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Determinants of Product Sustainability in the B2B Industrial Lubricant Sector: The Mediating Role of Customer Satisfaction

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Abstract

Purpose: The impetus for this study arises from the growing importance of retaining industrial customers and maintaining consistent sales performance amid increasingly stringent environmental requirements, pressures for operational efficiency, and expanding adoption of sustainable business practices.

Research Methodology: Quantitative data were obtained through questionnaires administered to 150 industrial B2B customer companies that had been selected by means of purposive sampling. Analysis data using Structural Equation Modeling–Partial Least Squares (SEM-PLS) with SmartPLS 4.

Results: Empirical findings indicate that service quality, product quality, price perception, and green marketing each exert a positive and statistically significant influence on customer satisfaction and product sustainability. The analysis confirms that customer satisfaction partially mediates the relationships between these four antecedents and product sustainability.

Conclusions: The analysis demonstrates that customer satisfaction acts as a crucial bridging mechanism. Specifically, it functions as a partial mediator, meaning that while the four antecedent variables directly influence product sustainability, their overall effectiveness is significantly amplified when they successfully cultivate customer satisfaction first.

Limitations: Both the geographical and organizational parameters of the study are restricted to industrial B2B clientele of PT Pertamina Lubricants within Sales Region IV, an area encompassing Central Java and DIY.

Contributions: These results underscore the necessity of an integrated managerial strategy encompassing dependable service and distribution processes, uniform lubricant quality and performance, equitable and flexible pricing mechanisms, and the ongoing deployment of marketing initiatives oriented toward environmental concerns.

Keywords: *Customer Satisfaction, Green Marketing, Price Perception, Product Quality, Product Sustainability*

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1. Introduction

A major driver of escalating global demand for lubricant products has been the sustained worldwide expansion of industrial, transportation, and automotive activities (Pawar, Hulwan, & Mandale, 2022). Lubricants fulfill several essential technical functions, including the lowering of friction, the maintenance of engine performance, the prolongation of component service life, and the improvement of operational efficiency in vehicles, industrial machinery, and heavy equipment (Pichler, 2023; Shah, Woydt, & Zhang, 2021). Accordingly, the ongoing evolution of manufacturing, mobility, logistics, and other industrial sectors has increased lubricant use across land transportation, maritime activities, aviation, and manufacturing operations. Thus, a strategically pivotal role is performed by the lubricant industry in preserving the continuity of industrial operations and in contributing to broader economic development (Grützmacher, Voevodin, Kornyi-Both, Righi, DellaCorte, & Bagcivan, 2026).

The strategic importance of this industry is further underscored by expected growth in the worldwide lubricant market. As projected by Polaris Market Research (2026), the global lubricant market is expected to attain USD 200.16 billion by 2034, which corresponds to a Compound Annual Growth Rate (CAGR) of 3.5% between 2026 and 2034. From USD 146.37 billion in 2025, the market is anticipated to rise to USD 151.45 billion in 2026. Although North America continues to be recognized as a significant market, the Asia Pacific region is forecasted to become the dominant regional market, with an estimated value of USD 101.5 billion by 2034, thereby accounting for more than half of global demand. This anticipated trajectory is closely associated with rapid industrialization and sustained growth in manufacturing, transportation, and automotive activities across the region. At the industry level, it has been estimated by Fortune Business Insights (2026) that the automotive and transportation sectors represented 45.37% of the global lubricant market in 2026, followed by manufacturing and other specialized sectors. Hence, a strong linkage between lubricant consumption and the expansion of transportation and industrial activities is illustrated by these trends.

Within this global context, Indonesia is regarded as an important developing market for lubricant products. Mordor Intelligence (2026) projects that lubricant consumption in Indonesia will increase from 1.20 billion liters in 2025 to 1.23 billion liters in 2026, after which it will reach 1.41 billion liters by 2031, equivalent to a CAGR of 2.71%. This expansion is expected to be supported by various factors, encompassing growing vehicle ownership, manufacturing growth, infrastructure development, mining activities, transportation demand, and maritime modernization. In 2025, the largest product segment was represented by automotive engine oil, which accounted for 35.4% of the market, while hydraulic fluids, industrial engine oils, transmission fluids, and gear oils also constituted substantial market segments. Despite the business opportunities generated by this market expansion, competitive pressure among lubricant manufacturers is also intensified by such development (Althaqafi, 2023).

The increasingly competitive character of the market renders product sustainability especially pertinent, particularly within the B2B segment (Sithi, Ara, Dhrubo, Rony, & Shabur, 2025). When evaluating lubricant suppliers, multiple considerations are generally employed by industrial customers, including product performance, service reliability, supply availability, economic value, technical support, and environmental responsibility (Faganel & Abrami, 2022). Transactions in the B2B lubricant market also differ from ordinary consumer purchases, as supplier–customer relationships are frequently embedded within continuing operational processes (Albérico & Casaca, 2023). Operational risks for customers may be increased by inadequate product availability, technical compliance, delivery reliability, or cost efficiency, and such shortcomings may potentially motivate them to consider alternative suppliers (Joshi, 2025).

Consequently, Service Quality may be regarded as a dimension capable of contributing to Product Sustainability. The capacity of an organization to satisfy or surpass customer expectations is reflected through responsive service delivery, precise execution, effective communication, and suitable resolution of customer issues (Hochstein, Voorhees, Pratt, Rangarajan, Nagel, & Mehrotra, 2023; Sands, Campbell, Ferraro, & Plangger, 2022). Such a factor is especially pertinent within B2B relationships, as interactions between suppliers and industrial customers tend to be ongoing and are directly linked to operational performance (Agarwal, Kumar, & Katiyar, 2025). Customer satisfaction

may be cultivated, trust may be reinforced, and long-term commitment may be encouraged when services are effectively provided (McCarroll, 2026). Nevertheless, empirical evidence concerning this association has remained inconsistent. Fan, Pan, Tseng, and Chao (2023), Gounaris and Almoraish (2024), and Mittal, Han, Lee, and Sridhar (2021) reported positive linkages between service quality and product sustainability . Conversely, it has been suggested by Batarlienė and Slavinskaitė (2023), Furman, Diamant, and Kristal (2021), and Ribeiro, Ramos, and Moro (2024) that service quality in isolation may be insufficient for securing customer retention when greater emphasis is placed by customers on pricing, available alternatives, and operational efficiency.

To understand the complex purchasing behavior within this sector, this study integrates the Expectation Confirmation Theory (ECT) as the foundation for evaluating customer satisfaction, and the Natural Resource-Based View (NRBV) to explain how environmental capabilities, such as green marketing, contribute to long-term product sustainability. Prior investigations identified comparable inconsistencies concerning the relationship between Product Quality and Product Sustainability. Performance, reliability, durability, safety, and conformity with predetermined specifications constitute dimensions encompassed by product quality (Kosasih, Hidayat, Hutahayan, & Sunarti, 2024). Within lubricant applications, engine protection, friction management, equipment reliability, and operational effectiveness are closely associated with such attributes (Abuzaid, Alateeq, Madadha, & Alsbou, 2024). It has been reported by Gelderman, Schijns, Lambrechts, and Vijgen (2021), Pichler (2023), and McCarroll (2026) that continued product use may be encouraged by higher product quality through improvements in performance and reliability. In contrast, the contention has been made by Wu and Tham (2023) and Ru-Zhue, Rakangthong, Kim, and Issayeva (2025) that technical product quality may exert only a limited influence on customer decisions once environmental sustainability, total cost of ownership, and regulatory obligations become more prominent considerations. Such contrasting results imply that product quality ought to be examined alongside other dimensions that may shape customer decision-making.

An additional factor warranting consideration in industrial purchasing decisions is Price Perception. This concept denotes customers' judgments regarding the appropriateness of a price in relation to product quality, benefits received, and overall economic value (Huang, Lanzrath, & Homburg, 2026). For B2B lubricant customers, price assessment generally extends beyond the initial acquisition cost, since equipment efficiency, lubricant durability, maintenance costs, and long-term operational benefits associated with the product may also be taken into account by organizations (Abuzaid et al., 2024). This has been demonstrated by Correa, Alarcn, and Cepeda (2021), (Liu, Kinanmehr, Asadi, & Zarei, 2026) , and Bağcı (2026) that sustainable product usage may be supported by favorable price perceptions through the strengthening of perceived value and the reinforcement of perceived consistency between price and benefits. Nevertheless, it has been indicated by Nguyen-Viet, Tran, and Ngo (2024), Hui, Mamun, Reza, and Hussain (2025), and Roosta, Sadjadi, and Makui (2025) that customer retention is not necessarily guaranteed by competitive pricing alone, particularly when greater influence on purchasing decisions is exerted by service quality, operational risk, and strategic value.

The escalating apprehension surrounding ecological accountability has correspondingly amplified the significance of Green Marketing within B2B lubricant purchasing behavior (Gelderman et al., 2021; Huang et al., 2026; Oduro, & Matarazzo, 2025). The incorporation of environmental considerations into business activities such as production, distribution, promotion, and product utilization constitutes Green Marketing (Majeed, Aslam, Murtaza, Attila, & Molnár, 2022; Vangeli, Maecka, Mitrga, & Pfajfar, 2023). Within the lubricant industry, such practices may encompass the formulation of environmentally preferable products, packaging designed for recyclability, measures aimed at emission reduction, management of used-lubricant waste, and the adoption of cleaner technologies (Román-Augusto, Garrido-Lecca-Vera, Lodeiros-Zubiria, & Mauricio-Andia, 2022; Wilińska, & Wilkanowicz, 2025) . It has been indicated by Nguyen, Pham, Chovancov, and Duc (2023) that corporate image may be strengthened, and customer trust cultivated through Green Marketing. Comparably, positive associations linking Green Marketing, environmental awareness, perceived green value, and product sustainability have been identified by Ma, Coelho, and Santos (2026),

Kamalanon, Chen, and Le (2022), and Chaihanchanchai and Anantachart (2023). Nevertheless, it has been reported by Su and Li (2024), Braik, Saleh, and Jaaron (2024), and Haryono, Zulianto, and Purwanto (2025) that the contribution exerted by Green Marketing may be comparatively constrained when functional performance, price, and operational efficiency are prioritized by customers.

Within PT Pertamina Lubricants Sales Region IV, covering Central Java and Yogyakarta (DIY), a phenomenon gap is reflected in fluctuating sales, declining from 577.93 KL in 2023 to 459.65 KL in 2024 before recovering to 552.18 KL in 2025, while sales target achievement decreased from 120% to 86% between 2024 and 2025. A preliminary survey of 30 B2B customers in April 2026 revealed concerns regarding Service Quality, Price Perception, Green Marketing, and Product Sustainability, with Green Marketing receiving the lowest favorable evaluation (43.33%), Product Sustainability receiving 50%, and 46.67% of respondents reporting neutral-to-highly-dissatisfied assessments. These findings suggest potential customer-retention challenges despite market growth. Accordingly, this study proposes an integrated framework examining the effects of Service Quality, Product Quality, Price Perception, and Green Marketing on Customer Satisfaction and Product Sustainability, with Customer Satisfaction as a mediator. Its novelty lies in integrating functional, economic, relational, and environmental dimensions within the B2B lubricant industry. Entitled "Determinants of Product Sustainability: The Mediating Role of Customer Satisfaction," the study aims to address theoretical inconsistencies and regional business challenges while providing practical insights for improving customer relationships, pricing strategies, service quality, and environmental initiatives.

2. Literature Review and Hypothesis/es Development

2.1 The Effect of Service Quality on Customer Satisfaction

Within the B2B lubricant sector, Service Quality reflects a supplier's ability to ensure reliable logistics, timely support, and operational efficiency. Based on Expectation Confirmation Theory (ECT), customer satisfaction results from comparing expectations with actual service performance, particularly delivery accuracy, responsiveness, and product authenticity. Demirel (2022); Maryani, Qomariah, Martini, and Sobirov (2025), and Dzaqia and Trenggana (2026) report empirical evidence indicating that Service Quality exerts a positive and statistically significant effect on Customer Satisfaction. Accordingly, the following hypothesis is advanced:

H_1: Service quality has a positive and significant effect on customer satisfaction

2.2 The Effect of Product Quality on Customer Satisfaction

Product Quality is regarded as a pivotal consideration within industrial markets, since lubricant performance is directly linked to machinery reliability and operational productivity. Industrial B2B customers typically assess lubricant quality based on functional attributes, including thermal stability, energy efficiency, viscosity consistency, and performance under demanding operating conditions. Evidence presented by Tahir et al. (2023), and Alzoubi et al. (2024) demonstrates that Product Quality exerts a positive and significant influence on Customer Satisfaction. Consequently, the following hypothesis is articulated:

H_2: Product quality has a positive and significant effect on customer satisfaction

2.3 The Effect of Price Perception on Customer Satisfaction

Within B2B purchasing relationships, Price Perception pertains to customers' appraisal of whether the monetary outlay required for a product is reasonable relative to the overall value obtained. Industrial purchasing choices generally extend beyond the initial acquisition price and may encompass considerations such as total ownership costs, operational efficiency, contractual flexibility, and volume-based incentives. Epferiyansah et al. (2024), Sani & Susanto (2025), and Ahmed et al. (2022) observed that perceived price fairness is positively and significantly associated with Customer Satisfaction. Drawing on this theoretical rationale, the following hypothesis is put forward:

H_3: Price perception has a positive and significant effect on customer satisfaction

2.4 The Effect of Green Marketing on Customer Satisfaction

Green Marketing denotes a supplier's endeavors to exhibit environmental responsibility through product development, communication approaches, and waste-management practices. Green marketing is a strategy that emphasizes the environmentally friendly attributes of products, price, promotion, and distribution (Maryani, Qomariah, Martini, & Sobirov, 2025). According to Stakeholder Theory, the implementation of green marketing permits firms to respond to the environmental expectations of corporate customers, particularly organizations that face growing requirements to comply with regulatory standards and sustainability objectives.Gelderman, Schijns, Lambrechts, and Vijgen (2021), Nuraini, Muzakir, Ponirin, and Buntuang (2025), and Ma, Coelho, and Santos (2026) provide empirical support indicating that Green Marketing exerts a positive and significant influence on Customer Satisfaction. From this theoretical perspective, the following hypothesis is suggested:

H_4: Green marketing has a positive and significant effect on customer satisfaction

2.5 The Effect of Service Quality on Product Sustainability

Sustaining consistent Service Quality is crucial for maintaining continuity across industrial supply chains. Dependable delivery systems and responsive logistics services can lower the risk of lubricant shortages that might otherwise interrupt manufacturing activities. In B2B relationships, reliable service performance may prompt customers to retain existing purchasing arrangements while concurrently diminishing their propensity to seek alternative suppliers. Tedja, Musadieq, Yulianto, and Kusumawati (2024) and da Silva, Ferecatu, Vanhamme, Puntoni, and Silva (2025) demonstrate that service quality has significant strategic implications for Product Sustainability. Based on this theoretical rationale, the following hypothesis is formulated:

H_5: Service quality has a positive and significant effect on product sustainability

2.6 The Effect of Product Quality on Product Sustainability

Within B2B markets, a reliable and consistent standard of Product Quality forms an essential basis upon which long-term supplier relationships are sustained. When an established lubricant product is replaced, technical and operational uncertainty may emerge, especially if satisfactory performance has already been demonstrated by the existing product in industrial applications. Functional advantages may be offered by lubricants that effectively protect machinery, preserve operational performance, and support component durability, thereby encouraging customers to retain their current product selection. A positive and significant relationship between Product Quality and Product Sustainability is reported by Litvaj et al. (2025) and Mahmoud et al. (2023). Based on this theoretical framework, the following hypothesis is proposed:

H_6: Product quality has a positive and significant effect on product sustainability

2.7 The Effect of Price Perception on Product Sustainability

The continuity of B2B purchasing relationships can be supported by perceived price fairness and competitiveness, since lubricant procurement is thereby ensured to remain economically viable for industrial customers. In practice, procurement costs are routinely assessed by corporate buyers so that operational efficiency is maintained while their competitive position is sustained. Evidence is provided by Huang, Lanzrath, and Homburg (2026) and Bağcı (2026) that customers' intention to maintain product usage over time can be increased by positive evaluations of price fairness. Based on this theoretical perspective, the following hypothesis is proposed:

H_7: Price perception has a positive and significant effect on product sustainability

2.8 The Effect of Green Marketing on Product Sustainability

According to the Natural-Resource-Based View (NRBV), Green Marketing represents an organizational environmental capability that can contribute to the achievement of sustainable competitive advantage. Environmental risks may be managed, and applicable regulatory obligations may be met by industrial customers through the provision of environmentally responsible products, reliable sustainability-related communication, and comprehensive waste-management assistance. A

positive and significant effect of Green Marketing on Product Sustainability is demonstrated by Machová, Ambrus, Zsigmond, and Bakó (2022) and Correia, Sousa, Viseu, and Larguinho (2023). Based on this theoretical framework, the following hypothesis is formulated:

H_8: Green marketing has a positive and significant effect on product sustainability

2.9 The Effect of Customer Satisfaction on Product Sustainability

Customer Satisfaction represents an overall evaluation of the extent to which the performance provided by a supplier fulfills or surpasses customers' prior expectations. Within B2B markets, stronger trust can be contributed to by consistently high levels of satisfaction; customers' propensity to switch suppliers can be reduced, and the development of enduring purchasing relationships can be facilitated. A positive and significant influence of Customer Satisfaction on Product Sustainability and continued consumption behavior is demonstrated by Waqas et al. (2024) and Asawawibul et al. (2025). Based on this theoretical framework, the following hypothesis is proposed:

H_9: Customer Satisfaction has a positive and significant effect on product sustainability

2.10 The Mediating Role of Customer Satisfaction

Within the B2B lubricant sector, the direct effects of service quality, product quality, price perception, and green marketing on product sustainability may not fully capture the complexity of organizational buying behavior. Instead, these antecedent factors often operate through an intervening cognitive mechanism. According to Expectation Confirmation Theory (ECT), customer satisfaction serves as a crucial evaluative process wherein industrial buyers compare their prior expectations with actual supplier performance. Favorable evaluations of operational performance such as reliable service, superior product quality, fair pricing, and credible green initiatives are converted into sustained contractual commitment primarily when they first generate a satisfactory overall customer experience. Furthermore, technical superiority in a product or economically appealing pricing alone may prove insufficient for ensuring continued procurement if a satisfactory overall relationship is not cultivated. This notion aligns with Mittal et al. (2023) and Cárdenas-Muga et al. (2023), who emphasize customer satisfaction as a vital intervening mechanism that links marketing-related attributes to the continuity of business relationships. Therefore, it is argued that the customer retention strategy of PT Pertamina Lubricants ought to be executed through an integrated approach, where the various dimensions of the marketing mix simultaneously enhance customer satisfaction as a precondition for sustaining product usage. Drawing on this theoretical rationale, the following mediating hypotheses are proposed:

H_{10}: Customer satisfaction mediates the relationship between service quality and product sustainability

H_{11}: Customer satisfaction mediates the relationship between product quality and product sustainability

H_{12}: Customer satisfaction mediates the relationship between price perception and product sustainability

H_{13}: Customer satisfaction mediates the relationship between green marketing and product sustainability

3. Research Methodology

3.1 Research Type

This study adopts a quantitative empirical approach. The quantitative strand is deployed to identify and appraise statistical associations among the variables considered in the study. The researchers collected data through a structured questionnaire distributed to representatives of B2B customer companies that procure or utilize goods supplied by PT Pertamina Lubricants in Central Java and Yogyakarta. The resulting quantitative dataset is analyzed using variance-based Structural Equation Modeling-Partial Least Squares (SEM-PLS). The quantitative strand functions as the principal

methodological component, being deployed to identify and appraise statistical associations among the variables considered in the study . The researchers collected data through a structured questionnaire distributed to representatives of B2B customer companies (Huang, Lanzrath, & Homburg, 2026) that procure or utilize goods supplied by PT Pertamina Lubricants in Central Java and Yogyakarta. The resulting quantitative dataset is analyzed using variance-based Structural Equation Modeling–Partial Least Squares (SEM-PLS) (Liu, Kinanmehr, Asadi, & Zarei, 2026), thereby permitting evaluation of relationships involving service quality, product quality, price perception, green marketing, customer satisfaction, and product sustainability. Such a design is selected because purchasing decisions within the B2B lubricant sector are complex; organizational buying considerations may encompass product performance, financial value, contractual arrangements, distributor reliability, operational demands, and adherence to environmental requirements (Cárdenas-Muga, Rodríguez-Zurita, Barcia, & Abad-Moran, 2025; Guenther, Guenther, Ringle, Zaefarian, & Cartwright, 2023).

3.2 Population and Sample

The target population comprises corporate and business entities classified as B2B customers and officially documented as either active or inactive purchasers of industrial lubricants distributed by PT Pertamina Lubricants within Sales Region IV, covering Central Java and the Special Region of Yogyakarta (DIY). Authorized industrial distributors across several key cities facilitate the regional distribution and market reach of industrial lubricant products, namely Semarang, Pekalongan, Tegal, Cilacap, Purwokerto, Surakarta (Solo), and Yogyakarta.

A total of 150 companies are included as respondents for the quantitative phase, with participants chosen through a non-probability sampling method based on purposive sampling (Makki, Jafari, & Parsanejad, 2026). To be eligible for inclusion, each respondent company must meet the following conditions: be an active or inactive B2B industrial customer registered with PT Pertamina Lubricants Sales Region IV; utilize Pertamina lubricants and/or products from other lubricant manufacturers; have an ongoing or prior purchasing relationship with PT Pertamina Lubricants; and appoint a representative who has sufficient knowledge and relevant authority regarding the company's business dealings with PT Pertamina Lubricants. The study determined the sample size of 150 companies based on Statistical Power Analysis for PLS-SEM, following the approach outlined by Hair & Alamer (2023). The calculation adopts a 5% significance level, 80% statistical power, and a minimum R^2 of 0.25. Under these parameters, the resulting sample size is regarded as adequate for statistically evaluating the structural relationships specified in the proposed research model (Gounaris & Almoraish, 2024).

3.3 Instrumentation

In this investigation, a structured questionnaire was adopted as the principal means by which quantitative data were gathered (Majeed, Aslam, Murtaza, Attila, & Molnár, 2022; Román-Augusto, Garrido-Lecca-Vera, Lodeiros-Zubiria, & Mauricio-Andia, 2022; Wang, & Yue, 2024). Through this instrument, six research constructs were intended to be measured: Service Quality (X_1), Product Quality (X_2), Price Perception (X_3), Green Marketing (X_4), Customer Satisfaction (Z), and Product Sustainability (Y). Respondents evaluated every statement using a five-point Likert scale, on which 1 signifies Strongly Disagree (STS), 2 denotes Disagree (TS), 3 represents Neutral (N), 4 indicates Agree (S), and 5 corresponds to Strongly Agree (SS). Operationalization of these constructs was achieved through indicators encompassing such aspects as service reliability and responsiveness, lubricant performance and durability, price affordability and competitiveness, environmental marketing initiatives, customer satisfaction, as well as continued product utilization and corporate loyalty.

3.4 Data Collection Procedure

Data collection was implemented through a structured survey. At the outset, quantitative information was obtained by administering structured questionnaires to 150 representatives of B2B customer companies. These instruments were provided in physical as well as electronic formats, including via Google Forms, while respondents were selected in line with the predetermined purposive sampling criteria. After data collection had been completed, the questionnaire responses were compiled and subsequently analyzed using SEM-PLS. The statistical outcomes were then interpreted in order to

ascertain whether significant, non-significant, and distinctive associations existed among the variables under examination.

3.5 Data Analysis

Examination of the quantitative data was conducted by means of Partial Least Squares Structural Equation Modeling (PLS-SEM) (Guenther, Guenther, Ringle, Zaefarian, & Cartwright, 2023). Within the analytical procedure, descriptive statistical analysis was first performed so that the characteristics of respondents could be described and the response patterns yielded by the questionnaire could be summarized. Subsequently, assessment of the measurement model, also designated as the outer model, was undertaken with respect to convergent validity, discriminant validity, and construct reliability. Convergent validity was established based on indicator loading values and Average Variance Extracted (AVE), while discriminant validity was inspected through the Fornell–Larcker criterion and the Heterotrait–Monotrait Ratio (HTMT). For each construct, reliability was evaluated by employing Cronbach Alpha and Composite Reliability (Jain, Basu, & Dwivedi, 2024). Testing of the hypotheses was thereafter carried out via the bootstrapping procedure provided in SmartPLS. Statistical significance was assessed at the 5% significance level, with a t-statistic exceeding 1.96 and a p-value below 0.05 being adopted as the stipulated decision criteria (Kurtaliqi, Miltgen, Viglia, & Pantin-Sohier, 2024). Moreover, the mediating effect of customer satisfaction was examined through the evaluation of indirect effects and the calculation of the Variance Accounted For (VAF)(Ioannou, Kassinis, & Papagiannakis, 2023; James, DeJonckheere, & Guetterman, 2024).

4. Results and Discussions

4.1 Outer Model

Table 1 presents the outer loading estimates obtained from the analysis of every indicator associated with the six constructs investigated in the present study. Convergent validity is regarded as adequate when an indicator's outer loading on the latent construct to which it is assigned exceeds 0.70.

Table 1. Results of indicator outer loading assessment

Latent Constructs	Indicators	Outer Loading
Service Quality (X_1)	X_1.1	0.792
	X_1.2	0.803
	X_1.3	0.855
	X_1.4	0.771
	X_1.5	0.810
	X_1.6	0.848
	X_1.7	0.828
	X_1.8	0.841
	X_1.9	0.840
	X_1.10	0.758
Product Quality (X_2)	X_2.1	0.813
	X_2.2	0.839
	X_2.3	0.809
	X_2.4	0.787
	X_2.5	0.853
	X_2.6	0.821
	X_2.7	0.830
	X_2.8	0.737
Price Perception (X_3)	X_3.1	0.855
	X_3.2	0.826
	X_3.3	0.790
	X_3.4	0.787

Latent Constructs	Indicators	Outer Loading
Price Perception (X_3)	X_3.5	0.826
	X_3.6	0.799
	X_3.7	0.863
	X_3.8	0.837
Green Marketing (X_4)	X_4.1	0.851
	X_4.2	0.753
	X_4.3	0.855
	X_4.4	0.841
	X_4.5	0.845
	X_4.6	0.810
	X_4.7	0.731
Customer Satisfaction (Z)	Z_1.1	0.760
	Z_1.2	0.795
	Z_1.3	0.844
	Z_1.4	0.864
	Z_1.5	0.828
	Z_1.6	0.874
	Z_1.7	0.811
	Z_1.8	0.790
	Z_1.9	0.786
Product Sustainability (Y)	Y_1.1	0.801
	Y_1.2	0.850
	Y_1.3	0.801
	Y_1.4	0.803
	Y_1.5	0.741
	Y_1.6	0.817
	Y_1.7	0.833
	Y_1.8	0.838
	Y_1.9	0.837

4.2 Average Variance Extracted (AVE)

Evidence presented in Table 2 reveals that the Average Variance Extracted (AVE) calculated for every latent construct within the research model proposed herein is greater than the accepted threshold of 0.50.

Table 2. Average Variance Extracted (AVE)

Latent Construct	AVE
Green Marketing (X_4)	0.662
Product Sustainability (Y)	0.663
Customer Satisfaction (Z)	0.669
Service Quality (X_1)	0.665
Product Quality (X_2)	0.659
Price Perception (X_3)	0.678

4.3 Construct Reliability

As shown in Table 3, all latent constructs in the proposed research model exhibited satisfactory reliability. Given that the generally accepted minimum benchmark of 0.70 was exceeded by each of these coefficients, the required reliability standards may be considered to have been satisfied by all

constructs. These results imply that strong internal consistency is displayed by the questionnaire items in their representation of the respective latent constructs. Therefore, the measurement instrument is regarded as reliable and suitable for utilisation in the subsequent structural model evaluation.

Table 3. Construct reliability

Latent Construct	Cronbach Alpha	Composite Reliability (ρa)	Composite Reliability (ρc)
Green Marketing (X_4)	0.915	0.925	0.932
Product Sustainability (Y)	0.936	0.938	0.946
Customer Satisfaction (Z)	0.938	0.939	0.948
Service Quality (X_1)	0.944	0.948	0.952
Product Quality (X_2)	0.926	0.932	0.939
Price Perception (X_3)	0.932	0.934	0.944

4.4 Hypothesis Testing (Direct Effects)

This study evaluated the hypothesized relationships using the bootstrapping technique incorporated in SmartPLS 4. The statistical results derived from the aforementioned hypothesis-testing procedure are consolidated in Table 4.

Table 4. Summary of hypothesis testing (Direct Effects)

Structural Path	Original Sample (O)	T-Statistics	P-Values	Decisions
Service Quality → Customer Satisfaction	0.353	6.323	0.000	Accepted
Product Quality → Customer Satisfaction	0.382	6.919	0.000	Accepted
Price Perception → Customer Satisfaction	0.200	3.984	0.000	Accepted
Green Marketing → Customer Satisfaction	0.217	3.886	0.000	Accepted
Service Quality → Product Sustainability	0.176	2.672	0.008	Accepted
Product Quality → Product Sustainability	0.176	3.097	0.002	Accepted
Price Perception → Product Sustainability	0.205	3.204	0.001	Accepted
Green Marketing → Product Sustainability	0.156	3.045	0.002	Accepted
Customer Satisfaction → Product Sustainability	0.386	4.021	0.000	Accepted

Table 4 demonstrates that all tested relationships have positive path coefficients, each of which is associated with a P-value of less than 0.05. These statistical outcomes indicate that every hypothesized relationship incorporated into the research model possesses a positive and statistically significant effect. Therefore, the hypotheses asserting direct associations among the variables are corroborated by the empirical results.

4.5 Hypothesis Testing (Indirect Effects)

The hypotheses proposed in this study were evaluated by means of the bootstrapping approach offered in SmartPLS 4, and the statistical findings thereby produced are presented in Table 5.

Table 5. Summary of hypothesis testing (indirect effects)

Mediating Structural Path	Original Sample (O)	T-Statistics	P-Values	Decisions
Service Quality → Customer Satisfaction → Product Sustainability	0.136	3.612	0.000	Accepted
Product Quality → Customer Satisfaction → Product Sustainability	0.147	3.274	0.001	Accepted
Price Perception → Customer Satisfaction → Product Sustainability	0.077	2.647	0.008	Accepted
Green Marketing → Customer Satisfaction → Product Sustainability	0.084	2.877	0.004	Accepted

As shown in Table 5, all indirect effects have positive path coefficients and P-values below 0.05, confirming that Customer Satisfaction significantly mediates the relationships between Service Quality, Product Quality, Price Perception, Green Marketing, and Product Sustainability. The structural relationships among these variables are illustrated in the SmartPLS path model presented in Figure 1.



Figure 1. SmartPLS path model diagram

4.6 The Effect of Service Quality on Customer Satisfaction

The initial hypothesis test revealed that Service Quality positively and significantly influences Customer Satisfaction among B2B customers. This result suggests that improved punctuality, dependability, and responsiveness in services provided by authorized distributors and Pertamina

commercial personnel increase satisfaction among industrial customers. The capacity to supply lubricant products in accordance with Purchase Order (PO) schedules, together with the timely handling of administrative matters, appears to be instrumental in shaping favorable customer perceptions. These findings are aligned with the Expectation Confirmation Theory (ECT) advanced by (Oliver, 1980), in which customer satisfaction is conceptualized as an outcome of comparing initial expectations with actual consumption experiences. Sustained service consistency may reduce operational uncertainty and reinforce customer confidence, thereby contributing to elevated satisfaction. This result also corresponds with the findings of Demirel (2022), Maryani, Qomariah, Martini, and Sobirov (2025), and Dzaqia and Trenggana (2026), which emphasize the role of consistent, professional, and responsive services in fostering customer satisfaction within industrial markets.

4.7 The Effect of Product Quality on Customer Satisfaction

Evidence obtained from the second hypothesis assessment indicates that Customer Satisfaction is positively and statistically significantly influenced by Product Quality. Such a result suggests that the functional performance and technical characteristics of Pertamina lubricants play a particularly decisive role in shaping satisfaction among industrial customers within Sales Region IV. Theoretically, additional empirical backing is provided by this finding for the application of Expectation Confirmation Theory (ECT) in the domain of technical industrial marketing. Lubricant quality is evaluated by B2B customers on the basis of performance attributes that are observable and measurable, including engine temperature stability under high-load operations, consistency of viscosity, and the effectiveness of protection against component wear. When these technical specifications are consistently met throughout engine operation and overhaul activities, a conclusion that the lubricant meets or exceeds engineering expectations is more likely to be reached by customers. More favorable assessments among plant managers and maintenance personnel can subsequently be generated by this positive confirmation. The result is aligned with Milanisti, Muzakir, Ponirin, and Asriadi (2025), Tahir, Adnan, and Saeed (2024), and Alzoubi, Ahmed, and Alshurideh (2022), by whom technical product quality and functional reliability as significant determinants of customer satisfaction in manufacturing environments.

4.8 The Effect of Price Perception on Customer Satisfaction

Findings derived from the third hypothesis test reveal a statistically significant and positive association between Price Perception and Customer Satisfaction. Such an outcome implies that, within Central Java and DIY, corporate buyers who perceive Pertamina pricing as transparent, fair, and competitive tend to report elevated satisfaction. A particularly salient determinant in the emergence of favorable assessments is the extent to which contractual pricing is regarded as aligned with the degree of engine protection afforded by the lubricant products. Within industrial procurement contexts, price is generally assessed not solely in terms of its direct monetary amount, since purchasing choices are also shaped by Total Cost of Ownership (TCO) and long-term cost efficiency considerations. Where the costs incurred for lubricant acquisition are viewed as proportional to the resulting benefits, such as diminished maintenance expenses and reduced exposure to operational downtime, customers are more inclined to perceive the price as reasonable. Perceived economic fairness may reinforce expectations of budgetary efficiency and, in turn, elevate satisfaction among procurement decision-makers. These results align with prior investigations by Epferiyansah, Pentiana, and Dewi (2026), Sani and Susanto (2025), and Ahmed (2023), in which a positive and significant linkage was documented between perceived price fairness and customer satisfaction in industrial lubricant markets.

4.9 The Effect of Green Marketing on Customer Satisfaction

Testing of the fourth hypothesis demonstrates that Green Marketing exerts a positive and statistically significant influence on Customer Satisfaction. This outcome suggests that greater adoption of green marketing measures, for instance, disseminating information about lower-emission lubricant formulations and facilitating the handling of used-lubricant waste, could enhance satisfaction among industrial customers located in Central Java and DIY. When interpreted through Stakeholder Theory and Expectation Confirmation Theory (ECT), green marketing may be regarded as a strategic means of addressing the environmental issues and regulatory pressures faced by manufacturing enterprises. It

is increasingly expected by industrial customers that lubricant suppliers will not merely deliver products but also assist them in meeting pertinent environmental standards and regulatory obligations. Consequently, the offering of environmentally preferable lubricant alternatives capable of supporting emission reduction may align with customers' expectations concerning environmental management, thereby eliciting favourable assessments at operational and managerial levels alike. Such a result is consistent with Gelderman, Schijns, Lambrechts, and Vijgen (2021),Nuraini, Muzakir, Ponirin, and Buntuang (2025) and (Ma, Coelho, & Santos, 2026) , whose studies indicated that credible and solution-focused green marketing activities can contribute substantially to customer satisfaction.

4.10 The Effect of Service Quality on Product Sustainability

A statistically significant and positive direct influence of Service Quality on Product Sustainability is revealed by the results of the fifth hypothesis test. Such an outcome implies that services which are dependable and consistently delivered through Pertamina authorized distributor network are implicated in fostering customers' continued procurement of lubricants over longer periods. In the management of industrial business relationships, the durability of inter-organizational cooperation is closely associated with the accessibility and reliability of product supply. Risks of disruption to manufacturing operations can be reduced when distributors are capable of completing orders accurately and in accordance with agreed delivery timelines. Should satisfactorily service performance be encountered repeatedly by customers, their contractual commitment may be reinforced, whereas their tendency to migrate to alternative lubricant suppliers may diminish. Such a circumstance demonstrates the manner in which switching resistance within B2B relationships may be facilitated by service reliability. This finding corresponds with prior investigations by Tedja, Musadieq, Yulianto, and Kusumawati (2024) and (da Silva, Ferecatu, Vanhamme, Puntoni, & Silva, 2025), wherein it is shown that customer retention and extended product utilization in B2B markets can be supported by service quality that is responsive and dependable.

4.11 The Effect of Product Quality on Product Sustainability

The sixth hypothesis test revealed that Product Quality exerts a positive and statistically significant influence on Product Sustainability. Such a result suggests that the physical characteristics and formulation performance of Pertamina lubricants constitute salient technical determinants that motivate industrial consumers in Central Java and DIY to continue utilizing these products over an extended period. This direct association can be explained by the reliance of industrial machinery on lubricants that satisfy suitable technical requirements. Production equipment possessing considerable operational value necessitates consistent lubricant performance in order to minimize the likelihood of component degradation and elevated operating temperatures. On the basis of their operational experience, customers may regard Pertamina lubricants as able to support extended oil-change intervals while maintaining component cleanliness throughout overhaul procedures. Such beneficial technical experiences may render maintenance and technical staff less willing to switch to alternative lubricant brands whose performance has not been adequately verified within their operational settings. This result aligns with Litvaj et al. (2022) and Mahmoud et al. (2025), who emphasize consistent functional product quality as a key determinant in preserving corporate customer loyalty.

4.12 The Effect of Price Perception on Product Sustainability

Evidence obtained through the testing of the seventh hypothesis reveals that Product Sustainability is positively and significantly influenced by Price Perception. Such an outcome signifies that corporate customers' evaluations concerning price fairness are capable of directly affecting their propensity to maintain long-term procurement relationships with Pertamina Lubricants. Within B2B purchasing contexts, budget efficiency is generally monitored by organizations through systematic and recurring financial assessments. Transparent pricing arrangements, when accompanied by quantity-based discounts for bulk purchasers and adaptable payment terms, are able to enhance predictability in financial planning and cash-flow management. If expenditures related to lubricant procurement are regarded as being proportionate to the benefits obtained, particularly those concerning engine protection and operational performance, the supplier relationship may be perceived by customers as delivering favorable economic value. Willingness to renew annual procurement contracts may thereby be increased by such an assessment. This result corresponds with Huang et al. (2026) and Bağcı

(2025), who reported that intentions to repurchase continuously in industrial markets can be positively affected by perceived price fairness and economic value.

4.13 The Effect of Green Marketing on Product Sustainability

Evidence derived from the eighth hypothesis test substantiates that Green Marketing exerts a positive and statistically significant effect on Product Sustainability. Such an outcome suggests that, through Pertamina supply of lubricant products with reduced environmental impact and its accompanying educational initiatives on used-oil waste management, industrial purchasers may be motivated to sustain procurement ties over an extended period. Viewed through the Natural-Resource-Based View (NRBV) introduced by Hart (1995), capabilities at the organizational level that pertain to pollution prevention and green product innovation are capable of functioning as bases upon which sustainable competitive advantage may be attained. Moreover, industrial entities active in Central Java and DIY are confronted with environmental regulations that are becoming progressively stricter. Where Pertamina lower-emission lubricant products align with the environmental aims of industrial customers, a mutual dedication to environmental accountability may be generated, and this may, in turn, facilitate the persistence of sustainable commercial relationships. The present finding aligns with Machová, Ambrus, Zsigmond, and Bakó (2022) and (Correia, Sousa, Viseu, & Larguinho, 2023), whose studies established that integrating green marketing practices within B2B strategies can foster longer-term business relationships and enhance commitment to environmentally responsible products.

4.14 The Effect of Customer Satisfaction on Product Sustainability

Evidence derived from the ninth hypothesis test demonstrates that Product Sustainability is positively and significantly influenced by Customer Satisfaction. Among the direct effects estimated for the dependent variable, this coefficient is the greatest, implying that the continuity of lubricant procurement in the B2B industrial sector is particularly contingent upon customer satisfaction. Conceptually, satisfaction may be understood as the cognitive and affective evaluations generated when the marketing mix's aggregate performance either meets or exceeds what an organization expects. When customers accumulate consistently favorable experiences over time, they cultivate stronger confidence in the competence. Such confidence may furnish technical departments and plant management with enhanced operational certainty, diminishing the perceived necessity of assessing alternative suppliers and heightening the likelihood that long-term partnership agreements will be extended. This result lends considerable support to Waqas et al. (2025) and Asawawibul et al. (2023), whose work showed that satisfaction after purchase exerts a significant direct influence on customer retention and repeat purchasing in B2B contexts.

More specifically, the results extend the scope of Expectation Confirmation Theory (AlSokkar, Law, AlMajali, Al-Gasawneh, & Alshinwan, 2024) by illustrating its applicability to inter-organizational commercial relationships. According to the evidence, favorable confirmation of supplier performance, particularly concerning logistics reliability and conformity with technical product specifications, may reduce industrial customers' propensity to switch and strengthen their readiness to sustain longer-term contractual relationships. The perspectives of the Natural Resource-Based View (Makhloufi, Laghouag, Meirun, & Belaid, 2022) and Stakeholder Theory (Mahajan, Lim, Sareen, Kumar, & Panwar, 2023) are also broadened by the study, as Green Marketing is shown to operate as a strategic environmental capability that fosters both organizational customer satisfaction and adherence to environmental regulations.

4.15 The Mediating Role of Customer Satisfaction in the Research Model

Evidence derived from the indirect-effect assessment indicates that Customer Satisfaction serves as a statistically significant mediator in the associations linking Service Quality (coefficient 0.136; $p = 0.000$), Product Quality (coefficient 0.147; $p = 0.001$), Price Perception (coefficient 0.077; $p = 0.008$), and Green Marketing (coefficient 0.084; $p = 0.004$) with Product Sustainability. Across each mediation pathway examined, Variance Accounted For (VAF) values were observed to fall within the range of 20% to 80%, thereby suggesting that partial mediation is present in the relationships under investigation. Such results reveal that Service Quality, Product Quality, Price Perception, and Green Marketing are capable of influencing Product Sustainability via direct routes, whereas their

explanatory contribution may be further strengthened when these factors are first allowed to elevate customer satisfaction. Within the framework of Expectation Confirmation Theory (ECT), satisfaction may be interpreted as a cognitive mechanism through which favorable evaluations of operational performance are converted into sustained contractual commitment. Accordingly, technical superiority in a product or economically appealing pricing alone may prove insufficient for ensuring continued procurement if a satisfactory overall customer experience is not generated. This result aligns with (Mittal, Han, Lee, & Sridhar, 2021) and Cárdenas-Muga et al. (2025), by whom customer satisfaction is emphasized as an intervening mechanism that links marketing-related attributes to the continuity of business relationships. The partial mediation detected in the present study therefore implies that the customer retention strategy of PT Pertamina Lubricants in Sales Region IV ought to be executed through an integrated approach, in which the various dimensions of the marketing mix are simultaneously managed so that customer satisfaction may be enhanced as an important precondition for sustaining product usage.

5. Conclusions

5.1 Conclusion

The present inquiry examined how Service Quality, Product Quality, Price Perception, and Green Marketing relate to Product Sustainability, with Customer Satisfaction acting as a mediator within the Business-to-Business (B2B) sector of PT Pertamina Lubricants Sales Region IV. The empirical results confirm that Customer Satisfaction serves as a partial mediator across all four pathways. This finding indicates that while functional and economic factors directly support product sustainability, their long-term effectiveness is heavily dependent on their ability to first generate a satisfactory customer experience. By evidencing this mediating mechanism in the B2B lubricant sector of an emerging-market context, this investigation contributes additional depth to scholarship on strategic marketing management, industrial buyer behavior, and sustainability management.

5.2 Research Limitations

Although the present investigation followed recognized methodological protocols, several constraints remain and merit consideration when the findings are interpreted and when avenues for future scholarly inquiry are delineated. First, both the geographical and organizational parameters of the study are restricted to industrial B2B clientele of PT Pertamina Lubricants within Sales Region IV, an area encompassing Central Java and DIY. The particular spatial circumstances, the profile of the regional industrial sector, and the configuration of the distributor network in this territory may restrict the direct extrapolation of the obtained results to alternative marketing regions or to the B2C retail channel. Second, a cross-sectional approach was adopted, with quantitative data being collected during a single period. Consequently, potential shifts in B2B purchasing behavior, variations in customers' perceptions of price, and the more extended effects associated with the implementation of green marketing practices could not be observed within the study. Third, only a comparatively narrow set of explanatory variables was incorporated into the research framework.

5.3 Suggestions and Directions for Future Research

A number of trajectories may be pursued in subsequent investigations. First, the scope of inquiry and geographical coverage could be widened through the inclusion of additional PT Pertamina Lubricants marketing regions throughout Indonesia, together with comparisons drawn between industrial B2B customers and B2C retail consumers. Second, the adoption of a longitudinal research design is advised, thereby enabling investigators to observe shifts in B2B procurement behavior and to evaluate the enduring consequences of environmental policies and green marketing initiatives. Third, the research model may be extended in later studies by incorporating further exogenous variables and moderating factors, including Brand Image, Digital Supply Chain Capability, Customer Trust, and Switching Cost. Through the incorporation of these variables, a more comprehensive understanding could be attained regarding the determinants that influence product sustainability and the cultivation of long-term relationships between industrial customers and lubricant suppliers.

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Author Contributions
Contributions to the conceptualization of the study, formulation of the theoretical framework, development of the research methodology, data collection, formal data analysis by means of PLS-SEM, and preparation of the initial manuscript were made by DK, LFN, and SS. Supervision throughout the research process, verification of the research findings, contribution of critical perspectives concerning the methodology and interpretation of the results, manuscript review and editing, and approval of the final version submitted for publication were undertaken by IMS.

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