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Analysis of Green Product Innovation and Cleaner Production Technology on Business Sustainability and Competitive Advantage in the Beauty Industry in West Java

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ABSTRACT

This study examines the impact of Green Product Innovation and Cleaner Production Technology on Business Sustainability and Competitive Advantage in the beauty industry in West Java. As environmental concerns and consumer demand for sustainable products grow, companies are increasingly adopting eco-friendly practices to enhance both their operational sustainability and market position. Using a quantitative research approach, data were collected from 160 beauty firms and analyzed through Structural Equation Modeling-Partial Least Squares (SEM-PLS). The findings reveal that Green Product Innovation and Cleaner Production Technology positively influence Business Sustainability, which in turn significantly enhances Competitive Advantage. These results underscore the strategic importance of integrating sustainability practices, highlighting their dual role in promoting environmental responsibility and providing a competitive edge. This study contributes to the literature on sustainability in the beauty industry and offers practical insights for industry practitioners aiming to achieve long-term success in a competitive and eco-conscious market.

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1. INTRODUCTION

The beauty industry is increasingly aligning with sustainability principles, driven by consumer demand for eco-friendly products and the need to minimize environmental impact. A significant trend in green product innovation is the use of nanotechnology in cosmetics, enabling the transformation of plant and animal by-products into high-value beauty products. This approach enhances the delivery efficacy and safety of bioactive compounds, aligning with global sustainability goals [1]. Edible cosmetics, utilizing food co-products and by-products, represent another innovative branch aiming to advance sustainability while respecting ecological boundaries, though challenges remain in consumer acceptance and regulatory standards [2]. Increased environmental awareness, particularly among younger generations, is driving demand for green cosmetics, prompting the industry to adopt green cosmetic principles perceived as beneficial for health and the environment [3]. Additionally, eco-friendly trends and ESG factors are influencing product development and production methods, with demand for natural ingredients, renewable materials, and recyclable packaging leading to the launch of eco-friendly product lines and sustainable production practices [4]. Despite the integration of circular economy principles being in its early stages and limited academic research, growing interest in clean development and sustainable practices presents significant opportunities for future innovation [5].

Green product innovation in the beauty industry is a strategic approach that aligns with environmental sustainability goals while meeting consumer demands for eco-friendly products. The use of plant and animal by-products in cosmetics, enhanced by nanotechnology, is gaining traction as nanocarrier systems improve the stability and bioavailability of bioactive compounds, offering a high-tech solution to sustainable beauty product development [1]. Additionally, bio-based oleochemicals derived from renewable sources are replacing petrochemical components, further promoting the green cosmetics movement [6]. Strategic green marketing, combined with eco-innovation, significantly influences the development of sustainable beauty products by addressing environmental challenges and boosting consumer confidence in green products [7]. Eco-innovation in packaging, driven by technological and organizational capabilities, plays a critical role in reducing waste and enhancing brand reputation [8]. Moreover, green product design minimizes environmental impact throughout a product's lifecycle, from sourcing to disposal, making it essential for addressing climate change and resource depletion [9]. Implementing green product design requires understanding the strengths and limitations of various support tools and methods, enabling designers to create products that meet environmental, societal, and economic needs [9].

Cleaner production technology is a crucial component of sustainable practices in the beauty industry, offering a pathway to reduce waste, lower emissions, and conserve energy throughout the manufacturing cycle. Cleaner production strategies focus on optimizing resource use and minimizing waste, with innovations such as nanotechnology enabling the efficient extraction and utilization of bioactive compounds from plant and animal by-products, thereby reducing waste and enhancing product efficacy [1]. In other sectors, such as aluminum processing, practices like measuring fuel usage and reusing waste by-products have demonstrated significant improvements in production efficiency [10]. Economically, cleaner production can lead to substantial cost savings; for instance, a study highlighted a notable reduction in external failure costs, including warranty expenses, through the adoption of cleaner production measures [11]. These strategies have proven to be both cost-effective and result-oriented, giving organizations a competitive edge [12]. Additionally, as regulatory requirements become more stringent, cleaner production technologies enable companies to comply with environmental standards while promoting sustainable practices [11], [13]. By adopting such technologies, beauty companies can position themselves as leaders in sustainability, appeal to eco-conscious consumers, and differentiate themselves in the market [1].

Integrating green product innovation and cleaner production technologies in the beauty industry enhances business sustainability and competitive advantage. Sustainable practices balance economic performance with environmental and social responsibility, reducing environmental impact, improving brand perception, and ensuring regulatory compliance. Sustainability-oriented innovation and cleaner production foster customer loyalty and market share by acting as key differentiators. Transparency and ethical engagement build long-term brand loyalty

[14], while green marketing improves efficiency, attracts sustainability-conscious consumers, and boosts profitability [15]. Green Competitive Advantage (GCA) emphasizes green innovation and environmental awareness to enhance organizational performance [16], and sustainable innovation strategies improve market competitiveness [17], [18]. Sustainable Competitive Advantage (SCA) leverages human resources and adaptability for both short-term revenue growth and long-term product benefits [18]. This study aims to explore the impact of green product innovation and cleaner production technology on business sustainability and competitive advantage in the beauty industry in West Java.

2. LITERATURE REVIEW

2.1 *Green Product Innovation*

Green product innovation in the beauty industry integrates sustainable practices and materials to minimize environmental impact while meeting consumer demand for eco-friendly products. This approach emphasizes the use of sustainably sourced ingredients and non-toxic formulations, which not only reduce environmental impact but also appeal to health-conscious consumers [9], [19]. Adopting sustainable ingredients enhances brand image and fosters consumer trust, leading to improved brand loyalty [20]. Additionally, utilizing biodegradable packaging reduces waste and environmental footprint, aligning with consumer expectations for sustainable solutions and serving as a market differentiator [9], [19]. Green innovation also ensures compliance with increasingly stringent environmental regulations, enabling companies to differentiate themselves in the competitive beauty market, command premium prices, and gain a competitive edge [21], [22].

2.2 *Cleaner Production Technology*

Cleaner production technology in the beauty industry integrates environmental considerations into production processes to enhance sustainability and efficiency. This approach reduces environmental impacts while improving efficiency and profitability, as evidenced by studies showing reduced external failure costs and improved product quality through environmentally friendly materials [11]. Implementing cleaner production practices significantly enhances environmental performance and economic competitiveness in the beauty industry [12]. Key factors for successful adoption include stakeholder engagement, efficient resource management, and strong top management commitment, alongside practices such as fuel usage measurement, process efficiency improvements, and waste reuse [10]. However, challenges like high initial investment costs, particularly for small and medium enterprises, remain significant barriers. Disseminating cleaner production knowledge and highlighting its social, environmental, and economic benefits are essential to overcoming these challenges and promoting broader adoption [13], [23].

2.3 *Business Sustainability*

Business sustainability in the beauty industry involves adopting eco-friendly practices, reducing environmental impact, and engaging in socially responsible activities to meet consumer demands and build long-term brand equity. Sustainable practices enhance brand loyalty by fostering trust through transparency, authenticity, and ethical engagement, creating deeper consumer connections [24]. Leveraging sustainability differentiates the beauty industry in a socially conscious market, attracting customers who value ethical and environmentally friendly products [14], [25]. Integrating sustainability into operations boosts efficiency, reduces costs, and improves product quality by optimizing processes and balancing consumer needs with market demands [26]. These efforts also help businesses adapt to regulatory changes, reducing risks linked to environmental and social responsibilities [27], [28]. Addressing waste management challenges, such as packaging and microbeads, initiatives like the "Waste Down Kindness Up" campaign highlight the industry's commitment to reducing its environmental footprint [29]. Circular economy principles and waste reduction strategies further enhance sustainability and appeal to environmentally conscious consumers [28].

2.4 *Competitive Advantage*

Sustainability-oriented practices have become a significant source of competitive advantage in the beauty industry, aligning with growing consumer demand for environmentally responsible products. Sustainability drives innovation, enabling firms to develop new products, access new markets, and enhance customer loyalty [30]. Proactive environmental strategies, such as cleaner production, positively contribute to competitive advantage [30]. Effective strategic management practices, including sustainability initiatives, are essential for achieving competitive advantage and overall business success, particularly in social and environmental dimensions [31]. Factors influencing competitive advantage include quality, delivery, flexibility, and cost, with sustainability playing a pivotal role in these areas [18], [30], [32]. Additionally, intangible resources and capabilities, such as innovation and sustainability, are critical for building unique core competencies that create long-term competitive advantages [33].

2.5 *Theoretical Framework and Hypotheses Development*

This study integrates Resource-Based View (RBV) and stakeholder theory to explain the relationship between green product innovation, cleaner production technology, business sustainability, and competitive advantage. The Resource-Based View (RBV) posits that a firm’s resources and capabilities, such as green product innovation and cleaner production technology, can serve as unique competitive assets that contribute to sustainability and competitive positioning [34]. Stakeholder theory emphasizes the need for businesses to consider the interests of various stakeholders, including consumers, employees, regulators, and the environment, as a means of achieving sustainable growth and market acceptance [35].

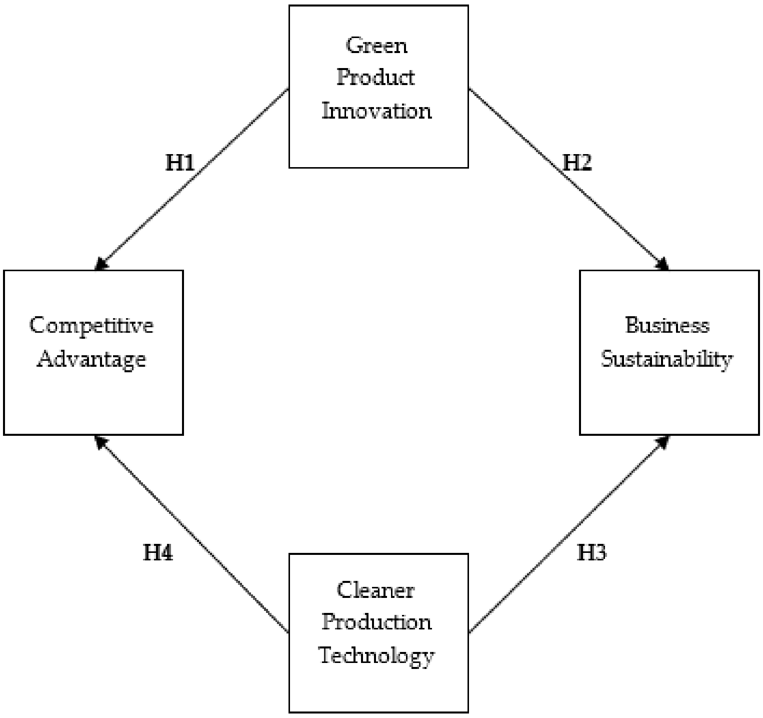

Figure 1. Conceptual Framework

3. METHODS

3.1 Research Design

This study employs a quantitative research design to examine the relationships between green product innovation, cleaner production technology, business sustainability, and competitive advantage, using a cross-sectional survey method to gather data from beauty companies in West Java. This approach facilitates data collection from a large sample, allowing for statistical analysis and generalization of findings across the industry. The study aims to test predefined hypotheses using Structural Equation Modeling-Partial Least Squares (SEM-PLS 3), an approach well-suited for analyzing complex relationships between multiple constructs. The population for this study consists of beauty industry firms operating in West Java, with a sample of 160 firms selected through purposive sampling, targeting those adopting or in the process of adopting green product innovation and cleaner production technology. This sample size aligns with SEM-PLS requirements for achieving reliable results [36].

3.2 Data Collection

Data were collected through a structured questionnaire distributed to managers or representatives of each participating firm. The questionnaire was designed to capture respondents' perceptions of green product innovation, cleaner production technology, business sustainability, and competitive advantage. To ensure clarity and comprehensibility, the questionnaire was pretested with a small group of respondents, and minor revisions were made based on their feedback.

3.3 Data Analysis

Data analysis was conducted using Structural Equation Modeling-Partial Least Squares (SEM-PLS 3), a multivariate technique suitable for examining complex relationships between latent variables, chosen for its capability to handle small-to-moderate sample sizes and to analyze models with both reflective and formative constructs. The analysis followed several key steps: first, descriptive statistics, including means and standard deviations, were calculated to summarize data and provide an overview of respondents' perceptions. Next, the measurement model was assessed for reliability and validity through Cronbach's alpha and composite reliability scores for internal consistency, while Average Variance Extracted (AVE) tested convergent validity; discriminant validity was checked using the Fornell-Larcker criterion. Following this, the validated measurement model allowed the structural model assessment to test hypotheses, with path coefficients calculated to examine relationships between green product innovation, cleaner production technology, business sustainability, and competitive advantage; significance was evaluated via bootstrapping with 5,000 subsamples. Hypothesis testing employed a 0.05 significance level to determine hypothesis support or rejection, with results interpreted for their practical and theoretical implications for the beauty industry. Finally, model fit assessment utilized indices such as Standardized Root Mean Square Residual (SRMR) and Normed Fit Index (NFI) to evaluate the model's overall fit, with SRMR values below 0.08 indicating good fit quality in SEM-PLS.

4. RESULTS AND DISCUSSION

4.1 Demographic Profile of the Sample

This study collected data from 160 respondents representing beauty firms in West Java, focusing on variables such as company size, age, type of products offered, and respondents' roles within the company. Company size, classified by employee count, revealed that 42.5% were small enterprises (1-50 employees), 32.5% were medium enterprises (51-200 employees), and 25% were large enterprises (201+ employees), with SMEs comprising 75% of the sample, indicating strong SME representation. Company age distribution showed that firms operating for 6-10 years constituted 34.4%, followed by 1-5 years at 28.1%, highlighting a mix of relatively established and newer companies. Regarding product types, skincare products were predominant (41.3%), followed by cosmetics (27.5%) and haircare (21.3%), with other beauty products (10%) representing a smaller segment. The roles of respondents were primarily middle management (41.9%), with top management at 30%, technical staff at 18.8%, and other roles at 9.3%, illustrating that most respondents had a significant role in decision-making and operational strategies related to sustainability practices.

4.2 Measurement Model Assessment

The measurement model assessment evaluates the reliability and validity of the constructs used in this study: Green Product Innovation, Cleaner Production Technology, Business Sustainability, and Competitive Advantage. This assessment involves examining the factor loadings, Cronbach's alpha, composite reliability, and average variance extracted (AVE) for each construct. All constructs meet the recommended thresholds for reliability and validity, confirming the robustness of the measurement model.

Table 1. Measurement Model Assessment

Variable	Code	Loading Factor	Cronbach's Alpha	Composite Reliability	Average Variant Extracted
Green Product Innovation	GPI.1	0.893	0.907	0.941	0.843
	GPI.2	0.942			
	GPI.3	0.919			
Cleaner Production Technology	CPT.1	0.754	0.875	0.915	0.730
	CPT.2	0.842			
	CPT.3	0.901			
	CPT.4	0.912			
Business Sustainability	BST.1	0.752	0.863	0.899	0.641
	BST.2	0.853			
	BST.3	0.864			
	BST.4	0.795			
	BST.5	0.730			
Competitive Advantage	CAV.1	0.869	0.848	0.941	0.689
	CAV.2	0.857			
	CAV.3	0.871			
	CAV.4	0.711			

Source: Data Processing Results (2024)

The factor loadings in this study demonstrate strong relationships between items and their respective constructs, as all loadings exceed the recommended 0.7 threshold [36]. For Green Product Innovation, items GPI.1, GPI.2, and GPI.3 have loadings of 0.893, 0.942, and 0.919, respectively, indicating high consistency. Cleaner Production Technology items CPT.1 to CPT.4 show loadings between 0.754 and 0.912, reflecting reliable item performance. Business Sustainability items BST.1 to BST.5 range from 0.730 to 0.864, and Competitive Advantage items CAV.1 to CAV.4 range from 0.711 to 0.871, both confirming strong construct representation. Reliability is confirmed with Cronbach's alpha and composite reliability scores exceeding 0.7 for all constructs, signifying satisfactory internal consistency: Green Product Innovation has a Cronbach's alpha of 0.907 and composite reliability of 0.941, Cleaner Production Technology 0.875 and 0.915, Business Sustainability 0.863 and 0.899, and Competitive Advantage 0.848 and 0.941. Convergent validity, assessed by Average Variance Extracted (AVE), shows all constructs meeting the 0.5 threshold [37], with AVE values of 0.843 for Green Product Innovation, 0.730 for Cleaner Production Technology, 0.641 for Business Sustainability, and 0.689 for Competitive Advantage. These results confirm that the constructs exhibit strong convergent validity, internal consistency, and represent the intended dimensions within the measurement model.

4.3 Discriminant Validity

Discriminant validity is a measure of the extent to which constructs in a model are distinct from one another, confirming that each construct captures a unique aspect of the data. In this study, discriminant validity is assessed using the Fornell-Larcker criterion, which requires that the square root of each construct's Average Variance Extracted (AVE) be greater than its correlations with other constructs. Meeting this criterion indicates that constructs have stronger correlations with their own items than with items from other constructs, supporting the uniqueness of each construct.

Table 2. Discriminant Validity

	Business Sustainability	Cleaner Production Technology	Competitive Advantage	Green Product Innovation

Business Sustainability	0.801			
Cleaner Production Technology	0.754	0.855		
Competitive Advantage	0.701	0.697	0.830	
Green Product Innovation	0.691	0.838	0.609	0.818

Source: Data Processing Results (2024)

The discriminant validity of the constructs in this study is confirmed by the Fornell-Larcker criterion, as each construct's square root of AVE is greater than its correlations with other constructs. Business Sustainability has a square root of AVE of 0.801, higher than its correlations with Cleaner Production Technology (0.754), Competitive Advantage (0.701), and Green Product Innovation (0.691), establishing its distinctiveness. Cleaner Production Technology, with a square root of AVE of 0.855, exceeds its correlations with Business Sustainability (0.754), Competitive Advantage (0.697), and Green Product Innovation (0.838); despite a high correlation with Green Product Innovation, it remains distinct, meeting the discriminant validity criterion. Competitive Advantage's square root of AVE is 0.830, surpassing its correlations with Business Sustainability (0.701), Cleaner Production Technology (0.697), and Green Product Innovation (0.609), affirming its uniqueness. Lastly, Green Product Innovation has a square root of AVE of 0.818, higher than its correlations with Business Sustainability (0.691), Cleaner Production Technology (0.838), and Competitive Advantage (0.609), further satisfying the Fornell-Larcker criterion and confirming discriminant validity across all constructs in the model.

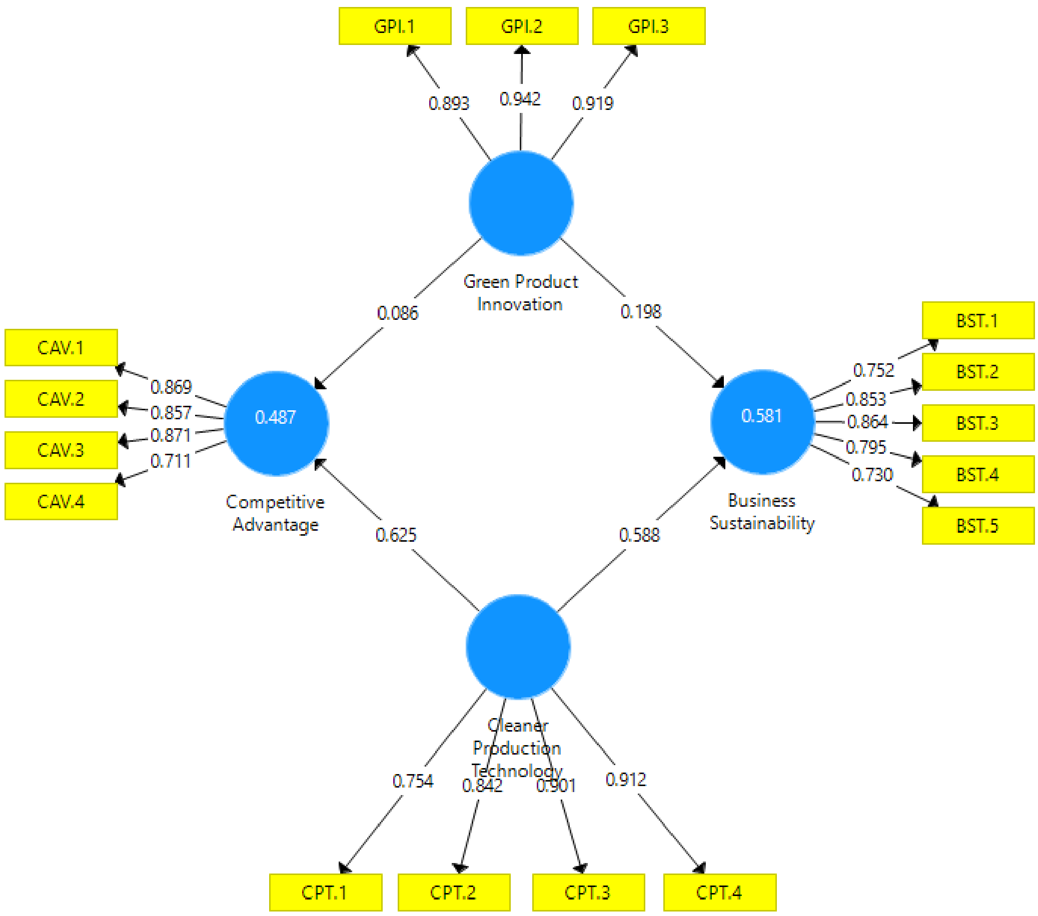

Figure 2. Model Results
Source: Data Processed by Researchers, 2024

4.4 Model Fit Assessment

The model fit assessment evaluates how well the proposed model aligns with the observed data. Several fit indices are used to assess the model, including the Standardized Root Mean Square Residual (SRMR), d_ULS, d_G, Chi-Square, and Normed Fit Index (NFI). These indices provide insights into the adequacy of the model in capturing the relationships among constructs.

Table 3. Model Fit Results Test

	Saturated Model	Estimated Model
SRMR	0.095	0.103
d_ULS	1.232	1.434
d_G	0.832	0.861
Chi-Square	5060.385	517.000
NFI	0.707	0.700

Source: Process Data Analysis (2024)

The fit of this model was assessed using various indices, with the Standardized Root Mean Square Residual (SRMR) indicating a moderate fit; the Saturated Model SRMR is 0.095, and the Estimated Model SRMR is 0.103, both within the acceptable range but slightly above the ideal threshold of 0.08, suggesting that minor adjustments could enhance the model. Additional fit metrics, d_ULS (Unweighted Least Squares discrepancy) and d_G (Geodesic discrepancy), show relatively low values (Saturated Model d_ULS: 1.232, Estimated Model d_ULS: 1.434; Saturated Model d_G: 0.832, Estimated Model d_G: 0.861), indicating an acceptable fit with the Estimated Model introducing slightly more discrepancy. The Chi-Square statistic, sensitive to sample size, presents a lower value for the Estimated Model (517.000) compared to the Saturated Model (5060.385), suggesting an improved fit in the Estimated Model that better represents the data. Lastly, the Normed Fit Index (NFI) values are around 0.7 (Saturated Model NFI: 0.707, Estimated Model NFI: 0.700), which is acceptable for SEM-PLS models, though there remains room for improvement to achieve a closer fit. Overall, these results indicate that the model fits the observed data reasonably well, though refinements could enhance the fit further.

Table 4. Coefficient Model

	R Square	Q2
Business Sustainability	0.581	0.573
Competitive Advantage	0.487	0.479

Source: Data Processing Results (2024)

The R^2 values in this study reflect the variance explained in each dependent variable by its predictors, with benchmarks of 0.26, 0.50, and 0.75 indicating weak, moderate, and substantial explanatory power, respectively (Cohen, 1988). For Business Sustainability, an R^2 of 0.581 suggests that 58.1% of its variance is explained by Green Product Innovation and Cleaner Production Technology, a moderately strong value indicating that these practices significantly enhance sustainability efforts. Competitive Advantage has an R^2 of 0.487, meaning 48.7% of its variance is accounted for by Business Sustainability, Green Product Innovation, and Cleaner Production Technology, suggesting a meaningful contribution to a firm's competitive positioning, albeit with potential influence from factors outside the model. The model's predictive relevance, measured by Q^2 values, further supports these relationships. Business Sustainability has a Q^2 of 0.573, indicating large predictive relevance, reinforcing that eco-friendly innovations and production efficiency are essential for sustainable practices. Competitive Advantage, with a Q^2 of 0.479, also shows large predictive relevance, underscoring that sustainable strategies provide firms with a competitive edge, thus validating the importance of sustainability for market differentiation.

4.9.8 Hypothesis Testing

The hypothesis testing results provide insights into the relationships between Cleaner Production Technology, Green Product Innovation, Business Sustainability, and Competitive Advantage. Each hypothesis is evaluated based on the path coefficients (Original Sample), sample mean, standard deviation (STDEV), T-statistics, and P-values. A T-statistic greater than 1.96 and a P-value less than 0.05 indicate a statistically significant relationship.

Table 5. Hypothesis Testing

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics	P Values
Cleaner Production Technology -> Business Sustainability	0.588	0.595	0.137	4.299	0.000
Cleaner Production Technology -> Competitive Advantage	0.625	0.627	0.114	5.481	0.000
Green Product Innovation -> Business Sustainability	0.498	0.493	0.152	3.304	0.000
Green Product Innovation -> Competitive Advantage	0.386	0.386	0.121	2.705	0.001

Source: Process Data Analysis (2024)

The hypothesis testing results confirm positive and significant relationships between Cleaner Production Technology, Green Product Innovation, Business Sustainability, and Competitive Advantage. For Cleaner Production Technology's impact on Business Sustainability, the path coefficient is 0.588, with a T-statistic of 4.299 and a P-value of 0.000, indicating a substantial positive effect, supporting the hypothesis that cleaner production practices enhance sustainability. Its influence on Competitive Advantage is even stronger, with a path coefficient of 0.625, T-statistic of 5.481, and P-value of 0.000, suggesting that cleaner production not only boosts sustainability but also provides a competitive edge through improved efficiency and cost savings. Similarly, Green Product Innovation has a positive impact on Business Sustainability, shown by a path coefficient of 0.498, T-statistic of 3.304, and P-value of 0.000, supporting its role in enhancing sustainability efforts. Additionally, Green Product Innovation positively influences Competitive Advantage, with a path coefficient of 0.386, T-statistic of 2.705, and P-value of 0.001, confirming its strategic value for market differentiation. Overall, the findings demonstrate that Cleaner Production Technology and Green Product Innovation significantly contribute to both Business Sustainability and Competitive Advantage, highlighting the importance of sustainable practices for firms aiming for operational efficiency and competitive strength.

Discussion

The findings of this study provide valuable insights into the relationships between Green Product Innovation, Cleaner Production Technology, Business Sustainability, and Competitive Advantage within the beauty industry in West Java. The study's results highlight the importance of adopting sustainable practices not only to enhance operational efficiency and environmental responsibility but also to gain a competitive edge in the market. Each hypothesis was supported, indicating that green product innovation and cleaner production technology significantly contribute to both business sustainability and competitive advantage.

The Role of Green Product Innovation in Business Sustainability and Competitive Advantage

The study confirms a positive and significant relationship between Green Product Innovation and both Business Sustainability (H3) and Competitive Advantage (H4). The path coefficient for Green Product Innovation's impact on Business Sustainability (0.498) indicates that companies focusing on eco-friendly product design and packaging are more likely to achieve sustainable operations, aligning with prior research [38], [39] that highlights the role of green innovation in reducing environmental footprints and meeting consumer demand for environmentally responsible products. Similarly, the significant positive effect of Green Product Innovation on Competitive Advantage (path coefficient = 0.386) underscores its strategic importance in differentiating firms within the beauty industry. By aligning products with eco-conscious consumer preferences, companies can foster customer loyalty, enhance brand reputation, and establish a unique selling proposition, consistent with findings by [7], [40], which emphasize that green innovations attract and retain environmentally conscious customers, creating a distinct market advantage.

The Impact of Cleaner Production Technology on Business Sustainability and Competitive Advantage

Cleaner Production Technology demonstrates a strong positive impact on both Business Sustainability (H1) and Competitive Advantage (H2), with path coefficients of 0.588 and 0.625, respectively. The positive relationship with Business Sustainability highlights the critical role of resource-efficient and waste-reducing production processes for firms aiming to operate sustainably, aligning with studies by [10], [41], which show that cleaner production not only reduces waste and emissions but also lowers production costs, contributing to long-term sustainability. Similarly, the significant impact on Competitive Advantage underscores the strategic value of cleaner production, as the path coefficient of 0.625 indicates its contribution to operational efficiency, regulatory compliance, and cost reductions, enhancing market positioning. This finding supports research by [12], [42], which suggests that firms implementing proactive environmental strategies tend to achieve better financial performance and stronger market positions. In the beauty industry, Cleaner Production Technology serves as a valuable asset for achieving both economic and environmental objectives.

Practical Implications for the Beauty Industry in West Java

The findings highlight key practical implications for beauty industry firms in West Java. Adopting Green Product Innovation and Cleaner Production Technology is essential for operating sustainably and meeting the growing consumer demand for eco-friendly products. Investments in sustainable ingredients, biodegradable packaging, and resource-efficient production technologies can enhance environmental performance and attract eco-conscious consumers. Additionally, the positive impact of these practices on Competitive Advantage underscores sustainability as a key market differentiator. Firms prioritizing green product innovation and cleaner production are well-positioned to gain a competitive edge by appealing to consumers who value environmental responsibility, translating into increased customer loyalty, enhanced brand reputation, and higher profitability. Moreover, the study emphasizes the mediating role of Business Sustainability in strengthening competitive outcomes, suggesting that companies should view sustainability as a core strategic element rather than merely a regulatory or ethical obligation. By integrating product innovation with cleaner production into a comprehensive sustainability strategy, beauty firms can build resilience, comply with regulatory standards, and capture the growing market segment of ethical consumers.

Limitations and Future Research Directions

While this study offers valuable insights, several limitations should be acknowledged. The cross-sectional design restricts the ability to infer causality between variables; future studies could adopt a longitudinal approach to examine how changes in sustainable practices influence competitive advantage over time. Additionally, the reliance on self-reported data may introduce response bias, suggesting the need for future research to incorporate objective measures of sustainability performance and competitive outcomes for validation. Furthermore, as the study focuses on the beauty industry in West Java, expanding to other regions and industries could help determine whether similar relationships exist. Comparative studies could offer insights into how regional and industry-specific factors shape the impact of sustainable practices on business outcomes. Finally, exploring additional mediators or moderators, such as government policy or consumer attitudes, could deepen the understanding of factors affecting the effectiveness of sustainable practices.

5. CONCLUSION

This study confirms that Green Product Innovation and Cleaner Production Technology are pivotal in enhancing Business Sustainability and Competitive Advantage in West Java's beauty industry. These practices not only uphold environmental responsibility but also serve as strategic tools to strengthen market positioning. Green Product Innovation fosters Business Sustainability by enabling companies to offer eco-friendly products that align with consumer preferences, comply with regulations, and boost corporate reputation. Meanwhile, Cleaner Production Technology enhances operational efficiency, reduces waste, and cuts costs, leading to improved sustainability outcomes and a stronger competitive edge. Business Sustainability further acts as a bridge, linking green innovations and production practices to market success, highlighting the importance of integrating sustainability into strategic frameworks. By adopting a comprehensive approach that combines product innovation with production efficiency, firms can build resilience, enhance brand loyalty, and secure long-term profitability. These findings underline the need for continuous investment in sustainable practices, while encouraging future research to explore these dynamics across other industries and regions and to investigate additional factors influencing the effectiveness of sustainability initiatives.

REFERENCES

[1] G. B. B. Nhani *et al.*, "High-Tech Sustainable Beauty: Exploring Nanotechnology for the Development of Cosmetics Using Plant and Animal By-Products," *Cosmetics*, vol. 11, no. 4, p. 112, 2024.

[2] I. Dini, "'Edible Beauty': The Evolution of Environmentally Friendly Cosmetics and Packaging," *Antioxidants*, vol. 13, no. 6, p. 742, 2024.

[3] K. N. Amanda, M. O. Armandari, and N. S. S. Ambarwati, "Pengaruh Kesadaran Lingkungan Mahasiswa Tata Rias UNJ terhadap Minat Beli Produk Green Cosmetic," *Acad. Educ. J.*, vol. 15, no. 2, pp. 1308–1316, 2024.

[4] R.-S. Seo, "The Impact of ESG (Environmental, Social, and Governance) Factors and Eco-Friendly Trends on the Beauty Industry: A Big Data Analysis of the Past Year," *J. Korean Soc. Cosmetol.*, vol. 29, no. 6, pp. 1378–1384, 2023.

[5] D. E. Vuc, "Current Challenges and Opportunities for Circular Economy in the Beauty Industry. A Bibliometric Analysis," in *Proceedings of the International Conference on Business Excellence*, Sciendo, 2024, pp. 185–197.

[6] N. Goswami, "Sustainability: The Green Cosmetic Brands for Eco-Friendly Transformation," *Res. Rev. Int. J. Multidiscip.*, vol. 9, no. 3, pp. 236–243, 2024.

[7] R. Kouser, K. A. Zahra, M. A. B. Memon, and G. Mahmood, "A Comprehensive Analysis of Role of Eco-Innovation in Linking Strategic Green Marketing and Service Innovation to Sustainable Products," *Sustain. Bus. Soc. Emerg. Econ.*, vol. 6, no. 2, pp. 227–242, 2024.

[8] U. Kaur and P. K. Siddhey, "Innovative Eco-Friendly Solutions for Sustainability in the Packaging Industry," in *Eco-Innovation and Sustainable Development in Industry 5.0*, IGI Global, 2024, pp. 247–266.

[9] S. Sharma, "Fostering Green Product Design and Innovation for a Sustainable Future," in *Waste Management and Life Cycle Assessment for Sustainable Business Practice*, IGI Global, 2024, pp. 86–110.

[10] D. Agustina, A. D. Wicaksono, and C. Meidiana, "The Influencing Factors in Cleaner Production Adoption on the Aluminium Processing Industry," *JEMIS (Journal Eng. Manag. Ind. Syst.*, vol. 11, no. 1, pp. 14–25, 2023.

[11] M. J. Soror and W. J. Ahmed, "The role of cleaner production costs to reducing failure costs," *J. Namibian Stud. Hist. Polit. Cult.*, vol. 33, pp. 2119–2138, 2023.

[12] S. K. O. Al-Humairi, M. F. Abd Ali, and A. A. Abbas, "The impact of cleaner production strategy on Sustainable supply chain performance," *Prod. Eng. Arch.*, vol. 30, no. 2, pp. 166–181, 2024.

[13] V. Prigozhin, W. Zheng, and F. Lee, "Implementing Cleaner Production Technologies: General Aspects," in *E3S Web of Conferences*, EDP Sciences, 2023, p. 1006.

[14] E. E. Agu, T. V. Iyelolu, C. Idemudia, and T. I. Ijomah, "Exploring the relationship between sustainable business practices and increased brand loyalty," *Int. J. Manag. Entrep. Res.*, vol. 6, no. 8, pp. 2463–2475, 2024.

[15] L. A. de Oliveira Lima *et al.*, "Sustainable Management Practices: Green Marketing as A Source for Organizational Competitive Advantage," *Rev. Gestão Soc. e Ambient.*, vol. 18, no. 4, 2024.

[16] S. Hendratmoko, "Developing Green Sustainable Entrepreneurship for Competitive Advantages through Green Management," *Indones. J. Bus. Anal.*, vol. 3, no. 6, pp. 2163–2176, 2023.

[17] D. De Clercq and M. Voronov, "Sustainability in entrepreneurship: A tale of two logics," *Int. Small Bus. J.*, vol. 29, no. 4, pp. 322–344, 2011.

[18] A. Liwafa, B. Suyanto, and Z. Choirunnisa, "Sustainable Competitive Advantage: A Literature Review and Future Research," in *RSF Conference Series: Business, Management and Social Sciences*, 2023, pp. 428–439.

[19] J. Ottman and N. B. Books, "Green marketing: opportunity for innovation," *J. Sustain. Prod. Des.*, vol. 60, no. 7, pp. 136–667, 1998.

[20] M. S. Ummah, *No 主観的健康感を中心とした在宅高齢者における 健康関連指標に関する共分散構造分析Title*, vol. 11, no. 1. 2019.

[21] A. Rahmani, A. B. Naeini, J. Mashayekh, R. Aboojafari, T. Daim, and H. Yalcin, "Green innovation for a greener future: A meta-analysis of the impact on environmental performance," *J. Clean. Prod.*, vol. 460, p. 142547, 2024.

[22] C. Zhou, "Green innovation: a key strategy for enterprises and countries to gain a competitive edge in the global market," *Technol. Anal. Strateg. Manag.*, pp. 1–16, 2024.

[23] A. M. Fet, C. Haskins, and M. Sparrevik, "Input-Output Analysis and Cleaner Production," in *Business Transitions: A Path to Sustainability: The CapSEM Model*, Springer International Publishing Cham, 2023, pp. 37–43.

[24] O. Urefe, T. N. Odonkor, N. R. Chiekezie, and E. E. Agu, "Enhancing small business success through financial literacy and education," *Magna Sci. Adv. Res. Rev.*, vol. 11, no. 2, pp. 297–315, 2024.

[25] L. Y. Li, A. M. Syah, M. Syukur, R. Limkanchanapa, and C. Srisurat, "Sustainable Micro, Small, and Medium Enterprises: A Developed Model of Entrepreneurial Marketing Behaviors for Thailand's MSMEs," *Sustain.*, vol. 15, no. 17, Sep. 2023, doi: 10.3390/su151713135.

[26] B. Widagdo and C. Sa'diyah, "Business sustainability: Functions of financial behavior, technology, and knowledge," *Probl. Perspect. Manag.*, vol. 21, no. 1, pp. 120–130, 2023, doi: 10.21511/ppm.21(1).2023.11.

[27] J. M. T. Balmer, "The corporate identity, total corporate communications, stakeholders' attributed identities, identifications and behaviours continuum," *Eur. J. Mark.*, vol. 51, no. 9–10, pp. 1472–1502, 2017, doi: 10.1108/EJM-07-2017-0448.

[28] A. K. Florek-Paszkowska and C. A. Hoyos-Vallejo, "A comprehensive bibliometric analysis and future research directions in the nexus of sustainable business practices and turnover intention," *Clean. Responsible Consum.*, vol. 11, p. 100146, 2023.

[29] K. Y. Ningrum and N. A. Risa, "Sustainable Beauty:'Waste Down Kindness Up Sociolla' Kolaborasi Sukin dengan Waste4Change dalam Upaya Pengolahan Sampah Kecantikan," *ijd-demos*, vol. 5, no. 4, 2023.

[30] V. Maráková, A. Wolak-Tuzimek, M. Lament, and L. Dzúriková, "The competitive advantage of enterprises from the customer perspective," 2023.

[31] C. Sigalas, "Competitive advantage: the known unknown concept," *Manag. Decis.*, vol. 53, no. 9, pp. 2004–2016, Oct. 2015, doi: 10.1108/MD-05-2015-0185.

[32] F. F. Fatonah, "Literature study on competitive advantage in official schools which is influenced by factors: Competitive strategies, leadership, and competence," *Dinasti Int. J. Manag. Sci.*, vol. 4, no. 5, pp. 822–832, 2023.

[33] P. M. G. de Leaniz and I. R. del Bosque, "Intellectual capital and relational capital: The role of sustainability in developing corporate reputation," *Intang. Cap.*, vol. 9, no. 1, pp. 262–280, 2013, doi: 10.3926/ic.378.

[34] J. Barney, "Firm resources and sustained competitive advantage," *J. Manage.*, vol. 17, no. 1, pp. 99–120, 1991.

[35] M. A. Y. Abbas, D. Setyadi, A. Paminto, and M. Azis, "The antecedents of financial performance and their implications for firm value in mining sector companies listed on the Indonesia Stock Exchange," *J. Law Sustain. Dev.*, vol. 11, no. 9, p. e991, Oct. 2023, doi: 10.55908/sdgs.v11i9.991.

[36] J. F. Hair Jr, W. C. Black, B. J. Babin, R. E. Anderson, and R. L. Tatham, "Multivariate Data Analysis. New Jersey: PrenticeHall." Inc, 2011.

[37] C. Fornell and D. F. Larcker, "Evaluating structural equation models with unobservable variables and measurement error," *J. Mark. Res.*, vol. 18, no. 1, pp. 39–50, 1981.

[38] H. C. Natalie, S. Bangsawan, and N. Husna, "Driving Sustainable Business Performance: The Impact of Green Innovation on Food & Beverage SMEs in Bandar Lampung City," *Int. J. Bus. Appl. Econ.*, vol. 3, no. 3, pp. 371–384, 2024.

[39] A. Majid and M. S. Farooq, "Enhancing Corporate Sustainability: An Examination Of Green Marketing Strategies And Their Impact On Environmental Commitment And Innovation Performance," *Educ. Adm. Theory Pract.*, vol. 30, no. 5, pp. 11939–11951, 2024.

[40] I. S. Djunaid, "The mediating role of sustainable product innovation in the relationship between green marketing and customer satisfaction: an empirical," in *IOP Conference Series: Earth and Environmental Science*, IOP Publishing, 2024, p. 12011.

[41] A. A. Rumanti, I. Sunaryo, I. I. Wiratmadja, and D. Irianto, "Cleaner production for small and medium enterprises: An open innovation perspective," *IEEE Trans. Eng. Manag.*, vol. 70, no. 7, pp. 2355–2368, 2020.

[42] G. Y. Töre and M. Can, "Clean production approaches in industries: a case study on pulp and paper production facility applications," *Clean Technol. Towar. a Sustain. Futur.*, p. 107, 2023.