

DESIGNING THE SUPPLY CHAIN SCORECARD AS A PERFORMANCE MEASUREMENT OF SUPPLY CHAIN DEPARTMENT (CASE STUDY: PT RST INDONESIA)

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Abstract

Globalization and digitalization are forcing industries to adapt new and efficient manufacturing practices because it raises challenges to all manufacture company. Competing strictly with competitors in the global market requires company to focus on improving operational function with effective supply chain management by reducing costs, sustaining customer-supplier relationship and increase profit and market share. Assessing the success of the company can be done with measuring one important management practice which is supply chain management, because it is an important management practice to determine company's success. This paper focus on designing the supply chain scorecard as a performance measurement for department level of Supply Chain Department at RST Company that measure and evaluate business operation from four following perspective: financial, operation, customer and strategic. This scorecard provides guidance for supply chain department in evaluation and measuring SCM in a balanced way and propose framework of performance management to map and analyze supply chain process. By translating the company's vision, mission, and strategy through the Supply Chain Scorecard approach, this study produces three strategic objectives on the strategic perspective, eight strategic objectives on operational perspective, three strategic objectives on the customer perspective and two strategic objectives on the financial perspective. In total, there are 48 KPI produced that consists of 28 leading indicators and 20 lagging indicators which are identified for the four perspectives of Supply Chain Scorecard. Operation perspective is the perspective with the highest priority level (0.485), the strategic perspective (0,284), the financial perspective (0,165) and the last is the customer perspective (0,066).

Keywords: Performance Measurement, Supply Chain Scorecard, Strategy Map, Key Performance Indicator & Analytical Network Process.

1. Background and Business Issue

Performance management has become a more important issue these days due to high intense competition in the global industry. It can be used to determine a company's success. Improving operational issue such as supply chain management in the company will directly influence company performance. The purpose of this study is to design, measure and evaluates day-to-day business operations of Supply Chain Department in automotive manufacture company from following four perspectives (finance, customer, operation, and strategic) through setting priorities of its strategic objectives and KPIs on the strategic maps thought the Analytical Hierarchy Process (AHP).

2. Research Methodology

In order to measure performance in Supply Chain Department, this research starts with mapping the company vision, mission and strategy to the four perspective of scorecard, formulating strategic objectives, creating strategic maps, determining key performance indicators that consist of lagging indicators and leading indicators, calculating priority weight using Analytical Hierarchy Process (AHP). Before calculating priority weight using AHP, the questionnaire distributed to all staff in Supply Chain Department. The items were measured on a 5-point (1-5) Likert scale and the validity of questionnaire result were checked using SPSS (Sig. < 0.05).

3. Analysis and Discussion

The paper starts with mapping the company vision, mission and strategy to the four perspective of scorecard (strategic, operational, customer and financial). This process will help the company in understanding the current condition of the company.

Table 1: Mapping of Company Vision, Mission and Strategy

Perspective - Company Vision	
Strategic	Building a strong business foundation and brand awareness in Indonesia
Operational	Building a good company
Customer	Maximize customer's satisfaction
Financial	-
Perspective - Company Mission	
Strategic	Respect individual's right (initiative, equality and trust)
Operational	The pleasure of making product
Customer	The pleasure of selling product
Financial	The pleasure of making profit
Perspective - Company Strategy	
Strategic	Building an awareness regarding a corporate culture
	Managed the required technical training correctly
	Improve training matrix
	Optimize personnel in line with the company's work program
	Complete business processes and ensure that the KPIs are placed correctly
Operational	Implementation of continuous improvement in the workplace
	Effectiveness of scheduling technique
	Maintaining stock availability
	Provide the best quality for all of our products
	Using the most advanced technology to produce the car
	Ensure the effectivity and efficiency machine capacity within the company
	Establish a better integration and communication within department

Customer	Building a good relationship with suppliers
	Provide fast responds to a customer enquiry with integrated information
	Provide better post transaction customer service
	Make the products available to meet the individual demand of our customers
Financial	Gain higher profit
	Reduce operational cost

Strategic objectives for each Supply Chain Scorecard perspective is translated based on the company's strategy that is adjusted to the Supply Chain Department function. The result is overall obtaining 16 strategic objectives in the Supply Chain Scorecard perspective.

Table 2: Formulate Strategic Objectives

STRATEGIC - Company Strategy	Objectives
Building an awareness regarding a corporate culture	Global Spirit
Managed the required technical training correctly	Training
Improve training matrix	
Optimize personnel in line with the company's work program	Clear KPI
Complete business processes and ensure that the KPIs are placed correctly	
OPERATIONAL - Company Strategy	Objectives
Implementation of continuous improvement in the workplace	Kaizen
Effectiveness of scheduling technique	Scheduling System
Maintaining stock availability	Stock Availability
Provide the best quality for all of our products	Best Quality
Using the most advanced technology to produce the product	Advance Technology
Ensure the effectivity and efficiency machine capacity within the company	Machine Capacity
Establish a better integration and communication within department	Better Integration & Communication
Building a good relationship with suppliers	Good Relationship With Suppliers
CUSTOMER - Company Strategy	Objectives
Provide fast responds to a customer enquiry with integrated information	The Customer Query Time
Provide better post transaction customer service	Post Transaction
Make the products available to meet the individual demand of our customers	Product Availability
FINANCIAL - Company Strategy	Objectives
Gain higher profit	Profit
Reduce operational cost	Operational Cost

Before coming to the final result, below is the supply chain strategy maps from arranging the company's strategic objectives.

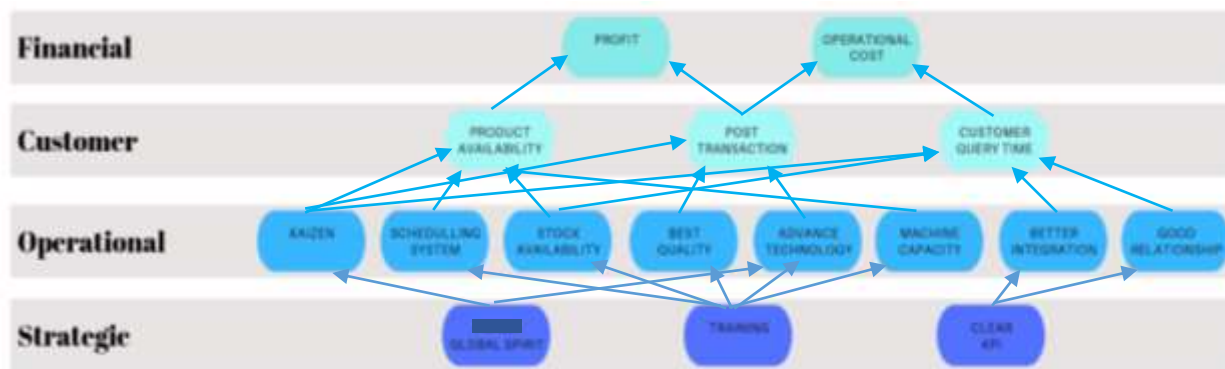


Figure 1: Four Perspective of Scorecard

KPI is translated to bring the company's vision and mission to reality based on the chosen strategies. The success measurements achieving the strategic objectives need to be determined with outcome measure (lagging indicator) and performance driver measure (leading indicator).

Table 3: Key Performance Indicator of Four Perspective

STRATEGIC	Key Performance Indicator	
Strategic Objective	Leading Indicator	Lagging Indicator
Global Spirit	Employee engagement survey about company culture	Employee engagement and satisfaction scores for company
Training	Number of training program days held per year	Training cost per employee
	% of employees involved in training	
Clear KPI	Employee engagement survey about job description	Absenteeism
	Evaluation of employee performance achievement per time period	The amount of positive feedback from employee
	Average time to achieve goals	
OPERATIONAL	Key Performance Indicator	
Strategic Objective	Leading Indicator	Lagging Indicator
Kaizen	Participate in Kaizen event	Number of improvement themes every month
Scheduling System	Product development cycle time	On-time delivery
	Purchase order cycle time	
	Frequency of delivery	
	Issue schedule weekly to supplier	
Stock Availability	Accuracy of forecasting techniques	Number of stopline in production line
	Stock opname to supplier to make sure material availability	Number of deadstock part
Best Quality	Quality of delivered good from supplier	Rejection rate of product

Advance Technology	Order entry system	Number of error in ordering system
Machine Capacity	Capacity utilization	Number of production output
Better Integration & Communication	Control and guarantee suitability of part for regular order and exceptional purchase order (EPO) to related department	Number of order accepted
	Monitor delivery for each supplier	
Good Relationship With Suppliers	Distribute partlist to supplier	Supplier delivery performance
	Issue trouble report if there is a problem	
	Distribute supplier monthly meeting invitation	
	Responsiveness to urgent delivery	
CUSTOMER	Key Performance Indicator	
Strategic Objective	Leading Indicator	Lagging Indicator
The Customer Query Time	Customer engagement survey	Customer satisfaction score
Post Transaction	The accuracy of solution for customer after complaints	Number of customer callbacks
Product Availability	Check product availability	Number of part residue
FINANCIAL	Key Performance Indicator	
Strategic Objective	Leading Indicator	Lagging Indicator
Profit	Increase the number of on-time delivery	Total logistics cost
	Develop milk run project to reduce the operational cost	
Operational Cost	Minimize deadstock part	Total scrap finished good cost per month
	Minimize buffer stock to reduce inventory cost	Total inventory cost per month

Determining the priority is done using a closed questionnaire. Respondents are asked to weigh the criteria and sub criteria of the company's performance measurement based on the outline of Supply Chain Scorecard by filling in the pairwise comparisons questionnaire. PT RST have 15 staffs in Supply Chain Department (Procurement Division). Data were collected by distributed questionnaire to all staff in Supply Chain Department in PT RST Indonesia. Questionnaire and data validation calculation will be shown in **Appendix 1 and 2**.

Table 4: Result of Criteria Weighting Questionnaire (Four-Perspective)

Criteria Element	Strategic	Operational	Customer	Financial
Strategic	1.0000	0.3333	3.0000	7.0000
Operational	3.0000	1.0000	5.0000	5.0000
Customer	0.3333	0.2000	1.0000	0.1429
Financial	0.1429	0.2000	7.0000	1.0000
Total	4.4762	1.7333	16.0000	13.1429

					Weights	Priority
Strategic	0.223	0.192	0.188	0.533	0.284	2
Operational	0.670	0.577	0.313	0.380	0.485	1
Customer	0.074	0.115	0.063	0.011	0.066	4
Financial	0.032	0.115	0.438	0.076	0.165	3
checksum	1.000	1.000	1.000	1.000	1.000	

Strategic initiatives in the **strategic perspective** consist of global spirit (G1), training (G2), and clear KPI (G3). The results of the weighting questionnaire are as follows:

Table 5: Result of Strategic Criteria Weighting Questionnaire

	G1	G2	G3					Weights	Priority
G1	1.000	3.000	5.000	G1	0.652	0.333	0.806	0.597	1
G2	0.333	1.000	0.200	G2	0.217	0.111	0.032	0.120	3
G3	0.200	5.000	1.000	G3	0.130	0.556	0.161	0.282	2
sum	1.533	4.333	9.003	checksum	1.000	1.000	1.000	1.000	

A Leading indicator in the strategic perspective consist of employee engagement survey about company culture (LE1), number of training program days held per year (LE2), percentage of employee involved by training (LE3), employee engagement survey about job description (LE4) and evaluation of employee performance achievement per time period (LE5). The results of the weighting questionnaire for leading indicator are as follows:

Table 6: Result of Strategic Criteria Weighting Questionnaire (Leading Indicator)

	LE1	LE2	LE3	LE4	LE5	
LE1	1.0000	3.0000	3.0000	3.0000	0.3333	
LE2	0.3333	1.0000	5.0000	0.3333	5.0000	
LE3	0.3333	0.2000	1.0000	0.3333	0.3333	
LE4	0.3333	3.0000	3.0000	1.0000	0.3333	
LE5	3.0000	0.2000	3.0000	3.0000	1.0000	
Total	5.0000	7.4000	15.0000	7.6667	7.0000	

						Weights
LE1	0.200	0.405	0.200	0.391	0.048	0.249
LE2	0.067	0.135	0.333	0.043	0.714	0.259
LE3	0.067	0.027	0.067	0.043	0.048	0.050
LE4	0.067	0.405	0.200	0.130	0.048	0.170
LE5	0.600	0.027	0.200	0.391	0.143	0.272
checksum	1.000	1.000	1.000	1.000	1.000	1.000

Lagging indicator in the operational perspective consist of the number of employee engagement and satisfaction scores for company (LA1), training cost per employee (LA2), absenteeism (LA3), the amount of positive feedback from employee (LA4) and average time to achieve goal (LA5). The results of the weighting questionnaire for lagging indicator are as follows:

Table 7: Result of Strategic Criteria Weighting Questionnaire (Lagging Indicator)

	LA1	LA2	LA3	LA4	LA5
LA1	1.0000	1.0000	5.0000	7.0000	3.0000
LA2	1.0000	1.0000	5.0000	0.3333	5.0000
LA3	0.2000	0.2000	1.0000	0.3333	0.3333
LA4	0.1429	3.0000	3.0000	1.0000	0.3333
LA5	0.3333	0.2000	3.0000	3.0000	1.0000
Total	2.6762	5.4000	17.0000	11.6667	9.6667

						<u>Weights</u>
LA1	0.374	0.185	0.294	0.600	0.310	0.353
LA2	0.374	0.185	0.294	0.029	0.517	0.280
LA3	0.075	0.037	0.059	0.029	0.034	0.047
LA4	0.053	0.556	0.176	0.086	0.034	0.181
LA5	0.125	0.037	0.176	0.257	0.103	0.140
checksum	1.000	1.000	1.000	1.000	1.000	1.000

Strategic initiatives in the **operational perspective** consist of kaizen (G1), scheduling system (G2), stock availability (G3), best quality (G4), advance technology (G5), machine capacity (G6), better integration and communication (G7) and good relationship with supplier (G8). The results of the weighting questionnaire are as follows:

Table 8: Result of Operational Criteria Weighting Questionnaire

	LA1	LA2	LA3	LA4	LA5
LA1	1.0000	1.0000	5.0000	7.0000	3.0000
LA2	1.0000	1.0000	5.0000	0.3333	5.0000
LA3	0.2000	0.2000	1.0000	0.3333	0.3333
LA4	0.1429	3.0000	3.0000	1.0000	0.3333
LA5	0.3333	0.2000	3.0000	3.0000	1.0000
Total	2.6762	5.4000	17.0000	11.6667	9.6667

Weights

LA1	0.374	0.185	0.294	0.600	0.310	0.353
LA2	0.374	0.185	0.294	0.029	0.517	0.280
LA3	0.075	0.037	0.059	0.029	0.034	0.047
LA4	0.053	0.556	0.176	0.086	0.034	0.181
LA5	0.125	0.037	0.176	0.257	0.103	0.140
checksum	1.000	1.000	1.000	1.000	1.000	1.000

	G1	G2	G3	G4	G5	G6	G7	G8
G1	1.000	0.333	0.200	0.200	0.333	3.000	5.000	5.000
G2	3.000	1.000	9.000	5.000	3.000	9.000	7.000	5.000
G3	5.000	0.111	1.000	5.000	7.000	9.000	1.000	3.000
G4	5.000	0.200	0.200	1.000	7.000	5.000	1.000	1.000
G5	3.000	0.333	0.143	0.143	1.000	3.000	1.000	1.000
G6	0.333	0.111	0.111	0.200	0.333	1.000	1.000	1.000
G7	0.200	0.143	1.000	1.000	1.000	1.000	1.000	7.000
G8	0.200	0.200	0.333	1.000	1.000	1.000	0.143	1.000
sum	17.733	2.432	11.987	13.543	20.667	32.000	17.143	24.000

									Weight	Rank
G1	0.056	0.137	0.017	0.015	0.016	0.094	0.292	0.208	0.104	4
G2	0.169	0.411	0.751	0.369	0.145	0.281	0.408	0.208	0.343	1
G3	0.282	0.046	0.083	0.369	0.339	0.281	0.058	0.125	0.198	2
G4	0.282	0.082	0.017	0.074	0.339	0.156	0.058	0.042	0.131	3
G5	0.169	0.137	0.012	0.011	0.048	0.094	0.058	0.042	0.071	6
G6	0.019	0.046	0.009	0.015	0.016	0.031	0.058	0.042	0.029	8
G7	0.011	0.059	0.083	0.074	0.048	0.031	0.058	0.292	0.082	5
G8	0.011	0.082	0.028	0.074	0.048	0.031	0.008	0.042	0.041	7
checksum	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	

Leading indicator in the operational perspective consist of the participate in Kaizen event (LE1), product development cycle time (LE2), purchase order cycle time (LE3), frequency of delivery

(LE4), issue schedule weekly to supplier (LE5), accuracy of forecasting techniques (LE6), stock opname to supplier to make sure material availability (LE7), quality of delivered good from supplier (LE8), order entry system (LE9), capacity utilization (LE10), control and guarantee suitability of part for regular order and exceptional purchase order to related department (LE11), monitor delivery for each supplier (LE12), distribute partlist to supplier (LE13), issue trouble report if there is a problem (LE14), distribute supplier monthly meeting invitation (LE15) and responsiveness to urgent delivery (LE16). The results of the weighting questionnaire for leading indicator are as follows:

Table 9: Result of Operational Criteria Weighting Questionnaire (Leading Indicator)

	LE 1	LE 2	LE 3	LE 4	LE 5	LE 6	LE 7	LE 8	LE 9	LE1 0	LE1 1	LE1 2	LE1 3	LE1 4	LE1 5	LE1 6
LE1	1.0	0.3	0.3	3.0	1.0	0.3	1.0	3.0	0.3	0.3	3.0	1.0	1.0	1.0	1.0	0.3
LE2	3.0	1.0	0.1	0.3	1.0	0.3	1.0	0.3	1.0	0.2	1.0	0.3	1.0	1.0	1.0	1.0
LE3	3.0	7.0	1.0	0.2	0.3	0.1	0.3	0.3	0.2	0.3	1.0	0.3	1.0	1.0	1.0	0.2
LE4	0.3	3.0	5.0	1.0	7.0	5.0	1.0	5.0	5.0	3.0	3.0	5.0	3.0	3.0	1.0	5.0
LE5	1.0	1.0	3.0	0.1	1.0	0.3	1.0	0.3	7.0	3.0	3.0	0.3	0.3	3.0	1.0	3.0
LE6	3.0	3.0	7.0	0.2	3.0	1.0	3.0	1.0	5.0	3.0	1.0	3.0	1.0	1.0	1.0	3.0
LE7	1.0	1.0	3.0	1.0	1.0	0.3	1.0	0.3	5.0	0.3	0.3	1.0	1.0	1.0	1.0	1.0
LE8	0.3	3.0	3.0	0.2	3.0	1.0	3.0	1.0	1.0	3.0	7.0	0.3	1.0	1.0	1.0	3.0
LE9	3.0	1.0	5.0	0.2	0.1	0.2	0.2	1.0	1.0	5.0	1.0	3.0	3.0	1.0	1.0	1.0
LE1 0	3.0	5.0	3.0	0.3	0.3	0.3	3.0	0.3	0.2	1.0	1.0	1.0	1.0	1.0	1.0	1.0
LE1 1	0.3	1.0	1.0	0.3	0.3	1.0	3.0	0.1	1.0	1.0	1.0	5.0	0.3	1.0	1.0	3.0
LE1 2	1.0	3.0	3.0	0.2	3.0	0.3	1.0	3.0	0.3	1.0	0.2	1.0	3.0	3.0	3.0	0.2
LE1 3	1.0	1.0	1.0	0.3	3.0	1.0	1.0	1.0	0.3	1.0	3.0	0.3	1.0	1.0	1.0	1.0
LE1 4	1.0	1.0	1.0	0.3	0.3	1.0	1.0	1.0	1.0	1.0	1.0	0.3	1.0	1.0	1.0	1.0
LE1 5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.3	1.0	1.0	1.0	1.0
LE1 6	3.0	1.0	5.0	0.2	0.3	0.3	1.0	0.3	1.0	1.0	0.3	5.0	1.0	1.0	1.0	1.0
sum	26.0	33.3	42.5	9.0	25.8	13.7	22.5	19.1	30.4	25.2	27.9	27.3	20.7	22.0	18.0	25.7

Weights

LE1	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.062
LE2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.037
LE3	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.041
LE4	0.0	0.1	0.1	0.1	0.3	0.4	0.0	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.149
LE5	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0	0.0	0.1	0.1	0.1	0.067
LE6	0.1	0.1	0.2	0.0	0.1	0.1	0.1	0.1	0.2	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.091
LE7	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.049
LE8	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	0.1	0.3	0.0	0.0	0.0	0.1	0.1	0.078
LE9	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.1	0.1	0.0	0.1	0.0	0.064
LE10	0.1	0.2	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.054
LE11	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.1	0.053
LE12	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.0	0.070
LE13	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.048
LE14	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.039
LE15	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.045
LE16	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.053
checksum	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.000

Lagging indicator in the operational perspective consist of the number of improvement themes every month (LA1), on time delivery (LA2), number of stopline in production line (LA3), number of deadstock part (LA4), rejection rate of product (LA5), number of error in ordering system (LA6), number of production output (LA7), number of order accepted (LA8) and supplier delivery performance (LA9). The results of the weighting questionnaire for lagging indicator are as follows:

Table 10: Result of Operational Criteria Weighting Questionnaire (Lagging Indicator)

	LA1	LA2	LA3	LA4	LA5	LA6	LA7	LA8	LA9
LA1	1.0	0.3	0.3	3.0	1.0	0.3	1.0	3.0	0.3
LA2	3.0	1.0	0.1	0.3	1.0	0.3	1.0	0.3	1.0
LA3	3.0	7.0	1.0	0.2	0.3	0.1	0.3	0.3	0.2
LA4	0.3	3.0	5.0	1.0	7.0	5.0	1.0	5.0	5.0
LA5	1.0	1.0	3.0	0.1	1.0	0.3	1.0	0.3	7.0
LA6	3.0	3.0	7.0	0.2	3.0	1.0	3.0	1.0	5.0
LA7	1.0	1.0	3.0	1.0	1.0	0.3	1.0	0.3	5.0
LA8	0.3	3.0	3.0	0.2	3.0	1.0	3.0	1.0	1.0
LA9	3.0	1.0	5.0	0.2	0.1	0.2	0.2	1.0	1.0
sum	15.7	20.3	27.5	6.3	17.5	8.7	11.5	12.3	25.5

										<u>Weights</u>
LA1	0.1	0.0	0.0	0.5	0.1	0.0	0.1	0.2	0.0	0.112
LA2	0.2	0.0	0.0	0.1	0.1	0.0	0.1	0.0	0.0	0.061
LA3	0.2	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.078
LA4	0.0	0.1	0.2	0.2	0.4	0.6	0.1	0.4	0.2	0.242
LA5	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.3	0.081
LA6	0.2	0.1	0.3	0.0	0.2	0.1	0.3	0.1	0.2	0.161
LA7	0.1	0.0	0.1	0.2	0.1	0.0	0.1	0.0	0.2	0.087
LA8	0.0	0.1	0.1	0.0	0.2	0.1	0.3	0.1	0.0	0.109
LA9	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.069
checksum	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.000

Strategic initiatives in the **customer perspective** consists of the customer query time (G1), post transaction (G2) and product availability (G3). The results of the weighting questionnaire are as follows:

Table 11: Result of Customer Criteria Weighting Questionnaire

	<u>G1</u>	<u>G2</u>	<u>G3</u>					<u>Weights</u>	<u>Priority</u>
G1	1.000	5.000	0.200	G1	0.161	0.556	0.130	0.282	2
G2	0.200	1.000	0.333	G2	0.032	0.111	0.217	0.120	3
G3	5.000	3.000	1.000	G3	0.806	0.333	0.652	0.597	1
sum	6.200	9.000	1.533	checksum	1.000	1.000	1.000	1.000	

A Leading indicator in the customer perspective consist of the customer engagement survey (LE1), the accuracy of solution for customer after complaints (LE2) and check product availability (LE3). The results of the weighting questionnaire for leading indicator are as follows:

Table 12: Result of Customer Criteria Weighting Questionnaire (Leading Indicator)

	<u>LE1</u>	<u>LE2</u>	<u>LE3</u>					<u>Weights</u>
LE1	1.000	5.000	5.000	LE1	0.714	0.556	0.789	0.686
LE2	0.200	1.000	0.333	LE2	0.143	0.111	0.053	0.102
LE3	0.200	3.000	1.000	LE3	0.143	0.333	0.158	0.211
sum	1.400	9.000	6.333	checksum	1.000	1.000	1.000	1.000

A Lagging indicator in the customer perspective consist of the customer satisfaction score (LA1), number of customer callbacks (LA2) and number of part residue (LA3). The results of the weighting questionnaire for lagging indicator are as follows:

Table 13: Result of Customer Criteria Weighting Questionnaire (Lagging Indicator)

	LA1	LA2	LA3					<u>Weights</u>
LA1	1.000	7.000	3.000	LA1	0.677	0.778	0.600	0.685
LA2	0.143	1.000	1.000	LA2	0.097	0.111	0.200	0.136
LA3	0.333	1.000	1.000	LA3	0.226	0.111	0.200	0.179
sum	1.476	9.000	5.000	checksum	1.000	1.000	1.000	1.000

Strategic initiatives in the **financial perspective** consist of profit (G1) and operational cost (G2). The results of the weighting questionnaire are as follows:

Table 14: Result of Financial Criteria Weighting Questionnaire

	G1	G2				<u>Weights</u>	<u>Priority</u>
G1	1.000	5.000	G1	0.833	0.833	0.833	1
G2	0.200	1.000	G2	0.167	0.167	0.167	2
sum	1.200	6.000	checksum	1.000	1.000	1.000	

A Leading indicator in the financial perspective consist of increase the number of on-time delivery (LE1), develop milk run project to reduce the operational cost (LE2), minimize deadstock part (LE3) and minimize buffer stock to reduce inventory cost (LE4). The results of the weighting questionnaire for leading indicator are as follows:

Table 15: Result of Financial Criteria Weighting Questionnaire (Leading Indicator)

	LE1	LE2	LE3	LE4	
LE1	1.0000	0.3333	3.0000	7.0000	
LE2	3.0000	1.0000	5.0000	5.0000	
LE3	0.3333	0.2000	1.0000	0.1429	
LE4	0.1429	0.2000	7.0000	1.0000	
Total	4.4762	1.7333	16.0000	13.1429	

	<u>Weights</u>				
LE1	0.223	0.192	0.188	0.533	0.284
LE2	0.670	0.577	0.313	0.380	0.485
LE3	0.074	0.115	0.063	0.011	0.066
LE4	0.032	0.115	0.438	0.076	0.165
checksum	1.000	1.000	1.000	1.000	1.000

A Lagging indicator in the financial perspective consist of total logistics cost (LA1), total scrap finished good cost per month (LA2) and total inventory cost per month (LA3). The results of the weighting questionnaire for lagging indicator are as follows:

Table 16: Result of Financial Criteria Weighting Questionnaire (Lagging Indicator)

	LA1	LA2	LA3		Weights			
LA1	1.000	7.000	3.000	LA1	0.677	0.778	0.600	0.685
LA2	0.143	1.000	1.000	LA2	0.097	0.111	0.200	0.136
LA3	0.333	1.000	1.000	LA3	0.226	0.111	0.200	0.179
sum	1.476	9.000	5.000	checksum	1.000	1.000	1.000	1.000

4. Result

Below is the result of priority weight for each perspective, strategic objective and KPI from this study:

Perspective (Weight)	Strategic Objectives	Weight	Leading Indicator	Weight	Lagging Indicator	Weight	
Strategic (0.284)	Global Spirit	0.597	Employee engagement survey about company culture	0.249	Employee engagement and satisfaction scores for company	0.353	
	Training	0.12	Number of training program days held per year	0.259	Training cost per employee	0.28	
			% of employees involved in training	0.05			
	Clear KPI	0.282	Employee engagement survey about job description	0.17	Absenteeism	0.047	
			Evaluation of employee performance achievement per time period	0.272	The amount of positive feedback from employee	0.181	
Operation (0.485)	Kaizen	0.104	Participate in Kaizen event	0.062	Number of improvement themes every month	0.112	
	Scheduling System	0.343	Product development cycle time	0.037	On-time delivery	0.061	
			Purchase order cycle time	0.041			
			Frequency of delivery	0.149			
			Issue schedule weekly to supplier	0.067			
	Stock Availability	0.198	Accuracy of forecasting techniques	0.091	Number of stopline in production line	0.078	
			Stock opname to supplier to make sure material availability	0.049	Number of deadstock part	0.242	
	Best Quality	0.131	Quality of delivered good from supplier	0.078	Rejection rate of product	0.081	
	Advance Technology	0.071	Order entry system	0.064	Number of error in ordering system	0.161	
	Machine Capacity	0.029	Capacity utilization	0.054	Number of production output	0.087	
	Better Integration & Communication	0.082	Control and guarantee suitability of part for regular order and exceptional purchase order (EPO) to related department	0.053	Number of order accepted	0.109	
			Monitor delivery for each supplier	0.07			
	Good Relationship With Suppliers	0.041	Distribute partlist to supplier	0.048	Supplier delivery performance	0.069	
			Issue trouble report if there is a problem	0.039			
			Distribute supplier monthly meeting invitation	0.045			
			Responsiveness to urgent delivery	0.053			
	Customer (0.066)	The Customer Query Time	0.282	Customer engagement survey	0.686	Customer satisfaction score	0.685
		Post Transaction	0.12	The accuracy of solution for customer after complaints	0.102	Number of customer callbacks	0.136
Product Availability		0.597	Check product availability	0.211	Number of part residue	0.179	
Financial (0.165)	Profit	0.833	Increase the number of on-time delivery	0.284	Total logistics cost	0.685	
			Develop milk run project to reduce the operational cost	0.485			
	Operational Cost	0.167	Minimize deadstock part	0.066	Total scrap finished good cost per month	0.136	
			Minimize buffer stock to reduce inventory cost	0.615	Total inventory cost per month	0.179	

Figure 2: Results of Priority Weight for Each Perspective, Strategic Objective and KPI

5. Conclusion

In accordance with the purpose of this study, the conclusions that are drawn based on the results of this study are 48 KPI produced that consists of 28 leading indicators and 20 lagging indicators which are identified for the four perspectives of Supply Chain Scorecard. Operation perspective is the perspective with the highest priority level (0.485), the strategic perspective (0.284), the financial perspective (0.165), and the final is the customer perspective (0.066). Operation perspective is to integrate the kaizen, scheduling system, stock availability, best quality, advance technology, machine capacity, better integration and communication and good relationship with supplier. Operation perspective contain many indicators that lead the company to execute business process to support function of the Supply Chain Department in order to be a successful company.

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Appendixes

Appendix 1. Questionnaire Performance Management in Supply Chain Department

Questionnaire to Measure Performance in Supply Chain Department

Name	:	NRK	:
Dept	:	Gender	:
Category	:	Age	:
Position	:	Length of work	:



1) Give us your opinion about the following sector. Please write "V" in the box under the best answer that describe your opinion. (1 - Strongly Disagree, 2 - Disagree, 3 - Neutral, 4 - Agree, 5 - Strongly Agree)

Questionnaire for Four-Perspective	1	2	3	4	5
Employee engagement about company culture					
Number of training program days held per year					
Employee involvement in training from company					
Employee engagement about job description					
Evaluation of employee performance achievement per time period					
Participation in Kaizen event					
Product development cycle time					
Purchase order cycle time					
Frequency of delivery					
Issue schedule weekly to supplier					
Accuracy of forecasting techniques					
Stock opname to supplier to make sure material availability					
Quality of delivered good from supplier					
Order entry system					
Capacity utilization					
Control and guarantee suitability of part to related department					
Monitor delivery for each supplier					
Distribute partlist to supplier					
Issue trouble report if there is a problem					
Distribute supplier monthly meeting invitation					
Responsiveness to urgent delivery					
Customer engagement					
The accuracy of solution for customer after complaints					
Check product availability					
Increase the number of on-time delivery					
Develop milk run project to reduce the operational cost					
Minimize deadstock part					
Minimize buffer stock to reduce inventory cost					

Appendix 2. Result of Validity for Strategic, Customer and Financial Objectives

Correlations

		Strategic	Strategic	Strategic	Strategic	Total Strategic
Strategic	Pearson Correlation	1	.532*	.056	.074	.667**
	Sig. (2-tailed)		.041	.842	.792	.007
	N	15	15	15	15	15
Strategic	Pearson Correlation	.532*	1	-.182	.161	.510
	Sig. (2-tailed)	.041		.515	.566	.052
	N	15	15	15	15	15
Strategic	Pearson Correlation	.056	-.182	1	.139	.529*
	Sig. (2-tailed)	.842	.515		.622	.042
	N	15	15	15	15	15
Strategic	Pearson Correlation	.074	.161	.139	1	.621*
	Sig. (2-tailed)	.792	.566	.622		.013
	N	15	15	15	15	15
Total Strategic	Pearson Correlation	.667**	.510	.529*	.621*	1
	Sig. (2-tailed)	.007	.052	.042	.013	
	N	15	15	15	15	15

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		Customer	Customer	Customer	Total Customer
Customer	Pearson Correlation	1	.829**	.364	.894**
	Sig. (2-tailed)		.000	.183	.000
	N	15	15	15	15
Customer	Pearson Correlation	.829**	1	.302	.861**
	Sig. (2-tailed)	.000		.275	.000
	N	15	15	15	15
Customer	Pearson Correlation	.364	.302	1	.692**
	Sig. (2-tailed)	.183	.275		.004
	N	15	15	15	15
Total Customer	Pearson Correlation	.894**	.861**	.692**	1
	Sig. (2-tailed)	.000	.000	.004	
	N	15	15	15	15

**. Correlation is significant at the 0.01 level (2-tailed).

Correlations

		Financi al	Financia l	Financia l	Financia l	Total Financial
Financial	Pearson Correlation	1	.829**	.364	.364	.789**
	Sig. (2-tailed)		.000	.183	.183	.000
	N	15	15	15	15	15
Financial	Pearson Correlation	.829**	1	.302	.302	.744**
	Sig. (2-tailed)	.000		.275	.275	.001
	N	15	15	15	15	15
Financial	Pearson Correlation	.364	.302	1	1.000**	.839**
	Sig. (2-tailed)	.183	.275		.000	.000
	N	15	15	15	15	15
Financial	Pearson Correlation	.364	.302	1.000**	1	.839**
	Sig. (2-tailed)	.183	.275	.000		.000
	N	15	15	15	15	15
Total Financial	Pearson Correlation	.789**	.744**	.839**	.839**	1
	Sig. (2-tailed)	.000	.001	.000	.000	
	N	15	15	15	15	15

** . Correlation is significant at the 0.01 level (2-tailed).

