# Analysis of Supply Chain Management Performance using SCOR and AHP Methods in Green Avenue Apartments of East Bekasi

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**Abstract**

This study analyzes the performance of a company's supply chain as measured by an approach using the SCOR method or the Supply Chain Operations Reference. SCOR is divided into 5 basic supply chain management processes, namely plan, source, make, deliver and return. Due to schedule delays of 3%, it is affected by the late delivery of raw materials ordered from suppliers and the quality of raw materials is below standard. Performing a performance measurement approach is also supported by the Analytical Hierarchy Process (AHP) method to determine the weight of each performance indicator and is calculated using the Expert Choice v11 program in this study. The purpose of this study was to determine how much value the PT Adhi Commuter Properti supply chain performance and what performance indicators should be improved. The results of the study resulted in a 75.444 overall supply chain performance achievement score of the GOOD category in achieving total company performance appraisal and priority improvement recommendations of 4 performance indicators that are expected to help improve the company's supply chain performance, namely the fulfillment of raw materials, structures, defective products and demand that the company can fulfill.

*Keywords:* Supply Chain Operations Reference, Expert Choice v11, Analytical Hierarchy Process

## 1. Introduction

In the world of construction today which is growing rapidly causing increasing competition between companies. In the construction world today it is demanded to improve its performance so that it can survive in the competition of the construction world today. One important performance measure is supply chain performance. Because in the supply chain performance, companies are demanded to have good performance from suppliers to consumers.

Schedule delays of 3% in green avenue apartment projects are influenced by the late delivery of raw materials ordered from suppliers and substandard quality of raw materials, so the supply chain performance is used the SCOR (Supply Chain Operation Reference) method approach, the excess SCOR model is used because it is more complete, namely at

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the source, make, deliver stages, where its use is to measure performance objectively based on company data and can identify where improvements need to be made to create competitive advantage.

To determine the performance of a company's supply chain, a measurement through an approach is needed, namely the Supply Chain Operation Reference (SCOR) method. The SCOR method is a reference model of supply chain operations. SCOR is able to map parts of the supply chain. The SCOR model includes three process levels. These three levels indicate that SCOR is decomposing or decomposing the process from general to detailed. At level 1 is called the Top level (type of process). Level 2 of SCOR is configuration level (Dimension type), and level 3 is called the process element level (performance indicator), which is an indicator that defines the company's business processes.

## 2. Methods

This study began through the identification stage, where this stage is done by making direct observations to identify problems at the research location. From the problems that have been identified, then formulate the problem and set research objectives. Then the literature study and field study are conducted to support the research so that the research runs well and correctly.
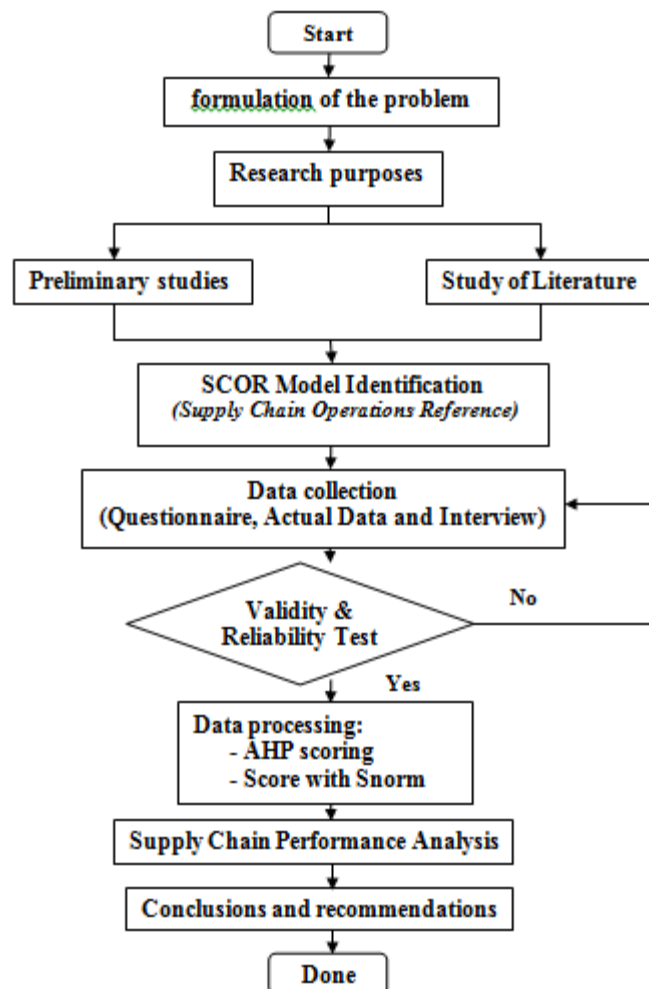


Fig. 1 Research Flowchart

Data collection is the next stage which consists of classification of supply chain mapping and determination of the SCOR model hierarchy with adjustments to the company's supply chain activities. The supply chain mapping classification is obtained by observation and interviews with experts which are classified based on 5 core processes namely plan, source, make, deliver and return on the SCOR model. This classification is used to compile a pairwise questionnaire that fits the hierarchy of the SCOR model.

## 3. Result and Discussion

The data used in this study are : company data and pairwise questionnaire based on the Supply Chain Operations Reference (SCOR) model which is processed using the Analytic Hierarchy Process (AHP) method and calculated using the Expert Choice V11 program.

### 3.1. Scoring

Scoring is using the Expert Choice V11 program using pairwise questionnaire data. The stages of data processing (weighting) using the Expert Choice program are:
   a) Step 1, create a file in the Expert Choice V11 program
   b) Step 2, create a weighting hierarchy
   c) Weighting Data Input
   d) Weighting Results

The results of the above weights are then arranged in tabular form (table 1).

Table 1  Performance Weighting Value

| Process (Level 1) | Weight Level 1 | Dimension (Level 2) | Weight Level 2 | Performance Indicator  (Level 3) | Weight Level 3 |
|---|---|---|---|---|---|
| PLAN | 0,254 | Reliability | 0,666 | Meeting with a client | 0,5 |
| | | | | Time identifying employee performance | 0,5 |
| | | Responsiveness | 0,333 | project scheduling timeframe | 0,75 |
| | | | | the intensity of the revised work plan | 0,25 |
| SOURCE | 0,274 | Reliability | 1 | fulfillment of raw materials | 0,25 |
| | | | | reliability in shipping | 0,75 |
| MAKE | 0,092 | Reliability | 0,606 | mistake in the implementation method | 0,25 |
| | | | | number of defective products | 0,75 |
| | | Responsiveness | 0,147 | bore pile production | 0,1314 |
| | | | | pile cap production | 0,1314 |
| | | | | structure production | 0,737 |
| | | Flexibility | 0,246 | speed of supply machine | 0,25 |

| Process (Level 1) | Weight Level 1 | Dimension (Level 2) | Weight Level 2 | Performance Indicator (Level 3) | Weight Level 3 |
|---|---|---|---|---|---|
| | | | | speed of material substitution | 0,75 |
| DELIVER | 0,261 | Reliability | 1 | number of requests the company can fulfill | 0,249 |
| | | | | number of incorrect shipments seen from the requested item | 0,750 |
| RETURN | 0,118 | Reliability | 1 | level of complaint from the client | 0,179 |
| | | | | the amount of defective material returned to the supplier | 0,820 |

*(Source: Processed Results, 2019)*

### 3.2. Performance Index Level 3

The level 3 performance index value is obtained by multiplying the level 3 AHP weights with the level 3 Performance Value.

Calculation:

Performance Index Level 3 = Weight AHP Level 3 x Performance Value Level 3

Table 2  Performance Index Level 3

| Process (Level 1) | Dimension (Level 2) | Performance Indicator (Level 3) | Weight Level 3 | Performance Rating Level 3 | Performance Index Level 3 |
|---|---|---|---|---|---|
| **PLAN** | **Reliability** | Meeting with a client | 0,5 | 100 | 50 |
| | | Time identifying employee performance | 0,5 | 75 | 37,5 |
| | **Responsiveness** | project scheduling timeframe | 0,75 | 70 | 52,5 |
| | | the intensity of the revised work plan | 0,25 | 100 | 25 |
| **SOURCE** | **Reliability** | fulfillment of raw materials | 0,25 | 50 | 12,5 |
| | | reliability in shipping | 0,75 | 70 | 52,5 |
| **MAKE** | **Reliability** | mistake in the implementation method | 0,25 | 100 | 25 |
| | | number of defective products | 0,75 | 65 | 48,75 |
| | **Responsiveness** | bore pile production | 0,1314 | 80 | 10,512 |
| | | pile cap production | 0,1314 | 90 | 11,826 |
| | | structure production | 0,737 | 60 | 44,22 |
| | **Flexibility** | speed of supply machine | 0,25 | 75 | 18,75 |
| | | speed of material substitution | 0,75 | 100 | 60 |

| Process (Level 1) | Dimension (Level 2) | Performance Indicator  (Level 3) | Weight Level 3 | Performance Rating | Performance Index |
|---|---|---|---|---|---|
| **DELIVER** | **Reliability** | number of requests the company can fulfill | 0,249 | 65 | 16,185 |
| | | number of incorrect shipments seen from the requested item | 0,75 | 80 | 60 |
| **RETURN** | **Reliability** | level of complaint from the client | 0,179 | 100 | 17,9 |
| | | the amount of defective material returned to the supplier | 0,82 | 76,6 | 62,812 |

*(Source: Processed Results, 2019)*

### 3.3. Performance Index Level 2

Level two performance index values are obtained by multiplying the AHP level 2 weights by level 2 performance values.

Calculation:

Level 2 Performance Index = AHP Weight Level 2 x Final Result Level 2

Table  3  Performance Index Level 2

| Process (Level 1) | Dimensi (Level 2) | Performance Rating (Level 2) | Weight Level 2 | Performance Index Level 2 |
|---|---|---|---|---|
| PLAN | Reliability | 87,5 | 0,666 | 58,275 |
| | Responsiveness | 77,5 | 0,333 | 25,807 |
| SOURCE | Reliability | 65 | 1 | 65 |
| MAKE | Reliability | 73,75 | 0,606 | 44,692 |
| | Responsiveness | 66,558 | 0,147 | 9,784 |
| | Flexibility | 78,75 | 0,246 | 19,372 |
| DELIVER | Reliability | 76,185 | 1 | 76,185 |
| RETURN | Reliability | 80,712 | 1 | 80,712 |

*(Source: Processed Results, 2019)*

### 3.4. Value of Supply Chain Performance

The total value of Supply Chain performance is obtained by multiplying the value of level one performance by the weight of level one AHP, then the total multiplication results are summed together to find out the total value of company performance.

Calculation:

Supply Chain Performance Value = AHP Weight Level 1 x Final Result Level 1 Performance Value

Table 4  Value of Supply Chain Performance

| Process (Level 1) | Performance Index Level 1 | Weight Level 1 | Performance Value SCM |
|---|---|---|---|
| PLAN | 84,082 | 0,254 | 21,392 |
| SOURCE | 65 | 0,274 | 17,840 |
| MAKE | 73,848 | 0,092 | 6,802 |
| DELIVER | 76,185 | 0,261 | 19,858 |
| RETURN | 80,712 | 0,118 | 9,550 |
| | | Total | 75,442 |

*(Source: Processed Results, 2019)*

Then the value of the performance of Supply Chain Management of PT. Adhi Commuter The property is 75,442. Based on the Supply Chain Management Performance monitoring table that the performance value of Supply Chain Management of PT. Adhi Commuter Property of 75.444 which is in the range of 70 - 90 and classified as Good in achieving SCM performance

### 3.5. Traffic Light System

Traffic Light System is a system for analyzing the achievement of performance values based on the target of a company. The use of the Traffic Light System can measure a performance whether it meets the target or needs improvement.

This Traffic Light System consists of three colors to identify each performance indicator, namely: red, yellow and green.

The color explanation of the Traffic Light System is as follows:

➢ Red

The red color indicates the achievement of a company's performance is below the target set and needs immediate improvement. The red color is set on the indicator that has a performance value smaller than 70.

➤ Yellow

Yellow indicates the achievement of a company's performance that has not reached the target even though it is close to the target set by the company. The yellow color is set on the indicator which has a performance value greater than 70 and smaller equal to 80 ($70 \leq \chi \geq 80$)

➤ Green

The green color indicates the achievement of a company's performance has reached the target set by the company, however the company must still be able to maintain the achievement of these achievements. The green color is set on the indicator that has a performance value greater than 80.

*3.6. Overall Performance Analysis*

To clarify the picture of the Traffic Light System on the overall SCOR model at PT. Adhi Commuter Properties, it will be written in the table 5.

Table 5  Traffic Light System on SCOR

| Process (Level 1) | Dimension (Level 2) | Performance Indicator (Level 3) |
|---|---|---|
| PLAN | Reliability | Meeting with a client |
| | | Time identifying employee performance |
| | Responsiveness | project scheduling timeframe |
| | | the intensity of the revised work plan |
| SOURCE | Reliability | fulfillment of raw materials |
| | | reliability in shipping |
| MAKE | Reliability | mistake in the implementation method |
| | | number of defective products |
| | Responsiveness | bore pile production |
| | | pile cap production |
| | | structure production |
| | Flexibility | speed of supply machine |
| | | speed of material substitution |
| DELIVER | Reliability | number of requests the company can fulfill |
| | | number of incorrect shipments seen from the requested item |
| RETURN | Reliability | level of complaint from the client |
| | | the amount of defective material returned to the supplier |

*(Source: Processed Results, 2019)*

Information :
Red        : $\chi < 70$
Yellow   : $70 \le \chi \ge 80$
Green     : $\chi > 80$

## 4. Conclusion

1) Weighting of performance indicators is calculated using the Analytical Hierarchy Process (AHP) method and Expert Choice v11 software, then the results of supply chain management performance appraisal at PT. Adhi Commuter Property is 75.444 and the achievement of the total performance appraisal is GOOD category.

2) From the results of the description of the Traffic Light System on SCOR, it can be determined the priorities of PT. Adhi Commuter Properties that must be immediately improved are:
   a. The first priority to improve is the performance indicator for the fulfillment of raw materials.
   b. The second priority for improvement is an indicator of structural production performance.
   c. The third priority for improvement is the performance indicators of the number of defective products and the number of requests the company can fulfill.

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