



MEASURING THE PERFORMANCE OF AGILITY IN SUPPLY CHAIN USING SCOR.

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ABSTRACT

This study aims to measure the supply chain performance aspects of Agility and provide suggestions for improving performance of Agility. In this research, the methodology used is the design and assessment of supply chain performance based on the SCOR 12.0 model to identify supply chain performance indicators with subjective (personal) and objective (data) field approaches and process adjustments was adjusted. The use of AHP results is weighted for each process, process category and performance indicators. The result of the design of supply chain performance appraisal is that there are 9 performance indicators that are grouped into 3 main business processes, namely: source, make and deliver. The scoring system uses the Snorm de Bour normalization process which is analyzed by a Traffic Light System for priority improvement. The result of the performance appraisal and weighting are in the good category with a value of 80,26 for the March 2019 period. There are 4 performance indicators that get yellow so that improvements are needed in the process, namely: Additional Source Volumes Obtained in 30 days, Current Source Volume, Current Make Volume, Current Delivery Volume.

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1. INTRODUCTION

Super Javanese Chicken has a fast growth compared to ordinary native chicken. Super Chickens are ready to be consumed within 45-75 days of maintenance, while native chickens need about 90-180 days to be ready for consumption [1]. The increasingly fierce business competition requires each company to develop strategies and business tactics on a daily basis. The essence of competition lies in the way companies implement processes in producing products that are better, cheaper, and faster than their competitors. Low-cost strategies and fast responses to market fulfillment are important challenges for competition. When companies try to improve competitiveness through product adjustment, high quality, cost reduction and speed of response to the market, it will put more pressure on the company's supply chain. So that collaboration between companies and stakeholders plays an important role in the creation of effectiveness and efficiency of the supply chain. The aim is to satisfy the final consumer.

To provide good quality products, supply chain management is the key determinant of the company's competitive advantage, but in the implementation of supply chain management in its activities have uncertainties from various things such as demand uncertainty, supply uncertainty and internal uncertainty (engine damage, imperfect engine performance). A company must be able to improve the performance of supply chain management in order to excel and compete and make progress. Therefore, the evaluation and measurement of the performance of the company's supply chain are very important for continuous improvement and improvement in supply chain performance. The supply chain is said to be better equipped to deal with sudden changes and make the supply chain more flexible. The questions that should be answered in this research are how the result of the performance value of the supply chain in the aspect of Agility in SCOR and alternative improvements that can be done to improve supply chain performance. To response the research question, this study focusses on two objectives (1) to determine the value of the

supply chain performance on the Agility aspect, (2) to provide alternative improvements to supply chain performance.

2. MATERIAL AND METHODS

2.1 Supply Chain Operation Reference (SCOR) 12.0

SCOR is a reference model of supply chain operations [2]. SCOR is basically a process-based model. This model integrates three main elements in management namely business process reengineering, benchmarking, and process measurement into a cross-functional framework in the supply chain. According to [3] stated in the SCOR process, there are several core processes used to describe the supply chain, including the following:

- a) Plan is a process that balances demand and supply to determine the best course of action in meeting distribution, inventory planning and control needs, production planning, material planning, capacity planning, and financial planning of the existing supply chain.
- b) Source is the process of procuring goods and services by considering scheduling related to shipping and payment of goods sent by the supplier. In this process, an evaluation process is also carried out whether the supplier has good performance or not.
- c) Make is the production process of an item to meet demand by scheduling the production process, carrying out the

production process, and maintaining the production itself in order to reach the target inventory on the basis of orders or on the basis of re-engineered orders.

- d) Deliver is the process of distributing a product that has been ordered by consumers from a company. This process consists of how the company receives orders from consumers, then selects freight forwarding services, manages the finished product that will be placed in the warehouse, and provides bills to consumers.
- e) Return is the process of returning or receiving product returns that can be caused by a defect in the product. The product is identified before being returned to the consumer by agreed scheduling of returns.
- f) Enable is a process related to how the supply chain management works in terms of company business rules, company performance, natural and human resources, facilities provided by the company, and risk management and supply chain of the company [4].

In addition to the core process, SCOR also has attributes and metrics used to analyze and evaluate supply chain performance in order to compete. These attributes and metrics are according to [4] as follows:

1. Reliability, namely the company's ability to get the right product

orders, and can meet the quality according to product requirements consistently.

2. Responsiveness, namely the company's ability to provide good products and services to consumers quickly and consistently.
3. Agility, which is the company's ability to respond and adjust changes that occur in the market.
4. Cost, namely the company's ability to manage and control the supply chain in terms of costs that must be incurred.
5. Assets management, namely the company's ability to manage and maintain supply chains in order to effectively meet consumer demand.

Bolstrotff & Rosebaum (2003) in [5] state quantitative measures to measure performance called assessment matrices. Its function is that supply chain performance can be measured properly and can find the desired target for improvement.

Table 1. The scale of work monitoring systems

Monitoring System	Performance Indicator
<40%	Poor
40 – 50%	Marginal
50 – 70%	Average
70 – 90%	Good
>90%	Excellent

2.2. Snorm de Boer

According to [6] the level of performance fulfillment is defined by the normalization of these performance indicators. Each indicator has a different weight with a different size scale as well. Therefore, we need the process of parameter matching by means of normalization. The method used for normalization is the Snorm de Boer method. The normalization process is carried out with the following formula:

$$S_{norm} = \frac{S_i - S_{min}}{S_{Max} - S_{min}} \times 100$$

S_i = The actual indicator value that was successfully achieved

S_{min} = The worst performance achievement value of the performance indicators

S_{Max} = The value of achieving the best performance of performance indicators

In this measurement, each indicator weight is converted into a specified interval of values from 0 to 100. Zero (0) is the worst and one hundred (100) is best interpreted. Thus, the parameters of each indicator are the same, after that we get a result that can be analyzed.

2.3 Analytical Hierarchy Process (AHP)

AHP is a model developed by Thomas L. Saaty as a decision support system. This AHP model will describe multi-factor or multi-criteria problems into a hierarchy so that complex problems can be more structured and systematic. Hierarchy is an illustration of complex problems in a multi-level structure where the first level is the goal, followed by the level of factors,

criteria, sub-criteria, and so on to the last level. Here is a picture of the hierarchical structure:

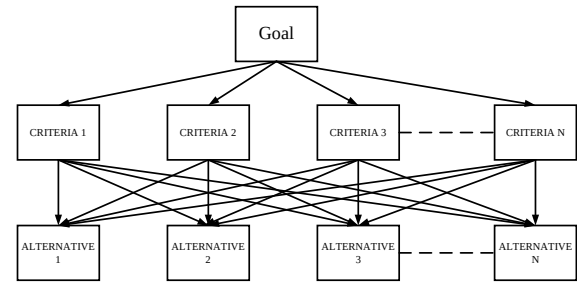


Figure 1. Hierarchical Structure [7]

The AHP model is often used as a method of problem-solving for the following reasons [4]:

1. The hierarchical structure, as a consequence of the criteria was chosen and reaches the deepest sub criteria.
2. Considering the validity of the tolerance limit of inconsistencies in various criteria and alternatives chosen by decision-makers.
3. Considering the durability of output analysis of decision-making sensitivity.

2.4 A Case Study

To justify our approach, this study was incorporating two private company in Indonesia is CV Rafli and Danu's Farm. CV Rafli and Dannu's Farm is a Super Javanese Chicken producer since 2009 located in Tegal Ringin, Sapen, Manisrenggo, Klaten. This approach will be used to improve the supply chain performance with the aspect of Agility using SCOR.

3. RESULT AND DISCUSSION

The results of the research that has been done are the design of supply chain performance indicators into Agility performance attributes that refer to SCOR 12.0 and validate performance indicators using the SMART method that is related to the target or objectives of the company.

Table 2. Agility Performance Indicator Validation Results

No	Level 1	Level 2	Level 3
1	Source	Source Stocked Product	Additional Source Volumes Obtained in 30 days
2			Current Purchase Order Cycle Times
3			Current Source Volume
4			Demand Sourcing Supplier Constraints
5			Current Make Volume
6	Make	Make to Stock Deliver Stocked Product	% Of Labor Used in Manufacturing, Not Used in Direct Activity
7			Additional Delivery Volume
8	Deliver		Current Delivery Volume
9			% Of Labor Used in Logistics, Not Used in Direct Activity

From a valid Agility performance indicator, then calculate the actual value of the

performance indicator. The calculation is done every period for 6 periods in 1-month ie March 2019. During the study period and the actual value obtained from the average value of the calculation for 6 periods. In calculating the actual value of each performance indicator using a formula that can be seen in the SCOR12.0 library. in the table below shows the results of the actual value in the study of supply chain performance measurement CV Rafli and Dan's Farm.

Table 3. Agility Performance Indicator Validation Results

No	Performance Indicator	Actual Value					
		Period (March 2019)					
		1	2	3	4	5	6
1	Additional Source Volumes Obtained in 30 days	5.501	4.527	2.006	1.820	2.875	5.687
2	Current Purchase Order Cycle Times	2	2	2	2	2	2
3	Current Source Volume	24.952	21.919	18.296	20.085	23.037	20.759
4	Demand Sourcing Supplier Constraints	100%	100%	100%	100%	100%	100%
5	Current Make Volume	11.703	10.117	7.757	8.443	9.938	10.147
6	% Of Labor Used in Manufacturing, Not Used in Direct Activity	30.76%	30.76%	30.76%	30.76%	30.76%	30.76%
7	Additional Delivery Volume	2.280	1.980	1.520	1.640	1.940	1.980
8	Current Delivery Volume	11.400	9.900	7.600	8.200	9.700	9.900
9	% Of Labor Used in Logistics, Not Used in Direct Activity	7.69%	7.69%	7.69%	7.69%	7.69%	7.69%

The next data processing is to calculate the normalization value of each Agility performance indicator, the normalization value calculation aims to equalize the unit value of each measurement matrix used to calculate the final value of the Agility supply chain performance aspects of the company. Normalization value calculation is obtained using the Snorm de Boer equation. Then the normalized values will be grouped using the traffic light system. This system consists of

three colors namely red, yellow, and green. The results of normalization values from the Agility aspects of performance indicators are as follows:

Table 4. Agility Performance Indicator Validation Results

No	Performance Indicator	Actual Value	Min	S Max	Normalization
1	<i>Additional Source Volumes Obtained in 30 days</i>	3.736	0	5.687	65.59
2	<i>Current Purchase Order Cycle Times</i>	2	5	2	100
3	<i>Current Source Volume</i>	21.508	10260	28.138	62.92
4	<i>Demand Sourcing Supplier Constraints</i>	100%	0	100%	100
5	<i>Current Make Volume</i>	9.684	0	16.823	57.57
6	<i>% Of Labor Used in Manufacturing, Not Used In Direct Activity</i>	30.76%	1538%	30.76%	100
7	<i>Additional Delivery Volume</i>	1.890	0	2.280	82.89
8	<i>Current Delivery Volume</i>	9.450	0	16.400	57.62
9	<i>% Of Labor Used in Logistics, Not Used in Direct Activity</i>	7.69%	0%	7.69%	100

To calculate the final value of supply chain performance we need the weight value of performance indicators and performance attributes in the research shown in the table:

Table 5. Agility Performance Indicator Validation Result

No	Performance Indicator	Score of Bour Val	AHP Weights	Final Score
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		March 2019		March 2019
1	Additional Source Volumes Obtained in 30 days	65.69	0.23	14.98
2	Current Purchase Order Cycle Times	100	0.20	20
3	Current Source Volume	62.92	0.33	20.48
4	Demand Sourcing Supplier Constraints	100	0.25	24.97
Total				80.11
5	Current Make Volume	57.57	0.50	28.78
6	% Of Labor Used in Manufacturing, Not Used in Direct Activity	100	0.50	50
Total				78.78
7	Additional Delivery	82.89	0.22	18.06
8	Current Delivery Volume	57.62	0.24	13.77
9	% Of Labor Used in Logistics, Not Used in Direct Activity	100	0.54	54.32
Total				86.15

Table 6. Agility Performance Indicator Validation Results

Process	Total Score	AHP Weights	Final Score (March 2019)
<i>Source</i>	80.11	0.56	44.86
<i>Make</i>	78.78	0.34	26.79
<i><u>Deliver</u></i>	<u>86.15</u>	<u>0.1</u>	<u>8.61</u>
Total			80.26

Based on calculation above, the final value for the supply chain performance of CV Rafli and Dan's Farm on the Agility aspect in March 2019 is 80.26. The overall performance value of the Agility aspects of SCOR 12.0 on CV Rafli and Dan's Farm measured in March with periods of one to six is good. It's just that there are some performance indicators that are included in the yellow group or need to be improved. Improvements to the performance indicators are carried out on the performance indicators that fall into the yellow group. This indicator has the final value of the performance indicator below the target set by the company which is greater than 75 (> 75). The performance indicators are Additional Source Volumes Obtained in 30 days, Current Source Volume, Current Make Volume and Current Delivery Volume.

Performance indicators Additional Source Volumes Obtained in 30 days get a yellow color with the final value of the performance indicator 65.59. The reason is in terms of the company has not planned the addition of raw materials if there is an increase. To overcome this problem CV Rafli and Danu's Farm should make forecasting the need for raw materials if there is a sudden increase in demand. Forecasting can use software such as WinQSB. Current Source Volume

performance indicators get yellow with the final performance indicator value 62.92. Based on identification with the company, this happens because of an error in estimating or predicting the need for raw materials. In addition, from suppliers there are also external factors and are unable to meet raw materials. To overcome these problems CV Rafli and Danu's Farm should make forecasting the need for raw materials. Forecasting can use software such as WinQSB which facilitates forecasting and improves the accuracy of forecasting results.

The Current Make Volume performance indicator gets yellow with the final value of the performance indicator 57.57. Based on identification with the company, this happened because of the large number of infertile hatched eggs, broken eggs, non-hatched eggs and leg deformed DOCs. Further improvement proposals for Current Make Volume performance indicators are by evaluating the mechanism of artificial insemination as a whole, regular cleaning of the cage, provision of vitamins and nutritious feed for the mother and male chickens, making an agreement to the supplier that infertile eggs must be taken back by the supplier on the day 7th after candling, maintenance of setter and hatcher machines on a regular basis, attaching SOP (Standard Operating Procedure) to setter and hatcher machines, strict supervision such as CCTV installation and the application of regulations to workers if breaking eggs will be sanctioned, giving directions to workers how to wash eggs properly and safely. Current Deliver Volume performance indicators get yellow with the final value of the performance indicator 57.62. Based on

identification with the company, this happens because the number of hatched eggs does not hatch and leg deformed DOC. Proposed improvement for the performance indicator Current Delivery Volume is the attachment of SOP (Standard Operating Procedure) for the operation of the hatcher machine, maintenance of the hatcher machine periodically, washing the hatcher machine after each harvest and fumigation with a strength of 1 dose, tightening machine supervision related to temperature and humidity, providing a base in the egg hatching basket. From the proposed improvements above, this study will simulate if such improvements are made. Here are the results of the comparison before and after improvements to the final value of the performance indicators.

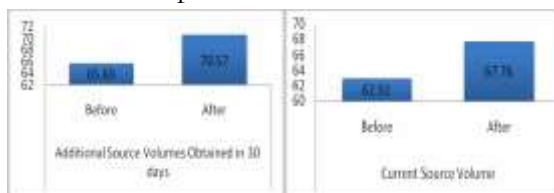


Figure 2. Comparison of the final value of performance indicators



Figure 3. Comparison of the final value of performance indicators

In the proposed improvement the final value of the performance indicator has increased, so that the proposed improvement should be applied in CV Rafli and Dan's Farm.

4. Conclusion and further research

The final performance score on the supply chain agility aspect at CV Rafli and Danu's Farm in March was 80.26. After obtained 4 improvement indicators that need to be done namely Additional Source Volume Obtained In 30 Days, Current Source Volume, Current Volume and Current Delivery Volume. Improvements for performance indicators Additional Sources Of Volume Obtained In 30 Days are forecasting related raw materials that will occur on-time or seasonally appropriate using software such as WinQSB. Use WinQSB to make it easy to predict to be accurate. Use improvements to performance indicators Current Source Volume also forecasts related to raw materials to be provided. This forecasting uses software for example with WinQSB to facilitate accurate forecasting. We are making further improvements to the Current Volume increase indicator by evaluating the policy of complete artificial insemination, routine maintenance, provision of vitamins and nutritious feed for mother and male chickens, arranging agreements with suppliers, eggs taken from infertile which must be returned by suppliers on the day seventh after candling, maintenance of setter and mother hen machines periodically, attaching SOP (Standard Operating Procedure) is transferred to the setter and mother hens, strict supervision such as CCTV installation and the effective and safe way to wash eggs. Improvements for the Current Delivery Volume performance indicators are sticking to SOP (Standard Operating Procedures) that uses a hatcher machine, maintenance of a hatcher machine periodically, an automatic hatcher machine after each

harvest and fumigation with the help of 1 dose, tightening the controller of the machine that is issuing with the help of heating, providing a base in the egg hatching basket. The suggestions that can be given by researchers for the company is performance appraisals are good enough, but it should be done periodically so that improvements are made continuously, and the company should implement the proposed improvements that have been given. For further research, it is expected to be able to draft a SOP (Standard Operating Procedure) for operating machines in a company.

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