Evaluation of Supplier Performance Effectiveness Measurement using the SCOR (Supply Chain Operations Reference) and ANP (Analytic Network Process) Method Approach

(Case Study: Supply of Silica Powder to PT. Freeport Indonesia - Java Integrated and Industrial Port Estate (JIIPE), Gresik)

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Received: 2024-08-05 Received in revised from 2024-08-05 Accepted: 2024-09-30

Abstract

Companies must be able to provide quality products at relatively efficient prices and distribute them quickly to survive and excel in competition. Companies need to collaborate with various parties to innovate and create competitive advantages. Suppliers are essential actors as providers of resources that companies need precisely, quickly, and efficiently, so good supply chain management is required. Companies must be able to assess supplier performance appropriately because this is the key to the success of successful SCM. The object of this research was carried out at the company PT. Freeport Indonesia. This company experienced several problems related to the instability of the supply of silica powder as a reducing agent for copper ore, such as non-fulfilment of order quantities, delays, price changes and so on. This research aims to identify appropriate criteria related to supplier performance using the SCOR (Supply Chain Operations Reference) and ANP methods in the companies studied. From the results of this research, the best supplier criteria will be obtained based on quantitatively weighted classifications.

Keywords: *Analytic; Network; Performance; Relationship; Supplier*

1. Introduction

Indonesia is only able to produce 276,200 metric tons of copper smelting products. Indonesia is a country that makes a lot of copper minerals compared to other countries. However, Indonesia is still in a lower position for the smelting process compared to other countries [1]. Indonesia is ranked below China, the United States and India. India defeated Indonesia. Even though this country does not produce much copper mineral production, it can make more smelting products than Indonesia, so this needs to be improved by the Indonesian government [2].

On January 12 2014, President Susilo Bambang Yudhoyono stipulated the enactment of Government Regulation Number 1 of 2014 concerning prohibiting raw mining exports as a form of realization of Law No. 4 of 2009 concerning Mineral and Coal Mining. Thus, mining companies must establish mineral processing plants known as smelters to support this goal [3]. One of Indonesia's largest copper mining sites is in Irian Jaya, which PT manages. Freeport Indonesia and one of the copper ore processing sites is in the Gresik area under the company PT Indonesian Smelting. The location in Gresik was chosen for several reasons, including ease of transportation related to cost savings. Gresik is an industrial area with various facilities that can reduce waste from copper ore refineries [4-5].

PT. Smelting Indonesia in processing copper ore certainly requires suppliers ranging from raw materials, machines and equipment, additional materials, etc. Still, the research discussed is related to the supply of silica as the primary material put into the furnace to lower the boiling point of the liquid: copper and gold. Mitigating supply chain risks and evaluating supplier selection is vital in the continuity of production at PT. Freeport Indonesia. Suppose a risk in the supply chain occurs, such as late delivery of raw materials. In that case, the business sector will also be disrupted, which will affect the company

in fulfilling customer requests, and the company may experience losses. PT Indonesian Smelting as a company operating in the copper ore refining smelter sector, Freeport Indonesia must compete with similar companies. Problems that occur at PT. Freeport Indonesia is a mismatch in supplier performance as a partner that has been targeted with its realization. This discrepancy is related to order fulfilment that could be more optimal in terms of quality and quantity due to the lack of implementation of structured risk management to identify and mitigate risks that occur, especially in the supply chain function, one of which is delays in order delivery [6-7]. Therefore, selecting a supplier that is less than optimal will cause delays in the required raw materials, so the project schedule that was initially planned will be delayed [8].

A measurement is needed to determine the performance of a company's supply chain using the Supply Chain Operations Reference (SCOR) method [9]. SCOR generally provides a business process framework, work indicators, and supporting collaboration between partners to increase management effectiveness and improve the company's supply chain [10]. To overcome existing problems, researchers only focus on existing issues using SCOR 11.0, where creating a performance measurement system based on SCM aims to control and evaluate performance continuously to create a competitive advantage [11].

Risk management and optimal supplier selection are the right solutions to prevent copper ore refining project delays [12]. Identifying risks that occur or have the potential to happen in the supply chain and the selection of appropriate criteria, sub-criteria, and alternative suppliers for selecting suppliers will significantly influence the continuity of production so that it can run optimally [13]. Based on the conditions described, this research was conducted to learn more about how supply chain risks are managed and supplier selection, especially in the copper ore refining project currently being carried out by PT Indonesian Smelting.

2. Method

2.1 Research Methods

The data collection and processing process begins with explaining the stages of data collection, namely collecting secondary data in the form of performance indicators for supply chain relationship management in the industry and strengthening the methodology. Meanwhile, at the primary data collection stage, data is collected through interviews and distributing questionnaires regarding key performance indicators for supply chain relationship management in the manufacturing industry, which will be tested on respondents. Secondary data collection produces several general performance criteria for supply chain relationships in various sectors. After adjustments were made to the research area, the manufacturing industry in the mining products sector, the supply chain relationship performance indicators tested were fewer. In its implementation, additional recommendation indicators were obtained from interviews with respondents and experts (expert judgment).

2.2 *Problem Identification*

In the form of identifying problems that occur in general, to get a relevant problem to be addressed object of research. This step is carried out by looking for relevant issues in the industry that require further study, both classic and actual problems. Ultimately, this research took the trouble of evaluating the performance of the silica powder supply chain between PT. Freeport Indonesia and its suppliers are the issues that will be discussed.

2.3 Literature review

Problems found in the object of observation can be reviewed in two ways: literature review using literature studies and field studies.

2.4 Data Collection

In the form of searching for data that will be used as input for data processing. The types of data used in this research are primary and secondary data, where primary data is obtained through direct field observations, interviews and requests to complete questionnaires with related and competent parties such as logistics manager, operational manager, purchasing manager, procurement and so on.

Meanwhile, secondary data is in the form of pre-existing data as a preference and usually takes the form of documentation such as data on machine components, time of failure, component prices, processing time per unit, machine operator costs and operator costs for repairs from PT Freeport Indonesia in the period September 2023 – November 2023.

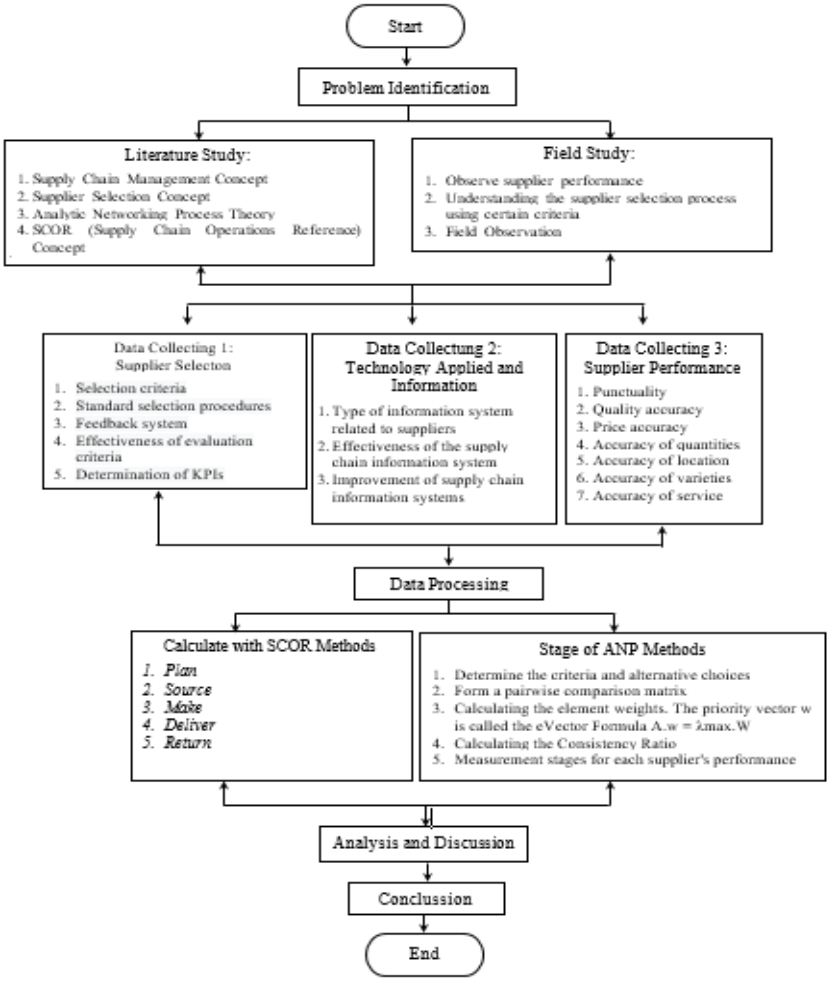


Figure 1. Flowchart of Research Methodologywd

2.5 Data processing

The initial step in data processing is for the researcher to carry out an analysis of each supplier. Then, the suppliers are grouped using clustering analysis. The dominant variables that describe the group are also identified. From the results of data processing and supplier grouping, the SCOR concept identifies the development of assessment criteria for each supplier group. At this stage, researchers carry out three types of data processing and calculations with several aspects of data processing and measurement, the first of which is supplier selection, among other selection criteria, standard selection procedures, feedback system, the effectiveness of negotiations and manufacturing standard contracts. Meanwhile, the second stage of data processing is related to the application of technology and information about SCM, which includes types of information systems, effectiveness of information systems and improvements to supply chain information systems. Meanwhile, the third stage of data processing is measurement related to supplier performance, which includes timeliness, quality accuracy, price accuracy, quantity accuracy, location accuracy, variety accuracy, service accuracy and SCOR criteria consisting of Plan, Source, Make, Deliver and Return.

2.6 Research Analysis Techniques

This research uses model construction from the ANP method. The research model construction process consists of determining criteria, sub-criteria, and alternatives and formulating performance measurements. The analysis technique used in data processing in this research is the ANP method. After collecting data from respondents, data in the form of assessments between criteria must be processed for analysis. Data processing from the assessment results uses software that can accommodate decision-making models, including ANP. In this research, the software used is Super Decision.

3. Results and Discussion

3.1 Selection of Performance Indicators

The selection of performance indicators was produced after conducting interviews and giving questionnaires to several key informants to plan performance indicators that were previously unknown to the company. Meanwhile, the questionnaire is used to select performance indicators to determine which indicators still need to be known about the company's performance. In Table 1, it is explained that there are 22 performance indicators and 16 performance indicators selected by the company. The following are 16 indicators chosen by the company, and their formulation includes:

Table 1 Performance Indicators

Process	Performance Indicators	Formulation	Unit
PLAN (Planning Process)	*Forecast accuracy*	$100 - \left(\frac{\text{Permintaan aktual} - \text{Peramalan permintaan}}{\text{Permintaan aktual}} \text{x} 100\%\right)$	%
	Raw materials Plan accuracy	$100 - \left(\frac{\text{Kebutuhan aktual} - \text{Peramalan kebutuhan}}{\text{kebutuhan aktual}} \text{x} 100\%\right)$	%
	Planning cycle time	Planning time	Day
SOURCE (Procurement Process)	*Percentage suppliers with EMS*	$\frac{\text{Jumlah pemasok yang memiliki EMS}}{\text{Total pemasok}} \text{x } 100\%$	%
	Timely Delivery by Supplier	$\frac{\text{Jumlah frekuensi pengiriman tepat waktu}}{\text{Total frekuensi pengiriman}} \text{x } 100\%$	%
	Delivery Item Accuracy for Supplier	$100 - \left(\frac{\text{Jumlah unit dipesan} - \text{Jumlah unit diterima}}{\text{Jumlah unit dipesan}} \text{x} 100\%\right)$	%
	Inventory Accuracy of Raw Materials	$100 - \left(\frac{\text{Jumlah unit di gudang} - \text{Jumlah unit tercatat}}{\text{Jumlah unit di gudang}} \text{x} 100\%\right)$	%
MAKE (Production Process)	*Adherence to the Production Schedule*	$\frac{\text{Fulfilment line schedule}}{\text{Total Line}} \text{x } 100\%$	%
	Product Defect from Production	$\frac{\text{Jumlah produk cacat}}{\text{Total produksi}} \text{x } 100\%$	%
	Number of Trouble Machines	Number of cases of machine failure	Case
	Material Efficiency (Yield)	$100 - \left(\frac{\text{Scrap}}{\text{Total produksi}} \text{x} 100\%\right)$	%
DELIVER (Delivery Process)	*Delivery Item Accuracy by The Company*	$\frac{\text{Jumlah frekuensi pengiriman tepat item}}{\text{Total frekuensi pengiriman}} \text{x } 100\%$	%
	Delivery Quantity Accuracy by The Company	$100 - \left(\frac{\text{Jumlah unit dikirim} - \text{Jumlah unit diterima}}{\text{Jumlah unit dikirim}} \text{x} 100\%\right)$	%
	Order Delivered Faultless by The Company	$100 - \left(\frac{\text{Jumlah unit cacat}}{\text{Jumlah unit dikirim}} \text{x} 100\%\right)$	%
RETURN (Return from Customer)	*Return rate from customers*	$\frac{\text{Jumlah produk dikembalikan}}{\text{Total produk dikirim}} \text{x } 100\%$	%
	Percentage of Solid Waste Recycling	$\frac{\text{Jumlah limbah padat yang dapat didaur ulang}}{\text{Total limbah padat}} \text{x } 100\%$	%

3.2 Validation of Performance Indicators

1. PLAN (Planning Process)
   a. *Forecast Accuracy*

   Forecast accuracy is the accuracy of forecasting sales demand.

Table 2 Forecast Accuracy

Month	Demand Forecasting	Actual Demand	Difference	Results
June 2023	1,275 tons	1,177 tonnes	-98 tons	108.3%
July 2023	1150 tons	1008 tons	-142 tons	114.1%
August 2023	925 tons	750 tons	-175 tons	123.3%
September 2023	560 tons	640 tons	80 tons	87.5%
October 2023	675 tons	785 tons	110 tons	86%
November 2023	800 tons	878 tons	78 tons	91.1%

As a result of the calculation above, the forecast accuracy value in June 2023 is 103.3%, with the company forecasting demand for silica raw materials for the refinery process in that month at 1275 tonnes and actual demand for refinery process requirements at 1177 tonnes, so at In June 2023 there is an excess supply of silica of 98 tons for the Aurum refinery process, and this is by the natural conditions that the price of gold on the world market in June, July and August 2023 is still relatively high so that the Aurum production and refinery process is also starting to fall. However, in September, October and November of 2023, when gold prices begin to stabilize and world demand for gold increases, demand for silica as the primary material for the refinery process increases, and suppliers cannot meet the need for silica raw materials according to PT Indonesian Smelters.

b. *Raw Material Planning Accuracy*
Raw Material Planning Accuracy is the accuracy percentage in predicting the need for silica raw materials.

Table 3 Raw Material Planning Accuracy

Month	Forecasting the Need for Main Raw Materials	Actual Main Raw Material Needs	Difference	Results
June 2023	14.200 ton	15.700 ton	1.500 ton	90.5%
July 2023	15.000 ton	16.750 ton	1.750 ton	89.6%
August 2023	13.750 ton	14.850 ton	1.100 ton	92.6%
September 2023	9.000 ton	11.325 ton	2.325 ton	79.5%
October 2023	10.200 ton	11.780 ton	1.580 ton	86.6%
November 2023	11.500 ton	14.375 ton	2.875 ton	80%

As a result of the calculation above, the raw material planning accuracy value in June 2023 is 90.4%. The company predicted the need for the main raw material, silica, to be 14,200 tons and the actual need for silica to be 15,700 tons, so in June, there is a difference of 1500 tons.

2. SOURCE (Proses Pengadaan)
   a. *Percentage Supplier with Environmental Management System*
   The percentage of suppliers with an environmental management system is the percentage of supplier selection that has an environmental management system.

Table 5. List of PT. Partner Suppliers. Indonesian Smelters

No.	Supplier Name	OPAL	B3	EMAS	IPU	PROPER	EMS
1.	PT. Delta Puro Indonesia	√	√	√	√	√	√
2.	PT Alter Abadi Tbk	√	√	√	√	√	√
3.	PT. Jara Silika	√	√	√	√	√	√
4.	PT. Sibara Bestari	√	√	√	√	√	√
5.	PT. Tochu Silica	√	√	√	√	√	√

All suppliers from PT. Indonesian Smelters have various requirements related to environmental management systems, including IPAL (Waste Water Treatment Plant), B3 Processing (Processing of Hazardous and Toxic Materials), EMAS (Echo Management and

Audit Scheme), IPU (Air Pollution Control Installation), PROPER and EMS (Environment Management System).

b. *Timely Delivery Performance by Supplier*

*Timely delivery performance by supplier*s is when suppliers send raw materials according to the specified time.

Table 6. Timely Delivery Performance by Supplier

Month	Raw Material Delivery	Timely Delivery of Raw Materials	Difference	Percentage
June 2023	Four times	Four times	0 times	100%
July 2023	Four times	Four times	0 times	100%
August 2023	Four times	Two times	Two times	50 %
September 2023	Two times	One time	One time	50 %
October 2023	Three times	Two times	One time	67 %
November 2023	Three times	One time	Two times	33 %

The calculation above's results can be explained by the fact that in November 2020, raw materials were delivered four times, and there were no delays, so the performance value was 100%, the same as in December 2020 and January 2021. However, in February-April 2021, there were delays in the delivery process.

c. *Delivery Item Accuracy by Supplier*

Delivery Item Accuracy by Supplier is the performance of accurate delivery of raw materials for the correct items by the supplier within the specified time.

Table 8. *Delivery Item Accuracy by Supplier*

Month	Raw Material Delivery	Delivery of Raw Materials on the Right Items	Difference	Percentage
June 2023	Four times	Four times	0 times	100%
July 2023	Four times	Four times	0 times	100%
August 2023	Four times	Four times	0 times	100%
September 2023	Two times	Two times	0 times	100%
October 2023	Three times	Three times	0 times	100%
November 2023	Three times	Three times	0 times	100%

The results of the calculations above show that in June 2023 - November 2023, the value of delivery item accuracy by the supplier was 100%, which shows that during these 6 months, the supplier sent the right raw material items according to the silica raw materials ordered by the company.

d. *Delivery Quantity Accuracy by Supplier*

Delivery quantity accuracy by the supplier is a percentage of supplier accuracy in the quantity of silica raw materials sent. This data is contained in Table 4.7 as follows:

Table 9. *Delivery Quantity Accuracy by Supplier*

Month	Raw Materials Ordered	Raw Materials Accepted	Difference	Percentage
June 2023	14.200 ton	14.200 ton	0 kg	100 %
July 2023	15.000 ton	15.000 ton	0 kg	100 %
August 2023	13.750 ton	13.750 ton	0 kg	100 %
September 2023	9.000 ton	9.000 ton	0 kg	100 %
October 2023	10.000 ton	10.200 ton	0 kg	100 %
November 2023	11.500 ton	11.500 ton	0 kg	100 %

3. *MAKE (Production Process)*

a. *Adherence to the Production Schedule*

Adherence to the production schedule is the accuracy of the production process schedule by production planning.

Table 11. ***Adherence to the Production Schedule***

Month	Production	On-Time Production	Difference	Percentage
June 2023	25 times	20 times	Five times	80 %
July 2023	27 times	21 times	Six times	78 %
August 2023	24 times	17 times	Seven times	71 %
September 2023	13 times	Nine times	Four times	69 %
October 2023	19 times	14 times	Five times	74 %
November 2023	23 times	20 times	Three times	87

b. *Product Defect From Production*
Product defects from production are defective products resulting from the production process.

Table 12. ***Product Defect From Production***

Month	Production result	Inappropriate Results	Percentage
June 2023	1.275 ton	1,5 ton	0,11 %
July 2023	1.150 ton	1 ton	0,08 %
August 2023	925 ton	1 ton	0,1 %
September 2023	560 ton	0 ton	0 %
October 2023	675 ton	0.5 ton	0,07 %
November 2023	800 ton	1 ton	0,12 %

The result of the calculation above is that in June 2023, the value of product defects from production was 0.11% because that month in the production process, products from the refinery were still impure or dirty, the same as in July 2023, August 2023, October, and November 2023.

4. *DELIVER (Delivery Process)*
Delivery Item Accuracy by The Company
The company's delivery item accuracy is the percentage of accuracy of delivery items for refinery products produced by PT Smelting Indonesia in accordance with PT Freeport Indonesia's requests.

Table 13. ***Delivery Item Accuracy by The Company***

Month	Product Delivery	Delivery of the Right Product Item	Percentage
June 2023	20 times	20 times	100 %
July 2023	24 times	24 times	100 %
August 2023	19 times	19 times	100 %
September 2023	Ten times	Ten times	100 %
October 2023	13 times	13 times	100 %
November 2023	23 times	23 times	100 %

In June 2023 PT. Smelting Indonesia sent refined products 20 times and precisely delivered the refined product items according to PT's request. Freeport Indonesia 20 times, this shows that PT. Smelting Indonesia sends products to PT. Freeport Indonesia, according to the product items that have been ordered.

5. *RETURN (Customer Return Process)*
Return Rate From Customer
The return rate from customers is the percentage of return for PT refinery craft products. Freeport Indonesia to PT. Indonesian Smelting.

Table 14. ***Return Rate from Customer***

Month	Number of Products shipped	Number of Products Returned	Percentage
June 2023	1.168 ton	0 ton	0 %
July 2023	1.008 ton	0 ton	0 %
August 2023	750 ton	0 ton	0 %
September 2023	640 ton	0 ton	0 %
October 2023	785 ton	0 ton	0 %
November 2023	883 ton	0 ton	0 %

Table 14 explains that in June 2023, PT. Smelting Indonesia sent 1168 tons of refined products, with the total quantity of refined products returned by PT. Freeport Indonesia as much as 0 tons. This shows that no refinery products were sent to PT. Freeport Indonesia is out of specification.

3.3 Selection of Criteria and Sub-Criteria using the ANP Method

1. *Determination of Criteria and Sub-criteria*

The criteria and sub-criteria considered in selecting a vendor/supplier are determined by discussions with PT Smelting Indonesia and PT Freeport Indonesia through an open questionnaire.

Table 15. Determination of Criteria and Sub-Criteria

No.	Determination of Criteria and Sub-Criteria before FGD			Determination of Criteria and Sub-Criteria after FGD		
	Criteria	Index	Sub Criteria	Criteria	Index	Sub Criteria
1.	PLANS	P1.1	Demand forecasting	PLANS	P1.1	*Forecast accuracy*
		P2.1	Goods procurement plan		P2.1	*Raw materials Plan accuracy*
		P3.1	Scheduling of sorting, processing and finishing processes		P3.1	*Planning cycle time*
2.	SOURCE	S1.1	Carrying out goods procurement transactions	SOURCE	S1.1	*Percentage suppliers with EMS*
		S1.2	Goods receipt		S1.2	*Timely Delivery by Supplier*
		S1.3	Storage of goods from suppliers		S1.3	*Delivery Item Accuracy for Supplier*
		S1.4	Storage of sorted products		S1.4	*Inventory Accuracy of Raw Materials*
		S2.1	Storage of finishing products			
3.	MAKES	M1.1	*Sorting* product	MAKES	M1.1	*Adherence to the Production Schedule*
		M1.2	*Processing*product		M1.2	*Product Defect from Production*
		M1.3	*Quality control assessment*		M1.3	*Number of Trouble Machines*
		M2.1	*Finishing*		M2.1	*Material Efficiency (Yield)*
4.	DELIVER Y	D2.1	Goods sales transactions	DELIVERY	D2.1	*Delivery Item Accuracy by The Company*
		D2.2	Ensure legality and permits.		D2.2	*Delivery Quantity Accuracy by The Company*
		D2.3	Delivery of goods		D2.3	*Order Delivered Faultless by The Company*
		D2.4	Ensure products are received as agreed.			
5.	RETURN	R1.1	Accept returns when goods do not match the agreement	RETURN	R1.1	*Return rate from customers*
		R1.2	Returning goods to suppliers when they do not meet specifications			
		R1.2	Serve potential customers optimally.			
		R2.1	Providing maximum exclusive treatment to customers		R1.2	*Percentage of Solid Waste Recycling*
		R2.2	Provide exclusive treatment to suppliers.			
		R2.3	Provide exclusive treatment to distributors.			

2. *Relationship between Organizational Strategy and Business Process Mapping Results Based on SCOR*

Model In order to obtain key indicators that effectively represent the company's performance, it requires not only a description of the business process but also aspects related to what the company wants to achieve, as well as the company's focus and positioning in competing in the market, which can be reflected in the organization's strategy.

3. Ranking Criteria

Table 16. Local Criteria Weighted Ranking

Criteria	Local Weight	Ranking
DELIVERY	0.1738472	1
SOURCE	0.1693613	2
MAKE	0.1069284	3
RETURN	0.0988179	4
PLANS	0.0857299	5

The local weight of the DELIVERY (D) criterion is in first place with a value of 0.1738472 or 17.38%, which means that this criterion is considered the most important in selecting criteria. It is followed by the SOURCE (S) criterion of 0.1693613 or 16. 94%, MAKE (M) of 0.1069284 or 10.69%, RETURN (R) of 0.0988179 or 9.88%, and in last place PLAN (P) of 0.0857299 or 8.57%.

Organizational Strategy			**Business Process Mapping**			
No.	**Strategy**		**No,**	**Index**	**Process**	**SCORE MODEL**
1.	Providing products with quality above the market average in general		1.	P1.1	*Forecast accuracy*	PLANS
				P2.1	*Raw materials Plan accuracy*	
				P3.1	*Planning cycle time*	
2.	Ensure products are available when customers request them according to the requested product quality level classification.		2.	S1.1	*Percentage suppliers with EMS*	SOURCE
				S1.2	*Timely Delivery by Supplier*	
				S1. 3	*Delivery Item Accuracy for Supplier*	
				S1.4	*Inventory Accuracy of Raw Materials*	
3.	Provide quality assurance by the agreement until the customer receives the product.		3.	M1.1	*Adherence to the Production Schedule*	MAKES
				M1.2	*Product Defect from Production*	
				M1.3	*Number of Trouble Machines*	
				M2.1	*Material Efficiency (Yield)*	
4.	Providing qualified before-sales service facilities to prospective customers as well as maximum after-sales service based on the customer's priority level towards the company		4.	D2.1	*Delivery Item Accuracy by The Company*	DELIVERY
				D2.2	*Delivery Quantity Accuracy by The Company*	
				D2.3	*Order Delivered Faultless by The Company*	
5.	Providing exclusive treatment to business partners intensively to improve the performance of business partners towards the company		5.	R1.1	*Return rate from customers*	RETURN
				R1.2	*Percentage of Solid Waste Recycling*	

Figure 2. Relationship between Organizational Strategy and SCOR Model Business Process Mapping Results

4. Sub Criteria Ranking

Table 4.33 Global Weight Ranking of Sub-Criteria

Criteria	Local Weight	Ranking
Delivery Item Accuracy for Supplier(S1.3)	0.089321	1
Product Defect from Production(M1.2)	0.087391	2
Material Efficiency (Yield)(M2.1)	0.087364	3
Order Delivered Faultless by The Company(D3.3)	0.086342	4
Forecast accuracy(P1.1)	0.086141	5
Planning cycle time(P3.1)	0.074972	6
Return rate from customers(R1.1)	0.073549	7
Percentage suppliers with EMS(S1.1)	0.069371	8
Raw materials Plan accuracy(P2.1)	0.068925	9
Delivery Quantity Accuracy by The Company(D2.2)	0.065341	10
Number of Trouble Machines(M1.3)	0.063527	11
Adherence to Production Schedule(M1.1)	0.062853	12
Inventory Accuracy of Raw Materials(S1.4)	0.050403	13
Delivery Item Accuracy by The Company(D1.1)	0.049373	14

Timely Delivery by Supplier(S1.2)	0.047920	15
Percentage of Solid Waste Recycling(R1.2)	0.056380	16

The data processing results show that the highest priority criterion is DELIVERY (D) while the sub-criteria is Delivery Item Accuracy for Supplier (S1.3) as the top one. This indicates that there is a connection between criteria and sub-criteria that are in one cluster. The criteria and sub-criteria here influence each other in determining the available choices. Apart from that, in calculating priority criteria, the SOURCE (S) criterion is in the second highest position, while in sub-criteria calculations, the Product Defect from Production (M1.2) and Material Efficiency (Yield) (M2.1) sub-criteria get the highest scores. Therefore, when selecting a supplier, PT. Smelting Indonesia needs to give priority attention to the DELIVERY (D) and SOURCE (S) criteria as well as the Delivery Item Accuracy for Supplier (S1.3) and Product Defect from Production (M1.2) and Material Efficiency *(Yield)* (M2.1).

4. Conclusion

In general, using the SCOR method approach to assess supplier performance with these 16 indicators, the average is excellent, but several performance indicators still need to be improved, namely raw material planning accuracy is still 90.4%, adherence to production schedule is still 80%, product defects from production 0.11% and material efficiency (yield) 96.62%

Using the ANP approach, the criteria and sub-criteria here influence each other in determining the available choices. The highest priority criteria calculation is DELIVERY (D), and the SOURCE (S) criterion is in the second highest position, while in sub-criteria calculations, the sub-criteria Product Defect from Production (M1.2) and Material Efficiency (Yield) (M2.1) get the highest value. Therefore, when selecting a supplier, PT. Smelting Indonesia needs to give priority attention to the DELIVERY (D) and SOURCE (S) criteria as well as the Delivery Item Accuracy for Supplier (S1.3) and Product Defect from Production (M1.2) and Material Efficiency (Yield) (M2).

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