RESEARCH ARTICLE

Proposed Design of Knowledge Based Performance Management System (KBPMS) for SME In Metal Casting Business

Ahmad Auva Nadiyyi Kaff [1*], Dermawan Wibisono [2], Ima Fatima [3]

Abstract

PT. SPU is a private metal casting company located in the Ceper industrial area, Klaten, Central Java. The company operates a metal casting factory equipped with an Induction Melting Furnace. Their product portfolio includes a wide range of materials, such as Cast Iron, Stainless Steel, Steel, Aluminum, Brass, and various alloy metals, meeting diverse industrial demands. This study focuses on proposing a Knowledge-Based Performance Management System (KBPMS) to address the company's operational challenges. PT. SPU faces issues like fluctuating income, reliance on conventional marketing methods, frequent product defects, project delays, and the absence of well-defined key performance indicators (KPIs). These obstacles hinder sustainable growth and operational efficiency. The KBPMS framework offers a structured approach to performance management, integrating business knowledge and systematic evaluation to overcome these issues. By establishing clear KPIs, the system ensures alignment with organizational objectives, providing tools to track progress and identify areas for improvement. Additionally, the framework promotes a culture of continuous enhancement, ensuring quality, timeliness, and customer satisfaction. Implementing KBPMS is expected to stabilize financial performance, modernize marketing, reduce defects, and improve project completion rates, ultimately fostering a more resilient and competitive organization.

Keyword: Performance Management System, KBPMS, Metal Casting

Introduction

Indonesia, as a developing nation with a population exceeding 270 million, holds significant potential for economic growth. According to the Indonesian Ministry of Cooperatives and SMEs (Small and Medium-sized Enterprises), SMEs contribute approximately 61.9% to the country's GDP and employ 97% of the local workforce (Ministry of Cooperatives and SMEs, 2018). This highlights their vital role in job creation and poverty alleviation. To bolster the development and competitiveness of SMEs, the Indonesian government has implemented various policies and programs, including funding support and advancements in technology adoption (Tambunan, 2019). Among the sectors where SMEs are active, the Small and Medium Industries (SMIs) stand out as a cornerstone of Indonesia's economy. Within this domain, the Metal Casting Industry plays a strategic role in supporting other industrial branches, particularly in general machinery, agriculture, and construction, through the production of essential components and equipment.

The metal casting industry serves as the backbone for producing essential components, making it a crucial part of broader industrial operations. Ceper is home to approximately 300 business units with a total production capacity of around 3,000 tons per month and employs roughly 3,200 workers (Ministry of Industry, 2016). In recent years, both the number of business units and their production capacity have steadily increased, highlighting the growing significance of the metal casting industry in the region. One of the companies located in the Ceper metal casting industrial area is PT. SPU, a private enterprise specializing in metal casting manufacturing. The company operates a metal foundry in the Ceper industrial zone, Klaten, Central Java, equipped with an Induction Melting Furnace.

In today's competitive business environment and the fast pace of technological advancements, it is essential for companies to regularly evaluate their performance. A performance management system should be consistently applied throughout a company's operations. This system is designed to improve both the overall performance of the company and its employees (Yasa et al, 2024). To achieve this effectively and efficiently, the system should focus on maintaining high quality, supporting employee development, and addressing the challenges of evaluating individual and team performance. Therefore, a performance management system is the best way to evaluate all areas of a company like PT. SPU, helping to solve problems and improve performance at both the organizational and individual levels.

After comparing various Performance Management System (PMS) frameworks, such as Malcolm Baldrige National Quality Award (MBNQA), Balanced Scorecard (BSC), Performance Prism, and Knowledge-Based Performance Measurement System (KBPMS). The Knowledge-Based Performance Measurement System (KBPMS), introduced by Wibisono (2016), was selected as the most appropriate method for PT. SPU. This decision aligns with the objectives of this final project, as KBPMS effectively addresses the critical need to link performance management with the organization's business strategy, a gap often observed in other systems.

According to Wibisono (2016), KBPMS offers several advantages that make it particularly suitable for addressing the performance challenges faced by PT. SPU. First, it provides a clear and structured framework that focuses on both the processes and outcomes of performance management. Second, KBPMS fosters collaboration among stakeholders, enabling them to jointly develop strategies, set targets, and evaluate results. Third, it ensures fairness in assessing performance by

[1]School of Business Management, Institut Teknologi Bandung

*) corresponding author

Ahmad Auva Nadiyyi Kaff

Email: ahmad_auva@sbm-itb.ac.id

clarifying roles, responsibilities, and corresponding rewards. Additionally, KBPMS offers a strong foundation for accountability, ensuring that all parties involved share responsibility for performance improvement. Lastly, the framework integrates knowledge-based principles, allowing for detailed benchmarking and the use of advanced analytical methods, such as AHP (Analytical Hierarchy Process) to support decision-making.

Method

This research employs a data collection technique that incorporates both primary and secondary data. By using both types, the study aims to enhance the reliability of the information. The process includes defining the research scope, gathering data through unstructured or semi-structured observations and interviews, and developing procedures to include documents, visual content, and recorded information (Creswell and Poth, 2018). The primary data is gathered through face-to-face interviews with PT. SPU's top management and department heads. These interviews explore critical issues and provide in-depth insights into root causes, enabling the development of solutions aligned with the company's strategic goals. Secondary data complements the primary data by offering broader context and validation. Sources include internal documents such as sales data, inventory records, damaged goods reports, and annual reports.

Results and Discussion

PT. SPU is currently struggling due to the lack of an effective performance management system, which has been identified as a root cause impacting overall performance. To address this issue, a solution is proposed to implement a Knowledge-Based Performance Management System (KBPMS). The Current Reality Tree (CRT), a diagnostic tool from the Theory of Constraints (TOC) developed by Eliyahu M. Goldratt, is used to analyze the causal relationships between organizational challenges, known as Undesirable Effects (UDEs). These UDEs represent persistent, interconnected problems that hinder goal achievement. By mapping these relationships, CRT helps identify root causes that, when resolved, can simultaneously address multiple UDEs (Goldratt, 1990; Dettmer, 2007).
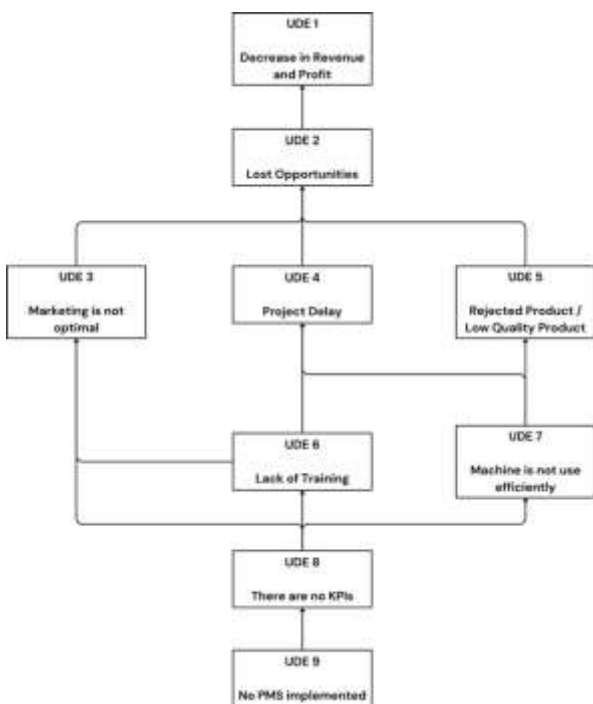

Fig 1.   Current Reality Tree of PT. SPU

Knowledge Based Performance Management System (KBPMS)

The Knowledge-Based Performance Management System (KBPMS), introduced by Wibisono (2016), enhances company effectiveness by aligning vision and mission with strategic goals. It addresses financial and non-financial aspects, engaging stakeholders in strategy formulation, performance measurement, and accountability. KBPMS emphasizes fair evaluation through clearly defined roles and rewards while distributing responsibilities to improve overall performance. Its framework is organized into three perspectives—organizational output, internal processes, and resource capabilities—offering a comprehensive approach to performance evaluation. KBPMS Framework as outline in table 1 below:

Table 1. SWOT Analysis

Strength	Aspect	Weakness
Business Result	Financial	
	Non-Financial	
Internal Process	Innovation	
	Operating Process	
	Marketing	
	After-Sales Service	
Resource Capabilities	Human Resources	
	Technology Resources	
	Organizational Resources	

Designing Performance Management System

To develop a performance management system, it is crucial to follow five foundational stages. Leveraging the insights from each of these stages is important for designing an effective and comprehensive performance management framework. Those five foundational stages can be seen in the figure 2 below:
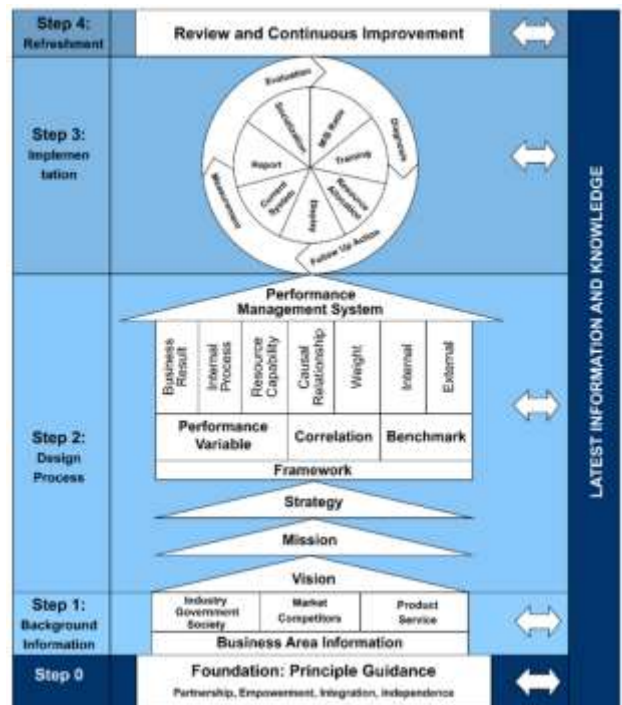

Fig 2.   KBPMS Foundational stage (Wibisono, 2016)

Stage 0: Foundation

To design an effective Performance Management System (PMS), PT. SPU must adhere to four core principles and five guiding rules, as outlined by Wibisono (2016):

Core Principles:
1.   Partnership: Foster collaboration among stakeholders (management, employees, consumers, suppliers) to

set goals and define relevant variables, ensuring **mutual understanding and support for the company's** objectives.

2. Empowerment: Strengthen leadership and enable employees to perform responsibilities aligned with the PMS framework, enhancing overall productivity.
3. Integrated System: Create a cohesive strategy linking departments and ensuring alignment across processes to promote teamwork and ownership.
4. Independence: Empower the team to design a PMS tailored to organizational needs, granting authority to manage variables and personnel while ensuring management support.

Guiding Rules:
1. Keep It Simple and Practical (KISS): Develop a straightforward system focused on improving performance rather than achieving perfect scores.
2. Long-Term Focus: Include financial and non-financial indicators to build sustainable strategies for growth.
3. Time-Based Approach: Use real-time variables to quickly address issues and maintain efficiency.
4. Continuous Improvement: Leverage internal and external benchmarking to enhance performance and competitiveness.
5. Quantitative Evaluation: Use data-driven methods to measure progress and identify areas for improvement.

Step 1 Basic Information

The SWOT and TOWS analyses, which combine insights from the external and internal environment, are presented below. These analyses ensure PT. SPU's performance management system is both strategically aligned with its internal capabilities and responsive to external opportunities and challenges:

Table 2. SWOT Analysis

Strength	Weakness
• Having the latest metal casting technology, with Induction Furnace system. • The company produces and casts not only cast iron, as is the case with most casting products in the Ceper area, but also aluminium, brass, and other metals with custom specifications	• Lack of maximizing social media, E-Commerce and Websites as company marketing program. • Some jobs are hampered by delays and rejected products.

Opportunities	Threat
• Government support for the industries through policies like TKDN (Domestic Component Level). • Opportunity to supply infrastructure projects. • Raw materials are easier to obtain. • Low minimum wage in Klaten regency.	• The price of raw materials (metal scraps) is quite fluctuating. • Competition in the metal casting industry. • Shifting of workers to other industries.

Based on the SWOT Analysis, the TOWS analysis can be identified in the table 2 below:

Table 3. TOWS Analysis

S-O	W-O
Leverage advanced technology to meet custom specifications and attract private sectors and infrastructure projects (S1, O2, O3).	Improve online marketing and e-commerce presence to reach broader clients and reduce reliance on local demand (W1, O2, O3). Enhance production
Utilize a range of metal products to diversify supply offerings, tapping into government support (S2, O1, O4).	efficiency through training to minimize delays and rejections (W2, O2, O4).

S-T	W-T
Use advanced technology to optimize production and manage raw material costs, helping to compete in a fluctuating market (S1, T1).	Increase employee engagement and retention programs to prevent labour shifts to other industries (W2, T3).
Differentiate products with custom specifications to stand out in the competitive market (S2, T2).	Invest in machinery maintenance to reduce delays and ensure consistent product quality (W2, T2).

Stage 2 Design

According to Wibisono (2016), In developing the Knowledge Based Performance Management System (KBPMS), the researcher will focus on critical elements such as the company's vision and mission, corporate strategy, performance indicators, the interconnection of variables, and benchmarking practices.

Vision:
The researcher proposed the vision for PT. SPU: *"To be the most trusted producer of high-quality metal casting products that meet customers' real needs."*

Mission:
-Deliver exceptional quality in metal casting to ensure every product meets or exceeds customer expectations.
-Build lasting, trust-based relationships with customers through transparency and reliability.
-Innovate in metal casting technology to meet the evolving needs of the market and provide tailored solutions.

Strategy
In accordance with KBPMS framework, the strategy are categorized into three perspectives as shown in the figure 2 below:
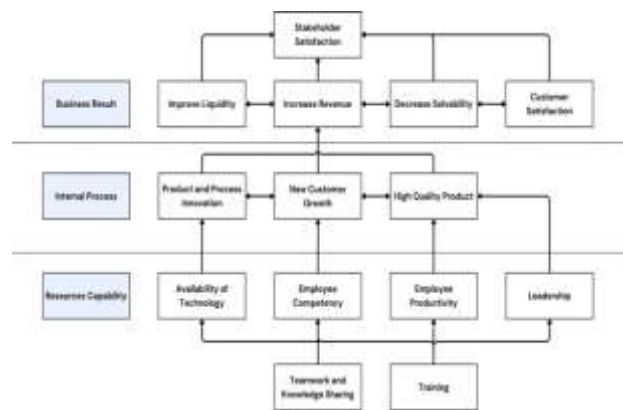


Fig 3. Strategy Map

Performance Variable

There are two primary types of variables: quantitative and qualitative. While certain variables may be challenging to measure directly in numerical terms, qualitative variables can still be effectively utilized when they are clearly defined and paired with a structured rating system. In designing the Knowledge-Based Performance Management System (KBPMS), performance variables are categorized into three key perspectives, as illustrated in the table 3 below:

Table 4. SWOT Analysis

Perspective	Aspect	Indicator (KPI)
Business Result	Financial	Revenue Growth
		Net Profit Margin
		Return on Asset
		Return on Equity
		Current Ratio
		Deb to Equity Ratio
	Non-Financial	Customer Satisfaction
		Employee Satisfaction
		Turnover Rate
Internal Process	Innovation	Product innovation
		New Product Introduction Time
	Operation Process	Process Innovation
		On Time Project Completion
	Marketing	New Customer Growth
	After sales services	Service Level
Resources Capability	Human Resources	Employee Productivity
		Employee competency
	Technology Resources	Technology Availability Rate
	Organizational Resources	Teamwork and knowledge sharing
		Leadership

Relationship Among Variables

The connection between performance variables plays a crucial role in effective performance management, yet few businesses, particularly in Indonesia, have adopted scientific methods to fully leverage these linkages. The Relationship Among Variable in PT. SPU can be seen in the figure 4 below:
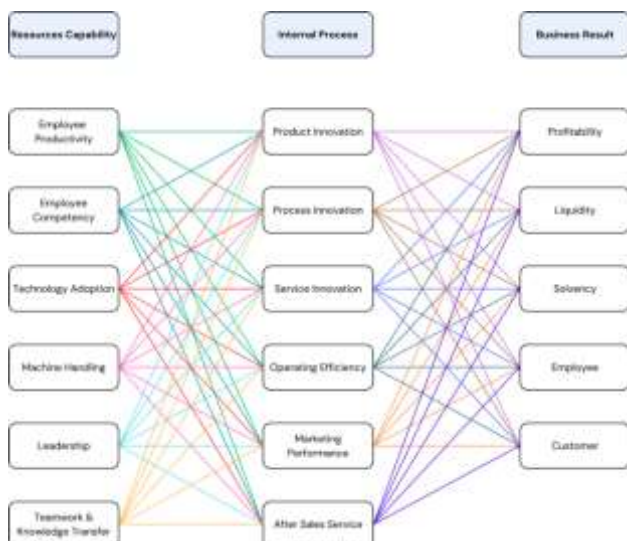

Fig 4. Linkage Among Variables

Analytical Hierarchy Process (AHP)

The Analytical Hierarchy Process (AHP) is widely recognized for its ability to prioritize criteria and alternatives in decision-making. It breaks complex problems into smaller parts and evaluates them systematically through pairwise comparisons. AHP is used to derive weights for decision criteria and determine the best alternatives in scenarios requiring structured analysis (Terzi, 2019). In this case, to obtain comprehensive input, a Focus Group Discussion (FGD) is conducted with management, so that views and assessments from various parties can be integrated. the AHP result can be seen in the figure 5 below:
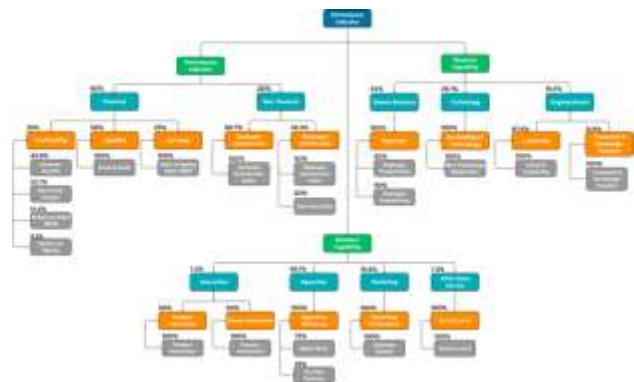
Fig 5. Performance Indicators Weighting

Benchmarking

Benchmarking is carried out to establish performance targets for PT. SPU by comparing the company's performance to industry standards or averages. This approach helps identify best practices and assess its competitive position. External benchmarks serve as a clear reference to evaluate PT. SPU's current performance and pinpoint areas for enhancement. To fine-tune and confirm these targets, discussions were conducted with key stakeholders within the company, ensuring that the defined goals align with industry norms and the company's strategic priorities. Table 5 below shows summary for benchmark to identify company's target:

Table 5. Benchmark to Identify Target KBPMS

Performance Indicator	Benchmark	Target
Revenue Growth	The global metal casting market is anticipated to grow at a compound annual growth rate (CAGR) of 5.5% from 2023 to 2030 (Grand View Research, 2024).	≥5.5%
Net profit margin	10% or higher is often considered a benchmark for a successful metal casting operation. (FMT Team, 2024)	≥10%
ROA	5% (good), 20% or higher (excellent) (Queensland Government, 2021)	≥5%
ROE	Average ROE for metal fabrication is 12.9% (FullRatio, 2024)	≥13%
Current Ratio	For most industries is 1.5 to 2.0 (Queensland Government, 2021)	2.0
Debt to Equity Ratio	Fabricated Metal Products average D/E ratio is 1 (Ready Ratios, 2023)	1.0

Customer satisfaction index	Customer Satisfaction Index (CSI) 0-35 very bad/highly unsatisfied 35-50 poor/unsatisfied 50-65 average/quite satisfied 65-80 good/satisfied 80-100 excellent/highly satisfied (Retently, 2024)	100%
Employee Satisfaction	Employee Satisfaction Index (ESI) 0-50: Very low satisfaction 50-60: Low satisfaction 60-69: Acceptable satisfaction 70-79: High satisfaction 80-100: Very high satisfaction (Get Ahead by LinkedIn News, 2024)	100%
Employee Turn Over	Most industries consider a figure of 10% or less to be optimal (Gohn & Smith, 2024)	≤10%
Product innovation	At least 2 on a year	2
Process Innovation	Product innovation: new metal casting product or new metal composition. Process innovation: using new process on producing metal casting product. McKinsey's research indicates that companies focusing on creating new products and services tend to grow faster than their peers (McKinsey, 2017)	2
Reject rate	Keeping the rejection rate under 2% is crucial as it is strongly linked to both production quality and cost efficiency in metal casting (FMT Team, 2024)	<2%
On Time Project Completion	By using the standard On-Time Delivery Rate, in the metal casting industry generally ranges between 85% and 95% (BPT Team,	≥95%

	2024).	
New Customer Acquisition	Increase from previous year performance.	20% better than previous year
Service Level	80% or higher is considered good First Contact Resolution Rate (Surveypal, 2023)	80%
Employee productivity	Refer to the target of revenue growth, which is on 5.5%.	5.5%
Employee competency	Based on survey	90%
Availability of technology	At least 1 Using technology that can help increase both effectiveness and efficiency, **refer to competitors'** technology. Adopting new technologies allows companies to offer personalized and efficient services, leading to increased customer satisfaction and loyalty (Weitzman, 2023)	1 Technology application
Teamwork and knowledge sharing	Based on survey	100%
Leadership	Based on survey	100%

Using the benchmark data, the current performance of PT. SPU can be analyzed and compared to the targeted objectives. This performance evaluation, derived from the three perspectives of the KBPMS framework and supported by available data, is visually represented through radar charts. These charts, depicted in Figures 6 to 8, provide a comprehensive illustration of PT SPU's performance across the key metrics:

Fig 6.   Business Result Display

Fig 7.   Internal Process Dsiplay

Fig 8.   Recourse Capability Display

There is no data available for some indicators due to the absence of a Performance Measurement System (PMS), meaning the company has not previously tracked or assessed those indicators.

Stage 3 Implementation

Successful implementation of a Performance Management System (PMS) requires attention to the following aspects: (1) Current System, aligning the new PMS with the existing framework to ensure smooth adaptation, (2) Report, providing clear, concise, and relatable reporting suitable for all organizational levels, (3) Socialization, promoting understanding and acceptance through tools like posters, meetings, or digital platforms, (4) Cost and Benefit Ratio, conducting cost-benefit analysis to confirm the PMS improves performance effectively, (5) Training, delivering comprehensive training to build understanding of the PMS and its tools, (6) Resources, assigning qualified personnel to manage performance variables and ensure proper resource allocation, and (7) Display, using visual tools such as spider graphs or dashboards to motivate and track performance goals. These steps support continuous improvement and alignment with organizational objectives.

The implementation plan will include details like the specific tasks to be completed, the people responsible for each task, and how long each task is expected to take. The detail in the following table 5:

Table 6.   Implementation Plan

Activities	PIC	Duration (Days)
Introduce and explain the performance management system (PMS)	Top Management & Consultant	1
Present the current company situation analysis and discuss the advantages of using a performance management system.	Top Management & Consultant	2
Present the proposed the Knowledge Based performance management system (KBPMS)	Top Management & Consultant	1

Explanation and Introduction about Stage 0: Foundation	Top Management & Consultant	1
Explanation and Introduction about Stage 1: Basic Information	Top Management & Consultant	1
Analysis of internal and external environment of company	Top, Middle Management and Consultant	1
Explanation and Introduction about Stage 2: Design of performance management system, vision, mission and strategy of company	Top, Middle Management and Consultant	5
Continue explanation from Stage 2: Performance Variable, Linkage Variable and Benchmarking	Top, Middle Management and Consultant	4
Explanation about Stage 3: Implementation	Top, Middle Management and Consultant	1
Report of the new performance management system	Top, Middle Management and Consultant	5
Analyze the benefit-to-cost ratio of the system	Top, Middle Management and Consultant	3
Training Employee	Human Resources	5
Allocation of resources	Top, Middle Management and Consultant	5
Designing display of performance management system	Human Resources	5
Socialization of performance management system	All Employee and Consultant	2
Performance measurement	Continuous Improvement	-
Evaluation of measurement	Continuous Improvement	-
Diagnosis for Improvement	Continuous Improvement	-
Follow up on identified areas for improvement.	Continuous Improvement	-

Stage 4 Refreshment

The final step in a performance management system is known as refreshment, which involves a thorough review based on the latest information and insights. This stage is critical for ensuring the system remains effective and relevant over time. It highlights the necessity of strong leadership, commitment, and active participation from all stakeholders. A well-maintained PMS should be flexible and regularly updated to adapt to changing business conditions, such as shifts in competition, regulations, customer expectations, societal trends, and technological advancements. Additionally, it should accommodate new performance standards and methodologies. Effective leadership and dedication are essential for the system's success, while consistent monitoring helps prevent errors and ensures the company achieves its goals.

Limitation Of The Study

This study focuses on designing a performance management system based on the KBPMS framework. However, it faces certain limitations, such as data availability and the limited timeframe for full implementation. Consequently, the findings and outcomes may require further adjustments once the system is put into practice by the company. Furthermore, the study's results are specific to the context of this business and cannot be directly applied to other small or medium-sized metal casting industries, as each

operates in a unique environment with distinct visions, missions, and strategies. Therefore, a universal performance management solution does not exist, and the system must be tailored to meet the specific needs of each business.

Conclusions

The company's primary challenge is the absence of a Performance Management System (PMS), identified as the root cause of issues such as inconsistent revenue, missed opportunities, ineffective marketing, project delays, product rejections, and insufficient employee training, as revealed by Current Reality Tree (CRT) analysis. To address this, PT. SPU plans to implement a Performance Management System using Wibisono's Knowledge-Based Performance Management System (KBPMS) framework. The KBPMS offers a simple yet comprehensive approach tailored to the company's needs, making it ideal for growing Indonesian businesses. By adopting KBPMS, PT. SPU aims to enhance performance, streamline operations, and achieve its business goals. The success of the system depends on collaboration and support across all organizational levels.

Recommendations

Implementing the Knowledge-Based Performance Management System (KBPMS) is expected to enhance PT. SPU's performance by addressing challenges like high reject rates, project delays, and outdated marketing methods. Success requires full organizational support and alignment with the company's vision and mission. Recommendations include fostering alignment with goals, organizing team-building activities to strengthen leadership and collaboration, providing employee training to enhance productivity and reduce errors, and regularly monitoring KPIs to track progress and address gaps. Additionally, the company should modernize its marketing efforts by developing digital marketing skills and leverage its unique strengths, such as product quality and customer service, to gain a competitive advantage.

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