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Strategic Performance Measurement Design using Balanced Scorecard and AHP: A Case Study in the Indonesian Tea Processing Industry

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Abstract - *This paper presents a strategic performance measurement framework for a tea manufacturing company in Indonesia. The model integrates the Balanced Scorecard (BSC) and Analytical Hierarchy Process (AHP) to support structured evaluation and prioritization of key indicators. The framework emphasizes alignment between strategic objectives and measurable outcomes across financial, customer, internal business process, and learning and growth dimensions. Findings indicate that customer-focused metrics are viewed as highly strategic, emphasizing the need for greater responsiveness to market demands. By incorporating stakeholder judgment through AHP, the model provides a basis for assigning strategic weights to indicators, ensuring that managerial attention is directed toward areas of greatest impact. The systems provide a structured mechanism for performance evaluation, strategic coherence, and adaptive improvement, particularly within the agribusiness processing sector. The study underscores the practical value of integrating BSC and AHP to strengthen managerial decision-making and organizational effectiveness, particularly in emerging market environments.*

Keywords - *performance measurement, balanced scorecard, analytical hierarchy process, key performance indicators, agribusiness industry*

I. INTRODUCTION

The agribusiness sector in emerging markets, particularly in Indonesia, plays a significant role in contributing to national economic development through employment creation, export generation, and rural empowerment. Among its key sub-sectors, tea processing holds a strategic position due to its historical legacy and market potential [1]. However, despite this importance, the Indonesian tea industry has faced a steady decline, with plantation areas shrinking by an average of 1.75% annually and national production decreasing by around 2% per year between 2015 and 2024 [2]. At the company level, the case company continue to rely heavily on conventional financial metrics to evaluate organizational performance, often neglecting broader strategic dimensions such as customer satisfaction, internal efficiency, and learning capability.

To address these limitations, organizations require a comprehensive performance measurement framework that captures both financial and nonfinancial dimensions. The Balanced Scorecard (BSC) provides an integrated model by incorporating four perspectives: financial, customer, internal business processes, and learning and growth. However, the selection and prioritization of performance indicators in BSC can be subjective without a systematic approach. The Analytical Hierarchy Process (AHP) offers a solution by enabling structured weighting of indicators based on expert judgment.

Building on these considerations, this study aims to develop a strategic performance measurement system by integrating Balanced Scorecard (BSC) and Analytical Hierarchy Process (AHP) for a tea processing company in Indonesia. The proposed model offers structured guidance for performance monitoring, strengthens strategic alignment, and supports continuous improvement, particularly within the agribusiness processing sector.

II. LITERATURE REVIEW

A. Performance Measurement

Performance is an indicator of how effectively an organization achieves its goals through activities aligned with its strategic direction [3]. It reflects the level of accomplishment in implementing programs, initiatives, or policies that contribute to the overall success of organizational objectives [4]. Several frameworks have been developed to measure performance comprehensively across both internal and external dimensions. Among the most widely

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adopted in industrial practice are the Balanced Scorecard (BSC), Performance Prism, and Integrated Performance Measurement System (IPMS), each offering a structured approach to integrate diverse performance indicators and provide a holistic view of organizational outcomes [5].

B. Balanced Scorecard (BSC)

The Balanced Scorecard (BSC) is a strategic performance evaluation approach introduced by Kaplan and Norton in 1992 to address the shortcomings of conventional performance measurement systems that predominantly emphasized financial results [6]. By incorporating customer, internal process, and learning and growth perspectives, BSC enables a more balanced evaluation of organizational performance. This framework allows companies to translate strategic vision into measurable goals and operational actions, supporting long-term strategic execution with greater clarity and focus [7].

C. SWOT Analysis and TOWS Matrix

The SWOT framework helps organizations assess internal strengths and weaknesses along with external opportunities and threats to support strategic planning [8], [9]. Strengths and opportunities offer advantages to be leveraged, while weaknesses and threats represent areas of risk. To transform these insights into strategy, the TOWS matrix links internal and external factors to generate four strategic alternatives: SO, ST, WO, and WT strategies. These combinations guide organizations in formulating proactive or defensive actions based on situational alignment [10], [11]. The combined use of SWOT and TOWS supports structured, evidence-based decision-making in strategy formulation.

D. Key Performance Indicators (KPI)

Key Performance Indicators are measurable tools used to evaluate organizational success in achieving strategic goals. They help translate qualitative processes into objective metrics that support performance monitoring and improvement. Effective KPIs should be specific, measurable, achievable, relevant, and time-bound to ensure clarity and strategic alignment [12].

E. Analytical Hierarchy Process (AHP)

The Analytical Hierarchy Process (AHP) is a multi-criteria decision-making method introduced by Thomas L. Saaty in the 1970s to address complex problems through a structured hierarchical model [13]. The method breaks down a decision problem into levels consisting of goals, criteria, sub-criteria, and alternatives. Each element is evaluated through pairwise comparisons using a 1-to-9 scale to determine relative importance, producing weighted priorities for each component. A consistency ratio is calculated to validate the logical coherence of judgments. AHP provides a systematic framework that integrates both qualitative and quantitative considerations to support informed decision-making [14].

III. METHODOLOGY

This study adopts a quantitative approach supported by qualitative inputs. The quantitative component is reflected in the Analytical Hierarchy Process (AHP), which generates numerical weights and performance scores, while the qualitative aspect is drawn from expert judgments and interviews used to formulate strategic objectives and KPIs within the Balanced Scorecard (BSC) framework. A structured, multi-stage methodology was employed to design the performance measurement system integrating BSC and AHP.

The case study was conducted at a tea manufacturing facility located in Pangalengan, West Java, Indonesia. The company was selected due to its reliance on traditional financial metrics and the absence of a comprehensive performance evaluation model. Data collection combined several sources, including field observations, internal company documents, and structured interviews with key personnel. Expert judgments were obtained from three company representatives directly involved in operations and strategic management. These experts also provided the pairwise comparisons required in the AHP analysis, ensuring that the resulting weights reflected the company's actual strategic priorities. The research process comprises seven sequential steps, as illustrated in Figure 1.

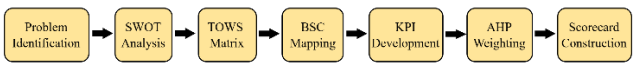

Figure 1. Stages of performance measurement system development

The research begins with problem identification through observations and interviews to assess limitations of the existing performance evaluation approach. The second step was the development of a SWOT analysis, where internal strengths and weaknesses were assessed alongside external opportunities and threats. These elements formed the foundation for strategic diagnosis. These factors are combined using a TOWS matrix to formulate strategic alternatives. In the next stage, the formulated strategies were translated into strategic objectives and

mapped across the four BSC perspectives. Each strategic objective was operationalized into measurable indicators during the KPI development stage. Indicators were formulated to reflect key success factors across all BSC perspectives.

Subsequently, the AHP weighting phase involved structuring the KPIs into a hierarchical model and conducting pairwise comparisons with expert input. Priority weights were calculated, and consistency ratios were evaluated to ensure decision reliability [15]. Finally, the scorecard construction stage integrated the weighted KPIs into a comprehensive performance measurement framework. This final output provides structured guidance for performance monitoring, strengthens strategic alignment, and supports continuous improvement within the case company.

IV. FINDINGS AND DISCUSSION

The resulting system comprises four perspectives, eight strategic alternatives, nine strategic objectives, and thirteen key performance indicators. These KPIs were derived from strategic objectives aligned with the company's vision and mission. The strategic alternatives were formulated through SWOT analysis and subsequently mapped using the TOWS matrix, which combined internal and external factors into actionable strategic directions. This process allowed the company to identify opportunities for growth while addressing internal weaknesses, thereby strengthening competitiveness in the tea processing sector. These alternatives are summarized in Table I.

Table I. Summary of Formulated Strategy

BSC Perspective	Code	Strategy
Financial	SF.1	Develop specialty tea products focused on quality and customer satisfaction at the lowest possible cost
	SF.2	Evaluate operational costs to reduce cost per kilogram
Customer	SC.1	Support domestic and international market expansion through timely production realization
	SC.2	Enhance product differentiation to maintain customer loyalty
Internal Business Process	SIBP.1	Improve production performance to meet increasing demand
	SIBP.2	Revitalize old production machines and raw material distribution systems to reduce costs and minimize quality variability
	SIBP.3	Optimize the production process within raw material supply and budget constraints
Learning and Growth	SLG.1	Improve employee retention by implementing a more competitive incentive system and regular technical training

The next step involves the formulation of strategic objectives, which serve as directional goals derived from each proposed strategic alternative and act as a bridge to measurable performance indicators. A summary of these strategic objectives is presented in Table II.

Table II. Summary of Strategic Objectives

BSC Perspective	Code	Strategic Objective
Financial	SSF.1.1	Control unit production costs to maintain efficiency and price competitiveness
	SSF.2.1	Reduce tea production costs
Customer	SSC.1.1	Improve production response accuracy to market demand projections
	SSC.2.1	Increase customer satisfaction
Internal Business Process	SSIBP.1.1	Maintain consistency of product quality standards
	SSIBP.2.1	Ensure smooth production process
	SSIBP.3.1	Improve efficiency in converting raw materials into finished goods
Learning and Growth	SSLG.1.1	Develop employee skills and knowledge
	SSLG.1.2	Improve employee well-being

The next step is to construct a strategy map based on literature review and internal company documents. This map visually illustrates the interrelationship among perspectives, as shown in Figure 2.

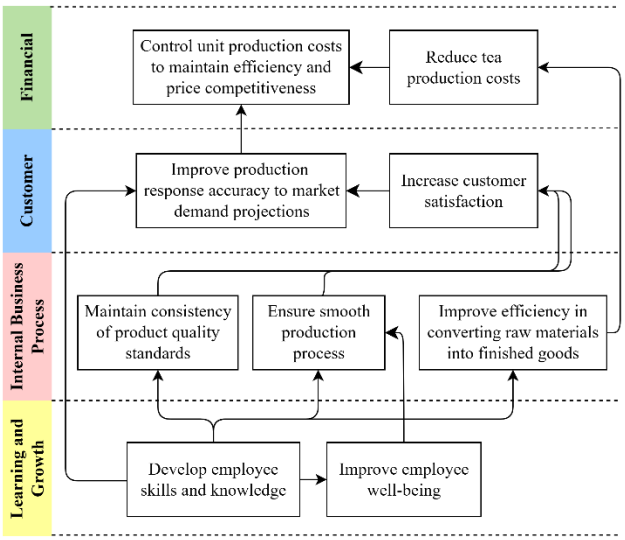

Figure 2. Strategy map based on Balanced Scorecard framework

A total of 13 KPIs were formulated based on the strategy map, covering all four BSC perspectives. These KPIs were designed to comprehensively measure the organization's strategic objectives, and the detailed list is presented in Table III.

Table III. List of Key Performance Indicators

BSC Perspective	Strategy Code	Objective Code	KPI Code	KPI
Financial	SF.1	SSF.1.1	KF.1.1.1	Total production cost per kg of finished product
	SF.2	SSF.2.1	KF.2.1.1	Percentage of budget realization for bulk tea production
			KF.2.1.2	Percentage of budget realization for tea bag production
Customer	SC.1	SSC.1.1	KC.1.1.1	Production output alignment rate with demand forecast
	SC.2	SSC.2.1	KC.2.1.1	Customer Satisfaction Index
			KC.2.1.2	Customer Complaint Rate
Internal Business Process	SIBP.1	SSIBP.1.1	KIBP.1.1.1	Percentage of Green Leaf (GL) raw material meeting quality specifications
	SIBP.2	SSIBP.2.1	KIBP.2.1.1	Average machine utilization rate for tea bag production
			KIBP.2.1.2	Rejection rate per tea bag machine
	SIBP.3	SSIBP.3.1	KIBP.3.1.1	Efficiency rate of GL utilization
Learning and Growth	SLG.1	SSLG.1.1	KLG.1.1.1	Number of training sessions delivered
			KLG.1.1.2	Percentage of employees participating in training
		SSLG.1.2	KLG.1.2.1	Employee Satisfaction Index

The identified KPIs were subsequently weighted using the Analytical Hierarchy Process to determine their initial relative importance across all levels of the BSC levels, including perspectives, strategies, strategic objectives, and indicators. The resulting initial weights serve as the foundation for the next step in the scoring process.

To ensure proportional alignment, the initial weights were normalized by multiplying hierarchical weights across each level. This normalization yields the final KPI weights, which reflect each indicator's overall contribution to strategic performance. The fully structured and weighted performance scorecard is presented in Table IV.

Table IV. Final Weighted Performance Scorecard

BSC Perspective	Weight	Strategy Code	Weight	Objective Code	Weight	KPI Code	Weight	KPI Rank
Financial	14.80%	SF.1	3.80%	SSF.1.1	3.80%	KF.1.1.1	3.80%	10
		SF.2	11%	SSF.2.1	11%	KF.2.1.1	8.33%	6
						KF.2.1.2	2.67%	12
Customer	37.40%	SC.1	11.86%	SSC.1.1	11.86%	KC.1.1.1	11.86%	3
		SC.2	25.54%	SSC.2.1	25.54%	KC.2.1.1	20.36%	1
						KC.2.1.2	5.18%	7
Internal Business Process	18.70%	SIBP.1	3.87%	SSIBP.1.1	3.87%	KIBP.1.1.1	3.87%	9
		SIBP.2	4.11%	SSIBP.2.1	4.11%	KIBP.2.1.1	0.93%	13
						KIBP.2.1.2	3.18%	11
		SIBP.3	10.72%	SSIBP.3.1	10.72%	KIBP.3.1.1	10.72%	4
Learning and Growth	29.10%	SLG.1	29.10%	SSLG.1.1	14.55%	KLG.1.1.1	3.91%	8
						KLG.1.1.2	10.64%	5
				SSLG.1.2	14.55%	KLG.1.2.1	14.55%	2

The final scorecard highlights the relative contribution of each KPI to the overall performance evaluation framework. As shown in Table IV, KPIs related to customer satisfaction and employee engagement were assigned higher final weights, indicating their strategic importance. In contrast, indicators linked to operational efficiency received lower weights, reflecting their supporting role in the broader performance landscape. These results suggest a strategic orientation toward market responsiveness and organizational development. This aligns with prior research in Indonesia's agribusiness sector, particularly in the dairy supply chain, where the customer perspective was found to dominate strategic performance measurement frameworks [16]. Accordingly, the proposed scorecard provides a quantifiable basis for decision-making and continuous performance improvement.

V. CONCLUSION

This study presents the development of a comprehensive strategic performance measurement system grounded in the Balanced Scorecard (BSC) framework, which encompasses four interrelated perspectives: financial, customer, internal business processes, and learning and growth. Each perspective is supported by clearly defined strategic objectives and measurable key performance indicators, systematically formulated to ensure strategic coherence. The KPIs were derived through a structured strategy mapping process that was closely aligned with the company's vision, mission, and long-term goals, thereby ensuring relevance and applicability. The application of the Analytical Hierarchy Process in weighting performance metrics revealed that customer-oriented measures are perceived as the most critical in supporting strategic alignment. All consistency checks in the prioritization process met

acceptable thresholds, ensuring the reliability of the results. The proposed model enables organizations to translate strategic direction into operational guidance, offering a comprehensive foundation for performance monitoring and continuous improvement in the agribusiness processing sector.

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