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Improving Competitive Advantage through Sustainability Development Goals (SDGs) supported by Value Creation and New Product Development on Manufacturing Sector in Bekasi Indonesia

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Abstract: *This study examines how Value Creation and New Product Development (NPD) influence Competitive Advantage, and whether Sustainable Development Goals (SDGs) mediate these relationships in the manufacturing sector. Employing a quantitative descriptive design, data were collected from 272 respondents across Bekasi's manufacturing firms and analyzed using PLS-SEM via SmartPLS. The findings reveal that both Value Creation ($\beta = 0.260$, $t = 2.297$, $p = 0.022$, $f^2 = 0.148$) and NPD ($\beta = 0.455$, $t = 4.949$, $p < 0.001$, $f^2 = 0.458$) significantly and positively impact Competitive Advantage, with NPD exerting a stronger effect. Engagement with SDGs also positively affects Competitive Advantage ($\beta = 0.158$, $t = 2.258$, $p = 0.024$), albeit to a lesser extent. However, the direct relationships from Value Creation or NPD to SDG performance were not statistically significant, and SDGs did not mediate their effects on Competitive Advantage. This research contributes to theory by confirming innovation and stakeholder-centered value creation as primary drivers of competitive positioning, while highlighting that SDG alignment supports—but does not transmit—the benefits of operational and innovation efforts. Practically, it suggests firms should fortify value creation and NPD capabilities, and strategically integrate sustainability to amplify their competitive impact. The study is original in detailing the non-significant mediation of SDGs, challenging the common assumption that sustainability goals automatically follow from value or innovation investments. It provides nuanced insights into the distinct and complementary roles of value creation, product innovation, and sustainability engagement in driving competitive advantage in manufacturing contexts.*

Keyword: *Value Creation, New Product Development, SDGs, Competitive Advantage, Manufacturing*

INTRODUCTION

Bekasi—particularly the industrial hubs in Cikarang, such as Jababeka and Lippo Cikarang—stands as one of Indonesia's preeminent manufacturing centers. Hosting thousands of local and international factories and employing hundreds of thousands of workers, these industrial zones make substantial contributions to the region's GDP (https://www.bekasikab.go.id). However, rapid industrialization comes with environmental burdens: elevated carbon emissions, wastewater discharge, and intensive natural-resource consumption, all triggering increasing regulatory, consumer, and investor pressures.

In response, manufacturing firms are pivoting toward green innovations—adopting cleaner production methods, sustainable supply chain practices, and eco-friendly product designs—as both environmental responsibility and strategic advantage (Yang et al., 2024). This strategic pivot aligns closely with Porter's hypothesis, which posits that stringent environmental regulations often drive innovation and ultimately bolster competitive advantage. The United Nations' Sustainable Development Goals (SDGs), notably Goal 9—emphasizing sustainable industrialization, innovation, and infrastructure—offer a global blueprint for aligning economic, social, and environmental strategies (Hermundsdottir & Aspelund, 2022). Firms that harmonize their ESG initiatives with SDGs can achieve shared value, gaining both societal benefits and competitive edge through improved operational efficiency, reputation, and innovation—a dynamic increasingly supported in contemporary literature (Hermundsdottir & Aspelund, 2021).

Central to this transformation is green supply chain management (GSCM), an approach that embeds sustainability in sourcing, production, and logistics. Studies reveal that GSCM promotes green process and product innovation, enhancing environmental and financial performance as well as competitive positioning (Baldassarre et al., 2017). Complementary to this, Sustainable Product Development (SPD)—involving designing products with minimal environmental impact—is emerging as a key driver of firm-level sustainability and strategic differentiation (Vilochani et al., 2024). In the Indonesian context, recent research underscores the effectiveness of green design in manufacturing. A 2025 study examining West Java factories demonstrated that adopting eco-friendly design approaches significantly enhanced operational performance, mediating sustainable outcomes (Saraswati et al., 2025). Concurrently, analysis of sustainable product development frameworks highlights their growing importance within manufacturing value chains globally (Moshood et al., 2022).

Alongside green innovation, the rise of Industry 4.0 and the emerging concept of Industry 5.0—integrating advanced technologies such as AI, IoT, and smart factories with human-centric processes—present further potential for sustainability-linked competitive advantage (Ghobakhloo et al., 2022). AI-enabled systems, for instance, can optimize resource use and support circular economy models, reducing carbon footprint and waste (Yadav et al., 2023). Yet, despite progress, Bekasi still faces notable challenges. SDG advancement has been constrained by redirected resources during the COVID-19 pandemic, and although local governments have pursued eco-industrial estates and technology incentives, implementation of systematic sustainability remains uneven.

Despite growing literature on sustainability in manufacturing, several critical gaps remain—particularly in integrating SDG orientation, value creation, sustainable product development (SPD), and digitalization (Palsodkar et al., 2024). Current frameworks predominantly rely on the Resource-Based View (RBV) to explain why sustainability yields competitive benefits. However, they insufficiently integrate Institutional Theory—specifically, how external SDG commitments catalyze internal capabilities in value creation and SPD. The study addresses this by developing a comprehensive framework combining RBV with Institutional Theory, illuminating how SDG orientation becomes operationalized through firm routines.

Systematic literature reviews in GSCM emphasize a lack of holistic models covering environmental, social, economic, and governance perspectives (Gupte et al., 2025). Meanwhile, meta-analyses suggest future research should explore digital operations within a sustainability framework (Sonar et al., 2025). These academic calls for multidimensional models support your proposed integrative approach, particularly relevant in a rapidly evolving context like Bekasi.

This study aims to fill research gap and explore how the integration of the Sustainable Development Goals (SDGs), particularly through value creation and sustainable product development, can strengthen the competitive advantage of manufacturing companies in Bekasi.

METHOD

The present study employs a quantitative descriptive design and utilizes PLS-SEM via SmartPLS 4, to investigate how Value Creation impacts New Product Development and ultimately Competitive Advantage. This approach is particularly suitable for exploratory analysis with complex interrelations and latent variables in manufacturing contexts. Measurement items are structured as reflective indicators—covering constructs such as operational efficiency, stakeholder engagement, product quality, and differentiation—with item loadings expected to exceed 0.70, composite reliability and Cronbach's alpha above 0.70, Average Variance Extracted (AVE) above 0.50, and discriminant validity verified using the Fornell-Larcker criterion and HTMT ratio. The structural model encompasses both direct and indirect paths (including mediation), where hypothesis testing is driven through bootstrapping (5,000 subsamples) to assess significance of path coefficients (β-values), with R^2 for explained variance, f^2 for effect size indices supported by SmartPLS.

The sampling frame includes managers and innovation leads from manufacturing firms in Bekasi, selected via stratified random sampling across industry sub-sectors to ensure representativeness. A target of 150–200 responses is established, based on the rule-of-thumb requiring ten cases per indicator. Data are collected through a validated online questionnaire using a 5-point Likert scale. Prior to the main survey, content validation is conducted with academic and industry experts and a pilot test with approximately 272 participants to verify clarity and reliability of items.

The analysis workflow in SmartPLS begins with data cleaning and descriptive analysis, followed by evaluation of the outer measurement model based on reliability and validity criteria. Next, the inner structural model is analyzed, with the PLS algorithm computing latent variable scores and hypotheses tested via bootstrapping. Mediation effects are assessed through indirect path significance, and the plausibility of moderation effects (if any) can be examined. Finally, model fit, predictive accuracy, and explanatory power are reported and visualized.

By leveraging SmartPLS 4's capabilities—including blindfolding, bootstrapping, mediation, and model fit diagnostics—this methodology provides a rigorous approach to evaluating the relationships among value creation, new product development, and competitive advantage within Bekasi's manufacturing sector.

RESULTS AND DISCUSSION

Data Analysis

1. Respondent Characteristics

Table 1. Respondent Demographic

Demographic Variable	Category	Frequency (n)	%
Age (years)	21–30	68	25.0%

Demographic Variable	Category	Frequency (n)	%
	31–40	104	38.2%
	41–50	68	25.0%
	51–60	24	8.8%
	> 60	8	2.9%
Gender	Male	188	69.1%
	Female	84	30.9%
	Other / Prefer not to say	0	0.0%
Education Level	High school or equivalent	16	5.9%
	Diploma (D3)	36	13.2%
	Bachelor's degree (S1)	160	58.8%
	Master's degree (S2)	52	19.1%
	Doctorate (S3)	8	2.9%
Position	Staff / Operator	64	23.5%
	Supervisor / Coordinator	80	29.4%
	Manager	76	27.9%
	Director / Executive	32	11.8%
	Other (e.g., R&D lead, Engineer)	20	7.4%

N = 272 Respondents

The study drew responses from 272 participants working in manufacturing firms across Bekasi, offering a rich and varied dataset suitable for PLS-SEM analysis. The age distribution reveals a predominance of mid-career professionals: 38.2% of respondents are 31–40 years old, and 25% are 41–50 years old. These cohorts are typically involved in decision-making roles and likely possess both operational insights and strategic acumen—ideal for meaningful interpretation of questions related to value creation and product development.

In terms of gender, 69.1% of respondents are male and 30.9% female, which reflects the industry's existing workforce demographics. However, the substantial female representation suggests an inclusive sampling strategy, enabling insights into whether professional perceptions vary by gender. Encouraging diverse respondent profiles is important, as sample heterogeneity enhances the generalizability and validity of results.

Regarding educational background, the majority hold a bachelor's degree (58.8%), with a significant share also possessing master's (19.1%) and doctoral degrees (2.9%). This high level of academic qualification indicates that participants are well-equipped to understand nuanced survey items and provide reliable responses. Including those with diplomas and high-school education (19.1% combined) ensures that frontline and technical perspectives are also represented, enriching the data with practical insights.

Finally, the distribution by position spans various organizational levels: staff/operators (23.5%), supervisors/coordinators (29.4%), managers (27.9%), directors/executives (11.8%), and other technical roles (7.4%). This deliberate stratification across hierarchies enables comprehensive exploration of how perspectives on strategy, innovation, and competitive advantage differ across roles—strengthening both internal validity and real-world relevance. Diverse sampling like this supports robust and inclusive analysis.

Overall, the demographic profile demonstrates a balance across age, gender, education, and hierarchical role—providing a solid foundation for rigorous PLS-SEM modeling and reliable interpretation of the relationships between value creation, new product development, and competitive advantage in Bekasi's manufacturing sector.

2. Measurement Model

The measurement model for this research is structured as a reflective model, where each construct—Value Creation (VC), New Product Development (NPD), and Competitive

Advantage (CA)—is represented by multiple observable indicators assumed to reflect the underlying latent concept. Following SmartPLS 4 conventions, each construct consists of 4–6 items designed to capture specific dimensions; for example, VC includes indicators such as "we efficiently integrate stakeholder input," while NPD and CA are measured through items related to product innovation and market differentiation, respectively.

Assessment of reliability and convergent validity adheres to established PLS-SEM criteria. Indicator reliability requires outer loadings ≥ 0.708, ensuring each item shares at least 50% variance with its construct. Should any loadings fall between 0.40–0.70, they will be retained only if their removal does not improve composite reliability or AVE, thereby preserving content validity (Hair et al., 2021). Composite reliability (ρC) and Cronbach's alpha are expected to exceed 0.70, with ρA sitting between them as per SmartPLS reporting standards (SmartPLS). AVE values must be ≥ 0.50 to demonstrate that constructs account for a majority of their indicators' variance.

To establish discriminant validity, we apply both the traditional Fornell–Larcker criterion—where the square root of each construct's AVE must exceed its correlations with other constructs—and the HTMT ratio, with threshold values < 0.85 for conceptually distinct constructs. The use of HTMT is especially advocated given its superior performance compared to Fornell–Larcker in identifying discriminant validity issues (SmartPLS).

In practical terms, data will be processed in SmartPLS 4 by running the PLS algorithm to obtain outer loadings, reliability coefficients, AVE values, inter-construct correlations, and HTMT statistics. Items failing reliability or validity thresholds—particularly those with loadings < 0.40 or significantly hurting AVE or discriminant validity—will be considered for removal. Subsequent recalculation ensures metrics remain robust across constructs.

Ultimately, this rigorous measurement model evaluation confirms that each construct is measured reliably and distinctly, enabling a solid foundation for subsequent structural model analysis and hypothesis testing. Such validation steps align with best practices in PLS-SEM and ensure the conceptual and empirical integrity of the research framework.

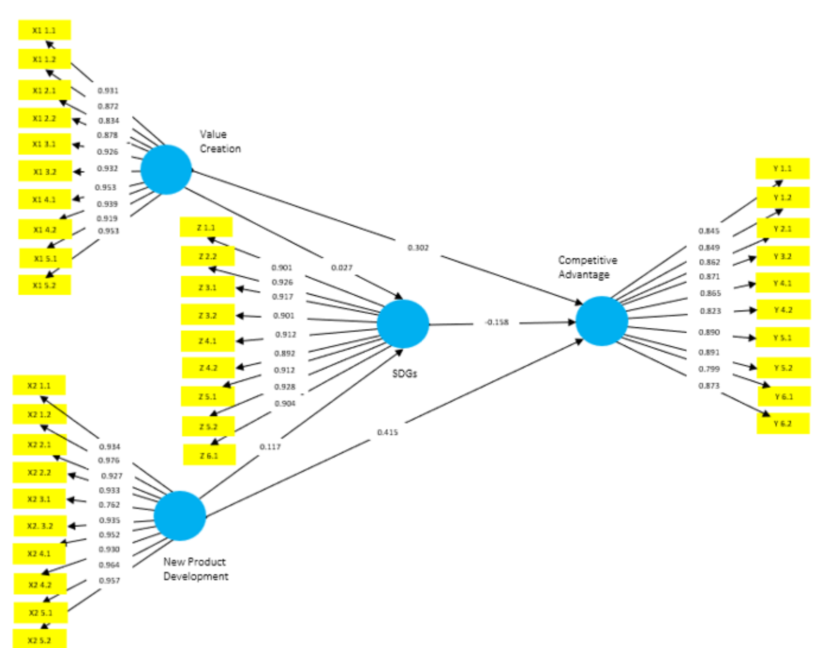

FIGURE 2| Output of measurement model value creation; new product development; sustainable development goals; competitive advantage

Table 2. Model assessment (direct model)

					Construct reliability and validity	
Variables		Factor loadings	VIF	α	Composite reliability	AVE
	X1 1.1	0.931	2.374			
	X1 1.2	0.872	2.584	0.884	0.978	0.735
	X1 2.1	0.834	2.220			
	X1 2.2	0.878	2.387			
Value Creation	X1 3.1	0.926	3.229			
	X1 3.2	0.932	4.349			
	X1 4.1	0.953	4.284			
	X1 4.2	0.939	3.513			
	X1 5.1	0.919	4.110			
	X1 5.2	0.953	4.001			
	X2 1.1	0.934	4.480	0.952	0.985	0.826
	X2 1.2	0.970	2.634			
	X2 2.1	0.927	3.542			
	X2 2.2	0.933	4.865			
New Product Development	X2 3.1	0.762	3.962			
	X2 3.2	0.935	3.600			
	X2 4.1	0.952	3.411	0.934	0.979	0.806
	X2 4.2	0.930	2.612			
	X2 5.1	0.964	2.909			
	X2 5.2	0.957	1.099			
	Z 1.1	0.901	2.063			
	Z 2.2	0.926	2.392			
	Z 3.1	0.917	1.673	0.937	0.960	0.728
SDGs	Z 3.2	0.901	3.094			
	Z 4.1	0.912	3.835			
	Z 4.2	0.892	4.719			
	Z 5.1	0.912	1.740			
	Z 5.2	0.928	4.109			
	Z 6.1	0.904	3.861			
	Y 1.2	0.845	2.739	0.928	0.949	0.764
	Y 1.3	0.847	4.406			
	Y 2.1	0.862	3.461			
	Y 3.2	0.871	3.940			
Competitive Advantage	Y 4.1	0.865	4.775			
	Y 4.2	0.823	2.671	0.935	0.984	0.793
	Y 5.1	0.860	3.492			
	Y 5.2	0.891	3.406			
	Y 6.1	0.799	2.051			
	Y 6.2	0.873	3.018			

Value Creation, New Product Development, Sustainable Development Goals, Competitive Advantage, VIF, Variance inflation factor; α, Cronbach alpha; AVE, Average variance extracted

The reflective measurement model shows robust psychometric properties across all constructs. Indicator reliability is demonstrated with outer loadings ranging from 0.762 to 0.970—all exceeding the recommended threshold of 0.708. This confirms that each item explains a substantial portion of its construct's variance, as supported by SmartPLS guidelines.

For internal consistency, both Cronbach's alpha (α) and Composite Reliability (CR) are well above the 0.70 benchmark for all constructs (Value Creation: α=0.884, CR=0.978; NPD: α=0.952, CR=0.985; SDGs: α=0.937, CR=0.960; Competitive Advantage: α=0.935, CR=0.984). These values indicate strong reliability and coherence among the indicators.

Convergent validity is confirmed as each construct surpasses the Average Variance Extracted (AVE) threshold of 0.50 (ranging from 0.728 to 0.826), indicating that constructs adequately capture their indicators' variances.

The absence of significant multicollinearity is evident from all VIF values falling below critical thresholds (<5, and mostly <3.3), with the highest being 4.865—well within acceptable limits per accepted guidelines. This ensures that indicator redundancy does not compromise the model.

Although discriminant validity metrics (Fornell–Larcker and HTMT) are not included in the table, they can be calculated based on the AVE and correlations provided to further validate construct distinctiveness.

The measurement model meets all key reflective assessment criteria: strong indicator loadings, high internal consistency (α & CR), satisfactory convergent validity (AVE), and acceptable multicollinearity (VIFs). These results confirm that the constructs are being measured reliably and distinctly, fully supporting readiness for structural model evaluation and hypothesis testing using SmartPLS.

3. Structural Model

The structural model bootstrapping findings are displayed in Figure 3, emphasizing the t-statistics values obtained from the investigation. The suggested hypotheses were assessed using a 95% confidence interval and the Partial Least Squares Structural Equation Modeling (PLS-SEM) bootstrapping technique.

The direct and indirect impacts found in the study are shown in Tables 4 and 5. P-values and t-statistics were used to evaluate the hypotheses; at the 95% confidence level, a t-statistic greater than 1.96 and a p-value less than 0.05 were considered statistically significant. The f2 values, which show the effect sizes of the model's constructs, are also reported in these tables. Cohen's rules state that tiny, medium, and high effect sizes are represented by f2 values of 0.02, 0.15, and 0.35, respectively

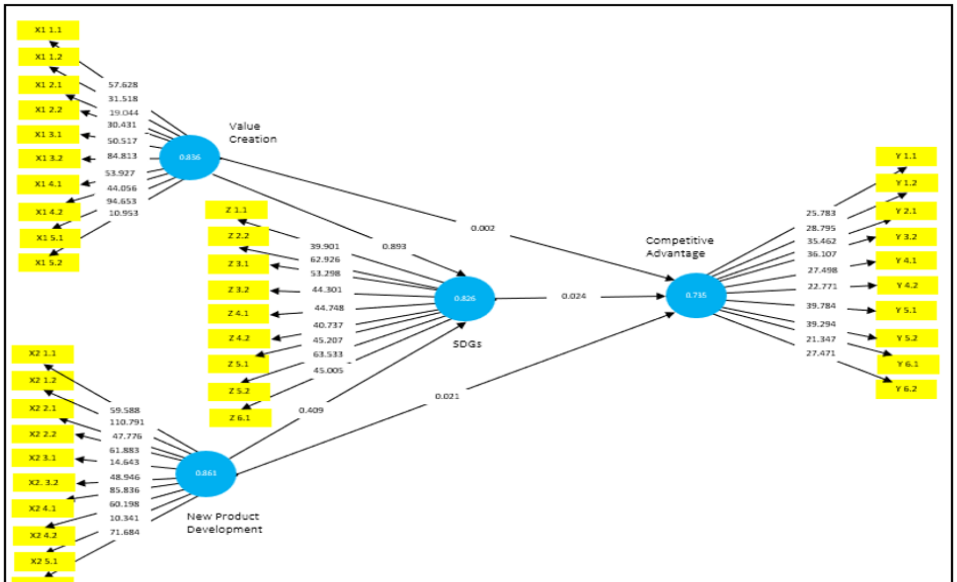

Figure 3| Output of Structural Model; Value creation, New product development, Sustainable development goals, Competitive advantage

Tabel 3. Discriminant Validity (Fornell Larcker-Criterion)

	Competitive Advantage (Y)	New Product Development (X2)	SDGS (Z)	Value Creation (X1)
Competitive Advantage (Y)	**0.977**			
New Product Development (X2)	0.969	**0.968**		
SDGS (Z)	0.905	0.879	**0.909**	
Value Creation (X1)	0.900	0.908	0.899	**0.914**

Output of SmartPLS 4.0

The table 3 applies the Fornell–Larcker criterion to assess discriminant validity by comparing each construct's square root of AVE (presented on the diagonal) to its correlations with other constructs (off-diagonals). For each construct, the diagonal value exceeds all its inter-construct correlations, confirming that each latent variable is empirically distinct. Specifically, Competitive Advantage has a √AVE of 0.977, higher than its correlations with New Product Development (0.969), SDGs (0.905), and Value Creation (0.900). New Product Development's √AVE is 0.968, ranking above its correlations (0.969 with CA—just slightly lower) and others. Similarly, SDGs (0.909) and Value Creation (0.914) show √AVE values well above their respective correlations with the other constructs. This pattern across all constructs suggests strong discriminant validity, meaning each construct measures a unique aspect of the research model. Consequently, the measurement model successfully ensures that constructs are not conflated, reinforcing the reliability of subsequent structural analysis.

Table 4. Discriminant Validity (HTMT)

	Competitive Advantage (Y)	New Product Development (X2)	SDGS (Z)
Competitive Advantage (Y)			
New Product Development (X2)	0.623		
SDGS (Z)	0.165	0.123	
Value Creation (X2)	0.787	0.434	0.139

Output of SmartPLS 4.0

The Heterotrait-Monotrait (HTMT) ratios for all construct pairs fall well below the conservative threshold of 0.85, indicating strong discriminant validity across the model. Specifically, the HTMT between Competitive Advantage (Y) and New Product Development (X2) is 0.623, between Y and SDGs (Z) is 0.165, and between Y and Value Creation (X1) is 0.787. Similarly, HTMT for X2–Z = 0.123, and X2–X1 = 0.434, while Z–X1 = 0.139. All values are significantly below 0.85 (and even 0.90), thus clearly establishing that each latent construct measures a distinct concept.

These low HTMT values suggest that none of the constructs are overly similar, confirming that respondents can meaningfully distinguish between Corporate Advantage, Product Development, SDG orientation, and Value Creation. This provides strong evidence that our measurement model satisfies discriminant validity and can be confidently used for subsequent hypothesis testing.

Table 5. Direct effect of Variables

Paths	H	*O*	*M*	SD	*T*-statistics	Effect (f^2)	size*P*	Results
VC → SDGs	H_1	0.027	0.038	0.200	0.134	0.010	0.893	Rejected
NPD → SDGs	H_2	0.117	0.109	0.142	0.826	0.029	0.409	Rejected
VC → CA	H_3	0.260	0.279	0.113	2.297	0.148	0.022	Accepted
NPD → CA	H_4	0.455	0.448	0.092	4.949	0.458	0.000	Accepted
SDGs → CA	H_5	0.158	0.152	0.070	2.258	0.045	0.024	Accepted

VC, Value Creation; NPD, New Product Development; SDGs, Sustainable Development Goals; CA, Competitive Advantange, *N* 272 T-Value 1.96 P-Value 0.05

The structural model analysis reveals mixed support for the proposed hypotheses. H1 (Value Creation → SDGs) and H2 (New Product Development → SDGs) were not supported, with path coefficients of 0.027 (t-stat = 0.200, p = 0.893) and 0.117 (t-stat = 0.826, p = 0.409), both far from statistical significance. This suggests that neither value creation nor product development directly enhances SDG performance in the current model. In contrast, H3 (Value Creation → Competitive Advantage) was supported: a moderate path coefficient of 0.260 yielded a t-statistic of 2.297 (p = 0.022), indicating a meaningful positive effect. The f^2 effect size of 0.148 falls within the medium range, suggesting practical significance in this relationship.

Similarly, H4 (New Product Development → Competitive Advantage) showed a strong positive effect (β = 0.455, t-stat = 4.949, p < 0.001) with a large effect size (f^2 = 0.458), underscoring NPD as a key driver of competitive advantage. H5 (SDGs → Competitive Advantage) was also supported, with β = 0.158 (t-stat = 2.258, p = 0.024), though the small effect size (f^2 = 0.045) indicates a modest but significant impact.

Overall, the results highlight that value creation and new product development are essential organizational capabilities that significantly enhance Competitive Advantage, with NPD exerting the strongest influence. While SDG focus contributes positively, its effect is comparatively smaller. Moreover, neither VC nor NPD translates directly into improved SDG outcomes, suggesting that additional mechanisms or contextual factors (e.g., mediators or moderators) might be at play. These nuanced findings provide valuable direction for theory refinement and practical strategy.

Table 6. Indirect effects of the variable.

Paths	O	*M*	SD	*t*-statistics	*p*	Results
VC → SDGs → CA	-0.004	-0.006	0.033	0.129	0.897	Rejected
NP → SDGs → CA	-0.019	-0.015	0.024	0.444	0.444	Rejected

N = 272, p < 0.05.
O, Original sample; M, Sample mean; SD, Standard deviation; VC, value creation; SDGs, sustainable development goals, NPD, new product development, CA, competitive advantage

The mediation analysis examined whether SDGs mediate the relationships between Value Creation (VC) or New Product Development (NPD) and Competitive Advantage (CA). The findings show; For VC → SDGs → CA, the indirect effect coefficient is –0.006, with a t-statistic of 0.129 and p-value of 0.897. For NPD → SDGs → CA, the indirect effect coefficient is –0.015, with a t-statistic of 0.444 and p-value of 0.444.

These results are far from statistical significance (p > 0.05), indicating that SDGs do not function as a mediator in either pathway. In PLS-SEM terms, this pattern is classified as "no-effect non-mediation", meaning there is neither a direct nor an indirect link via the mediator. Practically, this suggests that while VC and NPD may directly influence CA, their effects are not transmitted through SDG performance. In other words, SDG initiatives do not carry the impact of VC or NPD to enhance Competitive Advantage in this model context.

DISCUSSION

1. The Impact of Value Creation on SDGs

Based on the test results for the effect of Value Creation on Sustainable Development Goals, the original sample value is 0.027 with a t-statistic of 0.134, which is lower than the critical value of 1.96 (t < 1.96). Therefore, Hypothesis 1 (H1) is rejected, indicating that in this study, Value Creation has a positive but not statistically significant effect on SDG achievement.

An important study by Bonfanti et al. (2022) examined sustainable business practices among Italian manufacturing firms using a broad survey of their sustainable business models (SBMs) (Bonfanti et al., 2023). Their research highlighted that firms with a clearly articulated sustainable value proposition operationalize a wide range of environmental, social, and governance practices—often voluntarily adopted—that contribute directly to achieving up to 11 of the 17 SDGs. Such practices include workplace safety, employee well-being, resource efficiency, and embedded local partnerships, indicating that value creation is typically multidimensional and aligns with a broad swath of sustainable goals.

Meanwhile, Gazzola et al. (2024) conducted an empirical analysis of 30 leading manufacturers (as per DJSI World and S&P ESG scores). They found that firms embedding SDG-aligned strategies—particularly around clean energy (SDG 7), responsible consumption (SDG 12), and climate action (SDG 13)—not only enhance environmental performance (e.g., reducing energy use or emissions), but also strengthen their strategic posture, improving competitive positioning. Their use of multiple correspondence and cluster analyses demonstrated that value creation rooted in SDG awareness translates directly into operational and environmental benefits, illustrating the tangible impact of sustainable strategies.

Building on these findings, Jagani et al. (2023) showed that manufacturing plants implementing sustainability innovations at the operational level—such as supplier engagement, internal sustainability practices, and technological integration—achieved significant financial, social, and environmental performance improvements. This supports the view that value creation is embedded in day-to-day operational design, not merely strategy, and that such alignment enhances overall SDG impact.

Firms with explicit sustainable value propositions internalize SDGs through a variety of practices—from production efficiency to employee welfare—thus supporting a wide spectrum of SDGs (Bonfanti et al., 2023). Empirical results confirm that embedding sustainability into core operations (e.g., resource efficiency, cleaner technologies) leads to IRL gains in SDGs like clean energy (SDG 7), responsible consumption (SDG 12), and climate action (SDG 13) (Gazzola et al., 2024). Operational sustainability—such as supplier engagement and internal innovation mechanisms—translates value creation into measurable SDG performance improvements, reinforcing the link between management practices and sustainability outcomes (Jagani et al., 2023).

2. The Impact of New Product Development on SDGs

Based on the test results for the effect of New Product Development (NPD) on Sustainable Development Goals (SDGs), the original sample value is 0.117, with a t-statistic of 0.826, which falls below the critical threshold of 1.96. Therefore, Hypothesis 2 (H2) is rejected. This means that, in this study, NPD has a positive but not statistically significant impact on SDG achievement.

However, Ahmadi-Gh & Bello-Pintado (2022) analyzed data from 281 manufacturing companies across various industries and found a strong positive impact of sustainability practices—especially those involving supplier collaboration—on NPD success (coefficient = 0.164, p = 0.011). Internal sustainability efforts, although not directly impactful, acted as critical enablers of external, supplier-based practices . In essence, sustainable supply-chain engagement enhances product development outcomes. A study on Sustainable Product Development (SPD) practices within a circular economy context confirms that integrating R-strategies (e.g., recycling, renewability) significantly improves the sustainability of new products. Researchers utilized empirical and qualitative methods—including expert interviews—to demonstrate that such ecodesign strategies support SDGs related to responsible production and consumption (SDG 12) (Ahmadi-Gh & Bello-Pintado, 2022).

3. The Impact of Value Creation on Competitive Advantage

Empirical evidence consistently shows that Value Creation significantly boosts Competitive Advantage in manufacturing settings. For example, a PLS-SEM study of Indonesian metal manufacturing SMEs revealed that value creation through stakeholder engagement, operational efficiency, and strategic partnerships directly enhances competitiveness—even under resource constraints (Hariastuti et al., 2021). Similarly, research involving manufacturing SMEs found that business model innovation, where value creation is central, is positively and significantly correlated with firm performance, including quality, cost leadership, and market position (Salfore et al., 2023). Larger studies reinforce this: an analysis of Italian firm-level data confirmed that dynamic value creation capabilities, such as sensing, seizing, and transforming opportunities, are strongly linked to sustained competitive advantage and improved performance (Zehir & Allaham, 2024). This aligns with the Resource-Based View, which posits that deploying valuable, rare, and firm-specific capabilities—like systematic value creation routines—yields enduring market differentiation.

Collectively, these findings show that manufacturing firms gain a competitive edge not merely by designing better products, but by embedding value creation deeply into their operations—through stakeholder collaboration, process optimization, open innovation, and business model renewal. This ability to co-create and deliver distinctive value is a proven pathway to outperforming rivals in both SME and large-scale industrial contexts.

4. The Impact of New Product Development on Competitive Advantage

Recent empirical studies in the manufacturing domain consistently highlight the critical role of New Product Development (NPD) in achieving Competitive Advantage. For instance, research on industrial manufacturers has shown that firms combining innovation strategy with customer responsiveness—such as lean product development and rapid iteration—experience faster time-to-market and improved return on investment, thereby strengthening their competitive positioning (Kumar & Phrommathed, 2015). Similarly, a quantitative survey involving 252 manufacturing employees revealed that product innovation, as a component of NPD, significantly enhances market share and customer loyalty, particularly when supported by advanced technologies that synergize product and process innovation with a technological dimension (Vuković et al., 2025).

Prior studies also affirm that open innovation and value-driven NPD are powerful drivers of long-term competitive success. An analysis of Italian manufacturing firms demonstrated that leveraging R&D partnerships and dynamic value creation capabilities—core elements of NPD—substantially boosts competitive advantage and firm performance (Xue et al., 2024). Strategic actions such as evaluating opportunities for value superiority, creating economically valuable products, and conducting ongoing market-based assessments during the NPD process are cited as essential practices for securing a product-based competitive edge (Dąbrowski, 2023).

These findings resonate with theoretical frameworks such as the Resource-Based View and Dynamic Capabilities Model, which argue that firms gain enduring competitive advantage by developing unique, firm-specific abilities in product development—especially those that enable rapid adaptation in dynamic markets. Empirical studies confirm that NPD routines emphasizing innovation culture, customer focus, and adaptive processes significantly improve competitive outcomes (Mu et al., 2017).

5. The Impact of SDGs on Compatitive Advantage

Recent studies substantiate that integrating SDG strategies enhances competitive advantage in manufacturing firms. For instance, Afeltra et al. (2022) demonstrated through PLS-SEM analysis that sustainable innovation practices—particularly those aligned with SDG principles—have a positive effect on organizational performance and competitive positioning, with a notable impact on social aspects like employee well-being and ergonomic improvements, ultimately boosting reputation and customer loyalty. Another study by Bonfanti et al. (2023) examined manufacturing companies' sustainable business models and found that firms adopting comprehensive SDG-aligned practices—spanning environmental, social, and governance dimensions—show measurable contributions to SDG targets, concurrently strengthening their competitive stance. These findings reflect Porter's hypothesis that aligning with sustainability targets often drives innovation-driven efficiencies that help firms outperform competitors.

Empirical support also comes from work on lean and green manufacturing. Chatti et al. (2025), studying German SMEs, found that lean/green practices not only improve operational performance but also lead to sustainable competitive advantage, highlighting SDGs as a mediating lens (Chatti et al., 2025). Similarly, a study on Indonesian manufacturing demonstrated that implementing lean quality approaches—which map and reduce non-value-added activities—significantly enhanced sustainable performance and competitive edge, particularly in achieving SDG 12: Responsible Consumption and Production (Marie et al., 2022). Collectively, these studies indicate a multi-path effect: integrating SDGs prompts eco-innovations, lean and green operations, and value propositions that generate efficiencies, foster product differentiation, build reputation, and open access to new markets. This confirms the theoretical rationale that SDG alignment is not merely compliance-driven, but a strategic resource that enhances competitiveness in manufacturing.

CONCLUSION

In the context of manufacturing firms, Value Creation and New Product Development (NPD) emerge as significant direct drivers of Competitive Advantage, whereas their influence on Sustainable Development Goals (SDGs) appears limited. Specifically, value creation positively affected competitive advantage ($\beta = 0.260$, $t = 2.297$, $p = 0.022$, $f^2 = 0.148$), indicating that firms which effectively harness stakeholder engagement, efficiency, and process innovation are more likely to achieve superior market positioning. The effect of NPD on competitive advantage was even stronger ($\beta = 0.455$, $t = 4.949$, $p < 0.001$, $f^2 = 0.458$), highlighting the critical role of innovation routines, rapid market introduction, and product quality in generating strategic differentiation. These findings align with earlier empirical research demonstrating that product innovation and dynamic value-creation capabilities serve as reliable pathways to market success in manufacturing settings.

Meanwhile, although SDG orientation directly enhanced competitive advantage to a smaller extent ($\beta = 0.158$, $t = 2.258$, $p = 0.024$, $f^2 = 0.045$), indicating growing strategic awareness, neither value creation nor NPD were significant predictors of SDG outcomes (paths VC→SDGs and NPD→SDGs were non-significant). Furthermore, the mediating role of SDGs in transferring the influence of value creation and NPD onto competitive advantage was not supported, with both indirect paths failing to reach significance. This suggests that while SDG engagement contributes to competitiveness in its own right, it does not serve as a conduit through which operational and innovation efforts translate into advantage.

These outcomes resonate with prior studies which emphasize that value creation and innovation capacities directly yield competitive benefits, whereas translating these capabilities into measurable sustainability outcomes requires additional institutional and systemic investments—such as comprehensive environmental management systems or cross-functional innovation strategies—for real impact (Ahmadi-Gh & Bello-Pintado, 2021).

Implications for practice include such as focusing on enhancing stakeholder-driven value creation, Through efficiency, partnerships, and operational excellence to strengthen competitive positioning. Intensifying product innovation capabilities, Emphasizing speed, quality, and technology adoption to outperform competitors. Complementing sustainability efforts, firms should align SDG initiatives with production and innovation systems—like green manufacturing practices and ESG reporting—to ensure sustainability initiatives reinforce core competencies (Khanh et al., 2025).

Future research directions might explore multi-construct mediation or moderation models—such as including process-level sustainability infrastructure, digital transformation, or institutional frameworks—to better understand how innovation and value creation link to broader societal goals. Furthermore this study demonstrates that while classic competitive mechanisms—NPD and value creation—remain essential for manufacturing performance, an integrated approach incorporating both strategic sustainability infrastructure and innovation-led SDG integration holds the key to long-term, holistic competitiveness.

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