

Performance Management System for Industrial Water Management Company using Balanced Scorecard Model

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Abstract

The balanced scorecard (BSC) is a famous performance and strategic measurement model applied in various companies and industries. A few previous research are applied to the BSC model for industrial water management companies to evaluate, monitor, and control their company's strategies. This research aims to apply the BSC model for industrial water management in one Indonesian water management company. Analytical Hierarchy Process (AHP) method, scoring system, and Traffic Light System is also used to develop the BSC model for the case company. In this research, customer is the type of perspective that is important. Increasing customer satisfaction perspective and optimizing productivity are the strategic objectives that the case study company emphasizes. Essential performance measurement is also carried out based on the targets that have been set and the results achieved by the company. It was found that there were 10 KPIs that had poor performance, such as O&M Sales increased, target customers per area, and others. The recommendations of improvement programs to increase the performance of several KPIs that had poor performance, such as increasing collaboration, event marketing, and rewarding program, are also written in this conclusion.

Keywords

Balanced Scorecard (BSC), industrial water management company, the Indonesian case company

1. Introduction

Water management is the planning, developing, distributing, and managing the optimal use of water resources to make the whole processing process better. This process involves mechanical, biological, chemical, and human elements, all of which must meet the proper standards for the treatment system to run effectively and reliably. If there is a discrepancy in one of these elements, the process can be inefficient and require more significant maintenance costs. In the worst case, the treatment process can fail and lead to the non-fulfilment of environmental permits or poor-quality water conditions.

As a case study in this research, PT A is a water management service company for industrial and institutional markets. The company sells various products and services designed to reduce energy, water, and other natural resources, improve air quality, minimize waste disposal to the environment, and increase productivity and end products. In this study, the research objective is devoted to water management. Water management is a critical system for PLTU and its scope of work includes (1) provision of experts in the field of water management, (2) supply of chemical products, (3) Service for Operation and Maintenance (O & M), and Chemical Management Service (CMS).

Most of power plants have their water treatment plant (WTP). Only about 10% of PLTUs in Indonesia outsource water management to other parties. For this reason, it is necessary to design a performance management system for industrial

water management companies at PLTU, to convince the PLTU to outsource its water management to obtain optimal benefits.

The balanced scorecard (BSC) is a tool used to measure company performance from the results of strategic implementation owned by the company and aims to make business strategies more measurable and concrete (Kaplan, 2004). The company's vision, mission, and strategic objectives are needed to determine the objectives strategy of each perspective (financial, customers, internal business process, and learning and growth) (Kaplan, 1996). Initially, the balanced scorecard was created to overcome the weakness of the executive performance measurement system that focuses on the financial aspect. Furthermore, the balanced scorecard has developed in its implementation as a measuring tool for organizational performance and an approach to strategic planning. Several previous research in BSC design and implementation (Pan, 2004; Lam, 2006) were conducted, such as in manufacturing industry (Vanany et al., 2005) and bank (Sumani, 2012). Research on performance measurement with BSC is also supported by several decision-making methods such as DEMATEL and ANP (Leksono et al., 2019).

The significant growth of the power generation industry over the past few years has been followed by the growth of the industrial water treatment and management technology industry. In Indonesia, several industrial water treatment companies were initially chemical companies. In their development following the market direction, they have turned into industrial water management companies that provide special chemicals, general chemicals, spare parts, or water treatment and services equipment. All these products and services are combined into a one-stop solution offered to the power generation industry.

PT A is one of the largest companies and world market leaders engaged in the water treatment industry, including power plants. Top management believes that outsourcing WTP & WWTP will provide benefits and savings for power plant owners or power plant Operation & Maintenance (O&M) service companies. By looking at the company's high market share and observing the increasing need for WTP O&M outsourcing from the power generation industry, the company felt the need to re-examine its strategy in dealing with opportunities and future competition. The purpose of this research is to design a performance management system (PMS) for PT A, which engages in industrial water management at steam power plant using the balanced scorecard model and provide recommendations for future steps to implement the management system that has been designed successfully.

2. Literature Review

There are nine steps in building the balanced scorecard, divided into the design phase (building) and the implementation phase (Rohm et al., 2005). The nine steps are (1) assessment (development plan, strategic elements, and change management), (2) strategy (customer value, strategic themes and result), (3) objective (strategic action component), (4) strategy map, (5) performance measures (performance measures and targets), (6) initiatives (strategic project), (7) automation (software, performance reporting, and knowledge Sharing), (8) cascade (alignment through the unit and individual scorecards), and (9) evaluation (strategy result and revised strategy).

The balanced scorecard is a strategic management system that defines an accounting responsibility system based on strategy (Hansen, 2011). The balanced scorecard translates the organization's vision and strategy into a comprehensive set of measures and provides a framework for measurement and strategic management systems (Kaplan and Norton, 1996). Suppose the vision and strategy can be stated in strategic objectives, clear measures, and targets, which are then communicated to every organization member. Members of the organization can understand and implement them so that the vision and strategy of the organization are achieved.

The strategy map in the balanced scorecard shows a framework that can describe how the strategy relates intangible assets to the value creation process. The financial and customer perspectives explain the desired outcome of the strategy. Both perspectives contain many lag indicators. The internal business perspective identifies several essential processes that are expected to have a significant influence on strategy. The learning and growth perspective identifies intangible assets that have an important influence on strategy. This perspective aims to show which jobs, which systems, and what kind of corporate climate are needed to support the value creation process. In strategy mapping, the translation of the vision and mission into strategic goals is determined by the strategy chosen to realize the vision (Kaplan and Norton, 2004). There are four generic strategies used in strategy mapping, namely: (1) low total cost, (2) product leadership, (3) complete customer solutions, and (4) lock-in strategies.

The balanced scorecard is a company performance measurement tool that measures the company's overall performance, both financial and non-financial, by considering aspects related to the company (Kaplan and Norton, 1996). The purpose of the balanced scorecard is to describe the strategy and vision of the organization into the framework of the strategic learning process by linking all of them to the business environment so that they can still be used as feedback for strategies that the organization will carry out in a more complex environment. The balanced scorecard describes the strategy and vision of an organization into objectives and measurements into four perspectives. Each perspective has a steering component consisting of the objectives (objectives) of each perspective, measurements (measures), what targets to be achieved, and initiatives (initiatives) how to achieve these targets.

Key Performance Indicators (KPI) is the matrix companies use, both financial and non-financial, to measure their performance. KPI requires careful planning, supported by the availability of accurate and consistent data and information. Suppose the company can provide an information system that is accurate, consistent, and easily accessible for anyone with interest. In that case, the data obtained can be accounted for its accuracy and consistency. Finally, companies must also provide functional and targeted information technology tools. To function optimally, KPI must comply with the SMART rules (Scientific, Measurable, Achievable, Reliable, and Time).

Analytical Hierarchy Process (AHP) is a quantitative method to rank several and choose alternatives based on several predetermined criteria. AHP is the process of determining a numerical score to rank each alternative based on its suitability with the criteria of the decision-maker (Saaty, 2008). Vanany (2009) used AHP to determine the weight of each perspective, strategic objectives, and KPI to support them in developing the performance management system model in one company.

3. Research Methods

This research adopted a case study in developing the balanced scorecard model for the industrial water management industry. In the single case study, focusing on the depth results and discussion are suggested by Yin (1994). The top and middle managers were interviewed to explore the strategic objectives, KPI, and to determine their weight. The validation step was conducted using interviews and questionnaires. Some related data were collected to support the measuring of each KPI. This research used several steps of PMS based on some previous research such as determining strategic objectives and KPI, developing the strategy map, the weighting of each perspective, strategic objectives, and KPI, determining the scoring and Traffic Light System (Vanany, 2003; Vanany and Tanukhidah, 2004; Rohm and Halbach, 2005; Vanany et al., 2005; Lam et al., 2005)

4. Results and Discussion

Through the company's vision and mission, and from filling out questionnaires and interviews, several indicators were obtained for further assessment and can be seen in Table 1.

Table 1. The strategy objectives (SO) and KPI existing in the case study

Perspective	SO Code	Strategic Objective	KPI Code	Key Performance Indicators
Finance	SO-F1	Increase revenue growth	F1	Income growth
			F2	Revenue increased per area
Customer	SO-C1	Increase market share	C1	Customer number per year
			C2	Market share growth
	SO-C2	Find new market	C3	Education event number held
			C4	O&M Sales increased
			C5	Branch office addition
	SO-C3	Increase customer loyalty	C6	Customer loyalty increased
	SO-C4	Acquisition Competitor's market share	C7	Average contract duration of WTP O&M projects by customers
			C8	Comparison of the number of visits to potential customers
	SO-C5		C9	Customer satisfaction level

Perspective	SO Code	Strategic Objective	KPI Code	Key Performance Indicators
		Increase customer satisfaction	C10	Number of customer complaints
Internal Business Process	SO-BP1	Speed to market	BP1	Order handling speed
		Optimize productivity	BP2	Total employee turnover in one period
			BP3	Target customers per area
		Increase value	BP4	Program running
			BP5	Improved internet-based technology automation
Customer management	BP6	Achievement of on-time delivery		
Learning and Growth	SO-LG1	Continuous quality improvement	LG1	Number of innovations for service process improvement
			LG2	Technical sales training
	SO-LG2	Improve HR competence & effectiveness	LG3	Increased individual technical sales KPIs
			LG4	Level of the suitability of individual plans and targets

The formulation of the critical indicators compiled in the KPI of the WTP O&M Division was obtained from questionnaires and discussions between researchers and the WTP O&M Division, represented by the O&M Manager and assisted by the Site Leader. After conducting the discussion, 22 KPIs were obtained, consisting of 2 KPIs from the finance perspective, 10 KPIs from the customer perspective, 6 KPIs from the internal business process perspective, and 4 KPIs from the learning and growth perspective.

KPIs formulated on O&M business operations have been validated by employing a questionnaire. Respondents to the questionnaire were filled in by the O&M Manager and Site Leader as representatives of the O&M division. Each strategy and perspective used must be in such a way that it is related to each other so that its realization is a series. The balanced scorecard always has a perspective that becomes the ultimate goal. The O&M Division sets the customer perspective as the goal. The O&M Division has the responsibility to contribute to the company's profitability. Therefore, the finance perspective also gets special attention in the preparation of the strategy map. Figure 1 shows the strategy map in case study.

The process hierarchy is made before the weighting using AHP. The hierarchy of the weighting process can be seen in Figure 2. The weighting is only up to the BSC perspective and strategic objective. For the KPI weighting, the weighting is done by dividing the weight on the strategic objective according to the number of existing KPIs. The AHP is not used to weigh KPIs because the authors believe that KPIs are key indicators where each KPI should have a weight that is not much different. It is different from the weight of the strategic objective and the weight of the perspective. In both weightings, there is a preferred perspective and a preferred strategy. Hence, the resulting weights will vary. The weighting mechanism for the BSC and strategic objective perspectives is carried out by distributing questionnaires to internal parties considered as experts. There were as many as five experts who filled out the questionnaire. Each of these experts includes Business Unit Manager of Power Plant Industry, Manager of O&M, Manager of Engineering, Site Leader & Maintenance Supervisor. Based on the results of the AHP questionnaire processed in Expert Choice, the order of the most significant weights is the customer perspective. The learning and growth perspective, then the financial perspective, and the last is the internal business process perspective.

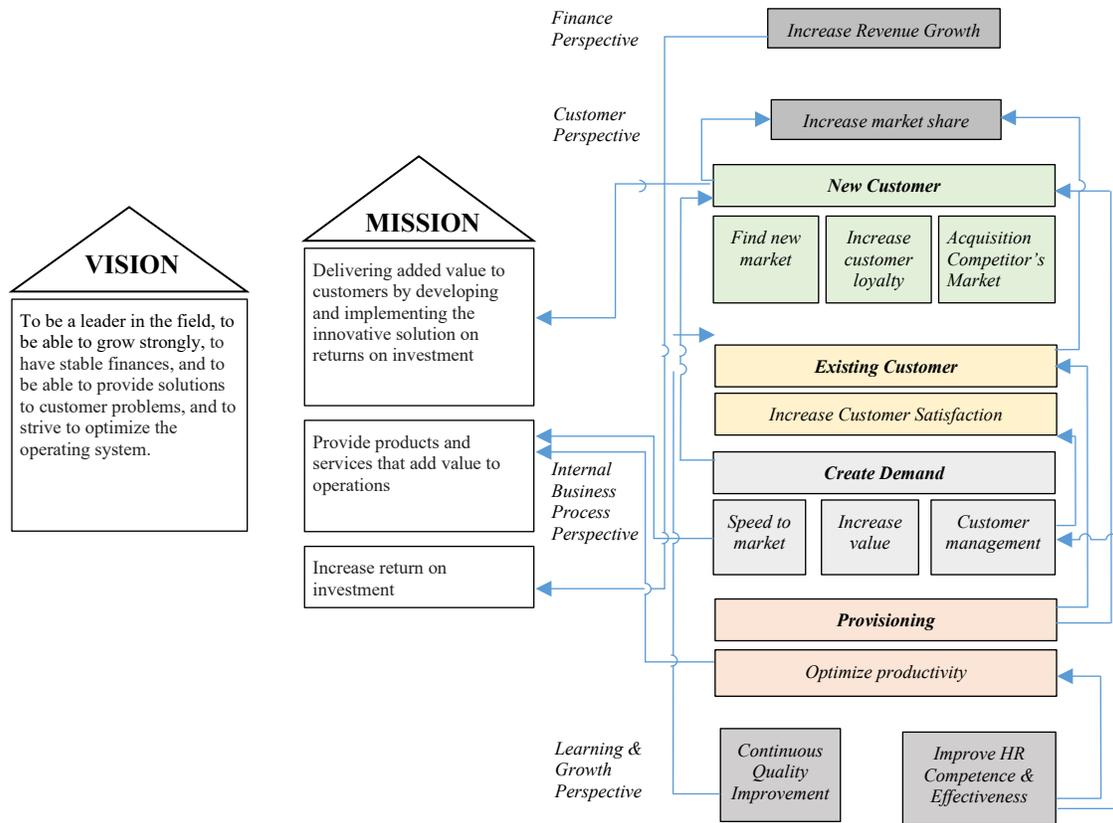


Figure 1. Strategy Map

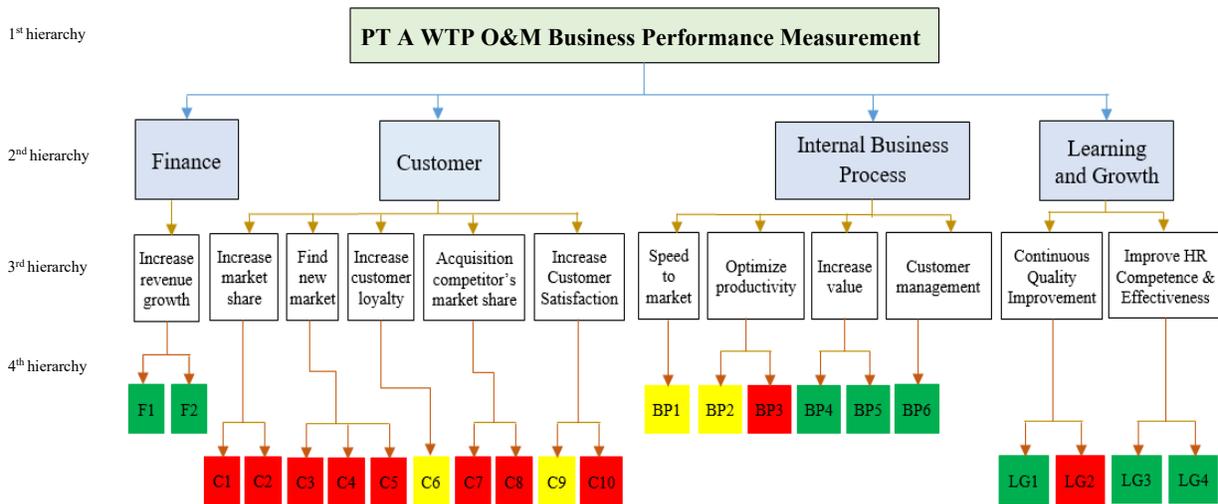


Figure 2. PT A WTP O&M Program Process Hierarchy

The results from the Expert Choice processing can be seen in Appendix 4, and the results of the perspective and strategic objective weighting can be seen in Table 2.

Table 2. The strategy objectives (SO) and KPI existing in the case study

Perspective – Weight	Strategic Objective (SO) – Weight	KPI – Weight
Finance – 0.156	Increase revenue growth – 1.00	Income Growth – 0.5
		Revenue increased per area – 0.5
Customer – 0.481	Increase market share – 0.052	Customer number per year – 0.5
		Market share growth – 0.5
	Find a new market – 0.097	Education event number held – 0.33
		O&M Sales increased – 0.33
		Branch office addition – 0.33
	Increase customer loyalty – 0.224	Customer loyalty increased – 1.00
	Acquisition Competitor’s Market Share – 0.180	Average contract duration of WTP O&M projects by customers – 0.5
		Comparison of the number of visits to potential customers – 0.5
Increase Customer Satisfaction – 0.447	Customer satisfaction level – 0.5	
	Number of customer complaints – 0.5	
Internal Business Process – 0.291	Speed to market – 0.068	Order handling speed – 1.00
	Optimize productivity – 0.607	Total employee turnover in one period – 0.5
		Target customers per area – 0.5
	Increase value – 0.212	Program running – 0.5
	Customer management – 0.112	Improved internet-based technology automation – 0.5
Achievement of on-time delivery – 1.00		
Learning and Growth – 0.072	Continuous Quality Improvement – 0.167	Number of innovations for service process improvement – 0.5
		Technical sales training – 0.5
	Improve HR Competence & Effectiveness – 0.833	Increased individual technical sales KPIs – 0.5
		Level of the suitability of individual plans and targets – 0.5

The determination of KPI targets is carried out by entering indicators from discussions with experts and indicators recommended for PT A in the chemical division [5], considering no KPI formulation in the WTP O&M Division. So that the indicator does not have target data from the internal companies, for KPIs that do not have targets, target determination is carried out by employing discussions and interviews with internal parties, namely the Country Manager and O&M Manager. Observations were made regarding the data required by the KPI using the interview method. The questionnaire distribution method was used to fulfill the KPI data related to PT A’s O&M customers. The questionnaires distributed were an online questionnaire about customer satisfaction and loyalty. The respondents of the online questionnaire are the company’s existing customers.

After determining the KPI targets, data collection is carried out to measure each of the KPIs that have been formulated. PT A still has some undocumented data. Therefore, completing the data must be carried out by conducting observations, interviews, and distributing questionnaires. After the data needed in the measurement is fully available, the performance measurement is carried out by comparing the targets and the actual achievements. Table 3 below shows the result of the measurement of each KPI that has been carried out. After calculating, the KPI achievements is grouped based on the Traffic Light System to determine all KPIs’ diversity achievement.

Table 3. The measuring performance of each KPI, strategy objective, perspective, and single performance in case the company

SO Code	KPI Code	Target	Unit	Scoring System	Achievement	% Achievement	KPI Weight	KPI Score	SO Weight	SO Score	Perspective Weight	Perspective Score	Single score
SO-F1	F1	10	%	Higher is better	11.21	112.10%	0.5	0.561	1	1.073	0.156	0.167	0.713
	F2	10	%	Higher is better	10.24	102.40%	0.5	0.512					
SO-C1	C1	5	unit PLTU	Higher is better	3	60.00%	0.5	0.300	0.052	0.016	0.481	0.221	
	C2	50	%	Higher is better	0.5	1.00%	0.5	0.005					
SO-C2	C3	12	Event per year	Higher is better	3	25.00%	0.33	0.083	0.097	0.015	0.18	0.048	
	C4	5	unit PLTU	Higher is better	1	20.00%	0.33	0.067					
	C5	1	branch per year	Higher is better	0	0.00%	0.33	0.000					
SO-C3	C6	4	point	Higher is better	3	75.00%	1.00	0.750	0.224	0.168	0.447	0.212	
SO-C4	C7	5	year	Higher is better	1	20.00%	0.5	0.100	0.18	0.048			
	C8	6	unit PLTU	Higher is better	2	33.33%	0.5	0.167					
SO-C5	C9	4	point	Higher is better	3	75.00%	0.50	0.375	0.447	0.212	0.291	0.250	
	C10	1	complaints per month	Lower is better	5	20.00%	0.50	0.100					
SO-BP1	BP1	5	days	Lower is better	7	71.43%	1.00	0.714	0.068	0.049	0.212	0.318	
	BP2	100	%	Lower is better	100	100.00%	0.50	0.500	0.607	0.395			
	BP3	100	%	Higher is better	30	30.00%	0.50	0.150					
	BP4	100	%	Higher is better	100	100.00%	0.50	0.500	0.212	0.318			
	BP5	1	process	Higher is better	2	200.00%	0.50	1.000	0.112	0.097			
	BP6	100	%	Higher is better	87	87.00%	1.00	0.870					
SO-LG1	LG1	1	innovation	Higher is better	1	100.00%	0.50	0.500	0.167	0.084	0.072	0.075	
	LG2	100	%	Higher is better	60%	0.60%	0.50	0.003					
SO-LG2	LG3	5	%	Higher is better	7	140.00%	0.50	0.700	0.833	0.962			
	LG4	100	%	Higher is better	91	91.00%	0.50	0.455					

6. Conclusions

The design of performance measurement in the O&M Division of WTP PT A is prepared based on four perspectives of the balanced scorecard. Based on the expert judgment using AHP, the most significant weight from the BSC perspective is the customer perspective. Each perspective in the BSC has a strategic theme developed into several strategic objectives. There is a total of 12 SOs generated from all the BSC perspectives. Furthermore, from the SO, 22 KPIs were obtained, consisting of 2 KPIs from the finance perspective, 10 KPIs from the customer perspective, 6 KPIs from the internal business process perspective, and 4 KPIs from the learning and growth perspective. Based on the Traffic Light System, there are 8 KPIs with green achievements, 4 KPIs with yellow achievements, and 10 KPIs with red achievements. From the results of performance measurement using the designed KPI, a single score of 0.713 was obtained. The score obtained is a score that is already quite high but still needs to be improved.

Suggestions in this study are intended both for companies and researchers who will conduct similar research. The authors suggest that PT A needs to do business modelling to make it easier for every organization or company to describe the whole business sequentially. A business process modelling technique models four business process perspectives: functional, behavioural, organizational, and informational. The selected modelling technique can be adapted for the modelling purpose. It needs to be considered to update in the strategy review on the previous year's achievements for improvement in the following year. A review of the previous year's results will be a good input and improvement if a scientific, empirical, and comprehensive study is carried out. Future research needs to be developed for other divisions to provide more profound input to the management of PT A.

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