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The Performance Measurement of Mobiya Material's Supply Chain to Support Special Projects for the UNHCR

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Abstract

The objective of this research is to ascertain the configuration of the supply chain flow and evaluate the performance of the supply chain material at for Mobiya Project at PT SCH, a company operating in the electrical industry. Mobiya is a solar lamp designed specifically for social business in collaboration with UNHCR. The employed methods used in this research is using the Supply Chain Operations Reference (SCOR) and the Analytical Hierarchy Process (AHP). The supply chain flow at PT SCH encompasses three primary distribution networks, namely inbound, internal, and outbound. The Supply Chain Operations Reference (SCOR) model implemented at PT SCH has three tiers, including five core processes (plan, sourcing, making, delivering, and returning), three performance attributes (reliability, responsiveness, and flexibility), and a total of 19 performance indicators that have been designed to align with the specific requirements of the organization. Upon performance measurements, a score of 75.70 out of 100.00 was obtained, categorizing it as "good."

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Introduction

The intensification of business competition necessitates ongoing efforts by companies to enhance their competitiveness in order to fulfill client satisfaction. The prioritization of consumer happiness is crucial for companies due to the fact that consumers place significant emphasis on the dimensions of timeliness, cost, and product quality. Supply chain management (SCM) is a significant concern that has the potential to enhance a company's competitive edge when executed in a cohesive and cooperative manner. There are several variables that may be used to ensure the efficient functioning of a company's supply chain, with one prominent aspect being the cultivation of strong supplier relationships. This can facilitate the execution of the strategy to ensure the product is delivered in optimal quantities, to appropriate locations, within specified timeframes, while maintaining high quality standards, and minimizing costs, so generating a competitive advantage.

PT SCH is a multinational corporation operating in the field of energy and situated in Batam City, Riau Islands Province. This company is responsible for the implementation of Supply Chain Management (SCM) practices. PT SCH has multiple ongoing projects to assist its commercial operations. One example is the Mobiya project, which provides assistance to a specific initiative led by the United Nations High Commissioner for Refugees (UNHCR). Mobiya is a solar-powered lighting solution that has been specifically tailored for use within the context of social enterprises. This lamp offers an inexhaustible and cost-free source of electrical energy for the purposes of illumination and smartphone battery recharging. The present endeavor is being conducted in partnership with the United Nations High Commissioner for Refugees (UNHCR). The commencement of this project is scheduled for July 2020, with its termination set for July 2022, marking the conclusion of its End-of-Life phase. The product offered by Mobiya comprises a total of 29 distinct materials that are essential for the production of the final goods.

PT SCH is a corporate entity that actively collaborates with both domestic and foreign suppliers. Based on the available corporate data, PT SCH has established supplier relationships with a diverse range of nations, such as Singapore, China, the Philippines, Thailand, India, Japan, Italy, France, Indonesia, and others. PT SCH operates a multifaceted supply chain that involves various stakeholders, encompassing both domestic and foreign entities. The material supply chain flow plays a crucial role in achieving the project requirements of Mobiya products, as it ensures the consistent availability of materials to fulfill project needs. The efficient management of the supply chain is crucial for ensuring optimal performance of the production system. In the event of supply chain issues within the organization, consequential disruptions may arise within the manufacturing system, subsequently leading to delays in the timely delivery of items to end consumers. The management of the material supply chain is inherently interconnected with the integrated management processes that facilitate order fulfillment in response to client demand.

Based on the delivery data pertaining to Mobiya items in July 2021, it is evident that a number of delivery statuses have experienced delays, while others have adhered to the scheduled timeframe, as indicated by the disparity between the CRD (Customer Requested Delivery) and Deliver Date dates. Conversely, certain accomplishments fail to align with the objectives of the current project. Based on the observed discrepancies in meeting these predetermined objectives, it is imperative for the organization to assess and evaluate the efficacy of its supply chain management practices. The research employed the Supply Chain Operations Reference (SCOR) and Analytical Hierarchy Process (AHP) methodologies. This study aims to analyze the configuration of the supply chain flow and assess the material performance within the context of the Mobiya project, which is designed to provide support for the UNHCR special project at PT SCH. The objective is to ensure that materials are procured and delivered in a timely manner, in the appropriate quantities, and with the desired level of quality, in accordance with the project's requirements and production schedule. In order to establish a proficient performance management framework, it is important to implement a comprehensive measurement system that can assess the overall performance of the supply chain (Pujawan, 2017).

The Supply Chain Operations Reference (SCOR) model was established in 1996 by the Supply Chain Council with the objective of assisting enterprises in comprehending, organizing, and assessing the performance of their supply chains. The utilization of the SCOR technique is anticipated to enable organizations to optimize their supply chain management, resulting in enhanced industrial efficiency and the attainment of a competitive edge.

Furthermore, in addition to employing the Supply Chain Operations Reference (SCOR) model, the AHP (Analytic Hierarchy Process) method was also utilized. The objective of this approach is to assign significance to each metric in order to determine the relative importance of performance metrics. By analyzing the mapping of supply chain material performance at PT SCH, a complex multi-factor problem hierarchy is established, enabling the identification of priority performance decisions. Hence, this research used the Supply Chain Operations Reference (SCOR) model and Analytic Hierarchy Process (AHP) to evaluate the performance of the supply chain material for the Mobiya project. The study is titled "Performance Measurement of Supply Chain Material Mobiya to Support Special Project for the United Nations High Commissioner for Refugees (UNHCR)."

Theoretical Review

Supply Chain Management

The concept of Supply Chain Management (SCM), was initially introduced by Oliver and Weber in 1982. The supply chain can be understood as a tangible interconnected system comprising many entities, such as enterprises, engaged in the procurement of raw materials, manufacturing of goods, and distribution to final consumers. On the other hand, supply chain management (SCM) is a strategic framework, technique, or methodology employed to effectively administer and optimize the operations within this network. Supply Chain Management (SCM) refers to the comprehensive integration of various activities inside an organization that are involved in the preparation and delivery of items to end users. The process encompasses several key components, namely planning, sourcing of input materials from suppliers, the conversion of raw materials into finished goods, transportation, distribution, warehousing, information systems, payment for goods, consumption by consumers, and a final stage involving product return services such as recycling, returning damaged goods, or replacing them with new ones.

SC Performance Measurement

Performance can be defined as the attainment of a quantitative value that reflects the quantity and quality of labor generated by individuals, groups, or organizations (Ramanujam, 1986). The measurement of supply chain performance holds significant importance in assessing the state of business operations, including identifying areas for enhancement and determining the necessary adjustments to enhance the efficiency of supply chain performance. Supply chain performance measurement refers to the implementation of a performance measurement system that aids in monitoring the advancements made in supply chain management. This system serves as a metric for evaluating the success achieved in maintaining the competitive advantage of the organization.

Supply Chain Operations Reference

The Supply Chain Operations Reference (SCOR) is a widely recognized framework used in the field of supply chain management. It provides a comprehensive and standardized set of metrics, processes, and best practices that organizations can use

The Supply Chain Operations Reference (SCOR) framework serves as a methodology to assess and enhance the overall performance of a company's supply chain, while also facilitating effective communication among the various stakeholders involved. The Supply Chain Operations Reference (SCOR) model was created by the Supply Chain Council (SCC) with the purpose of serving as a standardized framework for evaluating supply chain performance across various industries. The Supply Chain Operations Reference (SCOR) model is utilized to assess supply chain performance in an objective manner and to identify areas that require improvement. The Supply Chain Operations Reference (SCOR) model encompasses three distinct levels of hierarchy or process, ranging from the broader scope to the more specific.

Snorm De Boer Normalization Process

Normalization is done to equalize the measurement scale of each metric. Each indicator has a different weight with a different measurement scale. The following formula is Snorm De Boer (Trienekens and Hvolby, 2000).

Larger is better:

$$\text{Snorm} = \frac{\text{Si}-\text{Smin}}{\text{Smax}-\text{Smin}} \text{ x } 100\%$$

Lower is better:

$$\text{Snorm} = \frac{\text{Smin}-\text{Si}}{\text{Smax}-\text{Smin}} \text{ x } 100\%$$

where: Si, Smin, and Smax are the actual indicator values that have been achieved, the minimum and maximum value.

Analytical Hierarchy Process

The Analytical Hierarchy Process (AHP) is a decision support methodology that was conceptualized by Thomas L. Saaty. The Analytic Hierarchy Process (AHP) seeks to ascertain the relative weights or levels of significance attributed to the indicators, dimensions, and processes at each level within the measurement meter. The Analytic Hierarchy Process (AHP) possesses the benefit of facilitating the integration of both objective and subjective components within a given problem. Weighting is utilized in order to ascertain the relative level of priority or significance assigned to each performance indicator.

Literature Review

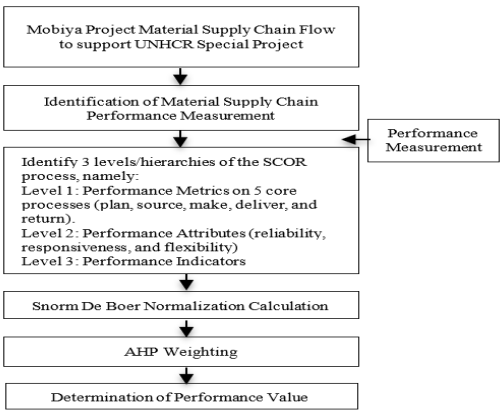

Figure 1: Research Framework
Source: Processed Data (2022)

The research undertaken by Yusrianafi (2021), Hasibuan (2018), and Prasetya (2017) exhibits commonalities in the utilization of analytical tools, specifically the SCOR and AHP methodologies. According to the study conducted by Mutaqin (2021), it was found that in addition to SCOR and AHP, the Traffic Light Theory also serves as an extra analytical tool. According to the study conducted by Setiawan (2020), it was found that in addition to the commonly used analytical tools such as SCOR and AHP, another tool called OMAX was also utilized. The study conducted by Prasetyaningsih (2019) revealed variations in the analytical methodologies employed, including the utilization of SCOR 12.0, the Kaizen Principle, and the PDCA Cycle. According to the study conducted by Bukhori (2016), it was found that in addition to SCOR and AHP, Cause Effect Diagrams are also considered as valuable analytical tools. Furthermore, this study distinguishes itself from previous studies through variations in the research subject, supply chain performance metrics, analytical methodologies employed, and the specific aspects examined, such as the nature of supply chain flow, the categorization of variables/attributes utilized, the process of material procurement, and the type of material investigated. This study lacks a hypothesis as it pertains to descriptive research, which seeks to elucidate rather than provide a specific theory. The subsequent section presents the structure of this study.

Research Method

This research is mixed methods research that uses a research approach that combines quantitative (descriptive analysis of numbers) and qualitative (thematic analysis of text or descriptions) to obtain more comprehensive, valid, reliable, and objective data.

Data Types and Sources

The following are primary data and secondary data from this study.

a. Primary data is research data obtained directly by observing and interviewing the company under study. Observations are made by observing the supply chain flow and other matters related to the company's supply chain. Interviews were conducted by

administering a questionnaire contain-ing several written statements that reflect the measurements of each SCOR level.

b. Secondary data is research data obtained indirectly from books, journals, and theses to obtain information related to theories related to research problems.

Techniques for Determining the Number of Informants

The study included a total of four informants who were chosen based on their direct participation in the procurement of project material supply chain activities. This selection ensured that the information gathered was pertinent. The informants consisted of the Project Leader, Downstream Flow Supervisor, Order Management representative, and Buyer.

Informant Withdrawal Technique

The present study did not employ a sample, but rather employed specific criteria to select informants/resources for interviews and questionnaires. These criteria included individuals who are experts within the company, possess detailed knowledge of the project material supply chain activities, and hold job positions that are directly related to key performance indicators.

Discussion & Results

Supply Chain Flow

The subsequent passage delineates the flow of the material supply chain at PT SCH, with a particular focus on the UNHCR special project. This study aims to assess performance by utilizing SCOR's main processes, specifically plan, source, make, deliver, and return, within the context of PT SCH. PT SCH is a multinational corporation that specializes in facilitating digital transformation through the integration of diverse internet of things (IoT) technologies, hence bolstering the advancements associated with the fourth industrial revolution.

The planning process encompasses several stages, such as product distribution schedule planning, master production scheduling, and end-to-end digital control. At this juncture, evaluations of supply and demand are conducted.

During the offer process, PT SCH and prospective clients, specifically UNHCR in this example, engage in the management of offers. During the discussion, a consensus was reached to undertake this project for a duration of two years. The corporation obtains significant data from the offer, including the date of receipt and the quantity of product orders.

Following this, a meeting was conducted within the internal PT SCH framework to officially communicate the availability of a fresh prospect to undertake the UNHCR Mobiya initiative. Subsequently, a demand process is initiated, wherein demand forecasting is conducted. During this procedure, a production plan is produced for the merchandise that has been requested by the consumer. The planning process encompasses the identification and procurement of necessary materials for manufacturing, as well as the development of a comprehensive schedule framework.

If the planning process is mature, then it is continued with the sourcing process, namely, the buyer in the Supply Chain Department orders raw materials and supporting materials that have been planned. They must ensure that the receiving schedule arrives on time and the quantity of materials required is appropriate. At this stage, vendor forecasts and collaborative planning with suppliers are carried out.

In the sourcing process, there is an inbound distribution network (which can be seen in Figure 1), which refers to the process of receiving and moving materials purchased from suppliers into the company's warehouse which will become inventory and managing operational needs to convert raw materials. and supports into finished goods. The source process at SCH Group already uses digital procurement, namely an application to automate reordering in real time to maintain a production schedule later, there are 130,000 orders per day, consisting of 350,000 materials, and 24,000 suppliers.

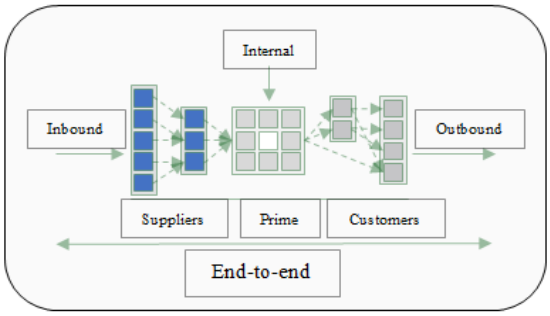

Figure 1: Company Supply Chain Flow

Source: Company Data (2022)

The next stage is the internal stage (which can be seen in Figure 1), which is the main stage (prime) which will carry out the production process (make process) of materials into finished goods, namely Mobiya's final product according to the specifications ordered by the customer. If the product is ready to be produced, then the product is then put into the warehouse and the product is ready to be shipped. The making process has implemented a smart factory with the help of a platform to support the smart factory. The SCH Group consists of 209 plants in 44 countries.

Next, the delivery process occurs in an outbound distribution network (which can be seen in Figure 1), namely the process of moving and sending products to customers which begins with the transfer of products from the company's warehouse to the transit port which will be forwarded to the main port. At this stage, the Shipping Department will arrange the departure date according to the planned schedule. SCH Group's delivery process has implemented a smart distribution center/warehouse using digital delivery to serve customers and has 98 distribution centers around the world. After the product is sent to the customer, if there is a product that is defective or not as desired, the customer can carry out the process of returning/returning the product from the inbound to the internal distribution network to solve the problem or repair it. However, in the supply chain project process, until now there have been no complaints from the customer because the company has fulfilled all customer wishes as previously planned.

Performance Measurement Results

1. Hierarchy and SCOR Identification

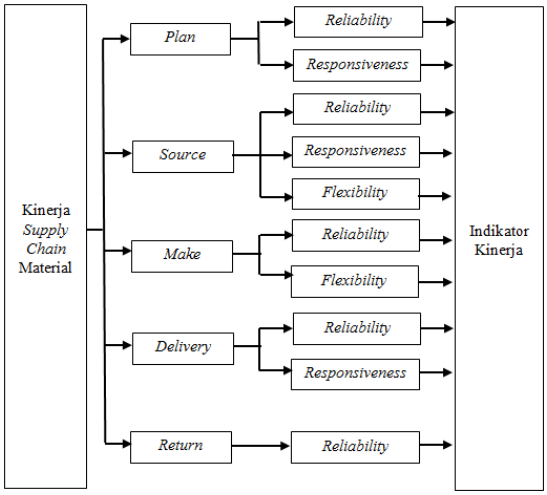

Figure 2: Performance Measurement Hierarchy

Source: Processed Data (2022)

The hierarchy of material supply chain performance measurement at PT SCH can be seen in Figure 2 above.

2. SCOR Verification

Table 1: Performance Indicators

Level 2 (Performance Attributes)	Level 3 (Performance Indicators)	Unit	Source
Reliability	Forecast Accuracy	%	Interview
	Inventory Level	%	Interview
Responsiveness	Planning Cycle Time	Minutes	Hastuti (2020)
Reliability	Perfect Order Fulfillment	%	APICS (2017)
	Supplier Source Fill Rate	%	Interview
Responsiveness	Supplier Delivery Lead Time	Days	Interview
	Supplier Responsiveness to Order Revision	%	Interview
Flexibility	Source Flexibility	Units	Interview
	Minimum Order Quantity	Units	Interview
Reliability	Make Cycle Time	Days	APICS (2017)
	Failure in Process	%	APICS (2017)
Flexibility	Production Item Flexibility	Units	Interview

Level 2 (Performance Attributes)	Level 3 (Performance Indicators)	Unit	Source
	Upside Make Flexibility	%	Interview
Reliability	On-Time Delivery	%	Interview
	Number of Meetings with Customer	Weeks	Interview
	Deliver Quantity Accuracy	%	Prasetyo (2021)
Responsiveness	Manufacturing Lead Time	Days	Interview
	Deliver Cycle Time	Days	Interview
Reliability	Number of Customer Complaints	Units	Hastuti (2020)

Source: Processed Data (2022)

At this stage, the performance indicators are validated by experts and calculated on each performance attributes (see Table 1). Forecast Accuracy (FA) is the percentage deviation of actual demand from forecasted demand. The FA formula used is the Mean Absolute Percentage Error (MAPE) formula, the result is provided in the Table 2 below.

MAPE Formula:

$$\frac{1}{n}\left|\left(\frac{\text{Actual Demand} - \text{Forecast Demand}}{\text{Actual Demand}}\right)\right| \text{x } 100\%$$

Table 2: Forecast Accuracy

No	Period	Forecast Demand (FD)	Actual Demand (AD)	%
1	Jul-21	44000	50694	13%
2	August-21	14000	16896	17%
3	Sep-21	29009	33792	14%
4	Oct-21	24000	29200	18%
5	Nov-21	27456	38016	28%
6	Dec-21	24000	25000	4%
7	Jan-22	23698	25000	5%
8	Feb-22	42000	44352	5%
9	Mar-22	41168	44352	7%
10	April-22	38978	40000	3%
11	May-22	6816	7328	7%
12	Jun-22	6300	4227	49%
	Total			170
	n			12
	MAPE			14

Based on Lewis (1982), MAPE values can be interpreted into four categories, namely: <10% (very accurate), 10-20% (good), 20-50% (fair), and >50% (inaccurate). The smaller the MAPE value, the smaller the forecast error will be, and it applied oppositely.

3. SCOR Normalization

At this stage, normalization of performance calculations is carried out to equalize parameters (see Table 3). Si, Smin, and Smax are the actual indicator values that have been achieved, minimum valeue, and maximum value, respectively.

Table 3: Normalization

Level 2 (Attributes)	Level 3 (Indicators)	Si	Smax	Smin	Snorm
Reliability	Forecast Accuracy	14	3	49	76,09
	Inventory Level	73	82	60	59,09
Responsiveness	Planning Cycle Time	135	30	240	50,00
Reliability	Perfect Order Fulfillment	95	96	90	83,33
	Supplier Source Fill Rate	100	100	0	100,00
Responsiveness	Supplier Delivery Lead Time	162	87	196	31,19
	Supplier Responsiveness to Order Revision	74	77	72	40,00
Flexibility	Source Flexibility	2	2	1	100,00
	Minimum Order Quantity	7	12	1	54,55
Reliability	Make Cycle Time	26,99	13,14	88,67	81,66
	Failure in Process	0,002	0	0,009	77,78
Flexibility	Production Item Flexibility	2	3	1	50,00
	Upside Make Flexibility	50	77	23	50,00
Reliability	On Time Delivery	100	100	0	100,00

Level 2 (Attributes)	Level 3 (Indicators)	Si	Smax	Smin	Snorm
	Number of Meeting with Customer	1	1	0	100,00
	Deliver Quantity Accuracy	100	100	0	100,00
Responsiveness	Manufacturing Lead Time	5,12	9,05	1,01	51,12
	Deliver Cycle Time	25	68	3	33,85
Reliability	Number of Customer Complaint	0	0	71	100,00

Source: Company Data (2022)

4. AHP Weighting

In the Table 4, the AHP weighting has been carried out using Software Expert Choice 11, which is assigned to each SCOR level. W1, W2, and W3 are the weight linked to each level of tiers.

Table 4: Weighting

Level 1 (Core Process)	W1	Level 2 (Performance Attributes)	W2	Level 3 (Performance Indicators)	W3
Plan	0,39	Reliability	0,73	Forecast Accuracy	0,73
				Inventory Level	0,27
		Responsiveness	0,27	Planning Cycle Time	1,00
Source	0,23	Reliability	0,60	Perfect Order Fulfillment	0,14
				Supplier Source Fill Rate	0,86
		Responsiveness	0,27	Supplier Delivery Lead Time	0,26
				Supplier Responsiveness to Order Revision	0,74
		Flexibility	0,13	Source Flexibility	0,87
				Minimum Order Quantity	0,13
Make	0,17	Reliability	0,73	Make Cycle Time	0,25
				Failure in Process	0,75
		Flexibility	0,27	Production Item Flexibility	0,25
Deliver	0,12	Reliability	0,73	On Time Delivery	0,70
				Number of Meeting with Customer	0,07
				Deliver Quantity Accuracy	0,23
		Responsiveness	0,27	Manufacturing Lead Time	0,89
				Deliver Cycle Time	0,11
Return	0,09	Reliability	1,00	Number of Customer Complaints	1,00
				Upside Make Flexibility	0,75

Source: Company Data (2022)

5. Determination of Final Performance Score

After weighting each level, the results of the weights for each level are multiplied to get the final weight. After knowing the final weight, the final weight and the results of snorm (normalization) are multiplied. After the results are known, then all the results of each performance indicator are totaled to determine the final value, which is 75.70 out of 100.00 and is categorized as good.

Table 5: Final Performance Score

Level 1 (Core Process)	Level 2 (Performance Attributes)	Level 3 (Performance Indicators)	Final Weight	Snorm x Final Weight
Plan	Reliability	Forecast Accuracy	0,21	15,81
		Inventory Level	0,08	4,54
	Responsiveness	Planning Cycle Time	0,11	5,27
Source	Reliability	Perfect Order Fulfillment	0,02	1,61
		Supplier Source Fill Rate	0,12	11,87
	Responsiveness	Supplier Delivery Lead Time	0,02	0,50

Level 1 (Core Process)	Level 2 (Performance Attributes)	Level 3 (Performance Indicators)	Final Weight	Snorm x Final Weight
		Supplier Responsiveness to Order Revision	0,05	1,85
	Flexibility	Source Flexibility	0,03	2,59
		Minimum Order Quantity	0,00	0,22
Make	Reliability	Make Cycle Time	0,03	2,53
		Failure in Process	0,09	7,24
	Flexibility	Production Item Flexibility	0,01	0,57
		Upside Make Flexibility	0,03	1,72
Deliver	Reliability	On Time Delivery	0,06	6,13
		Number of Meeting with Customer	0,01	0,61
		Deliver Quantity Accuracy	0,02	2,03
	Responsiveness	Manufacturing Lead Time	0,03	1,47
		Deliver Cycle Time	0,00	0,12
Return	Reliability	Number of Customer Complaints	0,09	9,00

Source: Company Data (2022)

After identifying each SCOR level, five core processes are obtained at level 1 (plan, source, make, deliver, and return), three performance attributes at level 2 (reliability, responsiveness, and flexibility), and 19 performance indicators at level 3 (APICS, 2017). The performance measurement that has been carried out for this project obtained a final score of 75.70 out of 100.00 which is categorized as good, so it can be concluded that the overall performance of the Mobiya project in supporting the UNHCR special project has been running well and satisfactorily in fulfilling expectations from customers.

From this research, the performance indicator that has the lowest value is the Supplier Delivery Lead Time. The indicator is still underperforming, this is because the material delivery made by the supplier is not on time. The buyer should supervise the Purchase Order (PO) that has been made so that the materials that have been made PO arrive according to a predetermined schedule and so that the Mobiya product production process does not stop because the material has not arrived properly.

Six performance indicators have the highest scores, each with a value of 100.00, namely Supplier Source Fill Rate, Source Flexibility, On Time Delivery, Number of Meetings with Customers, Deliver Quantity Accuracy, and Number of Customer Complaints.

1) The Supplier Source Fill Rate performance indicator in this project has performed well, this is because the number of orders ordered is in accordance with the amount of material that arrives.

2) The Source Flexibility performance indicator in this project has performed well, this is because there are substitute suppliers if the main supplier cannot fulfill orders which keeps this project running so there is no vacancy in stock material.

3) The On-Time Delivery performance indicator in this project has performed well, this is because the schedule for delivery of goods is in accordance with the schedule and quantity of the promised product.

4) The performance indicator of the Number of Meetings with Customers in this project has performed well, this is because the relevant parties who hold meetings with customers have held meetings as scheduled with customers to find out what the market wants.

5) The performance indicator of Deliver Quantity Accuracy in this project has performed well, this is because all requests (PO) desired by the customer can be fulfilled by the company (Prasetyo, Emaputra, & Parwati, 2021).

6) The performance indicator of the Number of Customer Complaints in this project has performed well, this is because the product has been delivered on time according to the date of the mother vessel given by the customer. In this case, in the continuity of the

project, there are no complaints from customers (customer complaints) regarding the delivery or return of Mobiya products (Hastuti, Sumartini, & Sultan, 2020).

Conclusion

Based on the results of research measuring the performance of Mobiya's supply chain material in supporting special projects, the following conclusions can be drawn.

1. The supply chain flow at PT SCH consists of inbound, internal, and outbound distribution networks, and consists of five core processes: plan (planning process), source (procurement process), make (production process), deliver (delivery process), and return (return process).
2. From the results of the research that has been done, there are performance indicators that have been validated by the informants. Then, the normalization and weighting process was carried out, namely the performance of PT SCH's material supply chain of 75.70 from 100.00 (which can be seen in Table 5). According to the monitoring table, the total performance has been categorized as good, meaning that in general, the company has had good performance values. These results are supported by research conducted by Mutaqin (2021) at PT XYZ in the good category with a value of 89.31 out of 100.00, research conducted by Setiawan (2020) at PT XYZ in April 2018 to March 2019 is in the good category. with a value of 80.88 out of 100.00, as well as research conducted by Yusrianafi (2021) on Veil SMEs in the good category with a value of 81.23 out of 100.00.
    a. Of the 19 performance indicators, the planning process has three performance indicators, the sourcing process has six performance indicators, the making process has four performance indicators, the delivery process has five performance indicators, and the return process has one performance indicator.
    b. Six performance indicators have the highest value from the normalization results, namely Supplier Source Fill Rate, Source Flexibility, On Time Delivery, Number of Meetings with Customers, Deliver Quantity Accuracy, and Number of Customer Complaints, each of which is worth 100.00.
    c. There is one performance indicator that has the lowest value from the normalization results, namely Supplier Delivery Lead Time which is worth 31.19.

Recommendation

The following are theoretical and practical suggestions from this research.

1. Theoretical suggestions from this study are that it is hoped that future researchers should use cost and asset performance attributes to provide overall supply chain performance results. And also, performance indicators that have a high value are maintained so that their achievement does not decrease, while the results of performance indicators that have a low value, namely the Supplier Delivery Lead Time indicator, should be controlled and improved so that the performance is better and the results can be maximized. The proposals that can be given to PT SCH related to low-performance indicators are that good supervision is needed on purchase orders (POs) received by suppliers so that there is a match between supply and demand for materials so that they do not cause obstacles and losses for the company such as materials that do not arrive in accordance with the requirements. predetermined schedule and the production process was stopped because the ordered material did not arrive as requested.
2. Practical advice in this research is that future researchers should be able to identify and develop more performance indicators so that they get a detailed description of performance. As for practical suggestions for companies, the results of this study should be used as material for consideration to improve the company's supply chain performance and should perform periodic performance measurements using all levels of SCOR completely so that they can measure performance optimally and get better in the future.

Research Limitations

This study has limitations, namely the research period is very short, only measuring performance for a year, in this project lasts for two years, so it is not optimal to measure overall performance from beginning to end. And also in measuring performance, do not use all existing performance attributes, namely only use reliability (reliability), responsiveness (responsiveness), and flexibility (response), do not use cost (cost) and asset (wealth) performance attributes because the two performance attributes This is confidential company data.

References

APICS. (2017). *APICS Supply Chain Operations Reference Metode SCOR Version 12.0.* Chicago: Association for Supply Chain Management.

Bukhori, I. B., Widodo, K. H., & Ismoyowati, D. (2016). Evaluation of Poultry Supply Chain Performance in XYZ Slaughtering House Yogyakarta using SCOR and AHP Method. *Social and Behavioral Sciences*, 221.

Chopra, S., & Meindl, P. (2013). *Supply Chain Management Strategy, Planning, and Operation.* Upper Saddle River: Pearson Education, Inc.

Hasibuan, A., Arfah, M., Parinduri, L., Hernawati, T., Suliawati, Harahap, B., et al. (2018). Performance Analysis of Supply Chain Management with Supply Chain Operations Reference Model. *Journal of Physics: Conference Series*, 1-7.

Hastuti, S. W., Sumartini, & Sultan, M. A. (2020). Pengukuran Kinerja Supply Chain Management dengan Menggunakan Pendekatan Supply Chain Operations Reference (SCOR). *Jurnal Ilmu Manajemen dan Bisnis*, 119-127.

Kusrini, E., Caneca, V. I., Helia, V. N., & Miranda, S. (2018). Supply Chain Performance Measurement Using Supply Chain Operations Reference (SCOR) 12.0 Method: A Case Study in A A Leather SME in Indonesia. *IOP Conf. Series: Materials Science and Engineering*, 1-8.

Mutaqin, J. Z., & Sutandi. (2021). Pengukuran Kinerja Supply Chain dengan Pendekatan Metode SCOR (Supply Chain Operations Reference) Studi Kasus di PT XYZ. *Jurnal Logistik Indonesia*, 13-22.

Prasetya, W., Natalia, C., Kristiana, S. P., Aldi, B. E., Silalahi, A., Monique, K., et al. (2017). Performance Measurement and Analysis of Coffee Supply Chain with SCOR Method (Case Study of North Sumatera Coffee). *Journal of Business Management*, 1-16.

Prasetyaningsih, E., Muhamad, C. R., & Amolina, S. (2019). Assessing of supply chain performance by adopting Supply Chain Operations Reference (SCOR) Model. *Conf. Series: Materials Science and Engineering*, 1-6.

Prasetyo, D. S., Emaputra, A., & Parwati, C. I. (2021). Pengukuran Kinerja Supply Chain Management Menggunakan Pendekatan Model Supply Chain Operations Reference (SCOR) pada IKM Kerupuk Subur. *Jurnal Penelitian dan Aplikasi Sistem & Teknik Industri (PASTI)*, 85-87.

Pujawan, I. N., & Mahendrawathi. (2017). *Supply Chain Manajemen* (Vol. III). Yogyakarta: Andi.

Saaty, T. L. (1993). *Pengambilan Keputusan Bagi Para Pemimpin.* Jakarta: PT Pustaka Bianaman Pressindo.

Setiawan, A., Pulansari, F., & Sumiati. (2020). Pengukuran Kinerja dengan Metode Supply chain Operations Reference (SCOR) (Studi Kasus PT XYZ). *Jurnal Manajemen Industri dan Teknologi*, 55.

Wibowo, M. A., Elizar, Sholeh, M. N., & Adji, H. S. (2017). Supply Chain Management Strategy for Recycled Materials to Support Sustainable Construction. *Procedia Engineering*, 185.

Yuniaristanto, Ikasari, N., Sutopo, W., & Zakaria, R. (2020). Performance Measurement in Supply Chain Using SCOR Metode in The Lithium Battery Factory. *IOP Conference Series: Materials Science and Engineering*, 1-5.

Yusrianafi, N., & Dahda, S. S. (2021). Pengukuran Kinerja Pada UKM Kerudung Menggunakan Metode Supply Chain Operations Reference (SCOR) dan AHP. *Jurnal Ilmiah Mahasiswa Teknik Industri*, 31.