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A Preliminary Study on the Measurement of Supply Chain Performance: The Determination of Key Performance Indicator (KPI) Weights

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***Abstract*—Supply chain performance measurement is crucial in determining strategies to improve company performance. PT XYZ is an export-scale sweet potato-based food processing company. The obstacle the company often faces is the mismatch in the quantity of raw material delivered from suppliers, resulting in delays in production and fulfillment of demand to consumers. For this reason, it is important to measure the performance of the supply chain, so that the company knows the parts of the supply chain that must be improved. Supply Chain Operations Reference (SCOR) is a method for measuring supply chain performance. Before applying the SCOR method, the first step that needs to be done is determining the Key Performance Indicator (KPI) and its weight. This research aims to determine KPI weights using the Analytical Hierarchy Process (AHP) method, at PT XYZ. The AHP method was chosen because of its ability to provide objective weights based on priorities determined by experts. The results showed that there were 6 KPIs at level 1, 19 KPIs at level 2 which were grouped in 6 dimensions, and 50 KPIs at level 3 which were grouped in 19 dimensions. The KPI determination is adjusted to the SCOR dimensions and the real conditions of the company. Furthermore, based on the AHP method analysis, the weight of each KPI is obtained, and the weight comparison between KPIs is known. The implementation of strategies that focus on the KPIs with the highest weights is expected to improve the overall supply chain performance.**

***Index Terms*— AHP, SCOR, Supply Chain Performance**

I. Introduction

THE industrial sector is currently undergoing a period of rapid expansion. One area that has witnessed a notable increase in activity is the food and beverage processing industry. In Indonesia, the Indonesian Central Bureau of Statistics (BPS) has recorded a 4.13% growth in the gross domestic product (GDP) of the processing industry sector between 2022 and 2024. In the food and beverage processing industry sector, the corresponding figure is 5.9% year-on-year, indicating a robust performance and supporting the growth of domestic products [1]. In light of the expansion of the industrial sector, companies must be prepared to meet consumer demand to maintain customer satisfaction and loyalty. Companies must be aware of their preparedness to confront augmented demand and intensified competition.

One strategy to enhance competitiveness is the implementation of supply chain management (SCM), which encompasses the administration of information throughout the company's supply chain operations, encompassing all stages from the initial to the final [2].

PT XYZ is a company engaged in the processing of sweet potatoes for human consumption. It is an export-oriented company with a significant market share in Japan and Korea. Its product range includes sweet potato paste, frozen whole sweet potatoes, frozen sweet potato cubes, and sweet potato powder, all produced using sweet potato as the raw material.

The production process at PT XYZ is divided into two distinct phases: the outer process and the inner process. The outer process encompasses the sorting, weighing, washing, and boiling or burning of raw materials. In contrast, the inner process involves the stripping of cooked raw materials, checking, grinding, and flattening during packaging, vacuum, sterilization, and freezing, as well as metal detection.

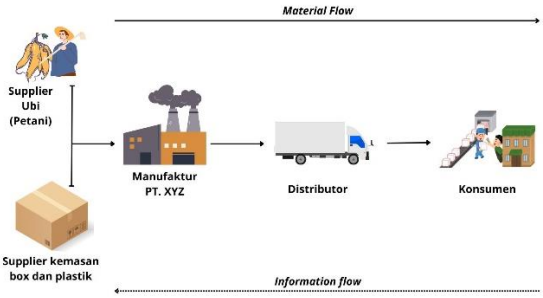


Fig 1. The Supply Chain Process of PT XYZ

The raw material employed by PT XYZ in the production of its products is derived exclusively from sweet potatoes. The company adheres to established standards for the types of sweet potatoes utilized, encompassing white ase, benizuma, kokei, naruto, cilembu, and violet sweet potatoes. PT XYZ is encountering difficulties in the receipt of raw materials that fail to meet the specifications outlined in the data presented in Fig. 2.

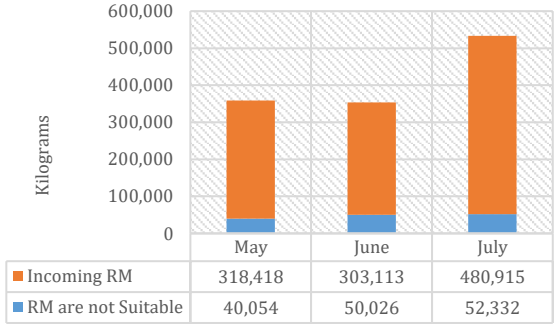


Fig. 2. The raw material recap does not correspond with the specifications established for the period between May and July

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The results of the calculation of raw materials that do not meet specifications for the period between May and July indicate a consistent trend, with the figures standing at 13%, 17%, and 11% respectively. Thus, over the past three months, the average raw material has failed to meet the requested specifications by 13.7%. If this issue is not addressed, it will have a detrimental impact on supply chain operations, ultimately leading to a decline in consumer satisfaction and trust.

The term reliability is used to describe a particular aspect of the supply chain, namely the consistent delivery of high-quality products or goods promptly. This concept is particularly pertinent in addressing the existing challenges within the supply chain [3].

Supply chain performance measurement must be carried out to determine the achievement of the company's supply chain performance so that it can be analyzed and provide accurate information for decision-making on lines that are not performing optimally. There are several methods for measuring supply chain performance, including the balanced scorecard, activity-based costing, multi-criteria analysis, economic value added, life-cycle analysis, and the SCOR model [4]. The research will measure supply chain performance using the SCOR 12.0 approach combined with AHP to determine the company's supply chain performance.

II. Theoretical Background

A. SCOR (Supply Chain Operation Reference)

The SCOR model is a cross-industry, standardized diagnostic tool for supply chain management. The SCOR model enables users to address, improve, measure, and communicate supply chain management. The SCOR model itself was developed by the Supply Chain Council (SCC) in 1996, and further developed by the American Production and Inventory Control Society in 2014 [3]. The SCOR model provides a comprehensive and structured view of the supply chain, helping organizations to evaluate and improve their performance in a systematic and measurable way [5].

Attributes are characteristics or dimensions used to describe and measure the performance of processes, metrics, and other elements in the supply chain. The attributes in the SCOR model are shown in Table I with an explanation of the supply chain performance attributes [3].

Table I
Performance Attributes of the SCOR 12.0 Model

Performance Attributes	Definition
Reliability	Reliability is the ability to perform tasks as expected.
Responsiveness	Responsiveness is the speed of task execution
Agility	Agility is the ability to respond to market changes to gain or maintain a competitive advantage.
Costs	The cost of operating supply chain processes. This includes labor, material, management, and transport costs.
Asset & Management Efficiency	Ability to use assets efficiently

B. AHP (Analytical Hierarchy Process)

The Analytical Hierarchy Process was developed by Thomas L. Saaty in 1970 as a multi-factor or multi-criteria decision support model. A hierarchy is a representation of a complex problem that is systematically compared from a multi-level structure where the initial level is an objective the final level is an alternative [6].

Table II
AHP Pairwise Comparison Matrix

	C1	C2	...	Cn
C1	1	S12	...	S1k
C2	1/S12	1	...	1/S2k
...	...	...	...	...
Cn	1/S1k	S2k	...	1

Table III
AHP Pairwise Comparison Scale

Importance score	Definition
1	Both elements are equally important, two elements have equal influence.
3	One element is slightly more important than the other, experience and judgment slightly favor one element over the other.
5	One element is more important than the other, experience and judgment strongly favor one over the other.
7	One element is more important in absolute terms than the other, one element is strongly favored and dominant in practice.
9	One element is more important than the other, the evidence in favor of one element over the other has the highest degree of corroboration possible.
2,4,6,8	Values between two values of neighboring considerations, this value is given when there are two compromises between 2 choices.

C. Literature Review

A study on the measurement of supply chain performance, conducted by [7], focused on the garment industry of small and medium-sized enterprises (SMEs) located in Madura City, Indonesia. The objective of the research was to evaluate the performance of the supply chains of garment SMEs and identify areas for improvement. The methodology employed was the SCOR model and the AHP.

A study on the measurement of supply chain performance was conducted by [4] at the UNS lithium battery factory using the SCOR model. The objective of the research is to devise an improvement plan for the company, based on the findings of the measurements taken along the supply chain. The methodology employed involved the following steps: identification of performance metrics, validation of key performance indicators (KPIs), measurement of metrics, and normalization according to the Snorm de Boer method.

Research on evaluating the sustainability performance of the e-waste supply chain and identifying performance indicators as a framework for evaluating supply chain performance was conducted by [8] using the Best-Worst Method (BWM), which is a method for a multi-criteria decision-making (MCDM) approach. Then the researcher also used the SCOR concept which became the basic

reference for evaluating supply chain performance. The BMW method is used to determine the criteria score after the performance evaluation hierarchy is formed. The results of applying the framework to several well-known supply chains in New Zealand showed that the attributes of 'Cost,' 'Quality,' and 'GreenScor' are very important to achieve high performance, while in this developed country, not much attention is paid to social issues.

The research conducted in [9] proposed a methodology for the measurement of performance in freight transport companies in the State of Mexico. The SCOR model served as the basis for the study, providing a framework for defining metrics and indicators for evaluating the performance of the company's logistics operations. The findings demonstrate that the deficiencies of smaller enterprises in this field can be discerned through the utilization of particular metrics and indicators that are readily comprehensible and quantifiable, yet remain pertinent for the oversight and assessment of enhancements in logistics process performance.

This study employs the SCOR model and AHP methods, as developed by [10], to assess the performance of food-producing companies in the supply chain. The researcher indicated that the utilization of the SCOR model would facilitate the generation of performance metrics, which would in turn serve as indicators for the observation and maintenance of organizational performance. The AHP model enables companies to determine the relative importance of performance metrics by assigning weights based on a defined set of criteria.

A comparable study was conducted by [11], who employed the use of the SCOR model to assess suppliers in terms of cost and performance.

The proposal from [12] is a performance prediction system that applies the SCOR model and utilizes artificial neural networks (ANN). The results demonstrated that the correlation coefficient value indicated a strong positive correlation between the anticipated and projected performance values for SCOR level 1 metrics across all ANN models. The results of the statistical hypothesis tests indicate that multilayer perceptron artificial neural networks are an appropriate means of predicting the performance of supply chains based on the SCOR model.

A study and analysis by [13] of activities related to green supply chain management (GSCM) in the palm oil sector, to measure the supply chain performance of palm oil companies with the SCOR model.

The present study evaluates the performance of the supply chain (SC) in the context of autonomous vehicle parking lot selection, as proposed by [14]. The present study did not allow for the application of a methodology based on historical data. Therefore, this study proposes a novel approach to the evaluation of supply chain performance, which combines the SCOR metrics with an adaptive network-based fuzzy inference system (ANFIS). The proposed system is designed to assist companies in the formulation of corrective action plans, based on the findings of the evaluation process.

III. METHOD

A. *Research Object*

This research was conducted at PT XYZ, an agro-industrial company that processes sweet potatoes. The company is located in Kuningan Regency.

B. *Data Collection Techniques*

Literature Study. A literature review is a set of activities is a method that involves collecting library data, reading, recording, and processing research materials [15]. A literature review is used as a reference based on previous research that has researched the topic of supply chain using the Supply Chain Operation Reference (SCOR) method. A literature review is obtained from journals, books, and articles.

Field Study. Field studies are conducted by observing and gathering information through various methods such as interviews, observations, and distribution of questionnaires [16]. Data collection in field studies is done by distributing SCOR 12.0 KPI selection questionnaires that are relevant to company conditions and KPI weighting questionnaires using AHP.

C. *Research Phases*

Fig. 3 provides a visual representation of the phases of this research.

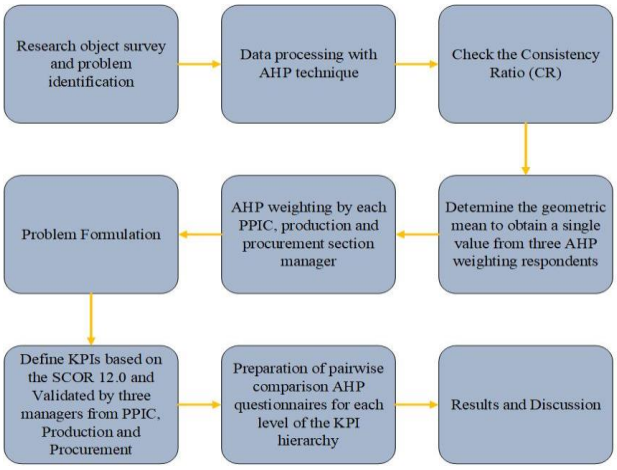


Fig. 3. Research

Remark:

1. Survey of the object of the research and identification of the existing problems.
2. Formulate the problems that exist in the object of research
3. Define KPIs based on the SCOR 12.0 hierarchy as shown in Figure 4, validated by three managers from PPIC, Production, and Procurement.
4. Preparation of pairwise comparison AHP questionnaires for each level of the KPI hierarchy.
5. AHP weighting by each PPIC, production, and procurement section manager.
6. Data processing with AHP technique.
7. Check the Consistency Ratio (CR) to ensure that the weighting is consistent.
8. Determine the geometric mean to obtain a single value from three AHP weighting respondents.
9. Results and discussion.

Table IV shows the KPI, validated by three section managers (PPIC, Production, Procurement) following company standards.

TABLE IV
SCOR KPI'S VALIDATED BY THREE SECTION MANAGERS

Hierarchy	Attribute	KPI/Metric
sP	Plan	
AG.1.1	Agility	Upside Supply Chain Adaptability
AG.1.2	Agility	Downside Supply Chain Adaptability
sP1	Plan Supply Chain	
RS.3.98	Responsiveness	Plan Cycle Time
AM.1.1	Aset	Cash to Cash Cycle Time
sP1.1	Identify, Prioritize & Aggregate Supply Chain Requirements	
RL.3.37	Reliability	Forecast Accuracy
RS.3.44	Responsiveness	identify, prioritize, and aggregate supply chain requirement cycle time
sP1.2	Identify, Prioritize & Aggregate Supply Chain Resources	
AM.2.2	Asset	Inventory Days of Supply
sP2	Plan Source	
RS.3.99	Responsiveness	Plan Source Cycle Time
sP2.1	Identify, Prioritize & Aggregate Product Requirement	
RL.3.37	Reliability	Forecast Accuracy
RS.3.41	Responsiveness	Identify, Prioritize, and Aggregate Product Requirements Cycle Time
sP3	Plan Make	
RS.1.1	Responsiveness	Order Fulfillment Cycle Time
sP3.1	Identify, Prioritize & Aggregate Production Requirement	
RL.3.37	Reliability	Forecast Accuracy
RS.3.42	Responsiveness	Identify, Prioritize, and Aggregate Production Requirements Cycle Time
sS2	Source MTO Product	
RL.1.1	Reliability	Perfect Order Fulfillment
RS.1.1	Responsiveness	Order Fulfillment Cycle Time
RS.2.1	Responsiveness	Source Cycle Time
AG.3.9	Agility	Additional Source Volumes Obtaines in 30 days
sS2.2	Receive Product	
RL.3.20	Reliability	%Order/Lines Received On-Time to Demand Requirement
RS.3.113	Responsiveness	Receiving Product Cycle Time
AM.3.16	Aset	Inventory days of supply - raw material
sS2.3	Verify Product	
RL.3.19	Reliability	%Order/Lines Received Defect-Free
RS.3.140	Responsiveness	verify product cycle time
sM2	Make to Order	
RL.1.1	Reliability	Perfect Order Fulfillment
RS.3.21	Responsiveness	Current manufacturing order cycle time
AG.3.38	Agility	Current Make Volume
AM.3.17	Aset	Inventory Days of Supply-WIP
AM.3.22	Aset	Recyclable waste as % of total waste
sM2.1	Schedule Production Activities	
RL.3.49	Reliability	Schedule Achievement
AM.3.9	Aset	Capacity Utilization
sM2.3	Produce and Test	
RL.3.58	Reliability	Yield
AM.3.5	Aset	% of production materials reused
sM2.4	Package	
RL.3.58	Reliability	Yield
sM2.5	Stage finished product	
RL.3.31	Reliability	Compliance Documentation Accuracy
sD	Delivery	
RL.1.1	Reliability	Perfect Order Fulfillment
RS.1.1	Responsiveness	Order Fulfillment Cycle Time
sD2.2	Receive, Configure, Enter, and Validate Order	
RL.3.33	Reliability	Delivery Item Accuracy
RS.3.94	Responsiveness	Order Fulfillment Dwell Time
sD2.11	Load product & Generate shipping docs	
RL.3.34	Reliability	Delivery Location Accuracy
sD2.12	Ship Product	
RL.2.2	Reliability	Delivery Performance to Customer Commit Date
RL.3.35	Reliability	Delivery Quantity Accuracy
RS.3.126	Responsiveness	Ship Product Cycle Time
sD2.13	Receive and Verify Products by Customer	
RL.3.42	Reliability	Orders Delivered Defect Free Conformance
sR	Return	
RL.1.1	Reliability	Perfect Order Fulfillment
sSR1	Source Return Defective Product	
AG.3.41	Agility	Current source return Volume
AM.3.28	Aset	Percentage Defective Inventory
sSR1.2	Disposition Defective Product	
AM.3.29	Aset	Percentage Defective Inventory in Disposition
sDR1.3	Receive Defective Product (Includes Verify)	
RS.3.104	Responsiveness	Receive defective product cycle time
sE5.3	Inspect and Troubleshoot	
RS.3.67	Responsiveness	Manage to Make Equipment and Facilities Cycle Time
sE10	Manage Supply Chain Procurement	
RS.1.1	Responsiveness	Order Fulfillment Cycle Time
RS.2.1	Responsiveness	Source Cycle Time

IV. RESULT AND DISCUSSION

A. Results

Table V shows the results of the weighting methodology applied to the primary supply chain process, which encompasses six constituent processes at the 1 level, and the weighting outcomes for the performance attributes of each principal process at the 2 level.

TABLE V. SUPPLY CHAIN KEY PROCESS WEIGHTING RESULTS FOR LEVEL 1 AND 2

Process (Level 1)	Weight	Attribute (Level 2)	Weight
Plan	0.16	Reliability	0.46
		Responsiveness	0.18
		Agility	0.13
		Asset & Management Efficiency	0.23
Source	0.27	Reliability	0.32
		Responsiveness	0.22
		Agility	0.19
		Asset & Management Efficiency	0.27
Make	0.25	Reliability	0.31

Process (Level 1)	Weight	Attribute (Level 2)	Weight
		Responsiveness	0.15
		Agility	0.24
		Asset & Management Efficiency	0.29
Delivery	0.22	Reliability	0.50
		Responsiveness	0.50
Return	0.05	Reliability	0.11
		Responsiveness	0.45
		Agility	0.22
		Asset & Management Efficiency	0.22
Enable	0.06	Responsiveness	1.00

Table VI shows the results of the key performance indicator (KPI) weighting for the principal processes associated with the planning process.

TABLE VI. WEIGHTING RESULTS FOR LEVEL 3 PLAN PROCESS

Hierarchy Code	KPI/metric	Weight
Reliability		
RL.3.37	Forecast accuracy-stock	0.29
	Forecast accuracy-raw material requirement	0.29
	Forecast accuracy-product demand	0.42
Responsiveness		
RS.3.98	Plan cycle time	0.10
RS.3.44	Identify. Prioritize. and aggregate supply chain cycle time	0.20
RS.3.99	Plan source cycle time	0.16
RS.3.41	Identify. Prioritize. and Aggregate Product Requirements Cycle Time	0.18
RS.1.1	order fulfillment cycle time	0.20
RS.3.42	Identify. Prioritize. and Aggregate Production Requirements Cycle Time	0.17
Agility		
AG.1.1	Upside Supply Chain Adaptability	0.50
AG.1.2	Downside Supply Chain Adaptability	0.50
Asset & Management Efficiency		
AM.1.1	Upside Supply Chain Adaptability	0.25
AM.2.2	Downside Supply Chain Adaptability	0.75

Table VII shows the results of the key performance indicator (KPI) weighting for the principal processes associated with the source process.

TABLE VII. WEIGHTING RESULTS FOR LEVEL 3 SOURCE PROCESS

Hierarchy Code	KPI/metric	Weight
Reliability		
RL.1.1	Perfect Order Fulfillment	0.70
RL.3.20	%Order/Lines Received On-Time to Demand Requirement	0.15
RL.3.19	%Order/Lines Received Defect-Free	0.15
Responsiveness		
RS.1.1	Order Fulfillment Cycle Time	0.25
RS.2.1	Source Cycle Time	0.27
RS.3.113	Receiving Product Cycle Time	0.25
RS.3.140	Verify product cycle time	0.23
Agility		
AG.3.9	Additional Source Volumes Obtaines in 30 days	1.00
Asset & Management Efficiency		
AM.3.16	Inventory days of supply - raw material	1.00

Table VIII shows the results of the key performance indicator (KPI) weighting for the principal processes associated with the make process.

TABLE VIII. WEIGHTING RESULTS FOR LEVEL 3 MAKE THE PROCESS

Hierarchy Code	KPI/metric	Weight
Reliability		
RL.1.1	Perfect Order Fulfillment	0.41
RL.3.49	Schedule Achievement	0.12
RL.3.58	Yield	0.20
	Yield-package	0.17
RL.3.31	Compliance Documentation Accuracy	0.11
Responsiveness		
RS.3.21	Current manufacturing order cycle time	1.00
Agility		
AG.3.38	Current Make Volume	1.00
Asset & Management Efficiency		
AM.3.17	Inventory Days of Supply-WIP	0.20
AM.2.22	Recyclable waste as % of total waste	0.15
AM.3.9	Capacity Utilization	0.48
AM.3.5	% of production materials reused	0.17

Table IX shows the results of the key performance indicator (KPI) weighting for the principal processes associated with the delivery process.

TABLE IX. WEIGHTING RESULTS FOR LEVEL 3 DELIVER PROCESS

Hierarchy Code	KPI/metric	Weight
Reliability		
RL.1.1	Perfect Order Fulfillment	0.43
RL.3.33	Delivery Item Accuracy	0.11
RL.3.34	Delivery Location Accuracy	0.11
RL.2.2	Delivery Performance to Customer Commit Date	0.07
RL.3.35	Delivery Quantity Accuracy	0.14
RL.3.42	Orders Delivered Defect Free Conformance	0.15
Responsiveness		
RS.1.1	Order Fulfillment Cycle Time	0.33
RS.3.94	Order Fulfillment Dwell Time	0.33
RS.3.126	Ship Product Cycle Time	0.33

Table X shows the results of the key performance indicator (KPI) weighting for the principal processes associated with the return process.

TABLE X. WEIGHTING RESULTS FOR LEVEL 3 RETURN PROCESS

Hierarchy Code	KPI/metric	Weight
Reliability		
RL.1.1	Perfect Order Fulfillment	1.00
Responsiveness		
RS.3.104	Receive defective product cycle time	1.00
Agility		
AG.3.41	Current source return Volume	1.00
Asset & Management Efficiency		
AM.3.28	Percentage Defective Inventory	0.37
AM.3.29	Percentage Defective Inventory in Disposition	0.63

Table XI shows the results of the key performance indicator (KPI) weighting for the principal processes associated with the enable process.

TABLE XI. WEIGHTING RESULTS FOR LEVEL 3 ENABLE PROCESS

Hierarchy Code	KPI/metric	Weight
Responsiveness		
RS.3.67	Manage to Make Equipment and Facilities Cycle Time	0.33
RS.1.1	Order Fulfillment Cycle Time	0.33
RS.2.1	Source Cycle Time	0.33

B. Discussion

KPIs exist at 3 levels, there are 6 KPIs at level 1, 19 KPIs at level 2 which are grouped in 6 dimensions, and 50 KPIs at level 3 which are grouped in 19 dimensions. The results of the calculation of KPI weights at level 1 have the highest weight in the source dimension with a value of 0.27 and the lowest weight in the return dimension of 0.05. The results of the calculation of KPI weights at level 2 are as follows: the highest weight plan dimension on reliability is 0.46; in the source dimension, the highest weight on reliability is 0.32; in the make dimension, the highest weight on reliability is 0.31; in the deliver dimension, the weight on reliability and responsiveness is the same at 0.5; in the return dimension, the highest weight on responsiveness is 0.45.

The results of the KPI weights calculation at level 3 include the following: In the plan-reliability dimension, the highest weight is assigned to forecast accuracy-product demand (0.42). In the plan-responsiveness dimension, the highest weight is assigned to identify, prioritize, and aggregate supply chain cycle time and order fulfillment cycle time (0.2). In addition, the plan-agility dimension, the same weight is attributed to upside SC adaptability and downside SC adaptability, with both assigned a value of 0.5. In the plan-asset dimension, the highest weight is assigned to inventory days of supply, with a value of 0.75. In the source-reliability dimension, the highest weight is assigned to perfect order fulfillment, with a value of 0.70. In the source-responsiveness dimension, the highest weight is assigned to source cycle time, with a value of 0.27. In the make-reliability dimension, the highest weight is assigned to perfect order fulfillment, with a value of 0.41. In the make-asset dimension, the highest weight is assigned to capacity utilization, with a value of 0.48. In the deliver-reliability dimension, the highest weight is on perfect order fulfillment, which accounts for 0.43. In the deliver-responsiveness dimension, the same weight is attributed to order fulfillment cycle time, order fulfillment dwells time, and ship product cycle time, which collectively account for 0.33. In the return-asset dimension, the highest weight is on the percentage of defective inventory in disposition, which accounts for 0.63. In the enable-responsiveness dimension, the same weight is attributed to managing to make equipment and facilities cycle time, order fulfillment cycle time, and source cycle time, which collectively account for 0.33.

The application of AHP analysis to PT XYZ has successfully identified the relative weights of various KPIs at three hierarchical levels. The results demonstrate that the source dimension is the most critical in the overall supply chain. In contrast, the return dimension has the lowest weight, indicating that the company may not currently pay sufficient attention to the product return process. This is potentially due to the absence of any product return management activity to date.

The highest weight on the source dimension indicates that the quality of raw materials, supplier selection, and managing relationships with suppliers are crucial to the success of PT XYZ. The company should focus more on building strong relationships with suppliers who can provide high-quality raw materials consistently.

At level 2, the reliability dimension consistently has a high weight on all major dimensions. This indicates that the company's ability to produce products to the specifications and production schedules that have been set is a key success factor.

The responsiveness dimension also has a significant weight, especially in the deliver and return dimensions. This shows the importance of the company's ability to respond to changes in market demand quickly and efficiently. At level 3, the inventory days of supply KPI in the plan-asset dimension has the highest weight, indicating that inventory management is an important factor in minimizing costs and improving operating efficiency.

Based on the results of this study, PT XYZ can take several corrective actions. Strengthening supplier management by conducting regular supplier performance evaluations, developing a more comprehensive supplier assessment system, and building long-term relationships with trusted suppliers. Improving production reliability by conducting routine equipment maintenance, implementing a strict quality control system, and conducting training for employees to improve production skills. Increased flexibility, i.e. increasing the flexibility of the supply chain to be able to respond quickly to changes in market demand. This can be done through diversification of supply sources, better use of information technology, and new product development. Conduct ABC analysis to identify critical inventory items, implement a material requirements planning (MRP) system, and use technology such as RFID to improve inventory visibility.

This research has several limitations, including that the scope of the research only focuses on PT XYZ, so the results of the research may not be generalized to other

companies. The data used in this study is data based on questionnaire answers from managers in 3 sections, namely procurement, PPIC, and production, so it may not fully reflect the overall current conditions. Similarly, there are AHP assumptions that the AHP method has several assumptions that need to be considered, such as the consistency of decision-making by experts. Further research can be done by expanding the scope of research to other companies in the same industry, using more real-time data, or combining the AHP method with other multi-criteria decision-making methods.

V. Conclusion

This research has successfully identified the relative weight of various KPIs in the supply chain of PT XYZ. The results of this research can be used as a basis for developing a more effective supply chain performance improvement strategy. PT XYZ needs to focus on KPI values that have the highest weights at all levels because it means that decision-makers related to the supply chain consider these KPIs to be very important for the continuity of the PT XYZ supply chain. KPIs with not too high weights must still be considered because based on the KPI selection validation process, these parameters have been determined by the business processes at PT. XYZ.

References

[1] KEMENKEU, "Pertumbuhan Ekonomi Triwulan I 2024, Tetap Kuat di Tengah Perlambatan Ekonomi Global," https://djpb.kemenkeu.go.id/kppn/jakarta4/id/data-publikasi/berita-terbaru/3289-pertumbuhan-ekonomi-triwulan-i-2024,-tetap-kuat-di-tengah-perlambatan-ekonomi-global.html.

[2] M. I. Adelino, M. Farid, M. Fitri, and M. Febry, "Pengukuran Kinerja Supply Chain Management dengan Metode Green SCOR," *Jurnal Teknologi Dan Sistem Informasi Bisnis*, vol. 6, no. 1, pp. 236–244, Jan. 2024, doi: 10.47233/jteksis.v6i1.1048.

[3] APICS, "SCOR (Supply Chain Operation Reference Model) Version 12.0," 2017. Accessed: Jun. 29, 2024. [Online]. Available: apics.org/myapics

[4] Yuniaristanto, N. Ikasari, W. Sutopo, and R. Zakaria, "Performance Measurement in Supply Chain Using SCOR Model in the Lithium Battery Factory," in *IOP Conference Series: Materials Science and Engineering*, IOP Publishing Ltd, Nov. 2020, pp. 1–6. doi: 10.1088/1757-899X/943/1/012049.

[5] A. Chatra *et al.*, *Manajemen Rantai Pasok*, Juni 2023., vol. 1. Jambi: PT. Sonpedia Publishing Indonesia, 2023. Accessed: Jun. 21, 2024. [Online]. Available: www.sonpedia.com

[6] A. Supriadi, A. Rustandi, D. H. L. Komarlina, and G. T. Ardiani, "Analytical Hierarchy Process (AHP)," 2018.

[7] Q. Qurtubi, R. Yanti, and M. F. N. Maghfiroh, "Supply chain performance measurement on small-medium enterprise garment industry: application of supply chain operation reference," *Jurnal Sistem dan Manajemen Industri*, vol. 6, no. 1, pp. 14–22, Jun. 2022, doi: 10.30656/jsmi.v6i1.4536.

[8] V. Jain, S. Kumar, A. Mostofi, and M. Arab Momeni, "Sustainability performance evaluation of the E-waste closed-loop supply chain with the SCOR model," *Waste Management*, vol. 147, pp. 36–47, Jun. 2022, doi: 10.1016/j.wasman.2022.05.010.

[9] E. Gonzalez-Pascual, J. Nosedal-Sanchez, and J. Garcia-Gutierrez, "Performance evaluation of a road freight transportation company through SCOR metrics," *Case Stud Transp Policy*, vol. 9, no. 4, pp. 1431–1439, Dec. 2021, doi: 10.1016/j.cstp.2021.07.001.

[10] I. S. Fauziyah, A. Y. Ridwan, and P. S. Muttaqin, "Food production performance measurement system using halal supply chain operation reference (SCOR) model and analytical hierarchy process (AHP)," in *IOP Conference Series: Materials Science and Engineering*, IOP Publishing Ltd, Dec. 2020. doi: 10.1088/1757-899X/909/1/012074.

[11] F. R. Lima-Junior and L. C. R. Carpinetti, "Combining SCOR® model and fuzzy TOPSIS for supplier evaluation and management," *Int J Prod Econ*, vol. 174, pp. 128–141, Apr. 2016, doi: 10.1016/j.ijpe.2016.01.023.

[12] F. R. Lima-Junior and L. C. R. Carpinetti, "Predicting supply chain performance based on SCOR ® metrics and multilayer perceptron neural networks," *Int J Prod Econ*, vol. 212, pp. 19–38, Jun. 2019, doi: 10.1016/j.ijpe.2019.02.001.

[13] M. Rosyidah, N. Khoirunnisa, U. Rofiatin, A. Asnah, A. Andiyan, and D. Sari, "Measurement of key performance indicator Green Supply Chain Management (GSCM) in palm industry with green SCOR model," in *Materials Today: Proceedings*, Elsevier Ltd, Jan. 2022, pp. S326–S332. doi: 10.1016/j.matpr.2022.03.158.

[14] F. R. Lima-Junior and L. C. R. Carpinetti, "An adaptive network-based fuzzy inference system to supply chain performance evaluation based on SCOR® metrics," *Comput Ind Eng*, vol. 139, Jan. 2020, doi: 10.1016/j.cie.2019.106191.

[15] N. M. Az-Zahroh, C. Safvitri, S. A. Putra, and M. I. Anshori, "Kajian Teori Kepemimpinan Situasional Dan Kepuasan Kerja : Studi Literature Review," *Jurnal Riset dan Inovasi Manajemen*, vol. 1, no. 3, pp. 131–154, 2023, doi: 10.59581/jrim-widyakarya.v1i3.784.

[16] B. J. P. Mulyono and R. Arfamaini, "Evaluasi Penerapan Sistem Pengendalian Internal Pembelian Kredit Guna Meningkatkan Ketepatan Atas Supply Chain Pada PT. Welco," *Journal of Innovation Research and Knowledge*, vol. 3, no. 5, 2023.



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