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Business Environment Dynamics and Adaptive Strategies for Sustainability: A Case Study of a State-Owned Meat Processing Company in Jakarta

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Abstract

Objective: This study aims to analyze the dynamics of the business environment and formulate adaptive strategies focused on sustainability for a state-owned beef processing company. Specifically, this research examines the impact of sustainable operational management on environmental and financial performance. **Findings**: The analysis shows that high waste ratios and a lack of real-time technology are internal weaknesses that can be addressed. The implementation of adaptive strategies has significant potential to improve environmental performance (waste and carbon footprint reduction) and financial performance (cost efficiency). **Originality/Value**: This study offers a unique contribution by integrating business environment analysis, operational strategy, and performance impacts into a single, coherent framework, specifically within the context of the meat processing industry in a developing country. **Practical/Policy Implications**: The results of this study offer practical guidance for managers in designing efficient and sustainable operational strategies. For policymakers, these findings can serve as a basis for formulating regulations and incentives that encourage the industry to adopt more responsible and competitive business practices.

Keywords: Business Environment Dynamics; PESTEL; SWOT; Business Strategy; Meat Industry

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INTRODUCTION

The food industry, particularly the meat processing sector, faces complex global challenges as the population grows and demands for food security increase. While population growth drives a rise in demand for animal products, conventional operational practices often have a significant negative impact on the environment, such as high waste and carbon footprints (Gilligan et al., 2023; Tutar et al., 2025). This situation compels companies not only to focus on economic efficiency but also to integrate sustainability into their entire value chain.

The contemporary business world is confronted with an environment characterized by volatility, uncertainty, complexity, and ambiguity (VUCA) (Bennett & Lemoine, 2014). Within this dynamic constellation, an organization's ability to understand and respond to external changes is a key determinant for its survival and the achievement of competitive advantage. One of the most fundamental and widely recognized frameworks for mapping the macro-environment is PESTEL

analysis: Political, Economic, Social, Technological, Environmental, Legal (Yusop et al., 2018). This analysis provides a systematic structure for managers to identify external forces that can shape the industry landscape and affect organizational performance.

Nevertheless, the application of PESTEL in practice often remains at a descriptive level. Many studies and managerial applications tend to treat PESTEL as a static checklist, identifying factors in isolation without modelling their interdependencies or causal relationships (Kim-keung, 2014). This limitation becomes crucial because, in reality, macro-environmental factors are interconnected and their changes are often systemic (Yüksel, 2012). As a result, a significant gap emerges between the identification of environmental changes (analysis) and the formulation of effective strategic responses (action).

In response, a paradigm shift toward sustainable operational management has emerged. This approach no longer separates economic performance from environmental and social responsibility but instead unifies them to create long-term value. Various initiatives, such as the implementation of circular economy principles, are becoming increasingly relevant in efforts to curb waste generation, optimize resource use, and reduce carbon footprints (Bullo et al., n.d.; Butuc & Akkerman, 2025). In this context, the adoption of cutting-edge technologies like Intelligent Manufacturing Execution Systems (IMES) and smart packaging is crucial for enhancing process efficiency, ensuring product traceability, and effectively minimizing waste (Boudjenoun et al., 2025; Butuc & Akkerman, 2025).

Furthermore, the successful implementation of sustainable operational management heavily depends on market dynamics and consumer behaviour. Today, consumers are demonstrating a strong preference for products that are not only of high quality but are also produced ethically and in an environmentally friendly manner (Duong et al., 2025). Brand trust and loyalty are important assets that can be built through transparent and authentic sustainable practices. Therefore, a company's ability to measure and communicate environmental and financial performance in an integrated manner is a decisive factor for competitiveness in a global market that is increasingly conscious of sustainability (Bachtiar et al., 2024; Yuan et al., 2025).

Although the urgency and benefits of sustainable operational management have been recognized, the scientific literature still shows a gap. Many studies focus on isolated elements of sustainability, such as technology analysis or consumer behaviour, but few integrate all of them into one coherent model. In particular, research focusing on case studies in Indonesia's meat processing industry, a country with significant potential in the halal market, remains limited. Therefore, this study aims to fill that gap by conducting an in-depth analysis of how the implementation of sustainable operational management practices affects the environmental and financial performance of a BUMD in Jakarta, thereby providing relevant practical and theoretical contributions to both industry and academia.

This study is theoretically distinct from previous research in three important ways. First, it provides a contextual extension by examining a regional-owned meat processing company in a developing country setting, where sustainability challenges are shaped by regulatory constraints, halal compliance, waste intensity, and limited technological infrastructure—conditions that are rarely addressed in studies dominated by private firms in developed economies. Second, the study offers a theoretical refinement by moving beyond the traditional descriptive use of PESTEL analysis. Rather than treating PESTEL as a static environmental scanning tool, this research explicitly links macro-environmental dynamics to adaptive operational strategies and subsequently to measurable environmental and financial performance outcomes, thereby clarifying the causal pathway from environment to strategy to performance. Third, the contribution lies in its methodological integration, combining PESTEL and SWOT with operational improvement tools (Six Sigma), digital manufacturing systems (IMES), and environmental measurement techniques (Life Cycle Assessment). This integrated framework allows for a more holistic and actionable analysis of sustainability-oriented transformation in the meat processing industry. Collectively, these contributions extend existing literature by demonstrating how environmental analysis, strategic decision-making, and performance evaluation can be systematically connected within a single, empirically grounded case study.

RESEARCH GAPS

Lack of an Integrated Model Linking Operational Practices to Comprehensive Outcomes. The majority of the literature tends to examine sustainability practices in isolation without holistically integrating them with operational, environmental, and financial impacts within a single, cohesive framework. For instance, a case study on the application of Six Sigma in a meat processing plant demonstrated success in reducing waste and improving yields, but it remains limited to a single case and has not been widely implemented in the food industry in general (Gilligan et al., 2023). Similarly, research on the halal food traceability framework has not fully provided a comprehensive discussion of the interaction between authority, standardization, and the implementation of halal practices with direct organizational performance (Bachtiar et al., 2024). This indicates a gap for building a model that integrates various operational practices into a single, cohesive framework.

The Gap Between Theoretical Approaches and Practical Application in the Industry. Many studies that focus on advanced technologies like Intelligent Manufacturing Execution Systems (IMES) and artificial intelligence (AI) tend to be conceptual and theoretical (Boudjenoun et al., 2025; R. Kumar et al., 2025). The existing literature is still fragmented and lacks a detailed discussion on how these technologies are implemented to address the specific needs and unique operational characteristics of the food industry, such as issues related to perishable products and waste management (Butuc & Akkerman, 2025). This creates a significant gap for case studies that can bridge theory with real-world practice, providing empirical insights into the application of advanced technologies in actual manufacturing environments.

Limitations in Multinational and Contextual Research. While the urgency of reducing food waste is globally recognized, the existing literature still has limitations in comprehensively analyzing the economic and environmental burdens of waste, especially in cross-country comparisons (Tutar et al., 2025). The majority of research is concentrated in developed countries, leaving a significant gap in understanding how food waste and sustainability dynamics apply in the context of developing nations like Indonesia, where structural and cultural factors may be significantly different.

Scarcity of In-depth Causal Analysis. Existing research often shows correlations between certain variables, but in-depth testing of causal relationships is still lacking. For example, a study on the financial resilience of meat producers during the COVID-19 crisis found a correlation between liquidity and performance, but did not explicitly frame a strong causal analysis (Růčková et al., 2025). Similarly, a study on the adoption of traceability technology noted that such practices do not directly improve a company's sustainability performance, suggesting that other factors mediating this relationship need further analysis (Bachtiar et al., 2024). Therefore, there is a need for research that examines the cause-and-effect relationships among these variables in a detailed manner.

The main purpose of this study is to conduct an in-depth analysis of the impact of implementing sustainable operational management practices at a state-owned meat processing company, focusing on the technical efficiency of meat cutting, the optimization of raw material formulation, and the control of waste ratios. Specifically, this research seeks to test the causal relationship between these practices and environmental performance, measured by carbon footprint and waste volume, as well as financial performance, reviewed in terms of cost efficiency and increased revenue. Through this case study, we aim to bridge the gap between theory and practice, providing a measurable empirical understanding of how investments in sustainability initiatives can yield significant operational and financial benefits for a company.

This study makes a unique contribution to the existing literature. First, this research answers the call for more integrated case studies in a developing country context, specifically in Indonesia, which has previously been limited to studies in developed countries. Second, by adopting a case study approach, this research fills a gap in the literature by detailing the practical implementation of advanced technologies like IMES and structured methodologies like Six Sigma in addressing operational and sustainability challenges. Finally, this research offers a holistic framework that can serve as a guide for industry practitioners and policymakers. This will help them design operational strategies that are not

only efficient and profitable but also environmentally responsible, thereby strengthening their competitiveness in a global market that increasingly demands sustainability.

LITERATURE REVIEW

Definition and Basic Function of PESTEL

PESTEL analysis (Political, Economic, Social, Technological, Environmental, Legal) is a strategic framework used to audit or scan an organization's external macro-environment. This framework was originally conceptualized by (Tacit Intellect, 2012) as ETPS (Economic, Technical, Political, Social) and has since evolved into one of the most fundamental environmental analysis tools in strategic management studies. Its primary function is to identify the "key drivers of change" that are beyond the direct control of the organization but have the potential to significantly influence the company's assumptions, strategic direction, and performance.

In practice, PESTEL serves as an initial step in the broader strategic planning process. By categorizing external factors into six clear domains, an organization can systematically understand emerging opportunities and threats. The results of this analysis then become a crucial input for other strategic tools, such as SWOT analysis (Strengths, Weaknesses, Opportunities, Threats), scenario development, and corporate strategy formulation. The ultimate goal is to enhance the organization's strategic awareness, ensuring that decisions are more informed and aligned with the realities of the external environment.

Critique of the Static and Fragmented PESTEL Approach

Despite its high popularity, the conventional PESTEL approach often draws sharp criticism from academics and practitioners due to several inherent limitations. The main critique is PESTEL's tendency to produce an output that is both static and fragmented. The analysis is often presented in the form of a list or table that isolates each factor, thus failing to capture the true nature of the business environment as a complex system with dynamic interactions. (Kim-keung, 2014) explicitly states that this approach neglects the "inter-relatedness," or the causal connections among factors—for example, how a new political policy can trigger changes in economic conditions, which then influence social trends.

A second weakness is the lack of a quantitative approach, which makes the analysis highly susceptible to the assessor's subjectivity. Without a clear mechanism to weight or prioritize the most crucial factors, an organization risks suffering from "paralysis by analysis," where a long list of external factors fails to lead to clear and focused strategic action. Consequently, the analytical value of PESTEL is often devalued, rendering it nothing more than an academic exercise rather than a powerful decision-making tool.

Efforts to Develop PESTEL

In response to these criticisms, modern strategic management literature shows various significant efforts to develop and enrich PESTEL analysis. These efforts can be grouped into three main evolutionary paths:

a. Systemic Approach: This path focuses on modelling the interdependencies among factors. Ho (2014) proposed using a "systemic PESTEL diagram" based on influence diagrams to visualize the cause-and-effect relationships between variables, making the analysis more dynamic and holistic.
b. Quantitative Approach: This path aims to increase objectivity by applying mathematical models. (Yüksel, 2012) integrated PESTEL with the Analytic Hierarchy/Network Process (AHP/ANP) and DEMATEL to calculate the weights of importance and quantitatively map the relationships between factors. Other approaches use fuzzy logic, such as Fuzzy Cognitive Maps (FCM) and Fuzzy Decision Maps (FDM), to model uncertainty and the complexity of relationships in PESTEL analysis, which is very useful for scenario analysis (Kokkinos & Nathanail, 2023; Leyva-Vázquez et al., 2018).

c. Integrative Approach: This path positions PESTEL as an input component within a larger analytical framework. The most common integration is with SWOT, where PESTEL provides the basis for identifying Opportunities and Threats. At a more advanced level, Anton (2016) proposed an Integrated Strategy Framework (ISF) that unites PESTEL, SWOT, Porter's 5 Forces, and Porter's Diamond into a single, comprehensive strategic map.

This evolution represents a paradigm shift in viewing PESTEL from a descriptive identification tool to a starting point for dynamic, measurable, and integrated strategic analysis.

METODOLOGI

This study employs a **mixed-methods approach** that integrates qualitative and quantitative methods to provide a holistic and in-depth understanding (Lewin et al., 2025). This approach is deemed appropriate for bridging the gap between theory and practice, as well as for validating quantitative findings with contextual insights from qualitative data (Butuc & Akkerman, 2025). By using a **single-case study design**, this research focuses on a state-owned meat processing company in Jakarta to conduct an in-depth analysis of its sustainable operational practices within a real-world context. This design was chosen because it allows for a comprehensive investigation of a complex phenomenon within one specific environment (Boudjenoun et al., 2025).

Data will be collected from a primary source of secondary data, with historical quantitative data gathered from the company's internal reports, including production data from the last five years, waste ratios, energy consumption, and financial data. This data will serve as the basis for quantitatively measuring environmental and financial performance variables, consistent with the approach used in previous studies on the financial performance of meat producers (Růčková et al., 2025).

Data analysis will be performed in stages to test the research hypotheses. For the Quantitative Analysis, quantitative data on sustainable operational strategy practices and operational performance will be analyzed (Sia et al., 2025). Additionally, to specifically measure environmental impact, the **Life Cycle Assessment (LCA)** methodology will be applied. This approach will be used to calculate and evaluate the carbon footprint (kgCO2eq) and other environmental metrics of the meat processing process, by comparing conventional practices with the green initiatives that have been implemented (Butuc & Akkerman, 2025).

To strengthen the empirical rigor of this study, environmental and financial performance are assessed using before–after comparative analysis based on historical company data. Environmental performance is measured through waste volume reduction and carbon footprint indicators, while financial performance is evaluated using cost efficiency and operational savings.

Environmental impact assessment employs the Life Cycle Assessment (LCA) approach, following ISO 14040/14044 principles. The LCA focuses on key indicators relevant to meat processing operations, including carbon footprint ($kgCO_2eq$), energy consumption, and waste generation. Baseline measurements represent conventional operational practices prior to the implementation of sustainable operational strategies, while post-implementation data capture performance after the adoption of Six Sigma process control, IMES-based monitoring, and waste reduction initiatives.

Financial performance data are derived from internal operational and cost reports, comparing production costs, waste-related losses, and efficiency metrics before and after strategy implementation. This comparative approach enables an integrated evaluation of how sustainable operational management influences both environmental and financial outcomes.

RESULT AND DISCUSSION

PESTEL Analysis

This study presents a PESTEL (Political, Economic, Social, Technological, Environmental, and Legal) analysis to identify and evaluate the key factors shaping the dynamics of the meat processing industry in DKI Jakarta, while also considering the broader Indonesian context. This analysis serves as the foundation for formulating adaptive and sustainable strategies.

Tabel 1: PESTEL Analysis

Politic	- Local government programs reduce waste and are environmentally friendly. - Local government incentives, environmentally friendly industries.
Economic	- Consumer purchasing power. - Fluctuations in raw material prices. - Energy and logistics costs.
Social	- Halal assurance requirements. - Sustainability concerns. - Health and food safety.
Technology	- Intelligent Manufacturing Systems. - Supply Chain Management. - Waste Reduction.
Environmental	- Waste and Pollution. - Carbon Footprint.
Legal	- Food safety certification, such as NKV, HACCP. - Waste management, such as IPAL.

P (Political)

Political factors in Indonesia have a significant impact on the meat processing industry. The government's strong commitment to achieving the Sustainable Development Goals (SDGs), such as SDG 2 (Zero Hunger) and SDG 12 (Responsible Consumption and Production), has led to the formation of stricter policies on food security and sustainability (S. Kumar et al., n.d.). Nationally, government authorities like the Halal Product Assurance Agency (BPJPH) play a central role in setting and enforcing halal certification standards, which are crucial in a Muslim-majority market (Bachtiar et al., 2024). Furthermore, regional government policies in DKI Jakarta, including regulations on waste management and sanitation, directly affect company operations. Government incentives for adopting green technologies are also important political factors that can accelerate the industry's transition to more sustainable practices.

E (Economic)

Economic factors are a primary determinant of a company's competitiveness and survival. The financial performance of meat producers is highly dependent on macroeconomic conditions and internal capabilities. Studies show that meat producers with higher equity and liquidity ratios demonstrate greater financial resilience during economic crises like the COVID-19 pandemic (Růčková et al., 2025). This highlights the importance of strong financial management to cope with market uncertainty. The industry also faces growing competition from alternative products, such as plant-based and cultured meat, which are gaining market share. This trend compels conventional producers to innovate and adjust their market strategies to remain relevant amid shifting consumer preferences (Caccialanza et al., 2025).

S (Social)

Shifting consumer values and behaviours are one of the most dynamic social factors. Consumers in Indonesia, particularly in urban areas like Jakarta, are increasingly prioritizing issues of hygiene, health, and sustainability in their purchasing decisions (Duong et al., 2025). These factors often serve as primary motivators, even outweighing price considerations (Yuan et al., 2025). In addition, halal assurance is a fundamental factor that significantly influences the trust and choices of Muslim consumers (Bachtiar et al., 2024). Producers must also be mindful of the food anti-consumption phenomenon, driven by environmental and ethical concerns, which could pose a long-term threat to market growth (Jaziri et al., 2025).

T (Technological)

Technological innovation is a key driver of efficiency and safety in the industry. The implementation of smart manufacturing technologies, such as Intelligent Manufacturing Execution Systems (IMES) integrated with AI and the Internet of Things (IoT), enables companies to monitor production processes in real-time, minimize variation, and proactively reduce waste, as evidenced by a Six Sigma case study (Boudjenoun et al., 2025). In the supply chain, technologies like blockchain offer solutions to enhance traceability and transparency, which are crucial for meeting consumer demands for clear product origins. However, the adoption of these technologies faces challenges, including high initial costs, data privacy concerns, and a lack of standardized regulatory frameworks (S. Kumar, 2025).

E (Environmental)

Environmental impact is one of the most critical factors driving change in the industry. Global food waste is considered an "anti-sustainability" trend that causes massive economic and environmental losses, with household waste being a significant contributor (Tutar et al., 2025). In the meat processing industry, measuring this environmental impact is essential. The ***Life Cycle Assessment*** **(LCA)** methodology is a powerful tool for quantifying the carbon footprint (kgCO2eq) and other environmental metrics of the entire operational process, from raw materials to waste management (Kazemian et al., 2025). Implementing circular economy strategies, such as energy recovery from waste, can significantly reduce a company's ecological footprint.

L (Legal)

A robust legal framework forms the foundation for ethical and sustainable operations. In Indonesia, regulations regarding Halal Product Assurance (JPH) are a crucial legal factor that mandates compliance for all meat producers (Bachtiar et al., 2024). This compliance covers the entire value chain, from sourcing raw materials to production processes. Additionally, companies must adhere to food safety and quality standards set by the Food and Drug Supervisory Agency (BPOM) and government regulations on industrial waste management. Compliance with these regulations not only prevents legal sanctions but also strengthens a company's legitimacy and public trust.

SWOT Analysis

Tabel 2 : SWOT Analysis

Strength	**Weaknesses**
Manpower with decades of flying hours	The information system is not stable
Strategic location of the supply chain	Warehouse and production facilities are outdated
The historical data analysis parameters have been created	Actualization of manpower in industrial development
Product Dev Capabilities	Logistic Hub's RKAP CAPEX is not yet ideal
Warehouse and Production Integration is up and running	Products with special treatment and highly regulated
Flexibility in responding to changes in production plans	Market needs have not been met by MD and sales
Fleet can cover distribution needs	Raw materials do not meet market demand
Opportunities	**Threats**
Potential to achieve NKV-1, ISO 22000 standardization	Facilities are closed if they are unable to comply with the minimum facility standards according to NKV-1, ISO 22000 regulations (if regulations require full adoption)

Opportunities	Threats
Improving the quality of manpower in collaboration with partners	Production results with raw materials that do not meet market expectations
Sl integration with external stakeholders (vendor, customer, external warehouse)	Production and warehouse capacity are unable to keep up with the development of the Quantity needed
Continuous Product Dev supported by its implementation	Trust stakeholder
Become a Regional Food Reserve (protein), which is real in nature	Pest flies, mice
Supply chain integration and collaboration with third parties (has more advanced facilities)	The drainage of water in the production and warehouse areas is not working
Development of industrial-scale frozen meat cutting services	Competitors have modern facilities with a 20-year lag

The analysis of the internal and external environment of a state-owned meat processing company reveals a complex dynamic that influences its sustainability strategy. The company's internal environment presents a clear set of Strengths grounded in its core operations. First, its focus on and compliance with halal and product safety standards is a fundamental asset, particularly given the central role of regulatory authorities like the Halal Product Assurance Agency (BPJPH) in enforcing standards throughout the supply chain (Bachtiar et al., 2024). The availability of historical production data over the past five years is another crucial strength, providing a solid foundation for structured analysis, such as the Six Sigma methodology, which has proven effective in reducing process variation, improving yields, and minimizing waste (Gilligan et al., 2023). As a state-owned enterprise (BUMD), the company often benefits from favorable government policies, which can further strengthen its operational position.

However, the company also faces significant internal Weaknesses. A notable issue is the high waste ratio and process variations that lead to operational inefficiencies and financial losses (Gilligan et al., 2023). The lack of real-time monitoring technology is another weakness, hindering the company's ability to identify and resolve production issues quickly. Furthermore, there is a gap in a holistic managerial model that integrates operational, environmental, and financial aspects, which is a prerequisite for making truly sustainable strategic decisions (Boudjenoun et al., 2025).

From an external perspective, the company is presented with promising market opportunities. There is a strong and growing consumer demand for products that are not only halal and hygienic but also transparent and sustainably produced (Duong et al., 2025; Yuan et al., 2025). These opportunities can be leveraged through the adoption of advanced technologies like Intelligent Manufacturing Execution Systems (IMES) and AI to enhance efficiency and gain a competitive edge (Boudjenoun et al., 2025; S. Kumar, 2025). Engaging in circular economy initiatives by converting waste into new products or energy can also open up new revenue streams and bolster the company's image as a responsible corporate citizen.

Despite these opportunities, there are also external Threats that could disrupt the business. A primary threat is the shift in consumer behaviour driven by social and environmental concerns. The phenomenon of food anti-consumption and the rising popularity of plant-based alternatives could reduce the market share for conventional meat products (Caccialanza et al., 2025). The regulatory environment is also becoming more stringent, demanding higher compliance with environmental standards and product traceability. Macroeconomic factors, such as pandemics, pose a significant financial threat, as experienced by many meat producers during the COVID-19 crisis (Růčková et al., 2025).

Sustainable Operational Management Improvement Strategy

This comprehensive strategic plan is designed to produce tangible results across all business aspects, beginning with Enhanced Productivity. Through the implementation of structured methodologies like Six Sigma, the company can systematically reduce process variation and waste, which are key internal weaknesses. This will directly improve operational efficiency and yield per unit, a finding supported by a case study in the meat processing industry that demonstrated significant waste reduction and increased revenue (Gilligan et al., 2023). Furthermore, the adoption of smart technologies like Intelligent Manufacturing Execution Systems (IMES) enables real-time monitoring and predictive analytics, helping the company address production uncertainties and optimize efficiency sustainably (Boudjenoun et al., 2025). This boost in productivity is a strategic response to competitive economic and technological factors.

The strategy also aims for a significant Improvement in Product Quality. Strict process control and the reduction of variation achieved through Six Sigma will automatically minimize product defects, which not only reduces financial losses but also enhances overall product quality. Consistent and guaranteed quality is essential to meet consumer demands for safe and hygienic products, a crucial social factor (Godfrey et al., 2025). This quality enhancement is bolstered by the application of AI in the supply chain, which can improve product traceability and detect potential contamination, thereby building greater customer trust (S. Kumar, 2025).

Finally, this strategy is centered on fostering continuous Innovation, which is vital for long-term competitiveness. With more efficient processes and better quality control, company resources can be reallocated to research and development of new products, as well as exploration of more sustainable processes. The use of smart technologies like IMES also facilitates innovation by providing operational data that can be analyzed to identify new opportunities for improvement and product development (Boudjenoun et al., 2025). This innovation enables the company to proactively respond to external threats from alternative products and shifting consumer behaviours, positioning it for greater resilience and success.

Roadmap Strategy

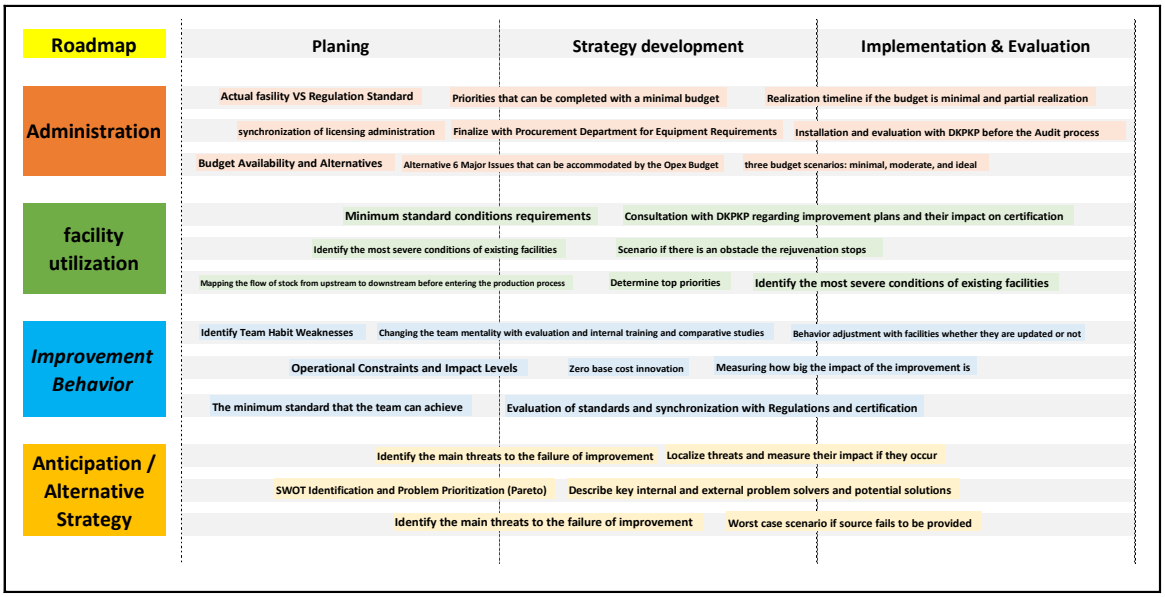

Figure 1: Roadmap Strategy

Results of Operational Management Improvements

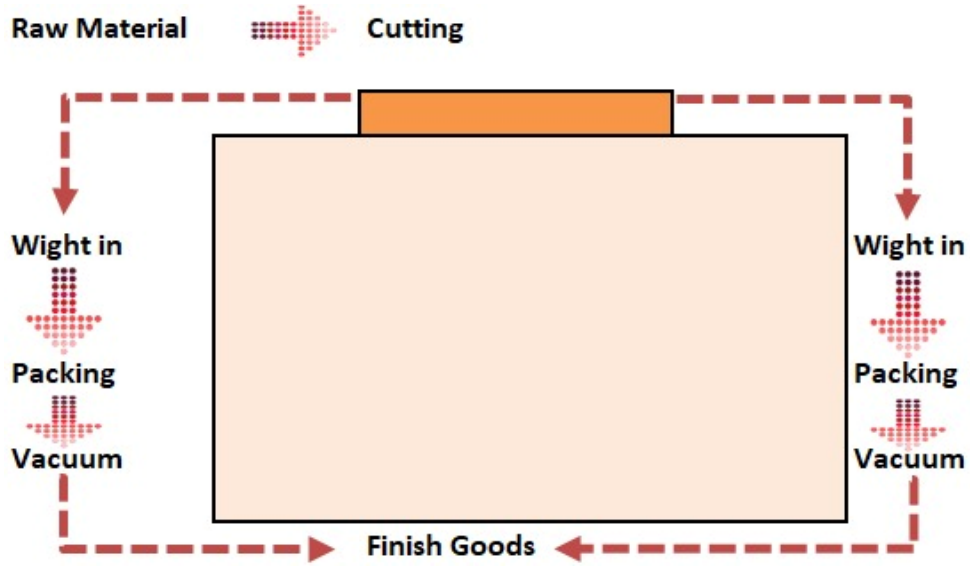

Figure 2: Operational Management Improvements

Mapping the capabilities needed to maximize production

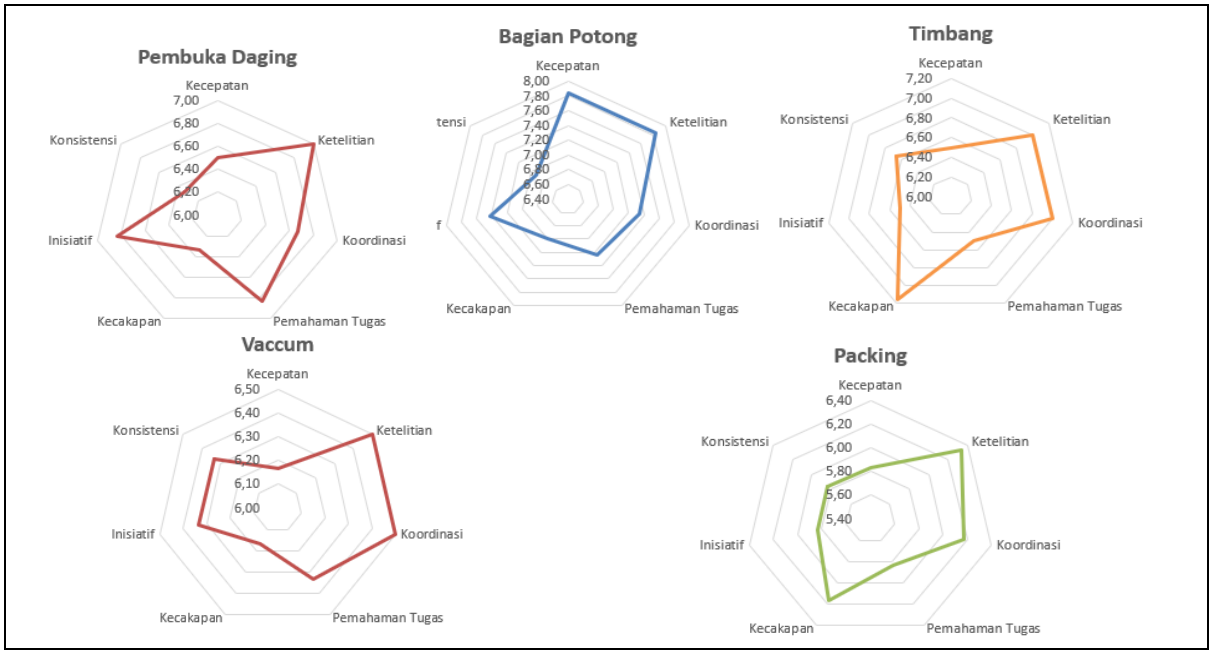

Figure 3: The capabilities needed to maximize production

The implementation of improvement strategies, initiated with process and variation control, directly aims to enhance environmental performance. Through the implementation of structured methodologies like Six Sigma, a company can systematically reduce process variation, which is a key internal weakness. This will concretely lead to better control of the waste ratio and more efficient use of natural resources. This result is strengthened by the strategy of applying smart technology, such as the Life Cycle Assessment (LCA) methodology, which enables the company to accurately measure the environmental impact of its operations, including carbon footprint (kgCO2eq), so that it can formulate more effective mitigation recommendations. Thus, this strategy not only responds to environmental pressures as an external factor but also transforms internal weaknesses into operational strengths.

The same strategy also directly influences the enhancement of financial performance. By successfully controlling variation and reducing waste through the Six Sigma methodology, the company can minimize the waste of raw materials and processes, which directly correlates with cost efficiency. A case study in the meat processing industry shows that significant waste reduction can lead to annual cost savings and increased profitability. Furthermore, the application of smart technologies like Intelligent Manufacturing Execution Systems (IMES) can provide real-time visibility across the entire value chain, enabling management to make faster and more precise decisions, thereby increasing operational efficiency and, ultimately, company profitability.

Ultimately, all these improvements will lead to the enhancement of the company's sustainable competitiveness. Amid threats from shifting consumer behavior and competition from alternative products, the company must strengthen its brand image and customer loyalty. The stakeholder engagement strategy, which focuses on approaches like Caring Food Marketing, places consumer well-being and ethics at the core of business relationships. This approach builds brand trust by demonstrating transparency and social responsibility. Additionally, by implementing smart technologies and controlled processes, the company can ensure product traceability and safety, which are key demands of today's consumers. As a result, the company not only responds to market trends but also builds a solid, long-term competitive advantage.

Results of Enhanced Production Performance

Table 3: Results of Enhanced Production Performance

Performance Testing	Quantity (Ton)						%					Production Average / Line	Increase
	Raw Material	Finish Goods	sawdust (waste)	Fat (waste)	Total	Liquid Shringkage	Raw Material	sawdust (waste)	Fat (waste)	Total	Liquid Shringkage		
After	287,76	269,5	1,93	14,40	285,83	16,33	93,65%	0,67%	5,00%	99,33%	5,67%		
	894,11	832,1	15,30	44,80	892,20	60,10	93,06%	1,71%	5,01%	99,79%	6,72%		
	734,94	695,5	2,70	35,00	733,15	37,70	94,63%	0,37%	4,76%	99,76%	5,13%		
	573,08	552,1	1,50	26,60	580,20	28,10	96,34%	0,26%	4,64%	101,24%	4,90%	570,55	
	490,53	480,5	5,70	2,50	488,67	8,20	97,95%	1,16%	0,51%	99,62%	1,67%		
	447,63	418,3	18,70	6,20	443,24	24,90	93,46%	4,18%	1,39%	99,02%	5,56%		
Total	**3.428,05**	**3.247,96**	**45,83**	**129,50**	**3.423,29**	**175,33**	**94,85%**	**1,39%**	**3,55%**	**99,79%**	**4,94%**		
Before	541,31	517,65	12,8	2,4	532,85	15,2	95,63%	2,36%	0,44%	98,44%	2,81%		**177%**
	93,85	85,5	0,3	7,6	93,4	7,9	91,10%	0,32%	8,10%	99,52%	8,42%		
	329,52	308,2	5,5	13,2	326,9	18,7	93,53%	1,67%	4,01%	99,20%	5,67%		
	42,85	41,2	0,1	0	41,3	0,1	96,15%	0,23%	0,00%	96,38%	0,23%	205,98	
	57,48	52,5	0,1	2,48	55,08	2,58	91,34%	0,17%	4,31%	95,82%	4,49%		
	189,16	186,26	0,1	0	186,36	0,1	98,47%	0,05%	0,00%	98,52%	0,05%		
Total	**1.254,17**	**1.191,31**	**18,90**	**25,68**	**1.235,89**	**44,58**	**94,37%**	**0,80%**	**2,81%**	**97,98%**	**3,61%**		

The comprehensive operational management improvement strategy is designed to yield tangible results across all business aspects, beginning with Enhanced Productivity. Through the implementation of structured methodologies like Six Sigma, the company can systematically reduce process variation and waste, which are key internal weaknesses. This directly improves operational efficiency and yield per unit, a finding supported by a case study in the meat processing industry that demonstrated significant waste reduction and increased revenue (Gilligan et al., 2023). Furthermore, the adoption of smart technologies such as Intelligent Manufacturing Execution Systems (IMES) enables real-time monitoring and predictive analytics, which helps the company address production uncertainties and optimize efficiency sustainably (Boudjenoun et al., 2025). Thus, this boost in productivity is a strategic response to competitive economic and technological factors.

This strategy also aims for a significant Improvement in Product Quality. Strict process control and the reduction of variation achieved through Six Sigma automatically minimize product defects (rework and scrap), which not only reduces financial losses but also enhances overall product quality. Consistent and guaranteed quality is essential to meet consumer demands for safe and hygienic products, a crucial social factor. This quality enhancement is bolstered by the application of AI in the supply chain, which can improve product traceability and detect potential contamination, thereby building greater customer trust (S. Kumar, 2025).

Finally, the strategy is centered on fostering continuous Innovation, which is vital for long-term competitiveness. With more efficient processes and better quality control, company resources can be reallocated to research and development of new products, as well as the exploration of more sustainable processes. The use of smart technologies like IMES also facilitates innovation by providing operational data that can be analyzed to identify new opportunities for improvement and product development

(Boudjenoun et al., 2025). This innovation enables the company to proactively respond to external threats from alternative products and shifting consumer behaviors, positioning it for greater resilience and success.

Raw Material Formula Strategy

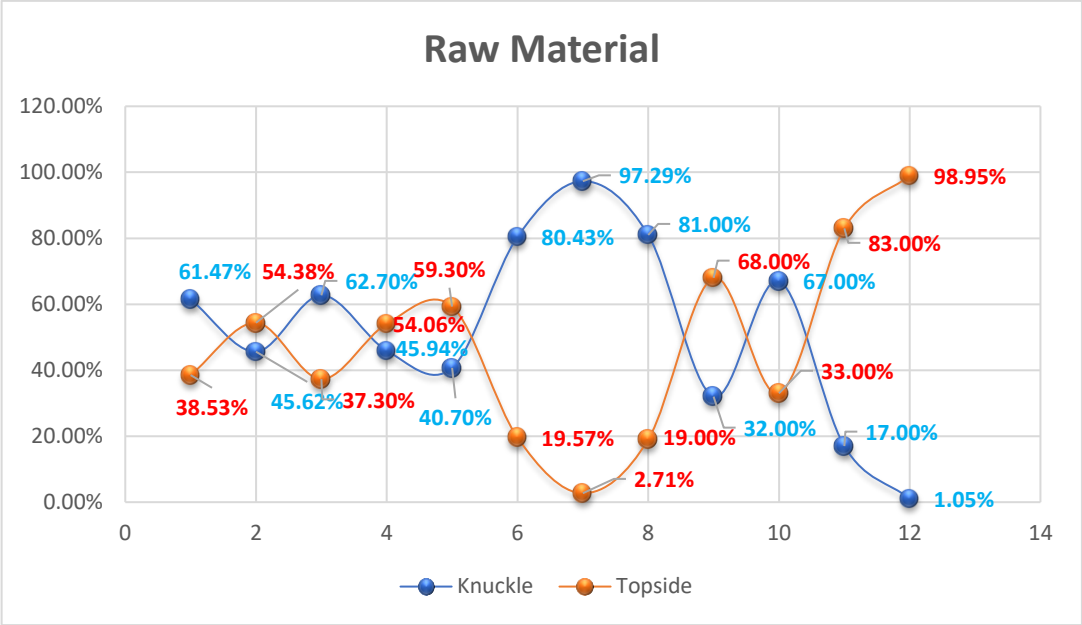

Figure 4: Raw Material Formula Strategy

An adaptive raw material formulation strategy is a critical pillar for enhancing a company's competitiveness. This strategy begins with the Use of Local and Sustainable Raw Materials. This directly responds to the Environmental and Legal factors identified in the PESTEL analysis. By optimizing the use of raw materials from local suppliers, the company not only supports the regional economy but also significantly reduces the carbon footprint from supply chain transportation (Gilligan, Moran, & McDermott, 2023). This approach is in line with modern consumer demands for products that are not only high-quality but also ethically and sustainably produced (Duong et al., 2025). Furthermore, this strategy strengthens the company's internal Strength of halal compliance, as a shorter, more traceable supply chain is easier to monitor to ensure product integrity (Bachtiar et al., 2024).

The next step is to formulate products based on Nutritional Content and Market Needs. This strategy capitalizes on the Opportunities identified in the SWOT analysis related to shifting consumer preferences. Today's consumers are highly health-conscious and actively seek products with specific nutritional attributes, such as high protein, in response to growing concerns about the health impacts of conventional meat (Yuan et al., 2025). By developing product formulations that highlight these attributes, the company can proactively address the Threat from alternative products, such as plant-based meats, and strengthen its position in the market. This approach also builds brand trust by demonstrating that the company is focused not just on profit but also on consumer well-being.

Finally, this strategy focuses on Process Control and Quality in Formulation to ensure product consistency. This directly addresses the company's internal Weaknesses related to process variation and the lack of real-time monitoring systems. By implementing a structured methodology like Six Sigma, the company can minimize variations in raw material formulation, thereby guaranteeing the quality and consistency of the final product (Gilligan et al., 2023). This is supported by the adoption of smart technologies, such as IMES, which enable real-time process monitoring and control, ensuring each batch meets the established standards (Boudjenoun et al., 2025). Strict quality control is essential for meeting rigorous consumer expectations and regulations, while simultaneously securing the company's legitimacy and reputation.

Impact of Waste Reduction

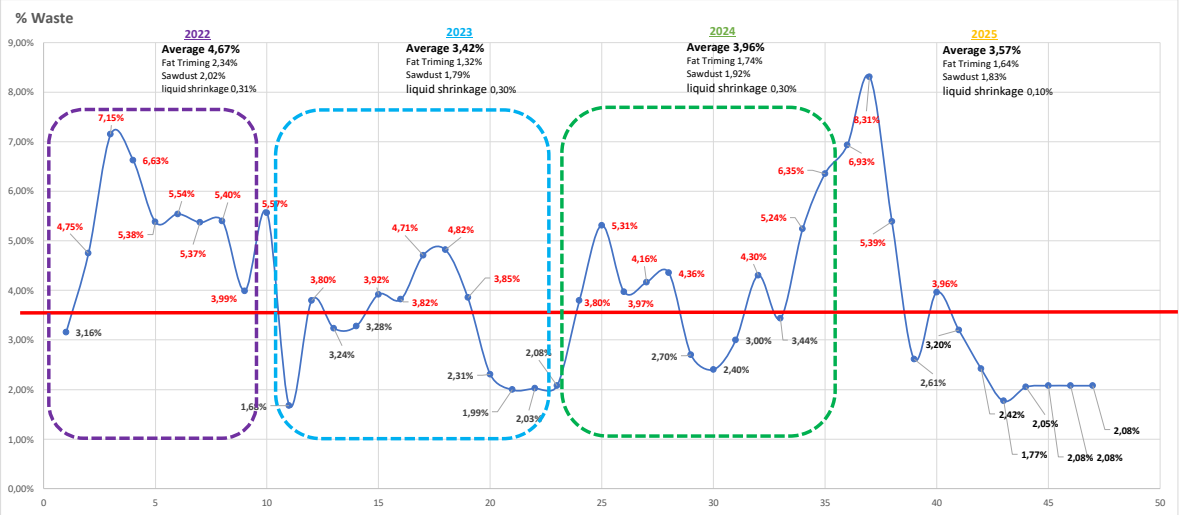

Figure 5: Impact of Waste Reduction

The impact of waste reduction is a tangible outcome resulting from the implementation of sustainable operational management strategies, which directly address the challenges identified in the PESTEL and SWOT analyses. This outcome first materializes as a significant Reduction in Environmental Burden. By adopting a structured methodology like Six Sigma, the company can control process variation and minimize the waste ratio, a crucial internal weaknes (Gilligan et al., 2023) s. This reduction is not merely in volume but also correlates directly with a decrease in carbon footprint (kgCO2eq) and pollution. This benefit can be accurately measured using the Life Cycle Assessment (LCA) approach, a method used to evaluate the environmental impact of a product's entire life cycle, from raw materials to waste management (Kazemian et al., 2025). As such, this strategy responds to environmental pressures and transforms an internal weakness into an operational strength.

Waste reduction also directly leads to Increased Resource Efficiency, which is vital for the company's performance. Strategies focused on process and variation control, combined with the Application of Smart Technology like Intelligent Manufacturing Execution Systems (IMES), enable the optimization of raw material usage. IMES provides real-time visibility that helps the company avoid waste and manage inventory more effectively (Boudjenoun et al., 2025). This efficiency gain also extends to energy consumption, a key factor in reducing operational costs. Therefore, these improvements address internal weaknesses and strategically enhance the company's economic competitiveness.

Ultimately, these impacts culminate in the Strengthening of the Company's Image as a responsible and sustainability-oriented entity. Amid social factors where consumers are increasingly concerned with product origins and environmental impact, measurable waste reduction provides concrete evidence of the company's commitment. This strengthened image can be communicated effectively through a Stakeholder Engagement Strategy, such as ethical and transparent marketing. The *Caring Food Marketing* concept posits that focusing on consumer well-being and social responsibility is central to building brand relationships (Tonner et al., 2025). This positive image becomes a powerful competitive advantage, enabling the company to mitigate the threats posed by shifting consumer behavior and to enhance customer loyalty in a demanding market.

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