PERFORMANCE MEASUREMENT OF GREEN SCM WITH SCOR APPROACH TO REDUCE POLLUTION IN MSMES

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ABSTRACT

Micro, Small, and Medium enterprises (MSMEs) play an essential role in the Indonesian economy, contributing 61.97% to GDP and absorbing 97% of the workforce. However, MSME production also impacts environmental pollution due to limited knowledge and technology. This study aims to identify performance measurement indicators and develop a measurement model combining Green Supply Chain Management (GSCM) and Supply Chain Operations Reference (SCOR). This model focuses on integrating environmental aspects in the supply chain to reduce negative impacts during the product life cycle. This research method combines GSCM and SCOR which include processes (plan, source, make, delivery, return, waste), to produce performance measurements. The results of the calculations obtained after the analysis were with a plan value of 3.817, source 3.569, make 3.273, delivery 3.275, return 2.950, and waste 3.013. These figures indicate different areas in supply chain management that need to be evaluated and improved, especially in return. The study results can provide recommendations for the government and MSME actors, especially in Sorong, in managing the supply chain sustainably and minimizing environmental impacts.

Keywords: GSCM, MSMEs, Performance Measurement, SCM, SCOR

1. INTRODUCTION

Micro, Small, and Medium enterprises (MSMEs) significantly contribute to the Indonesian economy in gross domestic product (GDP), which is currently spread throughout Indonesia, reaching 64.19 million souls or contributing 61.97% of Rp. 8,573.89 trillion every year. MSMEs also cover 97% of the total workforce. Indonesia's workforce is 116 million people and can mobilize up to 60.4% of total investment capital. National target start-up numbers are 3.9%, and new start-ups will grow by 4% in 2024 (Imaroh & Yusoff, 2023).

The development sector industry that includes various business activities and manufacturing can be considered as lots of activities that bring changes in impact environment caused throughout the cycle of life product starting from procurement material raw materials, through production processes, and use of return products, up to stage disposal (Fortuna et al., 2014; Nugroho et al., 2017). Impact buoyant development sector industry to public local among others, improvements per capita income, quality education, and convenience life, whereas impact negative is the occurrence of damage to the environment because of pollution (Fortuna et al., 2014; Heriyanto et al., 2019). Indonesia is known as the producer of rubbish plastic, the most significant second in the world, with 3.2 million tonnes dumped into the sea every year, according to data from BPS Inaplus and the Ministry of Maritime Affairs and Fisheries (Chalarhena & Hendayani, 2022; Liputan6.com, 2021).

Activity MSME production also contributes significantly to the polluted environment consequence of limited knowledge and the use of modern technology regarding the impact on health and the environment then, the chain process supply must be in a friendly environment so as not to harm society and the environment (Chalarhena & Hendayani, 2022). Supply Chain Management plays a role in smoothening operation and can also cause a disturbance environment. So, implementing green supply chain management is a step in management activity (Chalarhena & Hendayani, 2022; Manik et al., 2019).

Green Supply Chain Management is a stage indicator of an integrated approach to the draft environment to in-chain strategy supply to reduce the impact of product life cycle environment by coordinating with partner supply chain (Heriyanto et al., 2019; Srivastava, 2007). Companies are less capable in the production process and less care to impact the environment consequence its high production as Non-Product Output (NPO) (Kusumo, 2024) . Practice This is in line with the implementation of GSCM, including change climate, pollution, and resources power natural not many renewables used in its use as GSCM indicators (Heriyanto & Noviardy, 2019; Manik et al., 2019; Lestari & Dinata et al., 2019).

Supply Chain Network has gotten Lots of attention from researchers and practitioners for increased effectiveness and efficiency of its performance in large, medium, and small industries. The height dependence on supply chain, then repair must done based on existing conditions by using the measurement process proper performance (Green et al., 2012; Indra Kusuma et al., 2024; Rohdayatin et al., 2018). One of the approaches used to measure indicator performance is a Supply Chain Operations Reference (SCOR) model that covers the supply chain processes. Supply standards, attributes and measures performance standard, practice standards, and skills Work standard, which has been proven powerful and effective as a tool for describing, analyzing, and improving supply chain, which has stages, namely plan, source, make, delivery, return (Patradhiani et al., 2023; Permatasari & Sari, 2021). This research aims to provide references and recommendations to the government and actors business MSME industry in Sorong and surrounding

areas to support the stability of the industrial supply chain network. This study aims to support the management of source power naturally with the principle of eco-efficiency, namely managing source power naturally to minimize negative impact on the environment.

MSME production often causes environmental pollution due to limited knowledge and technology. This study aims to identify performance indicators and develop a measurement model that combines the concepts of GSCM and Reference SCOR, with a focus on integrating environmental aspects in the supply chain to reduce negative impacts during the product life cycle. This research method combines GSCM and SCOR which include processes (plan, source, make, delivery, return, waste), to produce performance measurements. The results of the study provide recommendations for the government and MSME actors in Sorong to manage the supply chain sustainability, while minimizing environmental impacts.

Based on previous research mentioned above, it can be concluded that there are still many shortcomings in designing indicator models to measure the performance of the MSME sector and similar measurement models have not been implemented in eastern Indonesia, especially in Sorong and its surroundings. Combining the concepts of GSCM and SCOR as an approach to determine the performance of the supply chain in MSME actors starting from upstream to downstream in accordance with the supply chain concept. So that the results of this study can be used as a reference for local governments and MSME business actors to create priority programs in accordance with the Sustainable Development Goals (SDGs) in the Sorong area and its surroundings.

2. METHODS

The methodology study started with quantitative interviews and a distribution questionnaire on MSME actors in Sorong City. The researchers processed the questionnaire results from interviews given by respondents using SPSS to show the results of the validity and reliability test of the distributed questionnaire data to show validity and reliability. In addition, the researchers searched for references about GSCM and SCOR to determine relevant indicators in designing the performance measurement model. The SCOR model is used for mapping or grouping business processes and company units in the processes included in GSCM to obtain a complete description of the supply chain in a company and its processes (Lestari & Dinata, 2019). Five SCOR processes are carried out are plan, source, make, delivery, and return with add stages management supply chain green namely waste.

Development technique data analysis and model measurements performed with steps:
1. Identify KPIs from GSCM and SCOR studies and interview with source person.
2. Validate the model by requesting the source person to sort and give mark measurement against KPI with the Likert scale (used to measure understanding of the source person regarding GSCM).
3. Measure the results of the value filled by the resource person using the SCOR model.
4. Analyze with merging of GSCM and SCOR methods and an exciting conclusion.
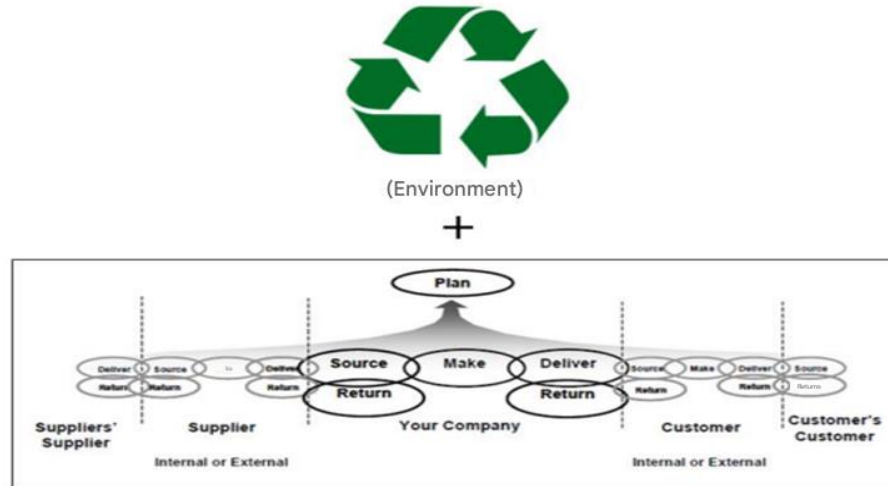
Figure 1. SCOR Model for GSCM

3. FINDINGS AND DISCUSSION

Identification, Validity Testing, and Reliability

The researchers then processed the interview results and distributed questionnaires to UMKM actors using a data analysis test. This analysis was carried out using Pearson correlation if the sample was normal with a table value for n = 30 respondents which was quite appropriate with the statistical test with a significance level of 5%, then the r table value was 0.3610. Testing uses the assistance of the IBM SPSS 26. Table 1 is the results testing validity and table 2 is the results of the reliability test with results conclusion that is reliable. There were 48 KPI questions asked, 34 valid, and 14 invalid questions. Questions that are declared valid will be used for advanced data retrieval.

Table 1. Validity Test

Question	Results	Rtable	Information	Question	Results	Rtable	Information
1	0.147	0.3610	Invalid	25	0.501	0.3610	Valid
2	0.498	0.3610	Valid	26	0.382	0.3610	Valid
3	0.267	0.3610	Invalid	27	0.164	0.3610	Invalid
4	0.613	0.3610	Valid	28	0.515	0.3610	Valid
5	0.272	0.3610	Invalid	29	0.375	0.3610	Valid
6	0.028	0.3610	Invalid	30	0.142	0.3610	Invalid
7	0.516	0.3610	Valid	31	0.574	0.3610	Valid
8	0.618	0.3610	Valid	32	0.729	0.3610	Valid
9	0.448	0.3610	Valid	33	0.661	0.3610	Valid
10	0.381	0.3610	Valid	34	0.579	0.3610	Valid
11	0.572	0.3610	Valid	35	0.550	0.3610	Valid
12	0.645	0.3610	Valid	36	0.688	0.3610	Valid
13	0.150	0.3610	Invalid	37	0.636	0.3610	Valid
14	0.489	0.3610	Valid	38	0.724	0.3610	Valid
15	0.468	0.3610	Valid	39	0.736	0.3610	Valid
16	0.450	0.3610	Valid	40	0.739	0.3610	Valid
17	0.238	0.3610	Invalid	41	0.616	0.3610	Valid
18	0.361	0.3610	Valid	42	0.268	0.3610	Invalid
19	0.333	0.3610	Invalid	43	0.394	0.3610	Valid

Question	Results	Rtable	Information	Question	Results	Rtable	Information
20	0.358	0.3610	Invalid	44	0.568	0.3610	Valid
21	0.092	0.3610	Invalid	45	0.640	0.3610	Valid
22	0.494	0.3610	Valid	46	0.213	0.3610	Invalid
23	0.262	0.3610	Invalid	47	0.646	0.3610	Valid
24	0.579	0.3610	Valid	48	0.620	0.3610	Valid

Table 2. Reliability Test

Cronbach's Alpha	N of Items
,741	30

Performance Model Assessment Results

After the KPI identification and analysis test results carry out, the next step is to conduct a performance measurement assessment, namely by providing valid questions to MSME business actors and an evaluation of 1 to 5 (Likert scale) to measure the understanding and knowledge of business actors regarding GSCM in the production process and processing of waste from production. Table 3 below is the result of the filtered performance measurement values, namely 34 questions submitted to MSME actors.
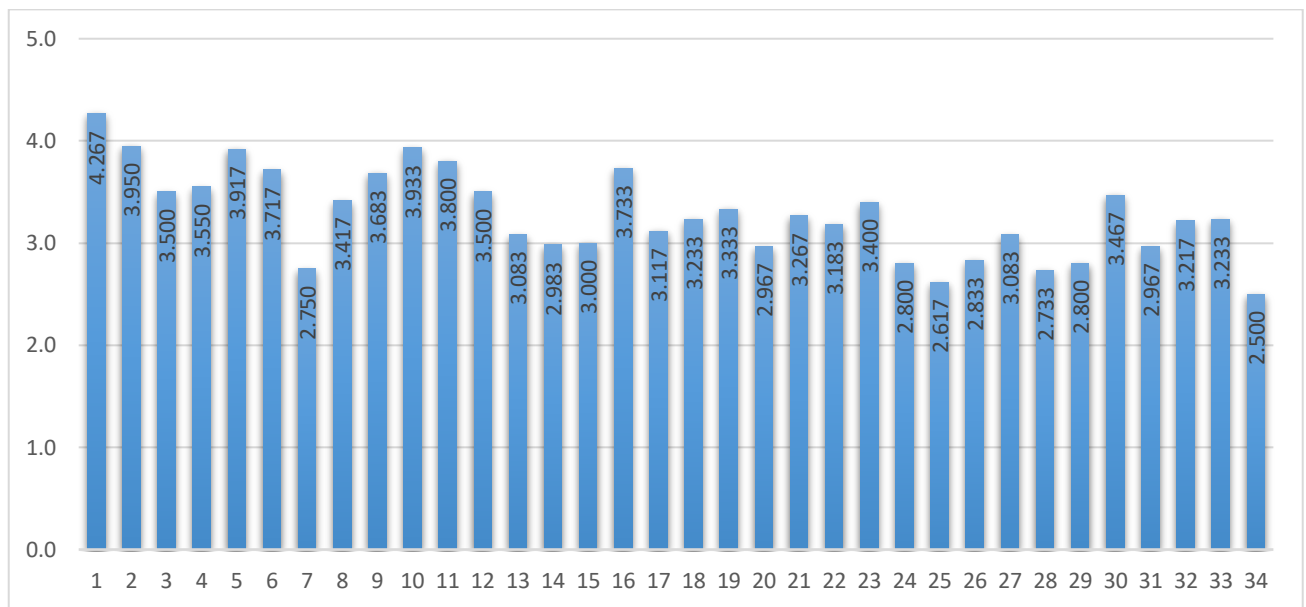

Figure 2. Results of Performance Measurement Assessment

Table 3. Assessment Results

No	Question	Results
1	Are you planning to apply a draft-friendly environment to procure goods/materials standards in your business? (PLAN)	4,267
2	Are you planning to utilize return materials or products to subtract waste in your business? (PLAN)	3,950

No	Question	Results
3	Are you planning to use technology system information to support the reduction of process waste (e.g., advertising uses paper)? (PLAN)	3,500
4	Have you ever planned to measure or evaluate the performance of your efforts in subtraction waste? (PLAN)	3,550
5	Do you decide the supplier of materials the raw material you purchased can support practice friendly environment in your business? (SOURCE)	3,917
6	Can you do it ensure that material raw materials used in the business have a friendly environment? (SOURCE)	3,717
7	Do you have specific cooperation with suppliers who implement practice-friendly environments? (SOURCE)	2,750
8	Do you manage or reduce waste from source material standards? (SOURCE)	3,417
9	Do you use criteria certain in evaluation performance suppliers in the procurement process material standards? (SOURCE)	3,683
10	Do you have a policy for supporting the local supplier in procuring goods/materials standards in your business? (SOURCE)	3,933
11	Are you sure that in the production process of your business, you have efficient use of energy or subtraction waste? (MAKE)	3,800
12	Whether your efforts to implement technology to increase efficiency energy in the production process of food/drink? (MAKE)	3,500
13	Did you adopt technology or innovation in the production process of food/ drink to minimize environmental impact (such as using energy-efficient equipment)? (MAKE)	3,083
14	There are strategies implemented in the management of waste produced during the production process of food/drink (including recycling repeat or using return waste)? (MAKE)	2,983
15	Whether your business have a policy or program for achieving zero waste in the production process of food/drink? (MAKE)	3,000
16	Do you choose a friendly packaging environment to deliver products from your business? (DELIVERY)	3,733
17	Do you collaborate with party delivery or service courier? (DELIVERY)	3,117
18	Do you use technology or system information to monitor shipping efficiency and reduce the impact environment from the delivery process product? (DELIVERY)	3,233
19	Do you decide or choose a shipping supplier or service courier to support practice friendly environment in supply chain delivery? (DELIVERY)	3,333
20	Do you train your employees about the importance of practicing delivery delivery-friendly product environment? (DELIVERY)	2,967
21	Have you ever applied innovation in management delivery to increase an awareness-friendly environment in your business? (DELIVERY)	3,267

No	Question	Results
22	Whether your business have a policy or procedure for managing the return or exchange of damaged goods Not used? (RETURN)	3,183
23	Do you plan to reduce waste produced from returned goods or exchanged? (RETURN)	3,400
24	Whether your business have a strategy to manage return returned packaging/goods/products or exchanged by customers? (RETURN)	2,800
25	Do you collaborate with the party that also manages waste as a form to reduce waste produced from return or exchange goods/packaging/products? (RETURN)	2,617
26	Do you use technology to monitor and manage the returns process goods more efficiently? (RETURN)	2,833
27	Do you improve awareness to customers about important return goods/packaging/products to support the practice of sustainability management waste? (RETURN)	3,083
28	Do you apply innovation or new strategy in management return goods/packaging/products to increase efficiency and practice sustainability management waste? (RETURN)	2,733
29	Whether the restaurants you manage waste organic reminder food to reduce impact environment? (WASTE)	2,800
30	There is step the concrete you take to reduce waste material standards and manage reminder production to minimize waste in your restaurants? (WASTE)	3,467
31	Whether your business have a policy or program for achieving zero waste in operation every day, especially in matter management waste? (WASTE)	2,967
32	Do you decide the criteria for choosing the suppliers who have practiced subtraction waste in supply chain? (WASTE)	3,217
33	Are you upgrading awareness and training employees about the importance of management waste? (WASTE)	3,233
34	Does your business collaborate with community local or regional programs for managing waste or recycling repeat goods? (WASTE)	2,500
	Average	**3,280**

A value of 3.280 indicates that respondents tend to agree with the statement but not strongly enough to use it as a statement. This statement also shows support, but doubt or uncertainty may still exist. The context of this analysis suggests that improvement is needed in the measured performance area.

GSCM and SCOR Results Analysis

Figure 3 below explains the results of the SCOR stage by adding waste as part of the development of waste management resulting from the production process from the green supply chain management process.
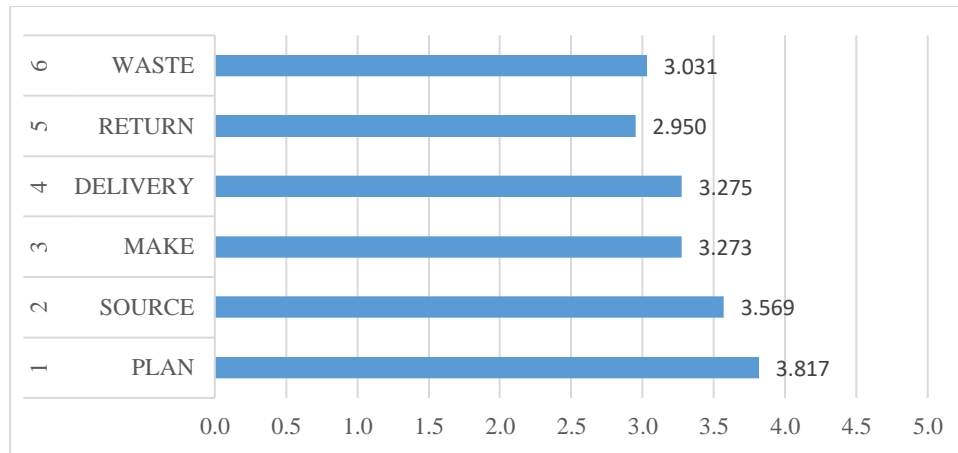
Figure 3. SCOR Stage Results

1. PLAN with a value of (3.817): This section shows that the performance value in planning has a high numerical value, which means that planning for MSME business actors has been carried out well.
2. SOURCE with a value of (3.569): This section reflects performance in procuring raw materials and supporting materials for production. Although not as high as planning, this stage still shows good procurement.
3. MAKE with a value of (3.273): this stage shows that improvements must be made in manufacturing products' efficiency to meet green supply chain management standards.
4. DELIVERY with a value of (3.275): This stage describes the performance in delivering products using the GSCM approach to customers. It shows quite good performance but needs to be improved.
5. RETURN with a value of (2,950): This stage has the lowest value, indicating a problem in handling returns or customer satisfaction.
6. WASTE with a value of (3.031): This stage shows waste management with reasonable efforts, but it still needs improvement to potentially reduce waste from the production process.

The low score at the RETURN stage indicates that the understanding and handling of this stage is still very lacking. This indicates an urgent need to improve the return policy and the process of handling problems related to product returns.

Likewise at the WASTE stage, although waste management has been carried out with quite good efforts, the low score indicates that the process is still less than optimal. Therefore, these two stages require the implementation of more efficient and environmentally friendly methods, to improve the return process and waste management in the supply chain to achieve better sustainability.

Overall, these figures indicate different areas in supply chain management that need to be evaluated and improved, especially in product returns and waste. These results also show that MSMEs still need to be socialized regarding green supply chain management that is in accordance with the Sustainable Development Goals (SDGs).

4.CONCLUSION AND SUGGESTION

This study aims to give references and recommendations to the government and actors in MSMEs business in Sorong for support stability supply chain and management source Power natural with principle eco-efficiency. The methodology study started with a quantitative approach through interviews and the distribution of questionnaires to MSMEs actors in Sorong City. Data from questionnaire results interviews obtained from Respondents were furthermore processed using SPSS to analyze the validity and reliability of the questionnaire data that was distributed. In addition, references related to GSCM and SCOR searched for set appropriate indicators in designing a measurement model performance. The SCOR model is used for mapping and grouping business processes and company units in the GSCM context to

comprehensively describe supply chain and processes that occur in the company. The results found that Lots lacks measurement indicator performance of MSMEs, especially in eastern Indonesia.

The methodology study uses a quantitative approach with interviews and distribution questionnaires to MSME actors, processed using SPSS for validity and reliability testing. Of the 48 KPI questions, 34 were declared valid. Data analysis shows mark performance in the PLAN (3,817), SOURCE (3,569), MAKE (3,273), DELIVERY (3,275), RETURN (2,950), WASTE (3,031) stages with mark lowest need attention special for repair, stages other need improved. Overall, this research identifies areas that need evaluation and improvement, especially in return products. This result aims to become a reference for the government and actors in MSME business to formulate a program according to the Sustainable Development Goals (SDGs) in Sorong.

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