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Integration of Environmental, Social, and Governance (ESG) Factors into Target Costing in Lean Production Systems: A Systematic Literature Review

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Abstract

This systematic literature review critically challenges the reductionist paradigm of traditional Lean Production, arguing that its narrow focus on physical waste elimination often termed "Green Lean" is inadequate for addressing complex, modern Environmental, Social, and Governance (ESG) mandates. To prevent the operational risks of greenwashing and false sustainability, manufacturing systems must undergo a holistic transformation that inherently integrates social accountability and governance transparency. By synthesizing 20 high-quality articles published between 2020 and 2026 using the PRISMA methodology, this study formulates an integrative framework that explicitly positions Target Costing as a crucial financial mediator within the Lean ecosystem. The research argues that the implementation of "Green Target Costing" effectively translates qualitative ESG compliance metrics into rigorous, quantifiable cost parameters during the pre-production design phase. Consequently, this strict cost control mechanism forces entities to internalize social and environmental investments rather than treating them as mere externalities. Furthermore, the study strongly advocates for socio-technical integration, demonstrating that digital systems and Big Data act as essential facilitators to successfully align Lean's operational agility with ethical stakeholder expectations without compromising human well-being. Ultimately, this research definitively debunks the prevailing myth that sustainability initiatives inherently stifle economic efficiency. The findings assert that integrating ESG dimensions into target cost structures is not merely an ethical obligation, but an absolute strategic imperative to ensure long-term competitive resilience in the face of rigorous global market disruptions.

Keywords: *Environmental, Social, and Governance (ESG), Target Costing, Lean Production.*

1. Introduction

Amid increasingly complex global market dynamics, ESG integration has evolved from a mere administrative requirement into a key determinant of a company's strategic success and long-term sustainability [21]. Although the Lean Production system has traditionally been recognized for its effectiveness in eliminating waste to improve operational efficiency, there is a critical challenge regarding the extent to which this practice can inherently address the multidimensional demands of ESG without the support of adaptive cost control mechanisms [15]. The central argument in this discourse is that pure operational efficiency through Lean is no longer sufficient unless aligned with strategic management accounting tools such as Target Costing, which serves as a bridge to achieving sustainable competitive advantage through cost-effective product innovation [1]. Through the "Green Target Cost" approach, organizations are required not only to minimize production costs but also to critically identify and reduce environmental failure costs and energy consumption from the design stage [6]. However, current literature still reveals significant fragmentation in mapping how Lean practices such as Kaizen can systematically strengthen governance accountability and social impact within the cost-targeting framework, particularly given the mediation of digital systems that demand higher transparency [9]. Therefore, this systematic literature review is urgently needed to critically evaluate the synergy between the precision of Target Costing, the flexibility of Lean, and ESG mandates to bridge theoretical gaps in creating a manufacturing model that is not only economically agile but also ecologically and socially responsible [12].

A more fundamental research gap lies in the scarcity of literature reviews that explicitly position Target

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Costing as a strategic cost control tool for achieving ESG goals within a Lean Production system. Although the concept of “Green Target Cost” has been introduced to manage environmental failure costs [6], the mechanisms for integrating it with Social and Governance variables during the product design phase have yet to be systematically explored. Many studies, including [1], focus on the role of Target Costing and Kaizen in achieving competitive advantage, but have not addressed how these cost targets must be renegotiated to accommodate ESG compliance costs, which are often external and long-term in nature. Furthermore, the use of Lean Accounting tools to support ESG reporting is still viewed in a fragmented manner, as the literature has not yet provided an integrated framework explaining how cost constraints in Target Costing can align with social investments and high governance standards without sacrificing Lean efficiency [20;21]. Therefore, this literature review aims to fill this gap by conducting a critical evaluation of the global literature to identify how Target Costing acts as a mediator between production efficiency and multidimensional ESG responsibilities, thereby producing a more comprehensive theoretical model for practitioners and academics in sustainable cost management.

The fundamental objective of this study is to conduct a systematic deconstruction and synthesis of the global literature to formulate an integrative framework that links ESG variables with Target Costing mechanisms within the Lean Production ecosystem. The urgency of this research stems from the critical argument that without adaptive strategic cost control instruments, organizational efforts to adopt ESG principles are often trapped in a dichotomy between short-term operational efficiency and high long-term compliance costs [15;21]. This research is crucial as it seeks to address the challenge of strategic convergence; where the Lean system provides a foundation for operational agility through the elimination of waste, while Target Costing acts as a financial mediator ensuring sustainability attributes are internalized from the product design stage to prevent future cost escalation [6]. Furthermore, this study aims to critically evaluate how Lean Accounting tools can transform qualitative ESG metrics into measurable cost targets, thereby overcoming the implementation barriers frequently faced by manufacturing companies [11;20]. By mapping the fragmented trajectory of previous research, this article is essential to provide scientific justification that integrating ESG into cost structures is not merely an ethical obligation, but a strategic imperative for achieving robust competitive advantage in the face of regulatory pressures and global market demands increasingly focused on governance transparency and environmental responsibility [8;12]

Furthermore, the escalating global emphasis on corporate accountability necessitates a transition from a siloed “Green Lean” approach toward a more robust, multidimensional integration of ESG metrics within core manufacturing strategy. It is argued that failing to internalize social and governance variables during the initial product conception phase leads to reactive, high-cost compliance measures that ultimately undermine the very efficiency Lean systems strive to achieve [6]. By positioning Target Costing as the primary mechanism for this synthesis, organizations can proactively align their cost structures with evolving stakeholder values and stringent international standards. This strategic alignment does not merely fulfill ethical mandates but serves as a critical defense against the volatility of global markets, where transparency and social responsibility have become non-negotiable prerequisites for sustained investor confidence and operational resilience [14].

2. Research Methods

2.1 Research Method

This study adopts the Systematic Literature Review (SLR) methodological framework, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure strict adherence to data extraction protocols. The SLR approach is essential for minimizing researcher bias in literature selection, thereby producing a comprehensive and replicable synthesis. The use of PRISMA provides a precise structure for mapping the complexity of retail investor behavioral anomalies in the digital ecosystem, ensuring that only studies with high empirical validity are evaluated [21].

The literature identification phase was conducted through a comprehensive search of high-reputation academic databases covering behavioral finance and information systems. Search keywords were carefully formulated using Boolean operators that combined the concepts of cognitive biases, retail investors, and digital investment platforms. This search strategy was designed to capture the widest possible range of multidisciplinary literature, in order to capture the evolution of financial decision-making pathologies amid massive algorithmic technological disruption over the past five years [19].

During the eligibility phase, all articles that pass the initial screening are comprehensively evaluated for methodological depth and theoretical relevance. This quality assessment requires a critical examination of

the study design, sample size, and the significance of findings related to costly behavioral biases. Articles that fail to present a robust causal argument or have fatal flaws in internal validity are automatically excluded. This rigorous evaluation ensures that the remaining body of literature possesses absolute explanatory power to construct a new conceptual framework [5].

The final stage focuses on the systematic extraction of data and narrative synthesis from articles that meet all eligibility criteria. The transformation of this raw data into a synthesis matrix is designed to clearly identify gaps in contemporary research. Through this PRISMA methodological approach, the study transforms a collection of literature fragments into a solid, argumentative thesis on investor behavior in the digital age.

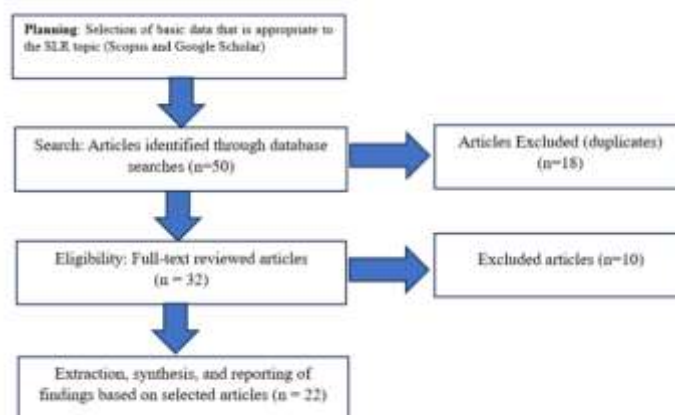


Figure 1. SLR Information Source Protocol

This study used the keyword combination “ESG,” “target costing,” and “lean production” to search the literature in reputable academic databases, including journals indexed in Scopus and Google Scholar. This search was conducted using the Publish or Perish software to identify high-quality articles published within the last five years (2020–2026), in line with the massive technological disruption in the capital markets. Adopting a systematic literature screening protocol, the initial process successfully identified 50 potential articles. Subsequently, a rigorous multi-stage selection process was applied based on inclusion and exclusion criteria. In the first stage, 18 articles were excluded because they lacked direct relevance to decision-making pathologies within the digital investment ecosystem or were not available in open-access format. In the subsequent feasibility assessment stage, 10 additional articles were eliminated for failing to meet research specifications, such as weak causal arguments or the absence of discussions regarding bias mitigation instruments. Through this series of screenings, a final set of 22 articles was identified as highly relevant, possessing robust empirical validity, and meeting the criteria for further analysis. This final collection of articles can then be comprehensively mapped based on journal identity, academic indexing status, and their specific contributions to the framework of this systematic literature review.

2.2 Classification of Journals by Identity, Index, and Number of Journal

Table 1. Journal Information and Number of Articles

| No. | Journal Identity | Index | Number of Articles | Percentage |
|-----|--|-------|--------------------|------------|
| 1 | World Development Sustainability | Q1 | 1 | 4,55% |
| 2 | International Journal of Lean Six Sigma | Q1 | 2 | 9,09% |
| 3 | Expert Systems With Applications | Q1 | 1 | 4,55% |
| 4 | Information & Management | Q1 | 1 | 4,55% |
| 5 | Journal of Manufacturing Technology Management | Q1 | 1 | 4,55% |
| 6 | E- Mentor | Q2 | 1 | 4,55% |
| 7 | Sustainability | Q1 | 2 | 9,09% |
| 8 | EURO Journal on Transportation and Logistics | Q1 | 1 | 4,55% |
| 9 | Journal of Industrial Engineering and Management | Q2 | 1 | 4,55% |
| 10 | Quality - Access to Success | Q4 | 1 | 4,55% |
| 11 | Journal of Cleaner Production | Q1 | 1 | 4,55% |
| 12 | British Journal of Management | Q1 | 1 | 4,55% |
| 13 | Indonesian Journal of Humanities and Social Sciences | Sinta | 1 | 4,55% |
| 14 | Ilomata International Journal of Management | Sinta | 1 | 4,55% |
| 15 | Jurnal Maneksi (Management Ekonomi Dan Akuntansi) | Sinta | 1 | 4,55% |

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|-------|---|----|----|-------|
| 16 | International Journal of Industrial Engineering and Operations Management | Q2 | 1 | 4,55% |
| 17 | Journal of Business and Socioeconomic-Development | Q2 | 1 | 4,55% |
| 18 | International Journal of Production Management and Engineering | Q2 | 1 | 4,55% |
| 19 | Cleaner and Responsible Consumption | Q1 | s1 | 4,55% |
| 20 | Business Process Management Journal | Q1 | 1 | 4,55% |
| Total | | | 22 | 100% |

2.3 Journal Index Identification

Table 2. Journal Index

| No | Index | Total | Percentage |
|----|-------|-------|------------|
| 1 | Q1 | 12 | 54,55% |
| 2 | Q2 | 6 | 27,27% |
| 3 | Q4 | 1 | 4,55% |
| 4 | SINTA | 3 | 13,64% |
| | Total | 22 | 100% |

2.4 Previous Research Results

Table 3. Research Results Based on Independent Variables: Author, Year, and Research Results

| Variable | Author dan Year | Result |
|-----------------|--|--------|
| ESG | (Kussaiyn & Potluri, 2026), (Lizarelli et al., 2025), (Szczerbak et al., 2024), (Belhadi et al., 2020) | + |
| | (Praditya et al., 2025) | - |
| Target Costing | (Kozhabayev et al., 2023), (Alkababji, 2023), (Hameed, 2024), (Stronczek, 2025) | + |
| | (Maqueira et al., 2021) | - |
| | (Shahin et al., 2026), (Hidayat et al., 2026) | NE |
| Lean Production | (Dey et al., 2020), (Argiyantari et al., 2020), (Nagadi, 2022), (Kosasih et al., 2023), (Lyama et al., 2023), (Pierli et al., 2026), (Erdal, 2024), (Silva et al., 2026) | + |
| | (Yang et al., 2026) | - |
| | (Simonsen et al., 2023) | NE |
| | | |

Positive (+); Negative (-); No Effect (NE)

3. Results and Discussions

3.1. Deconstructing Lean Production: From Reductionist Efficiency (Green Lean) to Holistic Social and Governance Integration (ESG)

Historically, Lean Production practices have often been trapped in a conceptual reductionism that prioritizes only the elimination of physical waste for the sake of resource efficiency and environmental conservation a narrow approach known as Green Lean [8]. However, grounded in Stakeholder Theory, a company's operational success and long-term legitimacy can no longer be measured solely by the maximization of internal utility for shareholders, but rather by its ability to create balanced value for all stakeholders [4;14]. This past reductionist paradigm has proven inadequate to fully address the complexities of Environmental, Social, and Governance (ESG) demands in the modern era. Pure operational efficiency without adaptive mechanisms supporting social and governance elements carries a high risk of creating an illusion of false sustainability [15]. Therefore, the deconstruction of the Lean system has become a strategic imperative to prevent the phenomenon of greenwashing, where manufacturing routines are required to transform from mere instruments of production cost savings into a holistic operational ecosystem that inherently adopts social accountability and governance transparency [19]. In this regard, the implementation of strong Corporate Governance mechanisms, such as board independence and audit committee effectiveness, has been empirically proven to play a crucial role in enhancing transparency quality through Integrated Reporting [7].

As a manifestation of this deconstruction, core technical tools in Lean Production such as Continuous Improvement (Kaizen) and Total Productive Maintenance (TPM) must be reconceptualized so that they can systematically accommodate the social and governance pillars. Comprehensively implemented Lean operational practices have been empirically proven to have a positive correlation that not only impacts ecological efficiency but is also strongly integrated with the achievement of other multidimensional sustainability elements [12]. Furthermore, the adaptation of these continuous improvement instruments has proven capable of strengthening governance accountability and optimizing social impact through the establishment of a participatory work culture centered on human well-being [9]. Through the lens of

Stakeholder Theory, this socio-cultural integration underscores that external pressures compel entities to radically internalize social and governance metrics into the very core of production routines. This holistic transformation ultimately ensures that the adoption of sustainability has become an absolute strategic imperative to mitigate operational reputational risks amid global market disruptions.

To truly transcend the reductionist limitations of traditional Lean paradigms, organizations must institutionalize a systemic shift where employee empowerment and equitable labor practices—core components of the 'Social' pillar within ESG are no longer treated as secondary byproducts of continuous improvement, but rather as its foundational prerequisites [11]. Furthermore, embedding proactive governance protocols directly into daily Lean operations ensures that decentralized decision-making processes, particularly those concerning resource optimization and waste elimination, remain transparent, accountable, and ethically rigorous [7]. This deep socio-technical integration ultimately dismantles the obsolete assumption that social and governance compliance investments inherently detract from operational leanness. Instead, it firmly establishes that rigorous human capital development and transparent governance architectures serve as indispensable catalysts for sustainable process innovation, thereby fortifying organizational resilience against the escalating pressures of stringent global regulatory landscapes [15].

3.2. Target Costing as a Financial Mediator: Transforming ESG Compliance Metrics into Design Cost Parameters

The integration of Environmental, Social, and Governance (ESG) requirements into the Lean Production ecosystem creates an absolute need for adaptive cost control tools, with Target Costing positioning itself as a strategic financial mediator. Grounded in Stakeholder Theory, manufacturing companies now face systemic pressure to no longer view environmental remediation costs and social compliance as externalities, but rather as integral parameters that must be anticipated from the pre-production stage. This critical paradigm shift drives a conceptual evolution toward Green Target Costing, a proactive mechanism designed to reduce environmental failure costs and minimize the direct carbon footprint from the product design phase [6]. Through this analytical tool, the maximum cost limit (allowable cost) is strictly renegotiated to absorb the burden of social investments and governance standards without compromising the essence of operational efficiency [21]. The transformation of qualitative ESG metrics into these quantified design cost constraints demonstrates that management accounting is not merely a tool for recording history, but rather the primary architect in designing sustainable future profitability [10].

Furthermore, positioning Target Costing as a key pillar of the Lean Accounting toolkit conceptually breaks down the classic dichotomy between achieving short-term operational efficiency and the high long-term costs of ESG compliance. Empirically, the synergy built between Target Costing and Continuous Improvement (Kaizen) on the production floor has proven capable of generating product innovations that are not only economically cost-effective but also ecologically superior, thereby creating a persistent competitive advantage [1]. This sustainability-oriented cost control inherently compels entities to adopt an integrated framework, where ESG reporting targets are fully supported by transparent product life-cycle cost calculations [20]. Communicating financial and non-financial ESG information through integrated reporting practices serves as more than just a form of compliance. This practice has been systematically proven to have a significant positive impact on increasing Firm Value in the eyes of investors and stakeholders [16]. Ultimately, the transformation of ESG mandates into design cost parameters reinforces the argument that sustainability compliance should not be positioned as a financial burden that erodes profit margins, but rather as a catalyst for radical efficiency that ensures the resilience of manufacturing entities amid stringent global market regulations [6;21]

Furthermore, the institutionalization of Target Costing as a financial mediator explicitly dismantles the traditional, retrospective approach to environmental cost management, shifting the organizational paradigm towards predictive and prescriptive cost forecasting [10]. By compelling cross-functional teams to reconcile strict allowable cost constraints with rigorous ESG compliance mandates during the nascent stages of product development, companies effectively preclude the escalation of post-production remediation expenses and future regulatory penalties [21]. This proactive internalization of socio-environmental externalities fundamentally redefines the scope of value engineering, positing that true operational excellence is structurally unattainable without embedding sustainability metrics directly into the core financial calculus of the manufacturing process (Hameed, 2024). Consequently, Green Target Costing transcends its function as a conventional accounting metric to become an indispensable strategic governance instrument, one that secures the firm's long-term competitive trajectory against the volatile landscape of stringent global environmental regulations and escalating stakeholder expectations [1].

3.3. Integrated Framework: Eliminating the Dichotomy of Operational Efficiency and Sustainability Through Socio-Technical Integration

Eliminating the false dichotomy between the operational efficiency of Lean Production and the financial burden of ESG compliance requires the adoption of an integrated framework grounded in socio-technical systems. In line with the postulates of Stakeholder Theory, the growing demands for transparency from various stakeholders compel companies to no longer view digitalization purely as a mechanical instrument, but rather as a facilitator that integrates human well-being with ecological governance. The convergence of digital technology and Lean practices has proven to yield optimal operational efficiency and innovation only when executed through a human-centered socio-technical systems perspective [22]. In this ecosystem, digital systems act as a fundamental mediator bridging continuous improvement (Kaizen) routines with the achievement of ESG performance in a transparent and accountable manner [11]. Furthermore, the creation of the “symbiotic factory” paradigm through comprehensive collaboration between Artificial Intelligence (AI) and workforce flexibility confirms that Lean’s radical efficiency can be fully aligned with the social pillars of sustainability without triggering worker alienation [17].

The expansion of this integrative framework also requires a broader focus beyond the internal boundaries of the production floor to include supply chain flexibility and Big Data architecture. The implementation of Lean Six Sigma and Green Manufacturing capabilities, precisely calibrated using Big Data analytics, has been empirically proven to significantly improve environmental performance without violating the cost constraints projected in Target Costing mechanisms [3]. The paradox of technology cost escalation is resolved when the flexibility of information systems within the supply chain ecosystem is optimized as a catalyst that strengthens the causal relationship between Lean production efficiency and improved business performance that adheres to ESG standards [13]. Therefore, contemporary governance architectures demonstrate that the configuration of Lean Manufacturing drivers is an absolute foundation for the successful adoption of advanced digital technologies [18]. This theoretical synthesis critically challenges the outdated assumption that environmental sustainability stifles efficiency, instead establishing socio-technical integration as a prerequisite for future manufacturing competitive advantage.

Ultimately, the efficacy of this socio-technical framework hinges on the strategic reconfiguration of organizational capabilities, preventing the mere superimposition of advanced digital technologies onto obsolete, rigidly mechanistic operational structures. By cultivating a “symbiotic factory” environment where human intuition and Artificial Intelligence (AI) operate in tandem, manufacturing entities can transcend the superficial automation of isolated tasks and instead embed sustainability metrics directly into real-time decision-making processes [17]. This profound synergy dictates that investments in digital infrastructure must be inextricably linked with human capital development, ensuring that the workforce is actively empowered to leverage data-driven insights for complex problem-solving rather than being marginalized by algorithmic dictates [22]. Consequently, operational efficiency and ESG compliance cease to be competing priorities; instead, they become mutually reinforcing outcomes of a cohesive, digitally-empowered Lean ecosystem that is structurally designed for advanced technological adoption and long-term adaptive resilience [18].

3.4. Strategic Synergies and Firm Value: Quantifying the Impact of ESG-Integrated Lean Systems on Long-term Organizational Resilience

The strategic convergence of ESG, Target Costing, and Lean Production ultimately serves as a powerful driver for superior firm value, transcending mere operational improvements to enhance market valuation and investor confidence [12]. Grounded in Stakeholder Theory, the transparent communication of ESG-integrated cost structures through integrated reporting has been empirically linked to increased firm value, as it effectively reduces information asymmetry and signals long-term stability to capital markets. Furthermore, by utilizing specialized Lean accounting tool packages to systematically track sustainability-oriented innovations, organizations can provide a robust financial justification for ESG investments that might otherwise be perceived as value-eroding. This synergy not only optimizes resource utilization but also fosters a sustainable competitive advantage by aligning the firm’s strategic objectives with the evolving ethical demands of global investors. In essence, the integration of ESG metrics into manufacturing cost structures transforms sustainability performance from a compliance burden into a measurable asset that significantly bolsters the organization’s overall economic and social legitimacy [20].

Extending this integrative framework beyond internal manufacturing operations reveals that supply chain flexibility acts as a critical multiplier for long-term firm value [13]. By enforcing Green Target Costing parameters across the entire procurement and distribution network, organizations can systematically mitigate external reputational risks associated with supplier non-compliance and ecological disruptions. The paradox of escalating operational costs is effectively neutralized when flexible information systems facilitate seamless coordination between Lean production practices and sustainable sourcing strategies, thereby enhancing overall business performance. Consequently, organizational resilience is no longer defined merely by internal cost efficiency, but by the capacity of the entire socio-technical ecosystem to adapt to dynamic ESG regulations without fracturing established allowable cost boundaries [10].

Furthermore, the rigorous implementation of these integrated accounting mechanisms fundamentally transforms the narrative presented to stakeholders, elevating sustainability from a peripheral concern to a core indicator of corporate governance quality [7]. The transparent communication of both financial and non-financial ESG performance through integrated reporting provides empirical evidence of an organization's proactive risk management capabilities. This comprehensive disclosure significantly diminishes the information asymmetry that traditionally plagues capital markets, fostering an environment where investors confidently reward sustainable operational models with higher market valuations and increased firm value [16]. Ultimately, synthesizing Lean efficiencies with rigorous ESG accountability solidifies the argument that sustainable manufacturing is an indispensable blueprint for maximizing shareholder wealth and securing enduring institutional legitimacy in an increasingly conscientious global economy.

4. Conclusion

This systematic literature review conclusively proves that traditional, reductionist-oriented Lean Production practices are no longer adequate to address the complexities of modern sustainability demands without a systemic deconstruction toward holistic Environmental, Social, and Governance (ESG) integration. As a foundational argument, pure operational efficiency has been shown to risk triggering the phenomenon of greenwashing if not aligned with adaptive strategic management accounting instruments. In this context, Target Costing plays a crucial role as a financial mediator bridging the gap between operational flexibility and sustainability compliance mandates. By transforming qualitative ESG metrics into maximum cost constraints in the pre-production phase, companies are forced to internalize environmental and social costs, no longer viewing them as mere externalities. This synthesis confirms that cost control through Green Target Costing effectively breaks down the classic dichotomy between short-term efficiency gains and long-term ESG compliance costs. Ultimately, this mechanism ensures that the resulting product innovations are not only economically superior but also ecologically and socially resilient. Furthermore, this study argues that the successful integration of ESG, Target Costing, and Lean Production requires the adoption of an integrated framework based on a socio-technical systems approach, not merely mechanical optimization. Digital systems and advanced analytical instruments, such as Big Data, are absolutely positioned as fundamental facilitators linking continuous improvement routines with governance transparency and worker well-being. This expanded integration confirms that comprehensive socio-technical collaboration throughout the supply chain can significantly boost environmental performance without violating established allowable cost parameters. Therefore, the adoption of ESG in manufacturing cost structures transforms from merely an ethical obligation to an absolute strategic imperative to mitigate operational risks amidst stringent global regulations. This conclusion critically debunks the outdated assumption that environmental sustainability stifles efficiency, instead establishing such synergy as an absolute prerequisite for future manufacturing competitive advantage.

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