# SUPPLY CHAIN PERFORMANCE MEASUREMENT USING SCOR 12.0 IN SPORT SHOES COMPANY

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***ABSTRACT***

*A manufacturing company in Indonesia creates sports shoes under the particular brand is still having trouble with a number of issues, including late raw material deliveries from suppliers, production that falls short of expectations, and delayed product delivery to customers. The performance of the supply chain must therefore be measured. The study assesses the importance of supply chain performance within the organization and offer recommendations for improvement to raise supply chain performance within the organization. Analytical Hierarchy Process (AHP) and Supply Chain Operation Reference (SCOR) 12.0 are used to gauge supply chain performance. The outcomes revealed that supply chain performance's value at 77,539. Improvements are required to increase the company's supply chain performance because three KPIs have low weights, the percentage of orders for raw materials that are delivered on time, the price of purchasing raw materials, and the cost of returning item. Corrective actions carried out by the company include arranging materials neatly in the warehouse, providing sufficient lighting, maintaining air humidity, keeping hands clean when holding shoes, checking glue on the upper shoes so that open bonding does not occur, giving penalties to suppliers who are late, and giving training to reduce material damage.*

***Keywords:*** *Analytical Hierarchy Process, Performance Measurement, Supply Chain Operation Reference, Sport Shoes Company*

***ABSTRAK***

*Sebuah perusahaan manufaktur di Indonesia yang menciptakan sepatu olahraga dengan merek tertentu masih mengalami kendala dengan sejumlah masalah, antara lain pengiriman bahan baku yang terlambat dari pemasok, produksi yang tidak sesuai harapan, dan pengiriman produk yang tertunda ke pelanggan. Oleh karena itu, kinerja rantai pasokan harus diukur. Studi ini menilai pentingnya kinerja rantai pasokan dalam organisasi dan menawarkan rekomendasi perbaikan untuk meningkatkan kinerja rantai pasokan dalam organisasi. Analytical Hierarchy Process (AHP) dan Supply Chain Operation Reference (SCOR) 12.0 digunakan untuk mengukur kinerja rantai pasokan. Hasilnya mengungkapkan bahwa nilai kinerja rantai pasokan sebesar 77.539. Perbaikan diperlukan untuk meningkatkan kinerja rantai pasokan perusahaan karena tiga KPI memiliki bobot yang rendah, persentase pesanan bahan baku yang dikirim tepat waktu, harga pembelian bahan baku, dan biaya pengembalian barang. Tindakan perbaikan yang dilakukan perusahaan berupa penyusunan material yang rapi di gudang, memberikan pencahayaan yang cukup, menjaga kelembaban udara, menjaga kebersihan tangan ketika memegang sepatu, mengecek pemberian lem pada upper sepatu agar tidak terjadi open bonding, memberikan penalti kepada supplier yang terlambat, dan memberikan pelatihan agar kerusakan material berkurang.*

***Kata kunci:*** *Pengukuran Kinerja, Supply Chain Operation Reference, Analytical Hierarchy Process, Perusahaan Sepatu Olahraga*

## INTRODUCTION

Nowadays, manufacturing organizations face a difficulty as the industrial world's competitiveness gets more intense [1]. Due to the growing ferocious competition among businesses, corporations must perform their production tasks even better [2]. Therefore, businesses must be able to innovate to put plans into place to provide goods and services that are inexpensive, of high quality, and simple to access [3]. The secret to identifying a company's benefits is to determine its ability to deliver products that are affordable, simple to purchase, and of high quality [4]. Additionally, for the supply chain to function properly and smoothly, cooperation, coordination, and synchronization of work among all parties

involved are necessary [5]. It is necessary to include suppliers as raw material providers, internal companies that will turn raw materials into finished products, as well as distribution networks that will deliver products to the hands of ultimate consumers, in order to achieve the desired results [6][7].

The supply chain is a network of businesses that work together to provide services or activities during the production process to create finished goods, which are subsequently delivered to customers [8]. The ability to distribute goods to customers in the appropriate quantity, in the appropriate location, and at the appropriate time is crucial for a network of these businesses [9]. The goal of the supply chain is to effectively manage and control the flow of products, with the hope that this will ensure that the flow is neither too fast nor too slow, that product quality can be maintained, and that the quantity is in line with needs and sent to locations where the product is actually required [10].

Measurement using a technique, such as the SCOR method, is required to ascertain the efficiency of the company's supply chain [11]. Using measurement indicators that are appropriate for the company, the SCOR supply chain performance measurement model may explain a company's supply chain in depth [12]. The SCOR model comprises three process levels, with level 1 being the highest and providing a general definition of the five key processes—plan, source, make, deliver, return, and enable—in generic terms [13][14]. The company's supply chain is believed to be able to mold the current or desired configuration at Level 2, which is the configuration level [4]. The third level is referred to as the "process element level," and it includes references (such as benchmarking and best practices), the specification of process elements, inputs, outputs, and measurements for each processing element [15].

A manufacturing company in Jepara, Indonesia produces sports shoes under the particular brand. Make to order is the production method used by this company. Products are manufactured in accordance with the quantity of consumer demands, and they are meant for export to countries like Germany, China, Japan, Korea, America, Canada, and Russia, among others. The sport shoes company encounters a number of issues with supply chain operations, such as supplier lateness in delivering raw materials, production failing to meet predetermined goals, production-related material damage, delayed delivery of finished goods to customers, and complaints from customers regarding faulty goods. In this regard, businesses must assess their supply chain systems by gauging the effectiveness of their internal supply chains [16]. This supply chain performance measurement is crucial for future improvement, monitoring and management, and evaluating a company's position in relation to competitors [17]. Although there is some literature on supply chain preference analysis using the SCOR model, studies of shoe companies are still uncommon.

Based on the observations that have been made, the company has several problems in supply chain activities including the late delivery of raw materials by suppliers, the production process does not reach predetermined targets, material damage in the production department, delivery of finished products to consumers is late, there are claims from consumers due to the product is defective. The following is a graph of the number of delays in product delivery to consumers during July - December which can be seen in Figure 1.

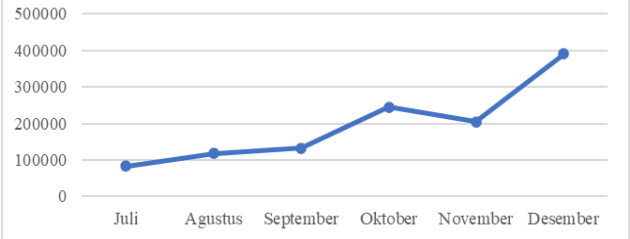


Figure 1. Number of Delays in Product Delivery to Consumers

Based on several problems encountered in the supply chain performance aspect, it can be concluded that the company's supply chain performance is still inefficient. In addition to measuring performance internally, this performance must also be carried out on other supply chain parties outside the company, such as suppliers, distributors, and consumers.

## METHODS

### Research Methods

It is descriptive quantitative research that is being used. Both interviews and questionnaires were used to collect the data for the quantitative analysis. The SCOR model will be used by the author to undertake research on supply chain performance measurement.

Field observations were the initial step in this study, followed by the preliminary stage, which covered the identification of issues, goals, and advantages of the study. The next stage is to choose a study strategy and gather data through questionnaire distribution and interviewing participants to collect both primary and secondary data. Designing Key Performance Indicators (KPI) [18], validating KPIs, weighting KPIs using the AHP technique [19], calculating normalization of Snorm de Boer, and calculating the overall value of supply chain performance comprise the third phase [20]. The fourth phase is to present an analysis of the findings in order to suggest changes, draw conclusions, and make improvements [21].

### Data Sources and Types

Both primary data and secondary data were used in this investigation. Primary data are facts discovered and gathered by researchers directly from the outcomes of their fieldwork, including observations, interviews, and questionnaires. Secondary data is information that has been gathered from books, journals, earlier studies, and the internet.

### Data Gathering Method

Collecting information for this study through questionnaires, interviews, and observations. In order to learn about the supply chain procedures that took place in the organization, field observations were made by conducting direct observations at the research site. The PPIC Manager, Production Manager, Logistics Supervisor, Purchasing Staff, Warehouse Staff, and Marketing Staff were all interviewed using a question-and-answer format to find out supply chain problems in each department. The question-and-answer session was held to ascertain the KPIs to be measured as well as the supply chain management issues that happened at the sport shoes company. A set of questions pertaining to the research topic was provided in order to distribute the questionnaire. This survey is intended for reliable individuals with a direct stake in the subject under investigation.

### Methods for Processing Data

The weighting of KPIs using the AHP approach constitutes the first stage of data processing in this study. This weighting's goal is to establish each indicator's relative value [22]. Calculating Snorm de Boer normalization is the second step. The goal of this calculation is to make the value scale for each indication, which is turned into a number between 0 and 100, equal. Calculating the supply chain's final performance is the third stage. This calculation seeks to calculate the final value of the supply chain performance of the organization. The normalized score is multiplied by the final weighted value of each KPI to arrive at this calculation.

## RESULTS AND DISCUSSION

### KPI Recognition

Jepara prepared the indicators for monitoring supply chain performance after watching and gathering data at the sport shoes company. There were created 22 KPIs, which are displayed in Table 1.

Table 1. Design of Supply Chain Performance KPIs

| Process | Attribute | KPI | Unit |
|---|---|---|---|
| Plan | Reliability | P01. Production planning forecasting accuracy | % |
| | Responsiveness | P02. Cycle time in determining production planning | Day |
| | | P03. Cycle time in determining raw material procurement planning | Day |
| Source | Reliability | S01. % Ordered raw materials delivered on time | % |
| | | S02. % Orders of raw materials received are defect-free | % |
| | | S03. % Received raw material orders with correct packaging | % |
| | Responsiveness | S04. Raw material receiving cycle time | Day |
| | | S05. Product verification cycle time | Day |
| | Agility | S06. Additional purchase of raw materials in 30 days | % |
| | Cost | S07. Cost of purchasing raw materials | $ |
| Make | Reliability | M01. Yield | % |
| | Responsiveness | M02. Production cycle time | Day |
| | | M03. Packing cycle time | Day |
| | Cost | M04. Production cost | $ |
| Deliver | Reliability | D01. Accuracy of product delivery according to quantity | % |
| | | D02. Accuracy of product delivery according to location | % |
| | | D03. Accuracy of product delivery according to item | % |
| | | D04. Product delivery accuracy is free from damage | % |
| | Responsiveness | D04. Product delivery cycle time | Day |
| Return | Asset Management | R01. Defective product return rate | % |
| | Cost | R02. Product return fee | $ |
| Enable | Responsiveness | E01. Delivery performance appraisal cycle time | Month |

The KPI weighting process is then carried out by having respondents—including the PPIC Manager, the Production Manager, the Logistics Supervisor, the Purchasing Staff, the Warehouse Staff, and the Marketing Staff—fill out questionnaires. The AHP approach was used for processing after respondents completed the questionnaire.

### Calculating Performance Weighting Using AHP

The weighting is done with AHP after the KPI has been established. By evaluating the significance of each variable and identifying which variable has the most influence, the AHP technique is used to tackle complicated issues that are not divided into multiple components and hierarchical rules [8][23]. The weights of various supply chain performance metrics are calculated using the weighted formula. Table 2 shows the results of weighting the sport shoes company's supply chain performance.

Table 2. Results of the Supply Chain Performance Weighting

| Process | Weight Level 1 | Performance Attributes | Weight Level 2 | KPI | Weight Level 3 | Final Weight |
|---|---|---|---|---|---|---|
| Plan | 0.174 | Reliability | 0.7 | P01 | 1 | 0.122 |
| | | Responsiveness | 0.3 | P02 | 0.50 | 0.026 |
| | | | | P03 | 0.50 | 0.026 |
| Source | 0.253 | Reliability | 0.59 | S01 | 0.50 | 0.075 |
| | | | | S02 | 0.35 | 0.052 |
| | | | | S03 | 0.15 | 0.022 |
| | | Responsiveness | 0.21 | S04 | 0.79 | 0.042 |
| | | | | S05 | 0.21 | 0.011 |
| | | Agility | 0.12 | S06 | 1 | 0.030 |
| | | cost | 0.08 | S07 | 1 | 0.020 |
| Make | 0.219 | Reliability | 0.6 | M01 | 1 | 0.131 |
| | | Responsiveness | 0.13 | M02 | 0.79 | 0.022 |
| | | | | M03 | 0,21 | 0.006 |
| | | cost | 0.27 | M04 | 1 | 0.059 |
| Deliver | 0.14 | Reliability | 0.79 | D01 | 0.34 | 0.038 |
| | | | | D02 | 0.16 | 0.018 |
| | | | | D03 | 0.13 | 0.014 |
| | | | | D04 | 0.37 | 0.041 |
| | | Responsiveness | 0.21 | D05 | 1 | 0.029 |

Continued Table 2. Results of the Supply Chain Performance Weighting

| Process | Weight Level 1 | Performance Attributes | Weight Level 2 | KPI | Weight Level 3 | Final Weight |
|---|---|---|---|---|---|---|
| Return | 0.091 | Asset Management | 0.3 | R01 | 1 | 0.027 |
| | | cost | 0.7 | R02 | 1 | 0.064 |
| Enable | 0.122 | Responsiveness | 1 | E01 | 1 | 0.122 |

## Calculation of Snorm De Boer Normalization

A scoring system that tries to equalize the parameters of the respective value scales for each performance indicator is created using the normalization procedure [24]. Every indicator has a unique weight and a unique size scale. As a result, normalization—a method of equating parameters—is required [25][26]. Each indicator weight used in this measurement is transformed into a range of values, from 0 to 100. The worst value is zero (0), while the best value is one hundred (100) [8]. Table 3 displays the results of the Snorm de Boer normalization calculation. The following formula is used to carry out the Snorm de Boer normalizing operation [12].

Large is Better $$\text{Snorms} = \left(\frac{(Smax - Si)}{(Smax - Smin)} \times 100\right) \quad (1)$$

Lower is Better $$\text{Snorms} = \left(\frac{(Si - Smin)}{(Smax - Smin)} \times 100\right) \quad (2)$$

Where:

Snorm : Normalized score
Si : The genuine benefit that has been attained
Smax : The indicator's optimal performance value
Smin : The indicator's poorest performance value

Table 3. Snorm de Boer Normalization Calculations

| Business Process | KPI | Si | Smin | Smax | SNORM | Type |
|---|---|---|---|---|---|---|
| Plan | P01 | 99 | 97 | 100 | 66.67 | Large is Better |
| | P02 | 1 | 1 | 2 | 100 | Large is Better |
| | P03 | 3 | 3 | 4 | 100 | Lower is Better |
| Source | S01 | 97 | 95 | 100 | 40 | Large is Better |
| | S02 | 100 | 0 | 100 | 100 | Large is Better |
| | S03 | 100 | 0 | 100 | 100 | Large is Better |
| | S04 | 12 | 11 | 14 | 66.67 | Lower is Better |
| | S05 | 1 | 1 | 2 | 100 | Lower is Better |
| | S06 | 24 | 0 | 61 | 60.66 | Lower is Better |
| | S07 | 147276 | 91298.4 | 202938 | 49.86 | Lower is Better |
| Make | M01 | 99.9 | 99 | 100 | 90 | Large is Better |
| | M02 | 22 | 21 | 24 | 66.67 | Lower is Better |
| | M03 | 1 | 1 | 2 | 100 | Lower is Better |
| | M04 | 90798.22 | 61117.4 | 128783 | 56.14 | Lower is Better |
| Deliver | D01 | 100 | 0 | 100 | 100 | Large is Better |
| | D02 | 100 | 0 | 100 | 100 | Large is Better |
| | D03 | 100 | 0 | 100 | 100 | Large is Better |
| | D04 | 100 | 0 | 100 | 100 | Large is Better |
| | D05 | 1 | 1 | 2 | 100 | Lower is Better |
| Return | R01 | 0.08 | 0.05 | 0.12 | 57.14 | Lower is Better |
| | R02 | 25182.15 | 21100.9 | 27025.4 | 31.11 | Lower is Better |
| Enable | E01 | 1 | 1 | 12 | 100 | Lower is Better |

## SCOR Final Performance Calculation

The calculation of the final SCOR performance comes after weighting the AHP and doing the subsequent Snorm de Boer normalization [18]. SCOR is a supply chain performance measurement model that uses measurement indicators specific to the organization to explain the supply chain in detail [12]. By dividing the normalized score by the final weight of each KPI, the calculation of the final SCOR performance is obtained. The category of performance indicators is shown in Table 4, which represents the computation of the final SCOR performance at the sport shoes company.

Table 4**.** Performance SCOR Final Analysis

| Process | Performance Attributes | KPI | Snorm | Final Weight | Final Performance | Total Final Performance |
|---|---|---|---|---|---|---|
| Plan | Reliability | P01 | 66.67 | 0.122 | 8.120 | |
| | Responsiveness | P02 | 100 | 0.026 | 2.610 | |
| | | P03 | 100 | 0.026 | 2.610 | |
| Source | Reliability | S01 | 40 | 0.075 | 2.985 | |
| | | S02 | 100 | 0.052 | 5.224 | |
| | | S03 | 100 | 0.022 | 2.239 | |
| | Responsiveness | S04 | 66.67 | 0.042 | 2.798 | |
| | | S05 | 100 | 0.011 | 1.116 | |
| | Agility | S06 | 60.66 | 0.030 | 1.842 | |
| | cost | S07 | 49.86 | 0.020 | 1.009 | |
| Make | Reliability | M01 | 90 | 0.131 | 11.826 | 77.539 |
| | Responsiveness | M02 | 66.67 | 0.022 | 1.499 | |
| | | M03 | 100 | 0.006 | 0.598 | |
| | cost | M04 | 56.14 | 0.059 | 3.319 | |
| Deliver | Reliability | D01 | 100 | 0.038 | 3.760 | |
| | | D02 | 100 | 0.018 | 1.770 | |
| | | D03 | 100 | 0.014 | 1.438 | |
| | | D04 | 100 | 0.041 | 4.092 | |
| | Responsiveness | D05 | 100 | 0.029 | 2.940 | |
| Return | Asset Management | R01 | 57.14 | 0.027 | 1.560 | |
| | cost | R02 | 31.11 | 0.064 | 1.982 | |
| Enable | Responsiveness | E01 | 100 | 0.122 | 12.2 | |

Based on the results of the KPI weighting calculation using the AHP method, it can be seen that the final weighted values of each KPI are as follows: P01 is 0.122, P02 is 0.026, P03 is 0.026, S01 is 0.075, S02 is 0.052, S03 is 0.022, S04 is 0.042, S05 is 0.011, S06 is 0.03, S07 is 0.02, M01 is 0.131, M02 is 0.022.

Measuring the accuracy of forecasting production planning aims to find out how precise the company is in forecasting the amount of production. Measuring the percentage of raw material orders sent on time aims to find out how much raw material is delivered on time by suppliers. Measuring the percentage of raw material orders received free of defects aims to find out how much the number of raw materials sent by suppliers has defects. Measuring the percentage of raw material orders received with the correct packing aims to find out how much raw material is sent by the supplier with the correct packing. Measurement of the addition of raw material purchases within 30 days aims to determine the supplier's ability to fulfill additional raw material purchases within 30 days. Yield measurement aims to determine the ratio of the number of products that have good quality with the number of products produced.

Measuring the accuracy of product delivery according to quantity aims to find out how much the number of products sent to consumers is in accordance with the quantity. Measuring the accuracy of product delivery according to location aims to find out how many products are sent to consumers according to their location. Measuring the accuracy of product delivery according to the item aims to find out how much the number of products sent to consumers corresponds to the right item. Measuring the accuracy of damage-free product delivery aims to find out how many products sent to consumers are damaged due to the shipping process. Measuring the return rate of defective products aims to find out how much the number of products returned from consumers due to damage or defects.

According to the results of the Snorm de Boer normalization calculation, there are 12 KPIs that fall into the excellent category (score greater than 90) of the 22 KPIs used to measure supply chain performance at the sport shoes company, 1 KPI that includes the good category (scores between 70 and 90), 6 KPIs that fall into the average category (scores between 50 and 70), 2 KPIs that fall into the marginal category (scores between 40 and 50 (scores less than 40).

It is clear from the computation of the final supply chain performance that the sport shoes company's supply chain performance value is 77.539. This result suggests that the sport shoes company's supply chain performance metrics fall into the good category.

Out of the 22 KPIs utilized by the sport shoes company to gauge supply chain performance, Jepara still has two KPIs that are considered marginal and one that is considered poor. The percentage of orders for raw materials that are delivered on time (S01) and the price of purchasing raw materials are KPIs that are included in the marginal category (S07). The cost of returning the item is the KPI that falls in the poor category (R02). The reasons for these indicators' low scores include the fact that suppliers frequently deliver raw materials late, that it costs money to replace damaged materials in the production process with new raw materials, and that there are still many products that customers return to the company and for which the latter must incur expenses. additional for shoe maintenance or replacement.

Supplier delivery performance analysis, purchasing/procurement strategy, and return cost recovery are best practices that can be used to raise these KPIs. Analyzing the performance of supplier delivery is one technique to assess how well suppliers deliver raw materials on schedule. The purchasing/procurement strategy is an approach to acquiring raw materials for the business that is intended to be economical. Recovery of the cost of returning goods is possible through return cost recovery [27].

Best practices that can be applied to improve KPIs based on the SCOR Guide version 12.0 are supplier delivery performance analysis, purchasing/procurement strategy and return cost recovery. Supplier delivery performance analysis is a way to analyze the performance of the timely delivery of raw materials by suppliers. Purchasing/procurement strategy is a raw material procurement strategy that is planned to be cost effective in purchasing the company's raw materials. Return cost recovery is a way to recover the cost of product returns. The corrective actions carried out by the company so that the company's supply chain performance can increase are as follows.

- Neat preparation of materials in the warehouse as well as providing sufficient lighting and maintaining air humidity to minimize the emergence of fungus on shoes.
- Maintain the cleanliness of employees' hands when handling shoes so that there is no dirt or food residue which will later cause mold on shoes.
- Increase the accuracy of employees when applying glue to the upper shoes so that open bonding does not occur (the glue comes off).
- Give penalties or penalties to suppliers who are late in delivering raw materials.
- Provide training to employees so that material damage in the production process can be reduced.

## CONCLUSION

The total score for the supply chain performance measurement at the sport shoes company utilizing the SCOR 12.0 method was 77.539. The supply chain performance metrics are in the good range. There are still two KPIs that fall into the marginal group and one KPI that falls into the poor category out of the 22 KPIs used to measure supply chain performance. The percentage of orders for raw materials that are delivered on time (S01) and the price of purchasing raw materials are KPIs that are included in the marginal category (S07). The cost of returning the item is the KPI that falls in the poor category (R02). There are several areas where the business can be improved, including the neat organization of the supplies in the warehouse, the provision of suitable lighting, and the maintenance of air humidity to reduce the formation of mold on shoes. When handling shoes, employees must practice good hand hygiene to prevent the build-up of dirt or food particles that could later result in mold on the shoes. To avoid open bonding, workers' precision when applying glue to shoe uppers must be improved (glue is released). Raw material suppliers must also be given firmness in the shape of fines or penalties if they are late with their deliveries.

Additionally, businesses should train their staff members to minimize material damage during production.

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