

Improving service supply chain performance with the Supply Chain Operations Reference (SCOR) approach; Case study: Indonesia government testing laboratory

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Abstract

Performance measurement in service supply chain management is very important to facilitate companies in achieving effectiveness and efficiency to meet customer satisfaction targets. Indonesia Government Testing Laboratory, one of whose functions is to provide testing, calibration, technical inspection and product verification services in the industrial sector. The purpose of this research is intended to identify and provide recommendations for improving the performance of the service supply chain at the Indonesia Government Testing Laboratory unit. One model for measuring performance in the service supply chain is the Supply Chain Operation Reference (SCOR). This model presents a business process framework, performance indicators which are divided into five basic processes namely plan, source, make, deliver, return and enable to support communication and collaboration between supply chain partners. Performance measurement in this study is also supported by the Analytical Hierarchy Process (AHP) method for weighting assessment combined with Objective Matrix (OMAX) for categorical systems. The results showed that the overall achievement value of the company's supply chain performance was 91.54. Of the total 10 performance indicators measured, there are two performance indicators that require corrective action, namely KPI 1 Percentage of realization of the quality assurance program for test results and KPI 8 Delivery time of chemicals to the laboratory. The author proposes four performance improvement recommendations that can be implemented by Indonesia Government Testing Laboratory in order to improve the quality of performance in the future.

Keywords: Performance Measurement; Service Supply Chain; Supply Chain Operation Reference (SCOR); Analytical Hierarchy Process (AHP); Objective Matrix (OMAX); Indonesia Government Testing Laboratory

1 Introduction

The management of the service supply chain is crucial for the efficient delivery of services to customers. It involves the coordination of various entities such as suppliers, consumers, and service providers to deliver the necessary resources, transform them into services, and ultimately provide these services to customers [1]. The importance of the service supply chain has garnered significant attention from both practitioners and academics in recent years [2]. The performance of service supply chains in terms of service levels and cost efficiency depends not only on the effort of service providers but also on the inputs of sub-contractors and the customer [3]. Furthermore, the integration of service resources is emphasized to enhance the overall benefit of the supply chain, highlighting service as a critical factor in the supply chain [4]. The significance of quality in the service supply chain is well recognized, with the need for a structured quality approach to continually improve products, services, and processes [5]. Additionally, service quality, improved lead time, and flexibility are identified as important factors in enhancing supply chain performance [6]. The complexity of the service supply chain presents a challenge, necessitating proper process design to ensure its effectiveness [7]. Moreover, the rising importance of the services sector and the service supply chain is underscored in the literature [8].

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One of the methods The Supply-Chain Operations Reference (SCOR) model, developed by the Supply Chain Council, is a widely recognized framework for characterizing supply-chain management practices and processes that lead to best-in-class performance [9]. The SCOR model has been evaluated and found to have relative strengths and weaknesses when compared to other supply chain management frameworks, highlighting its significance in the field [10]. Furthermore, the SCOR model has been found to assist managers and supply chain practitioners in improving performance measures, making it a valuable tool for enhancing overall supply chain performance [11]. The SCOR model encompasses various performance attributes that assess supply chain effectiveness, including delivery performance, flexibility, responsiveness, logistics cost, and asset management, which are crucial for evaluating and enhancing supply chain performance [12]. Moreover, the SCOR framework has been integrated into disaster response service supply chain analysis, indicating its adaptability and applicability in diverse supply chain contexts [13]. Additionally, the elements of Industry 4.0 are related to the fundamental processes of the SCOR model, further underlining its relevance in modern supply chain management practices [14].

Indonesia Government Testing Laboratory has functions to provide testing, calibration, technical inspection and product verification services in the industrial sector. Every year Indonesia Government Testing Laboratory is required to determine a competitive strategy in providing excellent service with the ultimate goal of customer satisfaction. Customers at the Indonesia Government Testing Laboratory consist of industrial actors in the fields of food and beverages, chemicals, metals, electronics and there are also educational institutions, government institutions, micro, small and medium enterprises, to individuals or the private sector. Indonesia Government Testing Laboratory is a service unit included in the service supply chain (SSC) system with the results in the form of a Test Result Report (LHU).

In this study, we aim to investigate the impact of implementing the SCOR framework on service supply chain operations in Indonesia Government Testing Laboratory to (1) Identify indicators that affect SSC performance at Indonesia Government Testing Laboratory; (2) Identify SSC performance indicators that require priority for improvement. This research was conducted on the scope of the operating system of BSPIJ Pekanbaru testing laboratory services. Measurement of work attributes is adjusted to the Key Performance Indicator (KPI) owned by Indonesia Government Testing Laboratory.

2 Service Supply Chain Management

The Service Supply Chain (SSC) is a network of suppliers, service providers, customers and other service partners that transfer resources into services or service products delivered to and received by customer [15]. Meanwhile, SSC in the view of (Wang et al., 2015) [16] classifies SCC into two categories, namely Service Only Supply Chains (SOSC) and Product Service Supply Chains (PSSC), so that SOSC is defined as a supply chain system in which the "product" is only a pure service and physical products do not play an important role. SSC in the point of view of (Zhang et al., 2016) [17] is a complex, customized value-added network structure for customers coordinated by an integrated service business that aims to achieve customer success and maximize the entire supply chain value.

The service supply chain operates based on customer orders, which decompose customer orders into detailed steps. With regard to the service performance aspect of supply chain outcomes in the service industry, Services are intangible products and services are also produced and consumed simultaneously at the time of demand and not before. Further, if at the time of customer demand, the service provider is unable to produce the service, then he may lose the order [18]. In addition, service customers according to (Sampson & Spring, 2012) [19] are customers who are component suppliers of mind, body, goods, and information. Therefore, information also acts as the starting material of the service supply chain. Meanwhile, still according to (Lin et al., 2010) [20] the definition of Service Supply Chain Management (SSCM) is the management of information, processes, and resources along the service supply chain to effectively deliver services or service products to customers.

2.1 Service Supply Chain Performance Measurement

Performance measurement is defined as the process of measuring the effectiveness and efficiency of a supply chain operation [21]. There are many researchers who have conducted literature reviews on supply chain performance measurement systems over the past few decades. However, most of these studies consider performance measures as part of the performance measurement system [22]. Efforts to develop conceptual models to describe SSC and provide an understanding of the differences that exist between the manufacturing and service sectors have provided useful insights for SSC studies [23].

Supply chain performance measurement requires several performance indicators called Key Performance Indicators (KPIs). Determining KPIs in supply chain performance measurement needs to be adjusted to the company's objectives.

The challenge faced in supply chain performance measurement is to determine KPIs based on the company's strategic objectives, how to measure and implement them [24].

Therefore, identifying the right performance parameters in measuring SSC performance at the Indonesia Government Testing Laboratory and then prioritizing them rationally becomes a very important issue. Clarity on what is more important than others, and how the various performance dimensions should be compromised to optimize the overall performance of the SSC at the Indonesia Government Testing Laboratory as well as guide each other every individual in the team.

2.2 Supply Chain Operation Reference (SCOR)

The Supply Chain Operations Reference model (SCOR) is a product of APICS following the merger between the Supply Chain Council and APICS in 2014. The SCOR model was established in 1996 and is regularly updated to adapt to changing supply chain business practices. SCOR has become a powerful measurement tool for evaluating and benchmarking supply chain activities and performance. SCOR provides methodologies, diagnostics, and benchmarking tools that help organizations make dramatic and rapid improvements in supply chain processes. In SCOR, five important criteria are presented: Reliability, Responsiveness, Flexibility, Cost, and Asset management. This supply chain process is described as 5 integrated processes, namely plan, source, produce, deliver and return [25].

Evaluation indicators in the SCOR model are expressed in several levels, including levels 1, 2 and 3. Therefore, in addition to modeling the supply chain process as a process hierarchy, evaluation indicators are also expressed in the form of an assessment hierarchy. The number and level of matrices used will be adjusted based on the type and number of processes and the level of supply.

2.3 Normalization

Each indicator has a different weight with a different size scale. Therefore, it is necessary to have a parameter equalization process by normalizing the indicator[26]. Here normalization plays a vital role in order to achieve the final value of performance measurement. The normalization process is carried out with the *Snorm De Boer* normalization formula, namely

$$\text{Larger is better : } Snorm = \left(\frac{Si - Smin}{Smax - Smin} \right) \times 100 \tag{1}$$

$$\text{Lower is better : } Snorm = \left(\frac{Smax - Si}{Smax - Smin} \right) \times 100 \tag{2}$$

Where: Si : actual indicator value achieved.

Smin : the worst performance achievement value of the performance indicator

Smax : the best performance achievement value of the performance indicator

Each indicator weight is converted into a specific value interval from 0 to 100. A score of 0 means the worst and 100 means the best. Thus the parameters of each indicator are the same, after which a result can be analyzed. Table 1. below shows the performance indicator monitoring system.

Table 1 Performance Indicator Monitoring System[27].

Monitoring Scale	Performance Indicator
< 40	Very Less
40-50	Low
50-70	Average
70-90	Good
> 90	Superior

2.4 Analytica Hierarchy Process (AHP)

Due to the level of influence on each process, the weighting of each process or performance metric with SSC performance indicators is very important in SSC performance measurement. Performance metrics and performance indicators on performance measurement have unequal levels/weights. The greater the weight on the process, performance metrics and performance indicators, the greater the influence of the process. The AHP methodology proposed by Thomas L. Saaty is applied to find the weighting scores of supply chain metrics. Supply chain performance attributes and metrics were organized into a hierarchy to find the weighting scores by expert judgment. Five expert assessments from the group of practitioners at the Indonesia Government Testing Laboratory participated in filling out the questionnaire to find consistent and valid metric scores using AHP.

AHP development consists of three basic steps (Vanany et al., 2005) [28] Design the hierarchy, Prioritize the procedures and Calculate the weighting results. After forming the preference matrix, the mathematical process begins to normalize and find the priority weights on each matrix by applying pair-ways comparison as shown in Table 2 below.

Table 2 Pairwise Comparison Matrix System

Attributes	A1	A2	An
A1	1	A1/A2	A1/An
A2	A2/A1	1	A2/An
....
An	An/A1	An/A2	1

Elements in AHP are compared using relative measurements on a scale of 1 - 9. To ensure validation of expert judgment, KPI consistency is measured with the Consistency Index (CI) using the following formula

$$CI = \frac{\lambda_{Max} - n}{n - 1} \tag{3}$$

Where: λ_{Max} : The maximum value of the n th eigenvalue

N : Number of criteria

The maximum eigen value is obtained by summing the product of the comparison matrix with the main eigen vector (priority vector) and dividing it by the number of elements. To calculate the level of consistency AHP has a formula for calculating the Consistency Ratio (CR), namely:

$$CR = \frac{CI}{RI} \tag{4}$$

Where: CI : Consistency Index

CR : Consistency Ratio

RI : Random Index

If the CR value is ≤ 0.1 , it can still be tolerated but if $CR > 0.1$ then revisions need to be made. CR value = 0 then it can be said "Perfectly Consistent" [29].

Number citations consecutively in square brackets (1). The sentence punctuation follows the brackets (2). Multiple references (2), (3) are each numbered with separate brackets (1)–(3). Please note that the references at the end of this document are in the preferred referencing style. Please ensure that the provided references are complete with all the details and also cited inside the manuscript (example: page numbers, year of publication, publisher’s name etc.).

2.5 Objective Matrix (OMAX) System

Object Matrix (OMAX) was conceptually developed in 1975 and introduced in 1980 by James L. Riggs of Oregon University. OMAX is a local productivity measurement system designed to monitor the productivity of each department of a company with productivity standards appropriate to the existence of the department. Performance is a function of several work group standards combined into a matrix. Each standard has a specific improvement path and is weighted according to its importance for performance purposes [30].

2.6 Traffic Light System (TFS)

Traffic Light System is a method to more easily understand the achievement of company performance with the help of three color categories (green, red and yellow). For the provisions of the boundaries of each color category, it is carried out through discussions with parties in the company who are considered to understand the flow of supply chain in the company well. This color category makes it easier for companies to evaluate the performance of companies that meet targets or those that do not reach targets [31].

2.7 Previous Research References

In conducting research using a theoretical basis to support the proposed theory. One of the foundations used as a reference is from previous research. Here are some previous studies that are still related to the writing of this article.

Table 3 Previous Research

Author	Title	Number of KPI	Methods
(Revaldiwansyah & Ernawati, 2021) [30]	Analysis of Supply Chain Management Performance Measurement Using the ANP and Omax Based Supply Chain Operation Reference (SCOR) Method (Case Study: PT. Karya Giri Palma)	32	SCOR, ANP,OMAX
(Kusrini & Miranda, 2021)[21]	Determining Performance Metrics of Supply Chain Management in Make-to-order Small-Medium Enterprise Using Supply Chain Operation Reference Model (SCOR Version 12.0)	52	SCOR ver.12.0
(Aryanto & Hasibuan, 2021)[32]	Framework for measuring the supply chain performance of the plastic packaging industry using SCOR and AHP method	29	SCOR & AHP
(Febrianti et al., 2018) [33]	Application of Green SCOR Model for Performance Measurement of Green Supply Chain Management at PT XYZ	31	SCOR & AHP
(Vanany et al., 2005) [28]	Design Of Supply Chain Performance Measurement System For Lamp Industry	23	SCOR & AHP

3 Equations

3.1 Research Flow Chart

Data analysis in this study begins with determining the standards and matrices to be studied. The matrix is formed based on literature related to the measurement of Service Supply Chain performance, SCOR model, KPI, AHP and OMAX literature, as well as opinions from several experts at the Indonesia Government Testing Laboratory. Therefore, the determination of the matrix itself must be adjusted to the needs of the Indonesia Government Testing Laboratory and the approval of the Indonesia Government Testing Laboratory. Each matrix is grouped according to its component parts. After that, the calculation is carried out for each criterion so that the results are obtained, then compared with the actual and target values of the Indonesia Government Testing Laboratory. The diagram below briefly describes the steps used in solving the problem in this research. The following is the research diagram.

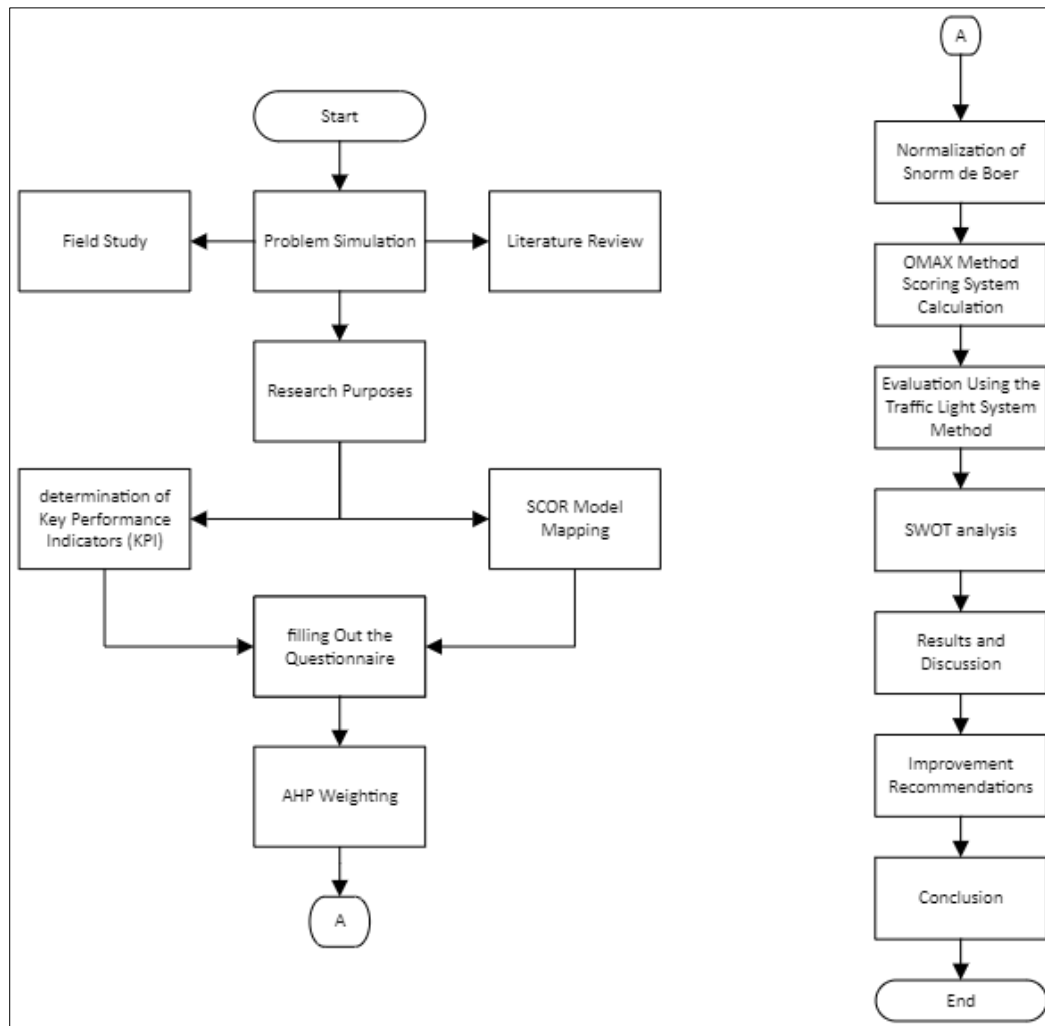


Figure 1 Research Flow Chart

3.2 Data Collection

The object of this research was conducted at Indonesia Government Testing Laboratory. Data collection comes from primary and secondary data. Primary data obtained from observation data, interviews and questionnaires. While secondary data is obtained from the first source and arranged in the form of documents involving several sections of the Indonesia Government Testing Laboratory. Data collection was carried out in May 2023. Determination of KPIs that will be weighted, researchers conducted interviews with decision makers at Indonesia Government Testing Laboratory. While the data from the questionnaire was obtained from five experts who have experience in the fields of testing, quality management, and procurement. The profiles of the respondents in this study are shown in Table 4.

Table 3 Previous Research

Respondent Type	Respondent Profile
Determination of appropriate KPIs	Head of Indonesia Government Testing Laboratory
Questionnaire Filling	Testing, Calibration and Inspection Sub Coordinator Standardization and Certification Sub-Coordinator Testing Laboratory Supervisor Calibration Laboratory Supervisor Vice Management

3.3 Other recommendations

3.3.1 Indonesia Government Testing Laboratory

The entire interaction process of the SSC Indonesia Government Testing Laboratory process related to testing technical services is presented in Figure 2. The entire testing business process interaction from start to finish involves several parts, both from the core testing activity process and other processes that are still related to the core testing activity. The testing technical service activities have implemented one-stop integrated services and have implemented digital information monitoring that can be monitored by customers by accessing the Public Service Information System.

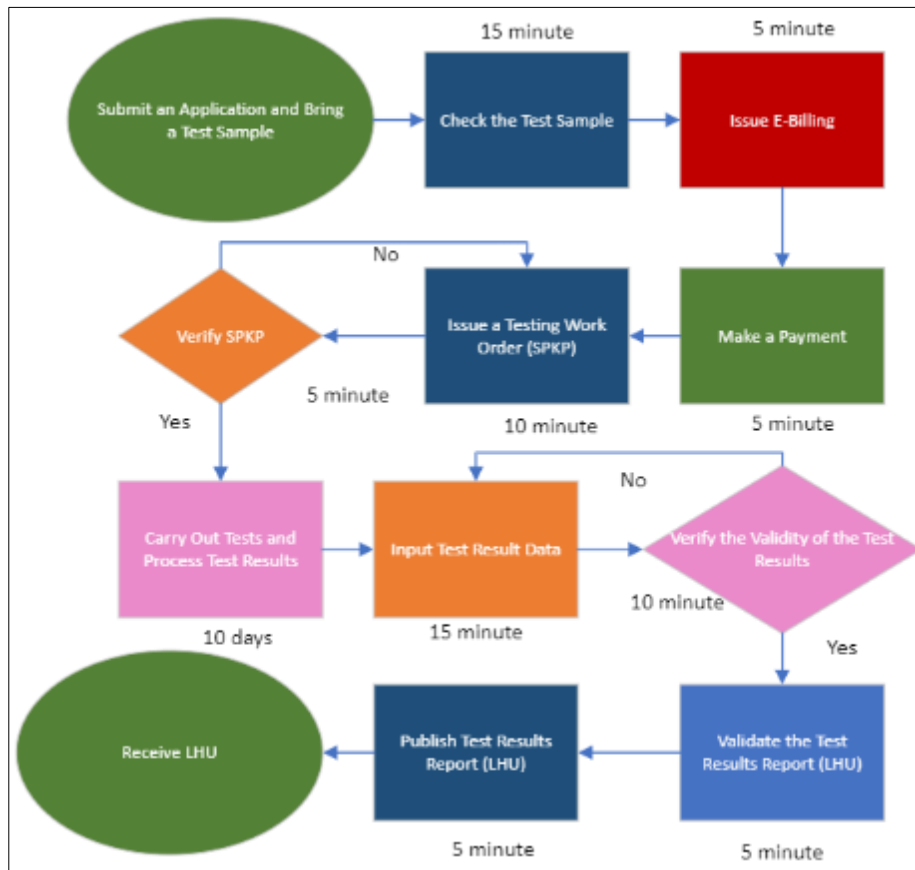


Figure 2 Testing Core Process Flow

3.4 Data Processing

After conducting the observation and interview stage with the Head of Indonesia Government Testing Laboratory, 10 KPIs were obtained that were most relevant to the problems and conditions at the Indonesia Government Testing Laboratory to fill out a questionnaire, the KPI data used was the working year 2022. After verification and filling out the questionnaire for the 10 KPIs, the next stage is weighting with the AHP method. For scoring calculation, OMAX method is used and TLS system is used to determine whether the performance indicators are appropriate or not. Meanwhile, SWOT data obtained from Indonesia Government Testing Laboratory and displayed in this article as additional information that is useful for making recommendations for corrective actions.

3.5 KPI Weighting Calculation

The next step from the identification of performance indicators is the weighting of KPI performance indicators. Weighting is carried out because the level of importance of KPI performance indicators on SSC performance measurement is not the same. The process of weighting KPI performance indicators by first modeling the network between indicators with the AHP model. This modeling explains the influence of one or more indicators on other indicators. This AHP method is used to determine the weight of business processes, attributes, and KPIs in the SCOR system by solving problems to be more structured and interrelated. The following is presented in Figure 3. Model of performance indicators between KIPs at each level.

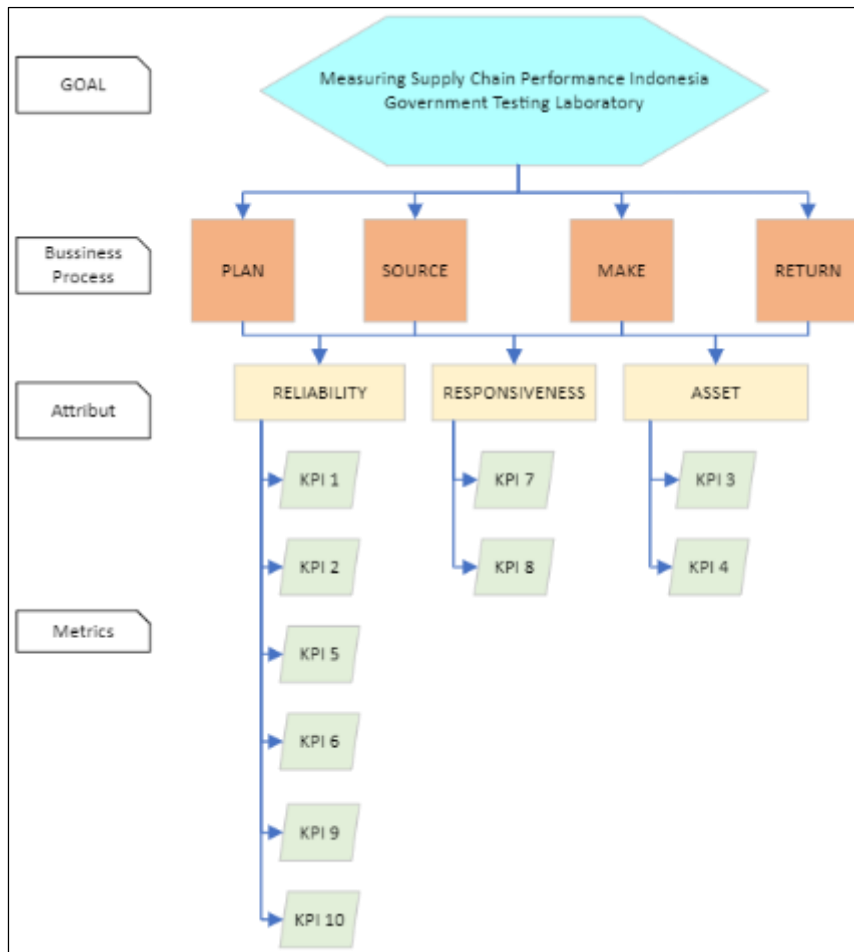


Figure 3 KPI Measurement Framework for Each level

Table 4 Key Performance Indicator (KPI) of Indonesia Government Testing Laboratory

KPI	Description
KPI 1	Percentage of realization of internal quality assurance program test results
KPI 2	Percentage of inlier realization of proficiency test results
KPI 3	Percentage of training program realization
KPI 4	Percentage realization of equipment calibration program
KPI 5	Training evaluation
KPI 6	Evaluation of chemical suppliers and external calibration laboratories
KPI 7	Test equipment repair time
KPI 8	Chemical delivery time to the laboratory
KPI 9	Percentage of testing completion time on time
KPI 10	Customer satisfaction index

3.6 Business Process Weighting

In business processes, weighting with AHP is based on the five main aspects contained in the SCOR business process, which consists of plan, source, make and return. The results of perspective weighting can be seen in Table 5 below.

Table 5 Business Process Weighting Results

Level	Business Process	Weight
1	Plan	0.4527
	Source	0.3241
	Make	0.1596
	Return	0.0636
Total		1
Consistency Ratio		0.09

3.7 Attribute Weighting

Attribute weighting of each attribute is presented against the perspective of SCOR performance attributes, namely reliability, responsiveness and assets. The results of the weighting of each attribute can be seen in Tables 6 and 7 below.

Table 6 Business Process Weighting Results

Business Process	Attributes	Weight
Plan	Reliability	0.7675
	Asset	0.2325
Total		1

Table 7 Results of Weighting Attributes that affect the Source

Business Process	Attributes	Weigh
Source	Reliability	0.7061
	Responsiveness	0.2939
Total		1

For the weighting of reliability attributes in the make and return business processes, each is worth 1 because it only has one attribute for each business process.

3.8 KPI Weighting

After previously obtaining the weight value on business processes and attributes, at this stage each KPI will be assessed for its weight. There are 10 KPIs that have been validated by the Head of the Indonesia Government Testing Laboratory. The results of KPI weighting are shown in Table 8 as follows.

The Consistency Ratio (CR) value is 0.09 where the value is not greater than 0.1 or 10%, so it is concluded that all respondents are still in a consistent stage in filling out the KPI filling questionnaire given.

Table 8 Key Performance Indicator (KPI) Weighting Results

Business Process	Attributes	KPI	Weight
Plan (0.4527)	Reliability (0.7675)	KPI 1	0.6862
		KPI 2	0.3138
	Asset (0.2325)	KPI 3	0.6131
		KPI 4	0.3869
Source (0.3241)	Reliability (0.7061)	KPI 5	0.6025
		KPI 6	0.3975
	Responsiveness (0.2939)	KPI 7	0.6607
		KPI 8	0.3393
Make (0.1596)	Reliability (1)	KPI 9	1
Return (0.0636)	Reliability (1)	KPI 10	1

3.9 Performance Measure

The next stage is carried out performance measurement in order to obtain the results of performance measurement of the Indonesia Government Testing Laboratory service supply chain. The scoring used is a calculation of the minimum target (Level 3) set by Indonesia Government Testing Laboratory through Snorm de Boer normalization. The results of performance measurement can be seen in Table 9 below.

Table 9 Results of Performance Measurement of SSC Indonesia Government Testing Laboratory

Business Process	Attributes	KPI	Weight	Scoring	Performance
Plan	Reliability	KPI 1	0.2384	64.94	15.48
		KPI 2	0.1090	100	10.90
	Asset	KPI 3	0.0645	100	6.45
		KPI 4	0.0407	100	4.07
Source	Reliability	KPI 5	0.1379	100	13.79
		KPI 6	0.0910	100	9.10
	Responsiveness	KPI 7	0.0629	100	6.29
		KPI 8	0.0323	96.44	3.12
Make	Reliability	KPI 9	0.1596	100	15.96
Return	Reliability	KPI 10	0.0636	100	6.36
Total Performance of SSC Indonesia Government Testing Laboratory					91.54

The results of measuring the performance of the Indonesia Government Testing Laboratory SSC are 91.94, then compared to Table 1. The Indonesia Government Testing Laboratory testing laboratory is included on a scale of > 90 so that it is categorized as having superior performance.

3.10 Objective Matrix (OMAX) System

The categorical system is carried out using the Objective Matrix (OMAX) system. The system using OMAX is necessary because the actual data collected is 2022 data without comparison with the previous year. The use of OMAX is also because Indonesia Government Testing Laboratory not only has a minimum or maximum limit of each KPI but Indonesia Government Testing Laboratory also has a minimum target that is inputted at level 3 in the OMAX table. From this

system, researchers can categorize the performance of KPIs whether they are in the performance group that needs improvement, performance that needs improvement, or performance that is already good. The results of each categorization system for the SCOR perspective are presented in Table 10 below.

Table 10 Results of the Categorical System Calculation of Performance Indicators with OMAX

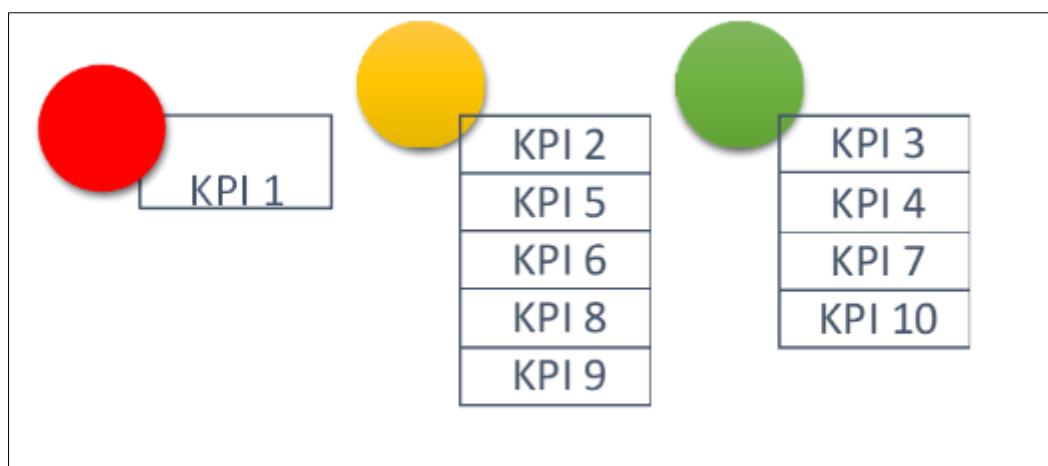
KPI No		KPI 1	KPI 2	KPI 3	KPI 4	KPI 5	KPI 6	KPI 7	KPI 8	KPI 9	KPI10
Performance		50	88.9	100	95.2	87.1	66.67	71.43	43.83	94.6	91
Performance is good	10	100	100	100	100	100	100	100	100	100	100
	9	96.4	97.1	97.1	97.1	96.6	92.9	89.8	92.21	98.6	97.4
	8	92.9	94.3	94.3	94.3	93.1	85.7	79.6	84.41	97.1	94.8
	7	89.3	91.4	91.4	91.4	89.7	78.6	69.4	76.62	95.7	92.2
Performance enhancement needs	6	85.7	88.6	88.6	88.6	86.3	71.4	59.2	68.83	94.3	89.5
	5	82.1	85.7	85.7	85.7	82.9	64.3	49.0	61.04	92.9	86.9
	4	78.6	82.9	82.9	82.9	79.4	57.1	38.8	53.24	91.4	84.3
	3	75	80	80	80	76	50	28.57	45.45	90	81.7
Performance improvement needs	2	50	53.3	53.3	53.3	50.7	33.3	19.05	30.3	60	54.5
	1	25	26.7	26.7	26.7	25.3	16.7	9.52	15.15	30	27.2
	0	0	0	0	0	0	0	0	0	0	0

The OMAX results, the KPIs that need improvement are KPI 1 (realization of the internal quality assurance program for test results) and KPI 8 (Delivery time of chemicals to the laboratory). KPI 8 is categorized as a KPI that needs improvement even though it has a yellow TFS because its performance value (43.83) is still below Level 3 (45.45). KPIs whose performance needs improvement are KPI 2 (realization of proficiency test result inlier), KPI 5 (Training evaluation), KPI 6 (Evaluation of chemical suppliers and external calibration laboratories), and KPI 9 (on-time test completion time). Finally, KPIs that already have good performance are KPI 3 (realization of training program), KPI 4 (realization of equipment calibration program), KPI 7 (test equipment repair time) and KPI 10 (customer satisfaction index).

3.11 Traffic Light System (TLS) Analys

The following is shown in Table 11. Color category TFS analysis to make it easier for the Indonesia Government Testing Laboratory to evaluate performance that meets targets or does not reach targets.

Table 11 Traffic Light System (TLS) Analysis



For performance indicators on KPI 1 Percentage of realization of the quality assurance program for test results, is in the quality of performance that requires improvement and KPI 8 Delivery time of chemicals to laboratories that are below

the minimum target. Table 12 presents some of the findings of the problems of KPI 1 and KPI 8 performance indicators, as follows

Table 12 Summary of Performance Indicator Issues

Work Indicator	Causes of Low Performance
Percentage of test result quality assurance program realization (intermediate check)	The Indonesia Government Testing Laboratory does not have all the standard tools used in the intermediate inspection process for test equipment, so that only 50% of the test equipment is available for intermediate inspection.
Chemical delivery time	Certain chemicals are difficult to obtain because they are imported products. The procurement department has not taken into account the time for receiving and examining goods from suppliers before being sent to the laboratory (end-user).

3.12 SWOT Analysis

As additional information that supports the writing of this article in the context of measuring and improving the Service Supply Chain Performance at the Indonesia Industrial Services Standardization and Service Center, that the Indonesia Government Testing Laboratory Hall has made a SWOT analysis as a guide in mapping and seeing threats and opportunities in improving the quality of service to the community. SWOT analysis is contained in the internal management document of Indonesia Government Testing Laboratory in the Organizational Context clause (PT.04). The following Figure 4 shows the SWOT analysis diagram of Indonesia Government Testing Laboratory.

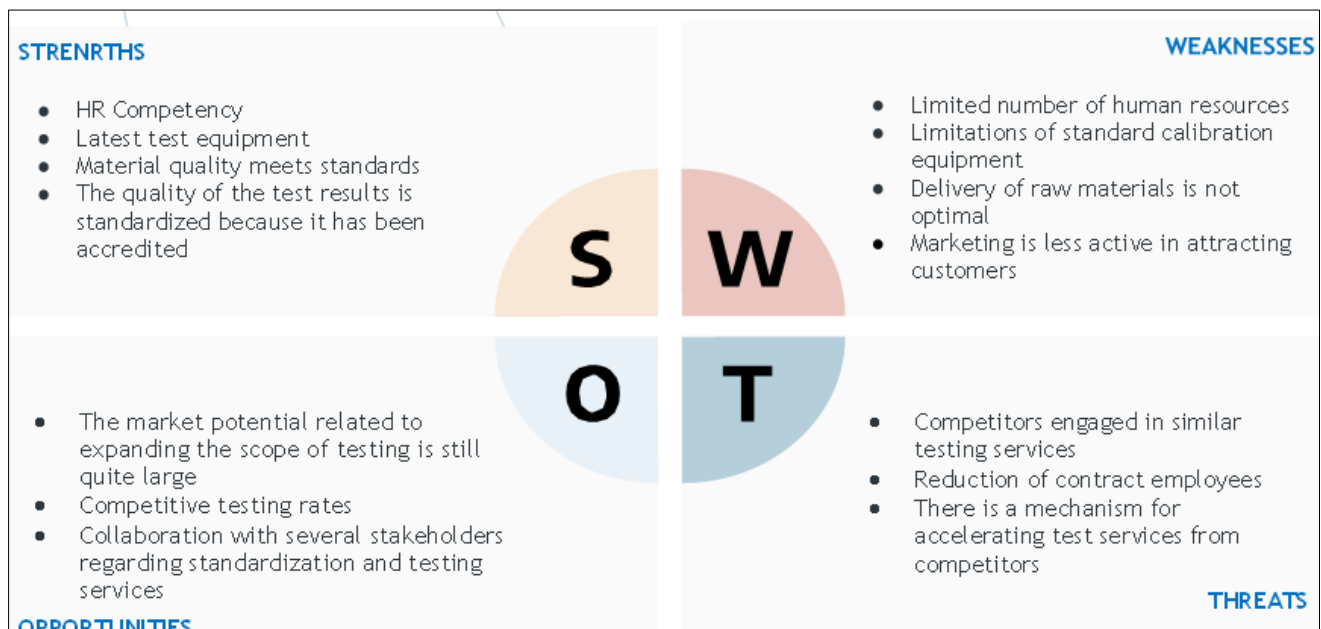


Figure 4 SWOT Analysis of Indonesia Government Testing Laboratory

3.13 Recommended Corrective Action

After being discussed in Table 12. regarding the factors that affect the low performance of KPI 1 and KPI 8 performance indicators, the following are some recommendations from the author in the context of performance improvements that can be made by the Indonesia Government Testing Laboratory. In summary, there are four performance improvements that the author recommends, as follows:

Looking for alternative suppliers by digging up information from the laboratory about the needs of the same goods / chemicals so as to obtain reliable supplier information.

Submit early requests for certain chemicals that have a long delivery trend.

Adding in the MoU / cooperation with suppliers articles related to penalties or fines if the delivery of chemicals is not as promised, this can be done but its application is constrained by the limited number of suppliers so that they must have alternative suppliers.

Cooperate with external calibration laboratories to simultaneously conduct intermediate checks when carrying out test equipment calibration.

3.14 Other recommendations

In order to improve performance to face fierce competition and provide customer satisfaction value in services at the Indonesia Government Testing Laboratory, it is appropriate to measure performance in the Service Supply Chain dimension. Performance measurement uses the SCOR framework combined with AHP for KPI weighting and OMAX as a scoring value counter for each performance indicator. The total result of SSC Indonesia Government Testing Laboratory Performance is 91.54 where the value is included in the Superior category.

The highest business process weighting result in the SCOR framework is Plan and the second highest is Source. In more detail, there are four performance indicators that have achieved their targets and must maintain their performance quality, the four indicators are KPI 3, KPI 4, KPI 7 and KPI 10. While KPI 2, KPI 5, KPI 6, KPI 9 are in the lower threshold that must be improved in the future. There are two performance indicators that experience performance non-achievement, namely, KPI 1 Percentage of realization of the quality assurance program for test results and KPI 8 Delivery time of chemicals to laboratories that are in the quality of performance that needs improvement.

It has been discussed in Subchapter 4.7 regarding the summary of factors that affect the low achievement of KPI 1 and KPI 8 and the author has provided in Subchapter 4.8 several performance improvement recommendations that management can apply for improvement. Of course this requires a strong and harmonious synergy from both the vertical and horizontal levels in the organizational structure of the Indonesia Government Testing Laboratory.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

- [1] W. Liu, D. Wang, S. Long, X. Shen, and V. Shi, "Service supply chain management: a behavioural operations perspective," *Modern Supply Chain Research and Applications*, vol. 1, no. 1, pp. 28–53, Feb. 2019, doi: 10.1108/MS CRA-01-2019-0003.
- [2] S. Wang, D. Li, Y. Zhang, and J. Chen, "Smart Contract-Based Product Traceability System in the Supply Chain Scenario," *IEEE Access*, vol. 7, pp. 115122–115133, 2019, doi: 10.1109/ACCESS.2019.2935873.
- [3] K. Selviaridis and A. Norrman, "Performance-based contracting in service supply chains: a service provider risk perspective," *Supply Chain Management: An International Journal*, vol. 19, no. 2, pp. 153–172, Mar. 2014, doi: 10.1108/SCM-06-2013-0216.
- [4] B. Huo, X. Zhao, and H. Zhou, "The Effects of Competitive Environment on Supply Chain Information Sharing and Performance: An Empirical Study in China," *Prod Oper Manag*, vol. 23, no. 4, pp. 552–569, Apr. 2014, doi: 10.1111/poms.12044.
- [5] B. B. Chapman, C. Brönmark, J. Nilsson, and L. Hansson, "The ecology and evolution of partial migration," *Oikos*, vol. 120, no. 12, pp. 1764–1775, Dec. 2011, doi: 10.1111/j.1600-0706.2011.20131.x.
- [6] J. Kamakoty, N. Sohani, and N. Sohani, "Determinants of service quality in education: service provider's perspective and academician's perspective," 2015.
- [7] H. Akkermans and B. Vos, "Amplification in service supply chains: An exploratory case study from the telecom industry," *Prod Oper Manag*, vol. 12, no. 2, pp. 204–223, 2003, doi: 10.1111/j.1937-5956.2003.tb00501.x.
- [8] A. Kaushik Sengupta, "Manufacturing and Service Supply Chain Performance: A Comparative Analysis."

- [9] A. Lockamy and K. McCormack, "Linking SCOR planning practices to supply chain performance," *International Journal of Operations & Production Management*, vol. 24, no. 12, pp. 1192–1218, Dec. 2004, doi: 10.1108/01443570410569010.
- [10] D. M. Lambert, S. J. García-Dastugue, and K. L. Croxton, "AN EVALUATION OF PROCESS-ORIENTED SUPPLY CHAIN MANAGEMENT FRAMEWORKS," *Journal of Business Logistics*, vol. 26, no. 1, pp. 25–51, Mar. 2005, doi: 10.1002/j.2158-1592.2005.tb00193.x.
- [11] K. S. Yogi and H. Kotzab, "The intellectual foundation of supply chain management performance models: a bibliometric analysis and synthesis," *International Journal of Comparative Management*, vol. 2, no. 1, p. 67, 2019, doi: 10.1504/ijcm.2019.100124.
- [12] H. Cirtita and D. A. Glaser-Segura, "Measuring downstream supply chain performance," *Journal of Manufacturing Technology Management*, vol. 23, no. 3, pp. 299–314, Mar. 2012, doi: 10.1108/17410381211217380.
- [13] A. Sustrisno, M. Benny, and J. Soukotta, "A Conceptual Model on Integrating Supply Chain Operations Reference (SCOR) into Disaster Response Service Supply Chain FMEA," *International Journal of Innovation in Enterprise System*, vol. 2, no. 02, pp. 39–43, Jul. 2018.
- [14] T. L. Kunrath, A. Dresch, and D. R. Veit, "Supply chain management and industry 4.0," *Brazilian Journal of Operations & Production Management*, vol. 20, no. 1, p. 1263, Oct. 2022, doi: 10.14488/BJOPM.1263.2023.
- [15] Y. Lin, Y. Shi, and L. Zhou, "Service Supply Chain: Nature, Evolution, and Operational Implications," 2010, pp. 1189–1204. doi: 10.1007/978-3-642-10430-5_91.
- [16] Y. Wang, S. W. Wallace, B. Shen, and T.-M. Choi, "Service supply chain management: A review of operational models," *Eur J Oper Res*, vol. 247, no. 3, pp. 685–698, Dec. 2015, doi: 10.1016/j.ejor.2015.05.053.
- [17] R. Zhang, J. Li, S. Wu, and D. Meng, "Learning to Select Supplier Portfolios for Service Supply Chain," *PLoS One*, vol. 11, no. 5, p. e0155672, May 2016, doi: 10.1371/journal.pone.0155672.
- [18] A. Ramish and S. M. Asher, "Supply chain performance measurement for services: An operational level framework," *Business Review*, vol. 10, no. 2, pp. 130–147, Jul. 2015, doi: 10.54784/1990-6587.1358.
- [19] S. E. Sampson and M. Spring, "Service Supply Chains: Introducing the Special Topic Forum," *Journal of Supply Chain Management*, vol. 48, no. 4, pp. 3–7, Oct. 2012, doi: 10.1111/j.1745-493X.2012.03281.x.
- [20] Y. Lin, Y. Shi, and L. Zhou, "Service Supply Chain: Nature, Evolution, and Operational Implications," 2010, pp. 1189–1204. doi: 10.1007/978-3-642-10430-5_91.
- [21] E. Kusriani and S. Miranda, "Determining Performance Metrics of Supply Chain Management in Make-to-Order Small-Medium Enterprise Using Supply Chain Operation Reference Model (SCOR Version 12.0)," *Mathematical Modelling of Engineering Problems*, vol. 8, no. 5, pp. 750–756, Oct. 2021, doi: 10.18280/mmep.080509.
- [22] J. M. Reddy, K. N. Rao, A. and Krishnanand, L., "A review on supply chain performance measurement systems," *Procedia Manuf*, vol. 30, pp. 40–47, 2019, doi: 10.1016/j.promfg.2019.02.007.
- [23] M. Giannakis, "Management of service supply chains with a service-oriented reference model: the case of management consulting," *Supply Chain Management: An International Journal*, vol. 16, no. 5, pp. 346–361, Aug. 2011, doi: 10.1108/13598541111155857.
- [24] A. Khare, A. Saxsena, and P. Teewari, "Supply Chain Performance Measures for gaining Competitive Advantage: A Review," *Journal of Management and Strategy*, vol. 3, no. 2, Apr. 2012, doi: 10.5430/jms.v3n2p25.
- [25] APICS, *APICS Supply Chain Operations Reference Model SCOR Version 12.0*, 12th ed. 2017.
- [26] Y. Wind and T. L. Saaty, "Marketing Applications of the Analytic Hierarchy Process," *Manage Sci*, vol. 26, no. 7, pp. 641–658, Jul. 1980, doi: 10.1287/mnsc.26.7.641.
- [27] A. Hasibuan et al., "Performance analysis of Supply Chain Management with Supply Chain Operation reference model," *J Phys Conf Ser*, vol. 1007, p. 012029, Apr. 2018, doi: 10.1088/1742-6596/1007/1/012029.
- [28] P. Suwignjo, U. Gadjah Mada, I. Vanany, and D. Yulianto, "Design of Supply Chain Performance Measurement System for Lamp Industry Dito Yulianto DESIGN OF SUPPLY CHAIN PERFORMANCE MEASUREMENT SYSTEM FOR LAMP INDUSTRY." [Online]. Available: <https://www.researchgate.net/publication/229035317>
- [29] A. Lockamy and K. McCormack, "Linking SCOR planning practices to supply chain performance," *International Journal of Operations & Production Management*, vol. 24, no. 12, pp. 1192–1218, Dec. 2004, doi: 10.1108/01443570410569010.

- [30] M. B. Revaldiwansyah and D. Ernawati, “ANALISIS PENGUKURAN KINERJA SUPPLY CHAIN MANAGEMENT DENGAN MENGGUNAKAN METODE SUPPLY CHAIN OPERATION REFERANCE (SCOR) BERBASIS ANP DAN OMAX (Studi Kasus Pada PT. Karya Giri Palma),” JUMINTEN, vol. 2, no. 3, pp. 1–12, May 2021, doi: 10.33005/juminten.v2i3.266.
- [31] L. Vencataya, K. A. Seebaluck, and D. Doorga, “Assessing the Impact of Supply Chain Management on Competitive Advantage and Operational Performance: A Case of Four Star Hotels of Mauritius,” International Review of Management and Marketing, vol. 6 (S4), no. 2146–4405, pp. 61–69, Dec. 2016.
- [32] F. F. Febrianti, G. J. E. I. Putra, and G. L. A. R. I. Putra, “Penerapan Model Green SCOR untuk Pengukuran Kinerja Green Supply Chain Management pada PT. XYZ,” Jurnal Informatika Merdeka Pasuruan , vol. 3, no. 2503–1945, Dec. 2018.