diagonal line, so it can be stated that the data meets the criteria for normality.

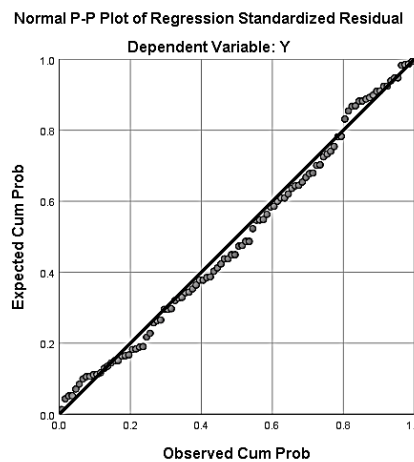


Figure 1. Normality Test

Figure 2 shows no clear pattern in the scatterplot, indicating that there are no signs of heteroscedasticity. In statistical analysis, the occurrence of heteroscedasticity refers to inconstant or uneven variation in the errors or deviations from the regression model. The statement in Figure 5 does not show a clear pattern forming on the scatterplot, hence no heteroscedasticity. Figure 5 is a scatterplot used to visualize the relationship between the independent variable and the dependent variable in regression analysis. If the scatterplot does not show a clear pattern, meaning that there is no particular pattern seen in the distribution of the data points, then this indicates that the variability or variation of the error in the regression model does not change significantly as the value of the independent variable changes.

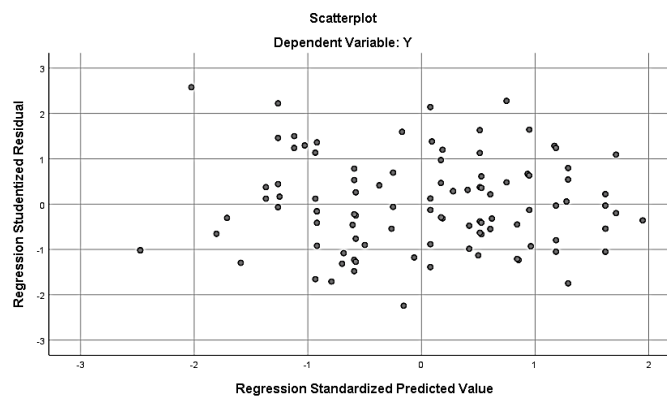


Figure 2. Heteroscedasticity test

To identify the presence of multicollinearity, one of the methods used is the Variance Inflation Factor (VIF) and tolerance. This is measured by VIF less than 10 and tolerance more than 0.1 is a sign that there is no multicollinearity problem in the regression model. This indicates that the independent variables in the model do not have a strong correlation with each other, and the interpretation of the regression coefficients can be done with more confidence. Table 3 shows that VIF values are less than 10 and tolerance is more than 0.1 for all independent variables. Therefore, it can be stated that there are no signs of multicollinearity in the model, and the regression analysis can proceed with confidence that the independent variables are operating independently of each other.

Table 1. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.868 ^a	.754	.746	4.00489	1.851

The adjusted R square value shows 0.746, which means that about 74.6 percent of the variation in business performance (Y) can be explained by the variation contained in the three independent variables, namely green innovation (X1), supply chain management (X2), and technological capability (X3). Meanwhile, about 25.4 percent (100% - 74.6% = 25.4%) of the variation is explained by other factors that influence the business performance process.

Table 2. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4707.151	3	1569.050	97.826	.000 ^b
	Residual	1539.759	96	16.039		
	Total	6246.910	99			

The F test will be used as a fit for the regression model, namely whether the model used in the study is appropriate or not. The model is considered appropriate if the significance value is <0.05. The results of the F test, as listed in Table 2, show a calculated F value of 97.826 with a significance level of 0.000, which is smaller than 0.05. Therefore, this regression model is considered suitable for use. In other words, green innovation, supply chain management, and technological capability simultaneously have a significant influence on business performance.

Table 3. Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	3.780	2.503		1.510	.134		
	X1	3.000	.413	.431	7.269	.000	.730	1.370
	X2	2.263	.446	.317	5.079	.000	.657	1.522
	X3	2.359	.442	.328	5.338	.000	.682	1.467

In Table 3, it can be seen that the green innovation variable (X1) has a t-value of 7.269, which is greater than the t-table value with a significance value of 0.000, which is less than 0.05. For this reason, it can be stated that the hypothesis of green innovation (X1) has a positive influence on business performance can be accepted and proven correct. This indicates that the higher the green innovation, the higher the level of business performance. Similarly, in Table 3, the supply chain management variable (X2) has a calculated t value of 5.079, which is greater than the t table value with a significance value of 0.000, which is also <0.05. This indicates that the hypothesis stating that supply chain management (X2) has a positive influence on business performance can be accepted or proven true. The better the supply chain management, the better the business performance. Furthermore, in Table 3, the technology capability variable has a calculated t value of 5.338, which is greater than the t table value with a significance value of 0.000, which is also less than 0.05. This indicates that the hypothesis stating that technology capability (X3) has a positive influence on business performance is accepted and proven. This indicates that the hypothesis stating that technological capability (X3) has a positive influence on business performance is accepted

and proven correct. The higher the level of technological capability, the higher the business performance.

Multiple linear regression analysis was used to evaluate the effect of independent variables on the dependent variable. In this regression analysis, the variable that has the most significant impact on business performance is green innovation, with the highest regression coefficient of 3.000. Furthermore, technological capability also exerts a considerable influence with a regression coefficient of 2.359, followed by supply chain management with a regression coefficient of 2.263. Thus, the results of this analysis show that green innovation has the most dominant influence on business performance, followed by technological capability and supply chain management.

3.2. Discussion

Based on the data processing conducted, this study has an indication that the effect between green innovation and business performance shows a high level of significance. This finding is consistent with previous studies conducted by several other researchers, such as Cheng et al. (2014); Larbi-Siaw et al. (2022); Moroni et al. (2022). The findings in these studies support the idea that high green innovation tends to contribute positively to business performance. The incorporation of green innovation in the business strategy of micro, small and medium-sized enterprises (MSMEs) is a step that has the potential to generate significant long-term benefits. This can contribute to increased profitability of MSMEs (Khurana et al., 2021). Innovations such as efficiency in the use of natural resources, waste reduction, or the use of renewable energy can reduce operating costs, improve efficiency, and in the long run increase profitability (Chien, 2022). In addition, the incorporation of green innovations also creates opportunities to access an increasingly environmentally conscious market. This can provide consumers increasingly seeking products and services that support the environment and contribute to sustainability. By having eco-friendly products or services, MSMEs can attract more customers and expand their market share, which has a positive impact on revenue (Lee & Tang, 2018). For this reason, MSME owners should have a performance measurement system that includes sustainable aspects. This will help them track the impact of environmental innovations on their business performance and provide data that can be used for reporting to relevant parties (Barney & Zajac, 1994; Darmawan et al., 2022).

The study results show significance in the influence between supply chain management variables and business performance variables. This finding provides a consistent indication of the studies conducted by Rosenzweig (2003); Kumar et al. (2018); Abdallah and Al-Ghwayeen (2020). Supply chain management can help MSMEs improve their operational efficiency. It covers the process from raw material procurement to production, distribution, and delivery of the final product to the customer. When the supply chain is well organized, operational costs can be reduced, which in turn increases profitability (Ganesan et al., 2009). By managing the supply chain efficiently, MSMEs can reduce production and logistics costs. This enables them to offer products at more competitive prices in the market (Cote et al., 2008). Therefore, adaptive supply chain management can improve customer satisfaction. By providing timely and quality products, and responding well to customer requests, MSMEs can build strong relationships with their customers (Morgan & Strong, 2003; Padma et al., 2018).

The results of this study confirm that the role of technological capabilities in improving business performance has strong significance. These findings provide evidence consistent with previous studies conducted by Cao and Dowlatshahi (2005); Yang et al. (2011); Kim et al. (2020). With the digital platform, MSMEs are not limited by geographical boundaries (Putra & Darmawan, 2022). They can sell their products or services to customers from different regions, even outside their original region. This allows businesses to capture a larger market share (Amiri et al., 2023). In addition, it helps MSMEs reduce operational costs, such as physical rental and inventory costs. This can increase their profit margins (Xie et al., 2022). However, technology and human resources must still synergize with each other. Human

resources (HR) play a very important role in the management of successful MSMEs. Recent studies have shown that an HR-based Total Quality Management (TQM) approach can help improve organizational quality and performance (Arifin et al., 2022; Putra, 2022). In the context of MSMEs, human resources with professionalism, achievement motivation, and organizational commitment are needed to achieve organizational effectiveness (Darmawan, 2019; Hariani et al., 2019; Jahroni & Darmawan, 2022; Munir et al., 2022). In addition, studies on innovative behavior and work engagement show that knowledge sharing and organizational justice are also important factors in driving innovation in MSMEs (Djazilan & Darmawan, 2022; Mardikaningsih & Darmawan, 2022; Retnowati & Darmawan, 2022; Wulandari et al., 2022). Innovative behavior is a key driver of business growth (Mardikaningsih, 2022). When individuals or organizations are able to generate new ideas and implement them, they can create products or services that meet new market needs or improve existing ones (Djazilan, 2022). Entrepreneurship brings those innovative ideas into action, enabling them to become sustainable businesses (Halizah, 2022). By understanding and optimizing all these aspects, MSMEs can maximize the potential of their human resources to achieve sustainable growth and business success. For MSMEs that are able to manage these aspects well, the use of digital platforms can be a powerful tool in developing business, increasing sales, and achieving sustainable growth. This must also be supported by developing the quality of human resources as the main driver of MSMEs.

4. Conclusion

The results of this study indicate that factors such as green innovation, efficient supply chain management, and technological capability have a significant influence on the business performance of micro, small, and medium-sized enterprises (MSMEs). First, green innovation plays an important role in improving MSME performance. The ability to develop more sustainable products and services provides a much-needed competitive advantage in an increasingly sustainable market. Second, efficient supply chain management helps MSMEs reduce costs, improve efficiency, and provide better services to customers. Finally, high technological capabilities enable MSMEs to automate processes, access broader markets, and improve their operational efficiency. More importantly, the combination of these strategies can create a strong synergy in improving MSME business performance. By focusing on these aspects, MSMEs can achieve better and sustainable business outcomes in an increasingly competitive environment.

In order to improve the business performance of MSMEs, several suggestions can be implemented. First, MSMEs should prioritize green innovation in their products and services, as this can add significant value and support a sustainable business reputation. Next, improvements in supply chain management are needed with evaluation and improvement of process efficiency, which can reduce operational costs. Investment in relevant technologies is also important to support operational efficiency. It is important to stay abreast of market trends and customer needs, and innovate continuously in products, services and operations. MSMEs also need to consider the environmental impact of their business practices and strive to reduce their environmental footprint. Partnerships and collaboration with others can open up new opportunities. Revisions and updates to business strategies in line with market and environmental changes are necessary. In addition, customer education on the value of environmentally friendly products or services can provide a better understanding and encourage the selection of MSME products. All of these are expected to help MSMEs achieve better and sustainable business performance in today's dynamic business environment.

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