Improving SME performance through entrepreneurial orientation and green innovation: The mediating role of green knowledge sharing

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Journal of Infrastructure, Policy and Development 2024, 8(11), 7733. https://doi.org/10.24294/jipd.v8i11.7733 Article Improving SME performance through entrepreneurial orientation and green innovation: The mediating role of green knowledge sharing Rozalina Novianty1, Yustinus Budi Hermanto2,* 1 Universitas Soerjo, Ngawi, Jawa Timur 63218, Indonesia 2 Universitas Katolik Darma Cendika, Surabaya, Jawa Timur 60117, Indonesia * Corresponding author: Yustinus Budi Hermanto, yustinus.budi@ukdc.ac.id CITATION Novianty R, Hermanto YB. (2024). Improving SME performance through entrepreneurial orientation and green innovation: The mediating role of green knowledge sharing. Journal of Infrastructure, Policy and Development. 8(11): 7733. https://doi.org/10.24294/jipd.v8i11.7733 ARTICLE INFO Received: 2 July 2024 Accepted: 23 August 2024 Available online: 22 October 2024 COPYRIGHT Copyright © 2024 by author(s). Journal of Infrastructure, Policy and Development is published by EnPress Publisher, LLC. This work is licensed under the Creative Commons Attribution (CC BY) license. https://creativecommons.org/licenses/ by/4.0/ Abstract: This study investigates the impact of entrepreneurial orientation and green innovation on the performance of SMEs. This research explores the wood waste industry in Ngawi, an area that has never been studied before, thus providing a new perspective and unique local relevance. These findings underscore the critical role of entrepreneurial orientation and green innovation in driving sustainable business growth and improving SME performance. The results show that both entrepreneurial orientation and green innovation having a positive and significant link with SMEs

performance. Further, the study reveals that the relationship between entrepreneurial orientation and green innovation having a positive and significant link with SMEs performance mediated by knowledge-sahring. The study also highlights the importance of larger sample sizes, and external factors to provide more comprehensive insights for practitioners and policymakers. Keywords: entrepreneurial orientation; green innovation; smes performance; green knowledge sharing; sustainability; competitive advantage 1. Introduction Green entrepreneurship has gained significant focus due to growing global awareness of environmental sustainability. It refers to business practices that aim for economic profit while minimizing negative impacts on the environment and society. This includes efficient use of natural resources, application of environmentally friendly technologies, and development of products and services that support environmental preservation. The urgency of sustainability has driven businesses to adopt greener practices, leading to the emergence of Green Entrepreneurial Orientation (GEO). GEO integrates environmental concerns into entrepreneurial activities, enhancing performance through proactive environmental strategies (Jiang et al., 2018). This phenomenon is evident across various industrial sectors, including small and medium enterprises (SMEs). SMEs play a crucial role in Indonesia's economy, especially in regions like Ngawi Regency, which has significant potential in the creative industries based on local resources. The wood waste processing industry, for example, has great potential for growth through green entrepreneurship. Green Innovation (GI), which includes new technologies and eco-friendly production methods, is a key driver of sustainable competitive advantage. GI not only contributes to sustainability goals but also enhances market position and operational efficiency (Khan et al., 2021). Wood waste, often considered a valueless byproduct and typically discarded, because it is generally perceived as a waste material with little to no economic value, can lead to significant environmental issues, including soil and water pollution (Tamanna et al., 2020). However, with the right approach, wood waste can be transformed into high-value products such as furniture, handicrafts, and alternative fuels. This transformation requires green innovation, encompassing new technologies, creative product design, and efficient, environmentally friendly production methods. Knowledge Sharing (KS) is essential in this process, fostering innovation through the creation and dissemination of knowledge within organizations (Nonaka and Takeuchi, 1995). The specific dynamics of Green Knowledge Sharing (GKS) and its impact on green innovation performance, however, require further investigation. Implementing green innovation in wood waste processing is difficult for SMEs due to limited resources, lack of access to technology and information, and insufficient knowledge of eco-friendly practices. Green knowledge sharing becomes a key factor in helping SMEs overcome these challenges and encouraging innovation. This study examines the mediating role of Green Knowledge Sharing (GKS) in the relationship between Green Entrepreneurial Orientation (GEO) and Green Innovation (GI). While the impacts of GEO and GI on firm performance have been studied individually, there is limited research on their integrative effects through knowledge sharing (Li et al., 2023). This research aims to contribute to the literature on green innovation and provide actionable insights for firms to enhance their innovation performance through sustainable practices. One often-cited definition of green entrepreneurship is "the creation of new environmentally friendly enterprises" (Arenal et al., 2020). The call for environmentally friendly entrepreneurship in the era of economic development is increasing, pushing the public and private sectors to establish institutions that pave the way for green entrepreneurship. Research has attempted to identify the characteristics and personal traits that promote green entrepreneurship, but there has been no significant breakthrough in creating predictive models (Prodanova et al., 2021). In this context, entrepreneurial orientation and product innovation during the

COVID-19 pandemic have shown that SMEs need to utilize online technology, innovate in product design and patterns, and participate in developing environmentally friendly technology. This approach can help SMEs improve operational efficiency and create new business opportunities. Research implications suggest that SMEs should use online technologies like marketplaces, social media, and e-commerce to reach a broader consumer base and innovate in product design to increase profits (Sukarno, 2018). Green entrepreneurship can be an important catalyst for transitioning to a more sustainable economy. Green entrepreneurs are key in creating new markets for environmentally friendly products and services while driving systemic changes in existing industries (Hockerts and Wüstenhagen, 2010). Green innovation can provide a competitive advantage for companies, particularly in terms of energy efficiency and raw material cost reduction (Schiederig et al., 2012). Additionally, environmentally conscious consumers often value environmentally friendly products, opening new market opportunities. Green innovation can also help SMEs meet increasingly stringent environmental regulations and gain support and incentives from the government. Despite the many benefits, implementing green innovation in SMEs is not easy. Major challenges include limited resources, lack of access to technology and information, and insufficient knowledge about environmentally friendly practices. SMEs often face difficulties accessing the necessary resources for green innovation, such as environmentally friendly technology and funding. Additionally, SMEs often lack the knowledge and skills to develop and implement green innovation (Revell et al., 2010). In this regard, green knowledge sharing becomes a crucial factor that can help SMEs overcome these challenges and encourage them to innovate. Knowledge about the latest technologies, efficient production methods, and business strategies that support sustainability can help SMEs overcome the challenges they face. Knowledge sharing is key to creating sustainable competitive advantages. It emphasizes the importance of the "knowledge spiral," which converts and communicates knowledge through various organizational levels, from individuals to groups and the entire organization (Crossan, 1996). In the context of SMEs, knowledge sharing can be done in various ways, including training, seminars, workshops, and collaboration among business actors. Lee et al. (2012) added that collaboration and knowledge sharing among business actors can drive innovation and improve overall business performance. They emphasized the importance of building strong networks and communities to support exchanging knowledge and experience. In the context of SMEs in Ngawi, these knowledge-sharing efforts are expected to help SME actors become more adaptive and innovative in facing environmental and market challenges. This research aims to highlight the importance of adopting and developing green entrepreneurial practices and green innovation in facing environmental sustainability challenges. In addition, this introduction also emphasizes the need to share knowledge to overcome the challenges of implementing green innovation in SMEs, as well as providing significant academic and practical contributions to the literature and sustainable business practices. 2. Literature review 2.1. Entrepreneurial orientation and green innovation performance Fahim and Baharun (2016) explain the relationship between orientation and business capabilities, including market, innovation, learning, and entrepreneurship, in the agricultural sector in Malaysia through 81 empirical studies. The findings indicate that an entrepreneurial mindset directly impacts an organization's capacity to assimilate new knowledge, leading to enhanced innovation and improved company success. Furthermore, Ilyas et al. (2017) examined the causal relationship between exogenous variables (strategic leadership, entrepreneurial orientation, innovation) and endogenous variables (SMEs performance) in small and medium enterprises (SMEs) in South Sulawesi Province. The study results indicate that strategic leadership, entrepreneurial orientation, and innovation significantly affect the performance of small and medium

enterprises, both simultaneously and partially. In this study, the roles of entrepreneurial orientation and innovation performance are not causally related because they stand together as exogenous variables. Lin and Chen (2018) researched the relationship between entrepreneurial orientation and innovation mediated by the ability to absorb knowledge. This study tested the influence of green entrepreneurial orientation and environmentally friendly relational quality on green service innovation in 542 hotel managers in Taiwan. The results show that green entrepreneurial orientation improves environmentally friendly relational quality and green service innovation. Guo et al. (2020) conducted a study to examine the direct and indirect effects of an environmentally friendly entrepreneurial approach on green innovation in 416 businesses in the electronics, transportation equipment, and chemical industries in China. They investigated supply chain learning as a mediator in this relationship. The study revealed that the organizations' environmentally conscious entrepreneurial mindset had a beneficial effect on acquiring knowledge within the supply chain. In addition, supply chain learning played a role in connecting green entrepreneurial orientation with both radical green innovation and incremental green innovation. H1: Entrepreneurial orientation has a positive and significant impact on SMEs' performance. 2.2. Green innovation and SMEs performance Creative processes and innovative products improve firm performance (Ahmed et al., 2021; Qiu et al., 2020). Using the contrast analysis method, Ahmed et al. and Xie et al. Ahmed et al. (2023) and Xie et al. (2019) found that process and product innovations help organizations improve their functioning. According to the study conducted by Alhadid and Abu-Rumman (2014), there is a strong correlation between green innovation and organizational performance. The study also found that ecological management influences the relationship between organizational roles and green innovation. Many factors influence the relationship between green product creativity and organizational achievement. Green product creativity promotes the efficient use of raw materials (Qiu et al., 2020). Qiu et al. (2020) reduce costs and help companies convert waste into usable products, thereby increasing profitability. This relationship also improves business performance and profitability, resulting in market advantages (Eiadat et al., 2008; Lu et al., 2020). Kammerer, (2009) emphasizes that consumer demand for green products generates economic and social benefits. Ahmed et al. (2021) also confirmed the positive relationship between consumer demand, organizational achievement, and green innovation. Based on previous research findings, green innovation has been adapted as a variable to examine its impact on organizational achievement. Green processes and innovations have a dual benefit: they minimize harm to the environment and enhance businesses' financial and social performance by being a cost-effective measure resulting from GI. (Weng et al., 2015). According to research, GI should be seen as a proactive strategy enterprises adopt to gain a competitive edge over their rivals rather than merely reacting to external regulations (Kratzer et al., 2017). H2: Green innovation has a positive and significant impact on SMEs' performance. 2.3. Green entrepreneurship, green innovation, SMEs performance, and green knowledge sharing Makhloufi et al. (2022) found that green entrepreneurial orientation is a strategic asset that can boost green innovation using green knowledge management. This research highlights that green knowledge sharing is key in strengthening the relationship between green entrepreneurial orientation and green innovation outcomes, especially in a corporate culture that supports environmental initiatives. Research (Wang et al., 2022) found that green entrepreneurial orientation has a positive impact on performance, with green knowledge sharing as a mediator. The study also showed that firms with a strong green knowledge-sharing strategy tend to be more successful in implementing green innovations, reducing costs, and improving operational efficiency and competitiveness in environmentally concerned markets.

Furthermore, Idrees et al. (2023) examined how green entrepreneurial orientation (GEO) affects performance (GIP) through the knowledge creation process (KCP) and the moderating role of resource orchestration capabilities (ROC). The results show that GEO significantly affects GIP, with partial mediation by knowledge integration and knowledge exchange. ROC strengthens the influence of GEO on knowledge exchange and its impact on GIP. Research (Li et al., 2023) explored the impact of green process innovation, GI strategy, and green action innovation on sustainable performance with the mediating role of green product innovation and the moderating role of employee green behavior. Data was collected from 411 employees working in the manufacturing sector of Pakistan. Employee green initiatives ensure the organization's sustainable performance through green products. Employee green behavior acts as a mediator between green product creation and sustainable performance. H3: Entrepreneurial orientation and green innovation have positive and a significant impact on SME performance. H4: Green knowledge sharing positively mediates between entrepreneurial orientation and SME performance. H5: Green knowledge sharing positively mediates the relationship between green innovation and SME performance. This research model is illustrated in Figure 1. Figure 1. Empirical model. 3. Methodology This study used a quantitative approach. This model contains variables from the relevant literature for research. The primary data is obtained through online questionnaires to respondents from small and medium-sized enterprises (SMEs). This study uses a non-probability sampling approach with purposive sampling techniques. Purposive sampling is a deliberate sampling strategy that involves specific considerations. According to Patton (2015), purposive sampling allows researchers to select participants that are particularly knowledgeable about or experienced with the phenomenon of interest, thereby ensuring the inclusion of relevant data for the study. This approach enables the selection of a sample that best represents the characteristics needed to address the research questions effectively. This study surveyed wood craftsmen with business licenses totaling 186 units in Ngawi district. The number of samples in this study is based on the Slovin formula (Tejada et al., 2012) which provides a method for calculating sample size based on the population size and desired margin of error. Slovin's formula for determining the number of samples is as follows: $n = N\ 1 + n\ (e)2$ Description: N = Population size/number of population n = Sample size/number of samples E = error tolerance The population of woodworking SMESs (N) = 186, assuming an error rate (e) = 10%, and the number of samples that must be used in this study is as many as n = 65 SMESs. The entrepreneurial orientation (X1) variable in this study is assessed using five indicators derived from the work of Jiang et al. (2018). The green innovation variable (X2) in this study was evaluated using eight indicators proposed by Albort- Morant et al. (2018). The performance variable (Y) of the small and medium-sized enterprises (SMEs) in this study was assessed using four indicators, which were created by Appiah et al. (2023). The green knowledge-sharing variable (Z) in this study was assessed using eight indicators by Cher-Min Fong (2012). The structural model analysis uses the Classical Assumption Test, R square, t-test, f-test statistics, and Path analysis to evaluate the hypothesis. 4. Results and discussion 4.1. Validity test Validity is often defined as the extent to which an instrument measures what it purports to measure. Validity requires that an instrument is reliable, but an instrument can be reliable without validity. Test construct validity with results as shown in Table 1 below: Table 1. Validity test. entrepreneurial orientation green innovation SMEs performance knowledge sharing Total_Score entrepreneurial orientation green innovation SMEs performance knowledge sharing Total_Score 1 0.787** 0.739** 0.821** 0.885** 0.787** 0.739** 1 0.885** 0.885** 1 0.879** 0.826** 0.964** 0.921** 0.821** 0.879** 0.826** 1 0.951** 0.885** 0.964** 0.921** 0.951** 1 **. Correlation is significant at the

0.01 level (2-tailed). Validity refers to the extent to which indicators can measure what should be measured precisely and accurately. From Table 1, the value of the sample (N) is 65, the R-Table value is 0.2058. For the entrepreneurial orientation variable (0.885 > 0.2058), green innovation (0.964 > 0.2058), SME performance (0.921 > 0.2058), and green knowledge sharing (0.951 > 0.2058), which means that all indicators are valid because R-count > R-table. 4.2. Reliability test Reliability estimates are used to evaluate (1) the stability of measures administered at different times to the same individuals or using the same standard (test- retest reliability) or (2) the equivalence of sets of items from the same test (internal consistency) or of different observers scoring a behavior or event using the same instrument (interrater reliability). Test results can be seen in Table 2. Table 2. Reliability test. Cronbach's Alpha N of Items 0.933 4 Reliability refers to the extent to which an indicator or measuring device can consistently produce stable and consistent results over time. The indicator is credible because of its Cronbach's Alpha value of 0.933, above the threshold of 0.6. 4.3. Normality test A normality test is a statistical test used to assess whether data distribution in a group or variable follows a normal distribution. Data with more than 30 (n > 30) can be assumed as the normal distribution. The regression result can determine whether it contains normal residual or not by looking at the probability of the result. If the probability is greater than 0.05 (> 0.05), then there is a presence of normal distribution. Vice versa, if the probability is less than 0.05 (0.05 <), there is no normal distribution. Test results are shown in Table 3. The normality test is used to assess whether or not the data obtained from the sample exhibits a normal distribution. The normal distribution occurs when the significance level exceeds 0.05, as determined by the Monte Carlo approach. According to Table 3, the significance (2-tailed) value is 0.189, greater than 0.05. Therefore, we can infer that the data follows a normal distribution. Table 3. Normality test. Unstandardized Residual N 65 Asymp. Sig. (2-tailed) 0.189c a. Test distribution is normal. b. Calculated from data. c. Lilliefors Significance correction. 4.4. Heteroscedasticity test A heteroscedasticity test is conducted when a disturbance in the regression function exhibits a non-constant variance, violating the OLS estimators' assumptions. This non-constant variance can lead to inefficiency in small and large samples, although the estimators remain unbiased and consistent. A method for identifying heteroscedasticity is using the Park test in conjunction with the t-test. The criterion for the test is that when the t-test value is less than the t-table value, there will be no heteroscedasticity between the independent variables. Conversely, suppose the residual variance of the regression model is homogeneous. The t-test value will be greater than the t-table value addition in that case. The white test can detect heteroscedasticity by comparing the chi-square value likelihood with the error degree. If the chi-square value is smaller than the degree of error (chi-square < degree of error), it indicates heteroscedasticity. If the chi-square value is greater than the degree of error, it indicates the absence of heteroscedasticity. The test results are displayed in Table 4. Table 4. Heteroscedasticity test. Model Unstandardized Coefficients Standardized Coefficients Beta t Sig. B Std, Error 1 (Constant) 0.512 entrepreneurial orientation −0.064 0.803 0.057 0.638 −0.256 −1.119 green innovation 0.004 0.041 0.029 0.106 knowledge sharing 0.038 0.053 0.208 0.704 0.526 0.268 0.916 0.484 a. Dependent variable: AB_RES. The heteroscedasticity test is a statistical method that determines whether the errors in the regression model have stable or unstable variations across different levels of independent variable values. The results of heteroscedasticity testing show that the tolerance value of the three variables, namely entrepreneurial orientation (0.268 > 0.05), green innovation (0.916 > 0.05), and knowledge sharing (0.484 > 0.05), Then it is assumed that the data in this research does not occur heteroscedasticity. 4.5. Multicollinearity test A multicollinearity test determines the relationship between some or all of the variables. If the

model contains multicollinearity, then the model has a large standard error, and the coefficients cannot be estimated with high accuracy. There are ways to detect multicollinearity; one is by looking at the value of the determination coefficient. Widarjono (2013) stated that if the value of the determination coefficient is greater than 0.8 (> 0.8), it means the result has multicollinearity and vice versa, and when most of the problem is largely affected by multicollinearity, then it does not affect the study. Test results are shown in Table 5. Table 5. Multicollinearity test. Model Unstandardized Coefficients Standardized Coefficients Beta t Sig. Collinearity Statistics B Std, Error Tolerance VIF 1 (Constant) entrepreneurial orientation green innovation knowledge sharing −1.880 1.435 0.046 0.103 0.047 0.398 0.073 0.685 0.131 0.096 0.185 −1.310 0.451 5.467 1.370 0.195 0.654 0.307 3.256 0.000 0.215 4.661 0.176 0.184 5.445 a. Dependent variable: SMEs performance. The multicollinearity test is used to evaluate the extent of the relationship between the independent variables in the regression model. Multicollinearity occurs when two or more independent variables in the regression model are highly correlated, which can interfere with the interpretation of regression results. The results of multicollinearity testing show that the tolerance value of the three variables, namely entrepreneurial orientation (0.307 > 0.1), green innovation (0.215 > 0.1), and knowledge sharing (0.184 > 0.1), and the VIF value of entrepreneurial orientation (3.256 < 10), green innovation (4.661 < 10) and knowledge sharing (5.445 < 10). So, it is assumed that the data in this research does not occur in multicollinearity. 4.6. Autocorrelation test The autocorrelation test measures the correlation between disturbances that are no longer efficient for estimators in small samples or models with large samples. Autocorrelation can be identified by employing the Durbin-Watson test (DW). The results will be subsequently compared with the F-table. If the value of DW (Durbin- Watson statistic) is less than the critical value of F-table (DW < F-table), it indicates the absence of autocorrelation in the regression. Conversely, if the value of DW is greater than the critical value of the F-table, it suggests the presence of autocorrelation. Test results are shown in Table 6. Table 6. Autocorrelation test. Model R R Square Adjusted R Square Std, Error of the Estimate Durbin-Watson 1 0.891a 0.795 0.784 0.788 1.771 The autocorrelation test is used to see if there is a correlation between a period and a previous period. The results of the autocorrelation test Durbin-Watson (d) value are 1.771. Furthermore, we will compare this Durbin-Watson value with the Durbin- Watson table value at the 5% significance level (4; 65). The Durbin-Watson value of 1.771 is greater than the upper limit (du) of 1.6294 and less than (4-du) 4 − 1.6294 = 2.3706, so it can be concluded that there are no autocorrelation symptoms. Thus, multiple linear regression analysis to test the hypothesis of this study can be continued. 4.7. Common method bias test Systematic errors in indicator data results caused by the same data collection method or measurement environment can typically be assessed through the Harman single-factor test on 25 items in the dataset to examine common method bias. Test results are shown in Table 7. Table 7. Common method bias. Total Variance Explained Factor Extraction Sums of Squared Loadings Total % of Variance Cumulative % entrepreneurial orientation 0.945 18.902 green innovation 1.722 21.527 knowledge sharing 1.838 20.427 SMEs performance 1.407 28.136 18.902 21.527 20.427 28.136 Extraction method: Principal axis factoring. Because this study involved self-report data collected from SMEs, the Harman single-factor test was used to test for common method bias. The results showed that the interpretation rates of the first factor were 18.90%, 21.52%, 20.42%, and 28.13%, respectively, all of which fall below the critical value of 40%. Therefore, this study may not have a significant common method bias. 4.8. Direct relationship regression test In conducting research, we have to create a research hypothesis that can be divided into two categories: null and alternative hypothesis. The null hypothesis represents the confidence level

of the researcher in proving his or her research by using sample data. An alternative hypothesis is the negation of the T-test. The T-test is a method that uses sample results to assess the validity of a hypothesis. In hypothesis testing, the goal is to identify whether a two-sided or one-sided test should be performed. A two-sided hypothesis test is selected when there is a lack of a strong theoretical foundation in research, while a one-sided hypothesis test is employed when there is a strong theoretical base. According to Field (2013) if the calculated t-value exceeds the critical t-value at a given significance level, the difference observed is statistically significant, leading to the rejection of the null hypothesis. When the calculated t-value is greater than the critical t-value, it indicates that the null hypothesis can be rejected. This conclusion is based on statistical principles outlined in standard statistical textbooks and research methodology guides. The test results are displayed in Table 8 below: Table 8. Results of the t-test. Model t Sig. 1 entrepreneurial orientation 4.162 0.000 green innovation 7.651 0.000 a. Dependent variable: SME performance. Entrepreneurial orientation variable t-value > critical t-value (4.162 > 1.668) so H1 is accepted. This shows that entrepreneurial orientation has a positive and significant effect on the performance of SMEs. While green innovation variable t- value > critical t-value (7.651 > 1.698) then H2 is accepted. This shows that green innovation has a positive and significant effect on the performance of SMEs. F-test is a test conducted by comparing the result of F calculated with table F to see the effect of all independent variables on the dependent variables. According to Hair et al., (2010), if the calculated F-value exceeds the critical F-value, the variance explained by the model is significantly greater than the variance not explained, leading to the rejection of the null hypothesis. When the calculated F-value is greater than the critical F-value it indicates that the null hypothesis can be rejected. This conclusion is supported by statistical theory and practice. Test results are shown in Table 9. Table 9. F-test results . Model Sum of Squares df Mean Square F Sig. 1 Regression Residuals Total 153.058 31.158 184.215 2 62 64 76.529 152.283 0.503 0.000b a. Dependent variable: SMES performance. b. Predictors: (Constant), green innovation, entrepreneurial orientation. The results of the F-test (simultaneously) show F-value > critical F-value, (152.283> 3.15) then H3 is accepted. This shows that entrepreneurial orientation and green innovation together have a positive and significant effect on the performance of SMEs. 4.9. Coefficient of determination The coefficient of determination, also called R squared, is a numerical value that quantifies the proportion of variance in the dependent variable, which the independent variable can explain. In other words, it means how big the regression line describes the data. Test results as shown in Table 10. Table 10. Determinant coefficient results. Model R R Square Adjusted R Square Std, Error of the Estimate 1 0.912a 0.831 0.825 0.709 a. Predictors: (Constant), green innovation, entrepreneurial orientation. The coefficient of determination in the R Square column is 0.831, meaning that the contribution of entrepreneurial orientation and green innovation impacts SME performance by 83.1%, and the remaining 16.9% is controlled by other variables not discussed in this study. 4.10. Moderation relationship The moderating variable is a variable-independent function that strengthens or weakens the relationship between variables independent of the dependent variable. There are several ways to test regression with moderating variables, and one of them is Moderated Regression Analysis (MRA). Testing Regression With Variables Moderating Using MRA Moderated Regression Analysis (MRA) or interaction testing is a particular application of linear regression, The regression contains elements of interaction (multiplication of two or more independent variables). Test results are shown in Table 11. Table 11. t-test results. Model Unstandardized Coefficients Standardized Coefficients t Sig. B Std. Error Beta (Constant) 6.113 0.667 1 Entrepreneurial Orientation_Knowledge Sharing 0.006 0.002 0.336 Green Innovation_Knowledge Sharing 0.006

0.001 0.580 9.161 2.362 4.070 0.000 0.021 0.000 a. Dependent variable: SMEs Performance. The t-test results (partial) show that the significance value of the entrepreneurial orientation - knowledge sharing variable is less than 0.05 (0.000 < 0.05), so H4 is accepted. This indicates that the knowledge-sharing variable has a moderating effect. Furthermore, the significance value of the green innovation-sharing knowledge variable is less than 0.05 (0.000 < 0.05), so H5 is accepted. This indicates that there is a moderating influence of the knowledge-sharing variable. The results of the determination coefficient test, as shown in Table 12, provide insight into the proportion of variance in the dependent variable that is explained by the independent variables within the model. Table 12. Determinant coefficient results. Model R R Square Adjusted R Square Std. Error of the Estimate 1 0.899a 0.808 0.802 0.755 a. Predictors: (Constant), Green Innovation_Knowledge Sharing, Entrepreneurial Orinetation_Knowledge Sharing. The coefficient of determination, represented by the R Square value of 0.808, indicates that 80.8% of the variation in the outcome can be attributed to the combined influence of entrepreneurial orientation and green innovation after considering the moderating effect. The remaining 19.2% is influenced by other variables not examined in this study. 5. Discussion The integration of entrepreneurial orientation (EO) and green innovation (GI) plays a pivotal role in the performance of small and medium enterprises (SMEs), particularly in sectors with significant environmental impacts, such as the woodcraft industry in Ngawi, Indonesia. The research underscores the importance of green knowledge sharing (GKS) as a mediator that enhances the positive effects of EO and GI on SME performance. This discussion aims to delve deeper into these relationships, drawing on the theoretical framework and empirical findings presented in the study. 5.1. Entrepreneurial orientation and SMEs performance Entrepreneurial orientation encompasses dimensions such as innovativeness, proactiveness, and risk-taking, essential for fostering a competitive edge and driving business success. EO is crucial for SMEs as it enables them to adapt to market changes, seize new opportunities, and implement innovative solutions. Fahim and Baharun (2016) demonstrated that an entrepreneurial mindset directly impacts an organization's capacity to assimilate new knowledge, leading to enhanced innovation and improved performance. Similarly, Ilyas et al. (2017) found that strategic leadership and EO significantly affect the performance of SMEs. The findings from this study align with these perspectives, indicating that EO positively influences SME performance. SMEs with strong EO are better equipped to undertake green innovations, improving their environmental and economic outcomes. The positive relationship between EO and SME performance can be attributed to several factors. First, innovative SMEs are more likely to develop unique products and services that meet the growing demand for sustainable solutions (Schiederig et al., 2012). Second, proactive SMEs anticipate market trends and regulatory changes, allowing them to adapt their strategies and operations accordingly (Covin and Slevin, 1991). Lastly, risk-taking SMEs are willing to invest in new technologies and business models that, although uncertain, hold the potential for substantial returns and competitive advantage (Miller, 1983). 5.2. Green innovation and SMEs performance Green innovation encompasses creating and adopting novel methods, goods, and behaviors that reduce ecological footprints and enhance sustainability. GI includes adopting environmentally friendly technologies, enhancing resource efficiency, and creating green products. The study by Alhadid and Abu-Rumman (2014) supports the notion that there is a strong correlation between GI and organizational performance. Green innovations reduce expenses, enhance effectiveness, and meet the increasing market need for environmentally friendly products, offering a competitive edge. This research confirms that GI has a significant impact on SME performance. SMEs that engage in green innovation can differentiate themselves in the market, meet regulatory requirements, and attract environmentally

conscious customers. The study confirms that GI positively impacts SME performance. This aligns with previous research indicating that green innovations—ranging from eco-friendly product designs to sustainable production processes—enhance operational efficiency, reduce costs, and open new market opportunities (Chen et al., 2006; Kammerer, 2009). By integrating green innovations, SMEs not only mitigate their environmental impact but also improve their financial and social performance, which is increasingly valued by stakeholders (Weng et al., 2015). Several mechanisms explain how GI contributes to improved SME performance. First, eco-innovations reduce resource consumption and waste, leading to cost savings and higher profitability (Qiu et al., 2020). Second, green products often command a price premium and foster customer loyalty among environmentally conscious consumers (Lu et al., 2020). Third, compliance with environmental regulations and standards can yield government incentives and avoid penalties, enhancing the financial stability of SMEs (Eiadat et al., 2008). 5.3. The mediating role of green knowledge sharing Green knowledge sharing refers to distributing and exchanging information about sustainable practices and technologies. It is a critical factor that helps SMEs overcome barriers to implementing green innovations, such as limited resources and lack of access to technology and information. Makhloufi et al. (2022) highlighted that GKS strengthens the relationship between EO and GI outcomes, particularly in a corporate culture that supports environmental initiatives. The findings of this study corroborate this view, showing that GKS serves as a crucial mediator that enhances the positive effects of EO and GI on SME performance. SMEs that actively share knowledge can leverage collective expertise to innovate more effectively, thus improving their sustainability and competitiveness. GKS emerges as a critical mediator between EO, GI, and SME performance. Knowledge sharing facilitates the dissemination and application of environmental best practices, innovative ideas, and technological advancements across the organization (Nonaka and Takeuchi, 1995). In the context of this study, GKS enhances the positive effects of EO and GI on SME performance by fostering a culture of continuous improvement and environmental stewardship. SMEs that actively share knowledge about green practices are better equipped to implement eco-innovations and adapt to changing market and regulatory landscapes (Wang et al., 2022). Furthermore, GKS helps SMEs overcome resource constraints by leveraging collective expertise and fostering collaborations with external partners, such as suppliers, customers, and research institutions (Idrees et al., 2023). The integrative model proposed in this research highlights the synergistic effects of EO, GI, and GKS on SME performance. The hypothesis testing revealed that EO and GI significantly impact SME performance, and GKS mediates these relationships. H1 and H2 were supported, indicating that EO and GI contribute to better SME performance. H3, H4, and H5 further confirmed that GKS enhances the effects of EO and GI on performance. These findings suggest that SMEs should foster a culture of knowledge sharing to maximize the benefits of their entrepreneurial and innovative efforts. 5.4. Practical implications The findings of this study have significant practical implications for SMEs managers and policymakers. First, SMEs managers should prioritize entrepreneurial orientation and green innovation as strategic pillars to enhance business performance. The results demonstrate that entrepreneurial orientation positively influences green innovation performance (GIP), which is consistent with previous studies (Makhloufi et al., 2022; Wang et al., 2022). By fostering an entrepreneurial mindset and encouraging innovative practices, managers can drive sustainable business growth. Second, the role of green knowledge sharing as a mediating factor highlights the importance of internal and external communication within organizations. Managers should implement structured knowledge sharing mechanisms to facilitate the dissemination of green practices and innovations (Jiang et al., 2023). This can include

regular training sessions, collaborative platforms, and incentivizing knowledge sharing among employees. Third, policymakers should create supportive environments that promote green entrepreneurship and innovation. This can be achieved by providing financial incentives, subsidies, and technical support to SMEs engaged in green practices. Policies should also focus on creating awareness about the benefits of green innovation and providing a framework that encourages sustainable business practices (Idrees et al., 2023). Furthermore, resource orchestration capabilities (ROC) are crucial for enhancing the effectiveness of green innovation. SMEs managers should focus on optimizing their resources, including human, financial, and technological assets, to support innovative initiatives. This aligns with the findings of prior research that emphasizes the strategic management of resources to achieve competitive advantage (Wang et al., 2022). 5.5. Theoretical contributions This study contributes to the theoretical understanding of the interplay between EO, GI, and SME performance by highlighting the mediating role of GKS. The study expands upon the firm's resource-based view (RBV) by showcasing the role of intangible resources, such as entrepreneurial orientation and green expertise, in stimulating innovation and enhancing performance (Barney, 1991). These findings underscore the importance of intangible resources in the context of RBV, which include entrepreneurial orientation that encourages proactive, innovative, and risk-taking behavior, and green expertise that enables firms to develop innovative, environmentally friendly solutions. As such, this study provides empirical evidence supporting the view that the combination of entrepreneurial orientation and green innovation can create sustainable competitive advantage and improve firm performance (Lumpkin and Dess, 1996; Wales et al., 2013). Furthermore, following the dynamic capabilities framework, this study shows that a firm's ability to adapt quickly to changes in the external environment and capitalize on new competencies is critical in maintaining superior performance. These dynamic capabilities include the processes of sensing (recognizing opportunities and threats), seizing (taking advantage of opportunities), and transforming (changing and reconfiguring resources) that are essential for a firm's long-term survival and growth (Teece, 2007). Thus, this study not only confirms the relevance of RBV theory and dynamic capabilities in the context of SMEs, but also expands the understanding of how entrepreneurial orientation and green innovation can be effectively implemented to achieve better performance in an increasingly competitive and dynamic business environment (Barney, 2001; Teece et al., 1997; Teece, 2007). 5.6. Challenges and limitations This study, while insightful, has certain limitations. First, the sample size was limited to 65 MSMEs in a specific region, which may affect the generalizability of the findings. Future research should consider larger, more diverse samples from various regions and industries. Additionally, this study did not extensively explore external factors such as regulatory environments, market conditions, and technological advancements, which could influence the relationship between entrepreneurial orientation, green innovation, and SME performance. Future studies should include these variables for a more comprehensive understanding. Lastly, while green knowledge sharing was identified as a key factor, the specific processes and practices involved were not deeply examined. Future research should investigate these mechanisms in greater detail, possibly through qualitative or mixed- method approaches. 6. Conclusion This study provides important insights into the positive and significant influence of entrepreneurial orientation and green innovation on SME performance. Based on the data analysis, it is found that SMEs with higher levels of entrepreneurial orientation and green innovation practices can improve their performance. These quantitative results support the hypothesis that entrepreneurial orientation and green innovation substantially contribute to the enhancement of SMEs' performance. The analysis shows that entrepreneurial orientation has a positive and significant effect on SME

performance with t-value > critical t-value (4.162 > 1.668), and green innovation also has a positive and significant effect on SME performance with t-value > critical t-value (7.651 > 1.698). The F-test results show that entrepreneurial orientation and green innovation simultaneously have a positive and significant effect on SME performance (F-value = 152.283 > F-critical = 3.15). In addition, the knowledge sharing variable has a significant moderating effect on the relationship between entrepreneurial orientation and SME performance (significance value < 0.05), as well as on the relationship between green innovation and SME performance (significance value < 0.05). This conclusion emphasizes the importance of developing an entrepreneurial mindset and encouraging green innovation practices in SMEs to achieve sustainable business growth. This study also underscores the need for further research that considers objective metrics, larger sample sizes, external factors, and green knowledge-sharing mechanisms to provide a more comprehensive understanding and offer clearer guidance for practitioners and policymakers. Author contributions: Conceptualization, RN and YBH; methodology, RN; software, RN; validation, RN and YBH; formal analysis, RN; investigation, RN; resources, RN; data curation, RN; writing—original draft preparation, RN; writing—review and editing, RN; visualization, RN; supervision, YBH; project administration, YBH; funding acquisition, YBH. All authors have read and agreed to the published version of the manuscript. Conflict of interest: The authors declare no conflict of interest. References Ahmed, R. R., Streimikiene, D., & Zheng, X. (2021). The Impact of Proactive Environmental Strategy on Competitive and Sustainable Development of Organizations. Journal of Competitiveness, 13(4), 5–24. https://doi.org/10.7441/joc.2021.04.01 Ahmed, R. R., Streimikiene, D., Qadir, H., et al. (2022). Effect of green marketing mix, green customer value, and attitude on green purchase intention: evidence from the USA. Environmental Science and Pollution Research, 30(5), 11473–11495. https://doi.org/10.1007/s11356-022-22944-7 Albort-Morant, G., Leal-Rodríguez, A. L.& De Marchi, V. (2018). Absorptive capacity and relationship learning mechanisms as complementary drivers of green innovation performance. Journal of Knowledge Management, 22(2), 432–452. https://doi.org/10.1108/jkm-07-2017-0310 Alhadid, A. Y., & Abu-Rumman, A. H. (2014). The Impact of Green Innovation on Organizational Performance, Environmental Management Behavior as a Moderate Variable: An Analytical Study on Nuqul Group in Jordan. International Journal of Business and Management, 9(7). https://doi.org/10.5539/ijbm.v9n7p51 Appiah, M. K., Sam, A., Twum, E., et al. (2023). Modelling the influencing of green entrepreneurship orientation on sustainable firm performance: a moderated mediation model. Economic Research-Ekonomska Istraživanja, 36(2). https://doi.org/10.1080/1331677x.2023.2179094 Arenal, A., Feijoo, C., Moreno, A., et al. (2019). An academic perspective on the entrepreneurship policy agenda: themes, geographies and evolution. Journal of Entrepreneurship and Public Policy, 9(1), 65–93. https://doi.org/10.1108/jepp-06- 2019-0056 Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. Journal of Management, 17(1), 99–120. https://doi.org/10.1177/014920639101700108 Cher-Min Fong. (2012). The impact of green learning orientation on proactive environmental innovation capability and firm performance. African Journal of business management, 6(3). https://doi.org/10.5897/ajbm10.544 Covin, J. G., & Slevin, D. P. (1991). A Conceptual Model of Entrepreneurship as Firm Behavior. Entrepreneurship Theory and Practice, 16(1), 7–26. https://doi.org/10.1177/104225879101600102 Crossan, M. M. (1996). The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation. Journal of International Business Studies, 27(1), 196–201. https://doi.org/10.1057/jibs.1996.13 Eiadat, Y., Kelly, A., Roche, F., et al. (2008). Green and competitive? An empirical test of the mediating role of environmental innovation strategy. Journal of

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Article

Improving SME performance through entrepreneurial orientation and green innovation: The mediating role of green knowledge sharing

Rozalina Novianty[1], **Yustinus Budi Hermanto**[2,*]

[1] Universitas Soerjo, Ngawi, Jawa Timur 63218, Indonesia
[2] Universitas Katolik Darma Cendika, Surabaya, Jawa Timur 60117, Indonesia
* **Corresponding author:** Yustinus Budi Hermanto, yustinus.budi@ukdc.ac.id

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Abstract: This study investigates the impact of entrepreneurial orientation and green innovation on the performance of SMEs. This research explores the wood waste industry in Ngawi, an area that has never been studied before, thus providing a new perspective and unique local relevance. These findings underscore the critical role of entrepreneurial orientation and green innovation in driving sustainable business growth and improving SME performance. The results show that both entrepreneurial orientation and green innovation having a positive and significant link with SMEs performance. Further, the study reveals that the relationship between entrepreneurial orientation and green innovation having a positive and significant link with SMEs performance mediated by knowledge-sahring. The study also highlights the importance of larger sample sizes, and external factors to provide more comprehensive insights for practitioners and policymakers.

Keywords: entrepreneurial orientation; green innovation; smes performance; green knowledge sharing; sustainability; competitive advantage

1. Introduction

Green entrepreneurship has gained significant focus due to growing global awareness of environmental sustainability. It refers to business practices that aim for economic profit while minimizing negative impacts on the environment and society. This includes efficient use of natural resources, application of environmentally friendly technologies, and development of products and services that support environmental preservation. The urgency of sustainability has driven businesses to adopt greener practices, leading to the emergence of Green Entrepreneurial Orientation (GEO). GEO integrates environmental concerns into entrepreneurial activities, enhancing performance through proactive environmental strategies (Jiang et al., 2018).

This phenomenon is evident across various industrial sectors, including small and medium enterprises (SMEs). SMEs play a crucial role in Indonesia's economy, especially in regions like Ngawi Regency, which has significant potential in the creative industries based on local resources. The wood waste processing industry, for example, has great potential for growth through green entrepreneurship. Green Innovation (GI), which includes new technologies and eco-friendly production methods, is a key driver of sustainable competitive advantage. GI not only contributes to sustainability goals but also enhances market position and operational efficiency (Khan et al., 2021).

Wood waste, often considered a valueless byproduct and typically discarded, because it is generally perceived as a waste material with little to no economic value, can lead to significant environmental issues, including soil and water pollution (Tamanna et al., 2020). However, with the right approach, wood waste can be transformed into high-value products such as furniture, handicrafts, and alternative fuels. This transformation requires green innovation, encompassing new technologies, creative product design, and efficient, environmentally friendly production methods. Knowledge Sharing (KS) is essential in this process, fostering innovation through the creation and dissemination of knowledge within organizations (Nonaka and Takeuchi, 1995). The specific dynamics of Green Knowledge Sharing (GKS) and its impact on green innovation performance, however, require further investigation.

Implementing green innovation in wood waste processing is difficult for SMEs due to limited resources, lack of access to technology and information, and insufficient knowledge of eco-friendly practices. Green knowledge sharing becomes a key factor in helping SMEs overcome these challenges and encouraging innovation. This study examines the mediating role of Green Knowledge Sharing (GKS) in the relationship between Green Entrepreneurial Orientation (GEO) and Green Innovation (GI). While the impacts of GEO and GI on firm performance have been studied individually, there is limited research on their integrative effects through knowledge sharing (Li et al., 2023). This research aims to contribute to the literature on green innovation and provide actionable insights for firms to enhance their innovation performance through sustainable practices.

One often-cited definition of green entrepreneurship is "the creation of new environmentally friendly enterprises" (Arenal et al., 2020). The call for environmentally friendly entrepreneurship in the era of economic development is increasing, pushing the public and private sectors to establish institutions that pave the way for green entrepreneurship. Research has attempted to identify the characteristics and personal traits that promote green entrepreneurship, but there has been no significant breakthrough in creating predictive models (Prodanova et al., 2021).

In this context, entrepreneurial orientation and product innovation during the COVID-19 pandemic have shown that SMEs need to utilize online technology, innovate in product design and patterns, and participate in developing environmentally friendly technology. This approach can help SMEs improve operational efficiency and create new business opportunities. Research implications suggest that SMEs should use online technologies like marketplaces, social media, and e-commerce to reach a broader consumer base and innovate in product design to increase profits (Sukarno, 2018).

Green entrepreneurship can be an important catalyst for transitioning to a more sustainable economy. Green entrepreneurs are key in creating new markets for environmentally friendly products and services while driving systemic changes in existing industries (Hockerts and Wüstenhagen, 2010).

Green innovation can provide a competitive advantage for companies, particularly in terms of energy efficiency and raw material cost reduction (Schiederig et al., 2012). Additionally, environmentally conscious consumers often value environmentally friendly products, opening new market opportunities. Green

innovation can also help SMEs meet increasingly stringent environmental regulations and gain support and incentives from the government.

Despite the many benefits, implementing green innovation in SMEs is not easy. Major challenges include limited resources, lack of access to technology and information, and insufficient knowledge about environmentally friendly practices. SMEs often face difficulties accessing the necessary resources for green innovation, such as environmentally friendly technology and funding. Additionally, SMEs often lack the knowledge and skills to develop and implement green innovation (Revell et al., 2010). In this regard, green knowledge sharing becomes a crucial factor that can help SMEs overcome these challenges and encourage them to innovate. Knowledge about the latest technologies, efficient production methods, and business strategies that support sustainability can help SMEs overcome the challenges they face.

Knowledge sharing is key to creating sustainable competitive advantages. It emphasizes the importance of the "knowledge spiral," which converts and communicates knowledge through various organizational levels, from individuals to groups and the entire organization (Crossan, 1996). In the context of SMEs, knowledge sharing can be done in various ways, including training, seminars, workshops, and collaboration among business actors.

Lee et al. (2012) added that collaboration and knowledge sharing among business actors can drive innovation and improve overall business performance. They emphasized the importance of building strong networks and communities to support exchanging knowledge and experience. In the context of SMEs in Ngawi, these knowledge-sharing efforts are expected to help SME actors become more adaptive and innovative in facing environmental and market challenges. This research aims to highlight the importance of adopting and developing green entrepreneurial practices and green innovation in facing environmental sustainability challenges. In addition, this introduction also emphasizes the need to share knowledge to overcome the challenges of implementing green innovation in SMEs, as well as providing significant academic and practical contributions to the literature and sustainable business practices.

2. Literature review

2.1. Entrepreneurial orientation and green innovation performance

Fahim and Baharun (2016) explain the relationship between orientation and business capabilities, including market, innovation, learning, and entrepreneurship, in the agricultural sector in Malaysia through 81 empirical studies. The findings indicate that an entrepreneurial mindset directly impacts an organization's capacity to assimilate new knowledge, leading to enhanced innovation and improved company success. Furthermore, Ilyas et al. (2017) examined the causal relationship between exogenous variables (strategic leadership, entrepreneurial orientation, innovation) and endogenous variables (SMEs performance) in small and medium enterprises (SMEs) in South Sulawesi Province. The study results indicate that strategic leadership, entrepreneurial orientation, and innovation significantly affect the performance of small and medium enterprises, both simultaneously and partially. In this study, the

roles of entrepreneurial orientation and innovation performance are not causally related because they stand together as exogenous variables.

Lin and Chen (2018) researched the relationship between entrepreneurial orientation and innovation mediated by the ability to absorb knowledge. This study tested the influence of green entrepreneurial orientation and environmentally friendly relational quality on green service innovation in 542 hotel managers in Taiwan. The results show that green entrepreneurial orientation improves environmentally friendly relational quality and green service innovation.

Guo et al. (2020) conducted a study to examine the direct and indirect effects of an environmentally friendly entrepreneurial approach on green innovation in 416 businesses in the electronics, transportation equipment, and chemical industries in China. They investigated supply chain learning as a mediator in this relationship. The study revealed that the organizations' environmentally conscious entrepreneurial mindset had a beneficial effect on acquiring knowledge within the supply chain. In addition, supply chain learning played a role in connecting green entrepreneurial orientation with both radical green innovation and incremental green innovation.

H1: Entrepreneurial orientation has a positive and significant impact on SMEs' performance.

2.2. Green innovation and SMEs performance

Creative processes and innovative products improve firm performance (Ahmed et al., 2021; Qiu et al., 2020). Using the contrast analysis method, Ahmed et al. and Xie et al. Ahmed et al. (2023) and Xie et al. (2019) found that process and product innovations help organizations improve their functioning. According to the study conducted by Alhadid and Abu-Rumman (2014), there is a strong correlation between green innovation and organizational performance. The study also found that ecological management influences the relationship between organizational roles and green innovation. Many factors influence the relationship between green product creativity and organizational achievement. Green product creativity promotes the efficient use of raw materials (Qiu et al., 2020). Qiu et al. (2020) reduce costs and help companies convert waste into usable products, thereby increasing profitability.

This relationship also improves business performance and profitability, resulting in market advantages (Eiadat et al., 2008; Lu et al., 2020). Kammerer, (2009) emphasizes that consumer demand for green products generates economic and social benefits. Ahmed et al. (2021) also confirmed the positive relationship between consumer demand, organizational achievement, and green innovation. Based on previous research findings, green innovation has been adapted as a variable to examine its impact on organizational achievement.

Green processes and innovations have a dual benefit: they minimize harm to the environment and enhance businesses' financial and social performance by being a cost-effective measure resulting from GI. (Weng et al., 2015). According to research, GI should be seen as a proactive strategy enterprises adopt to gain a competitive edge over their rivals rather than merely reacting to external regulations (Kratzer et al., 2017).

H2: Green innovation has a positive and significant impact on SMEs' performance.

2.3. Green entrepreneurship, green innovation, SMEs performance, and green knowledge sharing

Makhloufi et al. (2022) found that green entrepreneurial orientation is a strategic asset that can boost green innovation using green knowledge management. This research highlights that green knowledge sharing is key in strengthening the relationship between green entrepreneurial orientation and green innovation outcomes, especially in a corporate culture that supports environmental initiatives. Research (Wang et al., 2022) found that green entrepreneurial orientation has a positive impact on performance, with green knowledge sharing as a mediator. The study also showed that firms with a strong green knowledge-sharing strategy tend to be more successful in implementing green innovations, reducing costs, and improving operational efficiency and competitiveness in environmentally concerned markets.

Furthermore, Idrees et al. (2023) examined how green entrepreneurial orientation (GEO) affects performance (GIP) through the knowledge creation process (KCP) and the moderating role of resource orchestration capabilities (ROC). The results show that GEO significantly affects GIP, with partial mediation by knowledge integration and knowledge exchange. ROC strengthens the influence of GEO on knowledge exchange and its impact on GIP. Research (Li et al., 2023) explored the impact of green process innovation, GI strategy, and green action innovation on sustainable performance with the mediating role of green product innovation and the moderating role of employee green behavior. Data was collected from 411 employees working in the manufacturing sector of Pakistan. Employee green initiatives ensure the organization's sustainable performance through green products. Employee green behavior acts as a mediator between green product creation and sustainable performance.

H3: Entrepreneurial orientation and green innovation have positive and a significant impact on SME performance.

H4: Green knowledge sharing positively mediates between entrepreneurial orientation and SME performance.

H5: Green knowledge sharing positively mediates the relationship between green innovation and SME performance.

This research model is illustrated in **Figure 1**.

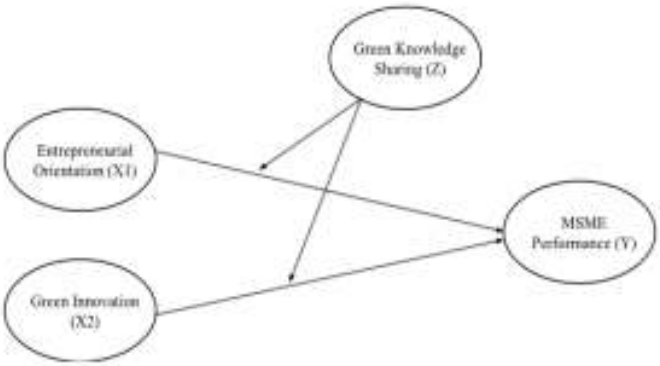

Figure 1. Empirical model.

3. Methodology

This study used a quantitative approach. This model contains variables from the relevant literature for research. The primary data is obtained through online questionnaires to respondents from small and medium-sized enterprises (SMEs). This study uses a non-probability sampling approach with purposive sampling techniques. Purposive sampling is a deliberate sampling strategy that involves specific considerations. According to Patton (2015), purposive sampling allows researchers to select participants that are particularly knowledgeable about or experienced with the phenomenon of interest, thereby ensuring the inclusion of relevant data for the study. This approach enables the selection of a sample that best represents the characteristics needed to address the research questions effectively. This study surveyed wood craftsmen with business licenses totaling 186 units in Ngawi district. The number of samples in this study is based on the Slovin formula (Tejada et al., 2012) which provides a method for calculating sample size based on the population size and desired margin of error. Slovin's formula for determining the number of samples is as follows:

$$n = \frac{N}{1 + n\,(e)^2}$$

Description:

N = Population size/number of population

n = Sample size/number of samples

E = error tolerance

The population of woodworking SMESs (N) = 186, assuming an error rate (e) = 10%, and the number of samples that must be used in this study is as many as n = 65 SMESs. The entrepreneurial orientation (X1) variable in this study is assessed using five indicators derived from the work of Jiang et al. (2018). The green innovation variable (X2) in this study was evaluated using eight indicators proposed by Albort-Morant et al. (2018). The performance variable (Y) of the small and medium-sized enterprises (SMEs) in this study was assessed using four indicators, which were created by Appiah et al. (2023). The green knowledge-sharing variable (Z) in this study was assessed using eight indicators by Cher-Min Fong (2012). The structural model analysis uses the Classical Assumption Test, R square, t-test, f-test statistics, and Path analysis to evaluate the hypothesis.

4. Results and discussion

4.1. Validity test

Validity is often defined as the extent to which an instrument measures what it purports to measure. Validity requires that an instrument is reliable, but an instrument can be reliable without validity. Test construct validity with results as shown in **Table 1** below:

Table 1. Validity test.

	entrepreneurial orientation	green innovation	SMEs performance	knowledge sharing	Total_Score
entrepreneurial orientation	1	0.787**	0.739**	0.821**	0.885**
green innovation	0.787**	1	0.885**	0.879**	0.964**
SMEs performance	0.739**	0.885**	1	0.826**	0.921**
knowledge sharing	0.821**	0.879**	0.826**	1	0.951**
Total_Score	0.885**	0.964**	0.921**	0.951**	1

**. Correlation is significant at the 0.01 level (2-tailed).

Validity refers to the extent to which indicators can measure what should be measured precisely and accurately. From **Table 1**, the value of the sample (N) is 65, the R-Table value is 0.2058. For the entrepreneurial orientation variable (0.885 > 0.2058), green innovation (0.964 > 0.2058), SME performance (0.921 > 0.2058), and green knowledge sharing (0.951 > 0.2058), which means that all indicators are valid because R-count > R-table.

4.2. Reliability test

Reliability estimates are used to evaluate (1) the stability of measures administered at different times to the same individuals or using the same standard (test-retest reliability) or (2) the equivalence of sets of items from the same test (internal consistency) or of different observers scoring a behavior or event using the same instrument (interrater reliability). Test results can be seen in **Table 2**.

Table 2. Reliability test.

Cronbach's Alpha	*N* of Items
0.933	4

Reliability refers to the extent to which an indicator or measuring device can consistently produce stable and consistent results over time. The indicator is credible because of its Cronbach's Alpha value of 0.933, above the threshold of 0.6.

4.3. Normality test

A normality test is a statistical test used to assess whether data distribution in a group or variable follows a normal distribution. Data with more than 30 (n > 30) can be assumed as the normal distribution. The regression result can determine whether it contains normal residual or not by looking at the probability of the result. If the probability is greater than 0.05 (> 0.05), then there is a presence of normal distribution. Vice versa, if the probability is less than 0.05 (0.05 <), there is no normal distribution. Test results are shown in **Table 3**.

The normality test is used to assess whether or not the data obtained from the sample exhibits a normal distribution. The normal distribution occurs when the significance level exceeds 0.05, as determined by the Monte Carlo approach. According to **Table 3**, the significance (2-tailed) value is 0.189, greater than 0.05. Therefore, we can infer that the data follows a normal distribution.

Table 3. Normality test.

	Unstandardized Residual
N	65
Asymp. Sig. (2-tailed)	0.189[c]

a. Test distribution is normal.
b. Calculated from data.
c. Lilliefors Significance correction.

4.4. Heteroscedasticity test

A heteroscedasticity test is conducted when a disturbance in the regression function exhibits a non-constant variance, violating the OLS estimators' assumptions. This non-constant variance can lead to inefficiency in small and large samples, although the estimators remain unbiased and consistent. A method for identifying heteroscedasticity is using the Park test in conjunction with the *t*-test. The criterion for the test is that when the *t*-test value is less than the *t*-table value, there will be no heteroscedasticity between the independent variables. Conversely, suppose the residual variance of the regression model is homogeneous. The *t*-test value will be greater than the t-table value addition in that case. The white test can detect heteroscedasticity by comparing the chi-square value likelihood with the error degree. If the chi-square value is smaller than the degree of error (chi-square < degree of error), it indicates heteroscedasticity. If the chi-square value is greater than the degree of error, it indicates the absence of heteroscedasticity. The test results are displayed in **Table 4**.

Table 4. Heteroscedasticity test.

Model		Unstandardized Coefficients		Standardized Coefficients Beta	*t*	Sig.
		B	Std. Error			
1	(Constant)	0.512	0.803		0.638	0.526
	entrepreneurial orientation	−0.064	0.057	−0.256	−1.119	0.268
	green innovation	0.004	0.041	0.029	0.106	0.916
	knowledge sharing	0.038	0.053	0.208	0.704	0.484

a. Dependent variable: AB_RES.

The heteroscedasticity test is a statistical method that determines whether the errors in the regression model have stable or unstable variations across different levels of independent variable values. The results of heteroscedasticity testing show that the tolerance value of the three variables, namely entrepreneurial orientation (0.268 > 0.05), green innovation (0.916 > 0.05), and knowledge sharing (0.484 > 0.05), Then it is assumed that the data in this research does not occur heteroscedasticity.

4.5. Multicollinearity test

A multicollinearity test determines the relationship between some or all of the variables. If the model contains multicollinearity, then the model has a large standard error, and the coefficients cannot be estimated with high accuracy. There are ways to detect multicollinearity; one is by looking at the value of the determination coefficient. Widarjono (2013) stated that if the value of the determination coefficient is greater than 0.8 (> 0.8), it means the result has multicollinearity and vice versa, and when

most of the problem is largely affected by multicollinearity, then it does not affect the study. Test results are shown in **Table 5**.

Table 5. Multicollinearity test.

Model		Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.	Collinearity Statistics	
		B	Std. Error				Tolerance	VIF
1	(Constant)	−1.880	1.435		−1.310	0.195		
	entrepreneurial orientation	0.046	0.103	0.047	0.451	0.654	0.307	3.256
	green innovation	0.398	0.073	0.685	5.467	0.000	0.215	4.661
	knowledge sharing	0.131	0.096	0.185	1.370	0.176	0.184	5.445

a. Dependent variable: SMEs performance.

The multicollinearity test is used to evaluate the extent of the relationship between the independent variables in the regression model. Multicollinearity occurs when two or more independent variables in the regression model are highly correlated, which can interfere with the interpretation of regression results. The results of multicollinearity testing show that the tolerance value of the three variables, namely entrepreneurial orientation (0.307 > 0.1), green innovation (0.215 > 0.1), and knowledge sharing (0.184 > 0.1), and the VIF value of entrepreneurial orientation (3.256 < 10), green innovation (4.661 < 10) and knowledge sharing (5.445 < 10). So, it is assumed that the data in this research does not occur in multicollinearity.

4.6. Autocorrelation test

The autocorrelation test measures the correlation between disturbances that are no longer efficient for estimators in small samples or models with large samples. Autocorrelation can be identified by employing the Durbin-Watson test (DW). The results will be subsequently compared with the F-table. If the value of DW (Durbin-Watson statistic) is less than the critical value of F-table (DW < F-table), it indicates the absence of autocorrelation in the regression. Conversely, if the value of DW is greater than the critical value of the F-table, it suggests the presence of autocorrelation. Test results are shown in **Table 6**.

Table 6. Autocorrelation test.

Model	*R*	*R* Square	Adjusted *R* Square	Std. Error of the Estimate	Durbin-Watson
1	0.891a	0.795	0.784	0.788	1.771

The autocorrelation test is used to see if there is a correlation between a period and a previous period. The results of the autocorrelation test Durbin-Watson (d) value are 1.771. Furthermore, we will compare this Durbin-Watson value with the Durbin-Watson table value at the 5% significance level (4; 65). The Durbin-Watson value of 1.771 is greater than the upper limit (du) of 1.6294 and less than (4-du) 4 − 1.6294 = 2.3706, so it can be concluded that there are no autocorrelation symptoms. Thus, multiple linear regression analysis to test the hypothesis of this study can be continued.

4.7. Common method bias test

Systematic errors in indicator data results caused by the same data collection method or measurement environment can typically be assessed through the Harman single-factor test on 25 items in the dataset to examine common method bias. Test results are shown in **Table 7**.

Table 7. Common method bias.

Total Variance Explained			
Factor	Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %
entrepreneurial orientation	0.945	18.902	18.902
green innovation	1.722	21.527	21.527
knowledge sharing	1.838	20.427	20.427
SMEs performance	1.407	28.136	28.136

Extraction method: Principal axis factoring.

Because this study involved self-report data collected from SMEs, the Harman single-factor test was used to test for common method bias. The results showed that the interpretation rates of the first factor were 18.90%, 21.52%, 20.42%, and 28.13%, respectively, all of which fall below the critical value of 40%. Therefore, this study may not have a significant common method bias.

4.8. Direct relationship regression test

In conducting research, we have to create a research hypothesis that can be divided into two categories: null and alternative hypothesis. The null hypothesis represents the confidence level of the researcher in proving his or her research by using sample data. An alternative hypothesis is the negation of the *T*-test. The *T*-test is a method that uses sample results to assess the validity of a hypothesis. In hypothesis testing, the goal is to identify whether a two-sided or one-sided test should be performed. A two-sided hypothesis test is selected when there is a lack of a strong theoretical foundation in research, while a one-sided hypothesis test is employed when there is a strong theoretical base. According to Field (2013) if the calculated *t*-value exceeds the critical *t*-value at a given significance level, the difference observed is statistically significant, leading to the rejection of the null hypothesis. When the calculated *t*-value is greater than the critical *t*-value, it indicates that the null hypothesis can be rejected. This conclusion is based on statistical principles outlined in standard statistical textbooks and research methodology guides. The test results are displayed in **Table 8** below:

Table 8. Results of the *t*-test.

Model		*t*	Sig.
1	entrepreneurial orientation	4.162	0.000
	green innovation	7.651	0.000

a. Dependent variable: SME performance.

Entrepreneurial orientation variable *t*-value > critical *t*-value (4.162 > 1.668) so H1 is accepted. This shows that entrepreneurial orientation has a positive and significant effect on the performance of SMEs. While green innovation variable *t*-value > critical *t*-value (7.651 > 1.698) then H2 is accepted. This shows that green innovation has a positive and significant effect on the performance of SMEs.

F-test is a test conducted by comparing the result of F calculated with table F to see the effect of all independent variables on the dependent variables. According to Hair et al., (2010), if the calculated *F*-value exceeds the critical *F*-value, the variance explained by the model is significantly greater than the variance not explained, leading to the rejection of the null hypothesis. When the calculated *F*-value is greater than the critical *F*-value it indicates that the null hypothesis can be rejected. This conclusion is supported by statistical theory and practice. Test results are shown in **Table 9**.

Table 9. *F*-test results .

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	153.058	2	76.529	152.283	0.000b
	Residuals	31.158	62	0.503		
	Total	184.215	64			

a. Dependent variable: SMES performance.
b. Predictors: (Constant), green innovation, entrepreneurial orientation.

The results of the *F*-test (simultaneously) show *F*-value > critical *F*-value, (152.283> 3.15) then H3 is accepted. This shows that entrepreneurial orientation and green innovation together have a positive and significant effect on the performance of SMEs.

4.9. Coefficient of determination

The coefficient of determination, also called *R* squared, is a numerical value that quantifies the proportion of variance in the dependent variable, which the independent variable can explain. In other words, it means how big the regression line describes the data. Test results as shown in **Table 10**.

Table 10. Determinant coefficient results.

Model	R	R Square	Adjusted R Square	Std, Error of the Estimate
1	0.912a	0.831	0.825	0.709

a. Predictors: (Constant), green innovation, entrepreneurial orientation.

The coefficient of determination in the *R* Square column is 0.831, meaning that the contribution of entrepreneurial orientation and green innovation impacts SME performance by 83.1%, and the remaining 16.9% is controlled by other variables not discussed in this study.

4.10. Moderation relationship

The moderating variable is a variable-independent function that strengthens or weakens the relationship between variables independent of the dependent variable. There are several ways to test regression with moderating variables, and one of them

is Moderated Regression Analysis (MRA). Testing Regression With Variables Moderating Using MRA Moderated Regression Analysis (MRA) or interaction testing is a particular application of linear regression, The regression contains elements of interaction (multiplication of two or more independent variables). Test results are shown in **Table 11**.

Table 11. *t*-test results.

Model		Unstandardized Coefficients		Standardized Coefficients	*t*	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.113	0.667		9.161	0.000
	Entrepreneurial Orientation_Knowledge Sharing	0.006	0.002	0.336	2.362	0.021
	Green Innovation_Knowledge Sharing	0.006	0.001	0.580	4.070	0.000

a. Dependent variable: SMEs Performance.

The *t*-test results (partial) show that the significance value of the entrepreneurial orientation - knowledge sharing variable is less than 0.05 (0.000 < 0.05), so H4 is accepted. This indicates that the knowledge-sharing variable has a moderating effect. Furthermore, the significance value of the green innovation-sharing knowledge variable is less than 0.05 (0.000 < 0.05), so H5 is accepted. This indicates that there is a moderating influence of the knowledge-sharing variable.

The results of the determination coefficient test, as shown in **Table 12**, provide insight into the proportion of variance in the dependent variable that is explained by the independent variables within the model.

Table 12. Determinant coefficient results.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.899a	0.808	0.802	0.755

a. Predictors: (Constant), Green Innovation_Knowledge Sharing, Entrepreneurial Orinetation_Knowledge Sharing.

The coefficient of determination, represented by the *R* Square value of 0.808, indicates that 80.8% of the variation in the outcome can be attributed to the combined influence of entrepreneurial orientation and green innovation after considering the moderating effect. The remaining 19.2% is influenced by other variables not examined in this study.

5. Discussion

The integration of entrepreneurial orientation (EO) and green innovation (GI) plays a pivotal role in the performance of small and medium enterprises (SMEs), particularly in sectors with significant environmental impacts, such as the woodcraft industry in Ngawi, Indonesia. The research underscores the importance of green knowledge sharing (GKS) as a mediator that enhances the positive effects of EO and GI on SME performance. This discussion aims to delve deeper into these relationships, drawing on the theoretical framework and empirical findings presented in the study.

5.1. Entrepreneurial orientation and SMEs performance

Entrepreneurial orientation encompasses dimensions such as innovativeness, proactiveness, and risk-taking, essential for fostering a competitive edge and driving business success. EO is crucial for SMEs as it enables them to adapt to market changes, seize new opportunities, and implement innovative solutions. Fahim and Baharun (2016) demonstrated that an entrepreneurial mindset directly impacts an organization's capacity to assimilate new knowledge, leading to enhanced innovation and improved performance. Similarly, Ilyas et al. (2017) found that strategic leadership and EO significantly affect the performance of SMEs. The findings from this study align with these perspectives, indicating that EO positively influences SME performance. SMEs with strong EO are better equipped to undertake green innovations, improving their environmental and economic outcomes.

The positive relationship between EO and SME performance can be attributed to several factors. First, innovative SMEs are more likely to develop unique products and services that meet the growing demand for sustainable solutions (Schiederig et al., 2012). Second, proactive SMEs anticipate market trends and regulatory changes, allowing them to adapt their strategies and operations accordingly (Covin and Slevin, 1991). Lastly, risk-taking SMEs are willing to invest in new technologies and business models that, although uncertain, hold the potential for substantial returns and competitive advantage (Miller, 1983).

5.2. Green innovation and SMEs performance

Green innovation encompasses creating and adopting novel methods, goods, and behaviors that reduce ecological footprints and enhance sustainability. GI includes adopting environmentally friendly technologies, enhancing resource efficiency, and creating green products. The study by Alhadid and Abu-Rumman (2014) supports the notion that there is a strong correlation between GI and organizational performance. Green innovations reduce expenses, enhance effectiveness, and meet the increasing market need for environmentally friendly products, offering a competitive edge. This research confirms that GI has a significant impact on SME performance. SMEs that engage in green innovation can differentiate themselves in the market, meet regulatory requirements, and attract environmentally conscious customers.

The study confirms that GI positively impacts SME performance. This aligns with previous research indicating that green innovations—ranging from eco-friendly product designs to sustainable production processes—enhance operational efficiency, reduce costs, and open new market opportunities (Chen et al., 2006; Kammerer, 2009). By integrating green innovations, SMEs not only mitigate their environmental impact but also improve their financial and social performance, which is increasingly valued by stakeholders (Weng et al., 2015).

Several mechanisms explain how GI contributes to improved SME performance. First, eco-innovations reduce resource consumption and waste, leading to cost savings and higher profitability (Qiu et al., 2020). Second, green products often command a price premium and foster customer loyalty among environmentally conscious consumers (Lu et al., 2020). Third, compliance with environmental regulations and

standards can yield government incentives and avoid penalties, enhancing the financial stability of SMEs (Eiadat et al., 2008).

5.3. The mediating role of green knowledge sharing

Green knowledge sharing refers to distributing and exchanging information about sustainable practices and technologies. It is a critical factor that helps SMEs overcome barriers to implementing green innovations, such as limited resources and lack of access to technology and information. Makhloufi et al. (2022) highlighted that GKS strengthens the relationship between EO and GI outcomes, particularly in a corporate culture that supports environmental initiatives. The findings of this study corroborate this view, showing that GKS serves as a crucial mediator that enhances the positive effects of EO and GI on SME performance. SMEs that actively share knowledge can leverage collective expertise to innovate more effectively, thus improving their sustainability and competitiveness.

GKS emerges as a critical mediator between EO, GI, and SME performance. Knowledge sharing facilitates the dissemination and application of environmental best practices, innovative ideas, and technological advancements across the organization (Nonaka and Takeuchi, 1995).

In the context of this study, GKS enhances the positive effects of EO and GI on SME performance by fostering a culture of continuous improvement and environmental stewardship. SMEs that actively share knowledge about green practices are better equipped to implement eco-innovations and adapt to changing market and regulatory landscapes (Wang et al., 2022). Furthermore, GKS helps SMEs overcome resource constraints by leveraging collective expertise and fostering collaborations with external partners, such as suppliers, customers, and research institutions (Idrees et al., 2023).

The integrative model proposed in this research highlights the synergistic effects of EO, GI, and GKS on SME performance. The hypothesis testing revealed that EO and GI significantly impact SME performance, and GKS mediates these relationships. H1 and H2 were supported, indicating that EO and GI contribute to better SME performance. H3, H4, and H5 further confirmed that GKS enhances the effects of EO and GI on performance. These findings suggest that SMEs should foster a culture of knowledge sharing to maximize the benefits of their entrepreneurial and innovative efforts.

5.4. Practical implications

The findings of this study have significant practical implications for SMEs managers and policymakers. First, SMEs managers should prioritize entrepreneurial orientation and green innovation as strategic pillars to enhance business performance. The results demonstrate that entrepreneurial orientation positively influences green innovation performance (GIP), which is consistent with previous studies (Makhloufi et al., 2022; Wang et al., 2022). By fostering an entrepreneurial mindset and encouraging innovative practices, managers can drive sustainable business growth.

Second, the role of green knowledge sharing as a mediating factor highlights the importance of internal and external communication within organizations. Managers

should implement structured knowledge sharing mechanisms to facilitate the dissemination of green practices and innovations (Jiang et al., 2023). This can include regular training sessions, collaborative platforms, and incentivizing knowledge sharing among employees.

Third, policymakers should create supportive environments that promote green entrepreneurship and innovation. This can be achieved by providing financial incentives, subsidies, and technical support to SMEs engaged in green practices. Policies should also focus on creating awareness about the benefits of green innovation and providing a framework that encourages sustainable business practices (Idrees et al., 2023).

Furthermore, resource orchestration capabilities (ROC) are crucial for enhancing the effectiveness of green innovation. SMEs managers should focus on optimizing their resources, including human, financial, and technological assets, to support innovative initiatives. This aligns with the findings of prior research that emphasizes the strategic management of resources to achieve competitive advantage (Wang et al., 2022).

5.5. Theoretical contributions

This study contributes to the theoretical understanding of the interplay between EO, GI, and SME performance by highlighting the mediating role of GKS. The study expands upon the firm's resource-based view (RBV) by showcasing the role of intangible resources, such as entrepreneurial orientation and green expertise, in stimulating innovation and enhancing performance (Barney, 1991).

These findings underscore the importance of intangible resources in the context of RBV, which include entrepreneurial orientation that encourages proactive, innovative, and risk-taking behavior, and green expertise that enables firms to develop innovative, environmentally friendly solutions. As such, this study provides empirical evidence supporting the view that the combination of entrepreneurial orientation and green innovation can create sustainable competitive advantage and improve firm performance (Lumpkin and Dess, 1996; Wales et al., 2013).

Furthermore, following the dynamic capabilities framework, this study shows that a firm's ability to adapt quickly to changes in the external environment and capitalize on new competencies is critical in maintaining superior performance. These dynamic capabilities include the processes of sensing (recognizing opportunities and threats), seizing (taking advantage of opportunities), and transforming (changing and reconfiguring resources) that are essential for a firm's long-term survival and growth (Teece, 2007).

Thus, this study not only confirms the relevance of RBV theory and dynamic capabilities in the context of SMEs, but also expands the understanding of how entrepreneurial orientation and green innovation can be effectively implemented to achieve better performance in an increasingly competitive and dynamic business environment (Barney, 2001; Teece et al., 1997; Teece, 2007).

5.6. Challenges and limitations

This study, while insightful, has certain limitations. First, the sample size was limited to 65 MSMEs in a specific region, which may affect the generalizability of the findings. Future research should consider larger, more diverse samples from various regions and industries.

Additionally, this study did not extensively explore external factors such as regulatory environments, market conditions, and technological advancements, which could influence the relationship between entrepreneurial orientation, green innovation, and SME performance. Future studies should include these variables for a more comprehensive understanding.

Lastly, while green knowledge sharing was identified as a key factor, the specific processes and practices involved were not deeply examined. Future research should investigate these mechanisms in greater detail, possibly through qualitative or mixed-method approaches.

6. Conclusion

This study provides important insights into the positive and significant influence of entrepreneurial orientation and green innovation on SME performance. Based on the data analysis, it is found that SMEs with higher levels of entrepreneurial orientation and green innovation practices can improve their performance. These quantitative results support the hypothesis that entrepreneurial orientation and green innovation substantially contribute to the enhancement of SMEs' performance.

The analysis shows that entrepreneurial orientation has a positive and significant effect on SME performance with t-value > critical t-value (4.162 > 1.668), and green innovation also has a positive and significant effect on SME performance with t-value > critical t-value (7.651 > 1.698). The F-test results show that entrepreneurial orientation and green innovation simultaneously have a positive and significant effect on SME performance (F-value = 152.283 > F-critical = 3.15). In addition, the knowledge sharing variable has a significant moderating effect on the relationship between entrepreneurial orientation and SME performance (significance value < 0.05), as well as on the relationship between green innovation and SME performance (significance value < 0.05).

This conclusion emphasizes the importance of developing an entrepreneurial mindset and encouraging green innovation practices in SMEs to achieve sustainable business growth. This study also underscores the need for further research that considers objective metrics, larger sample sizes, external factors, and green knowledge-sharing mechanisms to provide a more comprehensive understanding and offer clearer guidance for practitioners and policymakers.

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