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ANALYSIS OF SUSTAINABLE PERFORMANCE IN THE PALMYRA SUPPLY CHAIN USING CAUSAL-LOOP DIAGRAM

Ezar Amrullah[1*], Elisa Kusrini[2], Sakbani Sakbani[3]
[1,2,3] Master of Industrial Engineering, Faculty of Industrial Technology, Indonesia Islamic University, Yogyakarta 88854, Indonesia.
*Corresponding author; Email: ezar.amrullah05@gmail.com[1]

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Abstract

The study analyzed sustainable supply chain management performance in the Palmyra handicraft industry in Central Lombok. The study analyzed sustainability based on economic, social, and environmental performance attributes. Economic and environmental performance attributes used the SCOR 12 model, while social performance attributes were adopted from previous research. These performance attributes were modeled with causal-loop analysis to understand the interaction between performance attributes in influencing overall supply chain performance. This study explored critical factors in the Palmyra handicraft supply chain to gain sustainability. Support any stakeholders to make a strategic decision on the Palmyra supply chain. Theoretically, the contribution of this study is to expand the insight of sustainability in supply chain management in a small industry context.

Keywords: Sustainable, supply chain management, the Palmyra craft, small industry, system dynamics.

Introduction

Micro, small, and medium enterprises (MSMEs) have a strategic role in development in a developing country like Indonesia. The part of the MSMEs scale industry can be seen through its contribution to domestic income and can reduce social inequality related to unemployment and poverty (Wilujeng, Sarwoko, & Nikmah, 2022). MSMEs in Indonesia continue to require government support for MSMEs industry players (Permadi, Ridwan, & Juliani, 2019). However, in its development, many industry players on the MSMEs scale generally need help competing because they need help managing their supply chain performance (Konneh, Helmi, Ma'aram, & Hisjam, 2018; Permadi *et al.*, 2019). On the other hand, previous literature also states that today's competitive climate is no longer at the level of individual organizations but has shifted to the supply chain competition (Reddy, Nao, & Krishnanand, 2019; Lu, Zhang, & Fan, 2021). One of the reasons is the limited internal resource capabilities of MSMEs actors in implementing performance measurement systems for supply chain management, as has been done by many large-scale industries (Konneh *et al.*, 2018). Kusrini, Rifa'i, and Miranda (2019) stated that supply chain management manages and controls the entire process of creating product value, from material procurement to delivery of finished products to consumers. According to Fauzi, Ridwan, and Juliani (2019), good supply chain management is an effort to increase industry players' competitiveness in achieving consumer satisfaction. Thus, supply chain performance management (SCM) is essential for industry players to maintain business continuity and gain competitive advantage.

In cases relying only on operational elements, they will want more than improved supply chain performance. Many researchers have paid attention to the importance of social and environmental criteria in making decisions on sustainable supply chain strategies (Andjelkovic & Radosavljevic, 2019; Shibin *et al.*, 2020). Sustainable supply chain management (SSCM) aims to achieve commercial goals, realize social benefits, and reduce the environmental impact of all product manufacturing operational activities. It then becomes a demand for industry players so that the products produced are not only of high quality, inexpensive, precise, and fast, but the products made must also be environmentally friendly and have a good social reputation.

This study aims to analyze sustainable supply chain performance management (SSCM) in the Palmyra craft industry in Central Lombok. Several reasons underlie this research are essential to do, among others. First, the Palmyra craft industry in Central Lombok is one of the handicraft centers with the potential for regional economic growth. According to the Department of Industry and Trade of Central Lombok Regency, the Palmyra craft industry is the second most economic activity carried out by the

people of Central Lombok (Department of Industry and Trade, 2020). In this case, every ongoing economic activity involves a large workforce.

In addition, the Palmyra craft industry is a leading sector that is the mainstay of the Central Lombok regional economy (Zainuri, 2021), so strategic policies and tactical decisions at the supply chain level are urgently needed to accelerate the increase in competitiveness and sustainability of the handicraft industry in Central Lombok. Second, this research empirically obtained data that industry players are experiencing a recovery phase after the COVID-19 pandemic, which caused a decline in performance. Zainuri (2021) also explains that the performance of the MSMEs in the Central Lombok regency has experienced a decrease in performance due to the pandemic. When compared to the pre-pandemic period, industry players experienced demand trends that tended to be stable, but during the pandemic and post-pandemic, demand became unstable. Based on the results of the interviews, the problems that Palmyra craft industry players often experience include the issue of oversupply of raw materials and running out of product supplies when there is an increase in demand. It is due to the minimal material flow management in the supply chain and the focus on short-term strategies. Third, the Palmyra craft industry's supply chain performance influences economic and non-economic variables, such as worker welfare and environmental impacts. Therefore, it is necessary to have a systemic understanding of the dynamics of variables that affect the internal performance of a sustainable supply chain so that stakeholders can formulate policies and take appropriate tactical steps to achieve the sustainability of the Palmyra craft industry. Fourth, in this study, supply chain performance management in the Palmyra craft industry has yet to be found in previous research, especially in the Palmyra craft industry. In addition, this research involves a sustainable development paradigm in the context of supply chain management for MSMEs scale industries, so it is very relevant to the needs of all parties, both as business actors and other stakeholders, to build sustainable MSMEs scale industries in Indonesia.

This research analyzes sustainable supply chain performance management with the SCOR model version 12 approach and system dynamics modeling. The goal is to build a system dynamics model for sustainable supply chain performance management for the Palmyra craft industry. The system dynamics model is based on three sustainability aspects: economic, social, and environmental. In the financial aspect, the SCOR 12 model has three performance attributes: reliability, agility, and cost. The three performance attributes were selected based on the context of the problems and conditions faced by the Palmyra craft industry players, namely economic performance that focuses on consumers regarding supply chain reliability and agility and financial performance in supply chain internal costs. On the environmental aspect, this study uses two sustainable SCOR performance attributes in the SCOR 12 model, namely SS.1.001 total supply chain materials used and SS.1.015 total supply chain greenhouse gas (GHG) emissions. As for the social aspect, this study focuses on the social welfare aspects of workers by referring to indicators that have been studied by previous researchers (Immawan, Marimin, Arkeman, & Maulana, 2015; Mubiena & Ma'Ruf, 2018). The difference between this research and prior studies is using the performance attributes of sustainable SCOR. In contrast, previous studies did not use Sustainable SCOR performance attributes to analyze sustainable supply chains' environmental performance. System dynamics modeling aims at understanding the dynamics and overcoming conflicts or contradictions of each objective of each variable and attribute of sustainable performance due to the interrelationships and mutual influence of each other to support sustainable decision-making in supply chain performance management effectively.

Meanwhile, SSCM does not only focus on achieving economic aspects and focuses on consumers but also considers the sustainability of environmental and social aspects (Das, 2017; Malesios, Dey, & Abdelaziz, 2020; Narimissa, Farahani, & Zafardehi, 2020). Establishing a stakeholder perspective or theory is another factor contributing to sustainability in the supply chain, in addition to the urgency of the environmental sustainability issue (Yin, Zhang, & Jin, 2021). The point is that creating added value for output products involves all parties, not only workers or employees within the company but also other parties such as the community, society, organizations, and others. Thus, the issue of sustainability in the supply chain is significant for all parties for long-term sustainability. Fulfillment of demand is not only aimed at consumer satisfaction, but companies are also responsible for environmental performance and social interests so that these actions can boost company competitiveness.

Based on these explanations, it is evident in this instance that the success of the supply chain strategy plays a vital role in industrial competitiveness, especially for SME-scale industries in Indonesia. Therefore, this study investigates sustainable supply chain performance management in the Palmyra craft

industry, especially in Central Lombok regency, the province of West Nusa Tenggara. One of the pillars of economic income (PDRB) for the Central Lombok regency is the processing industry sector, which includes the Palmyra craft industry. The Palmyra craft industry is one of the MSME manufacturing industries, mainly carried out by the people of the Central Lombok regency (Department of Industry and Trade, 2020). According to data from the Department of Industry and Trade, handicrafts industry is the largest industrial sector in Central Lombok regency, and the Palmyra craft industry ranks second after the Ketak and Rattan woven handicraft industries (Department of Industry and Trade, 2020). The Palmyra craft industry processes Palmyra raw materials into finished and semi-finished products for household appliances, furniture, construction, and others. The finished products from processing Palmyra crafts include Palmyra ropes, roofs, and brooms. In addition, the observations show that the Palmyra craft industry in Central Lombok regency has considerable potential and a broad market reach. The source of Palmyra material supply is sufficient in most areas of the island of Lombok. The target market for handicraft products has now reached outside the province of West Nusa Tenggara, including Bali, East Java, and South Kalimantan. However, in its development, the research by Zainuri (2021) describes the business performance of industry players in the MSMEs, especially in Central Lombok regency, experiencing decelerations caused by the earthquake in 2018 and the Covid-19 pandemic. Indicates that the limitations in managing business performance for handicraft industry players are not only related to internal factors but also influence the complexity of external supply chain factors. Therefore, strengthening the SSCM strategy for the Palmyra craft industry is urgently needed internally and externally to maintain the continued existence of industry players.

Regarding the preliminary study, the development of research on cases similar to this research still needs to be improved, even though managerial demands in the miniature industry supply chain are significant. On the other hand, the issue of sustainability in the literature related to supply chain performance management in small industries must be considered sufficient to fill stakeholders' needs at both practical and theoretical levels. This research seeks to fill this opportunity to provide valuable and theoretical contributions related to small industry supply chain management through a systemic approach to facilitate implementation at a reasonable level for business actors.

Supply Chain Management Definition

Supply chain management (SCM) is a systematic approach that can improve enterprise performance by increasing consumer demand for a product that incorporates aspects of quality, quantity, time, and price (Heryjanto, Tannady, Ihalauw, Dwiatmadja, & Harijono, 2020). According to Astuti, Deoranto, and Aula (2019) and Narimissa *et al.* (2020), SCM is a critical factor in achieving customer satisfaction because the SCM process involves various stakeholders that affect the quality of the product from the supplier to the end-consumer. According to APICS (2017a), SCM has six main processes: plan, source, make, deliver, return, and enable.

SCOR Model

According to APICS (2017b), the supply chain operation references (SCOR) model is a set of frameworks popularized by the American Production and Inventory Control Society (APICS) that enables companies to diagnose supply chain problems and evaluate supply chain performance. The SCOR model contains four primary elements: SCOR performance attributes, processes, best practices, and sustainable SCOR. Delipinar and Kocaoglu (2016) stated that the SCOR model provides a measurement standard for supply chain performance that facilitates the evaluation of the achievements of supply chain management.

SCM Performance

Achieving the SCM objectives is necessary for the SCM performance measurement process. In the measurement process, there are SCM performance indicators that become measurement variables commonly known as key performance indicators (KPIs). These KPIs will then be evaluated based on the level of SCM measurement needs. In this case, the SCOR model provides a set of popular performance attributes that various parties can use to assess SCM performance. These performance attributes include reliability, agility, responsiveness, cost, and asset management. In the latest version 12, the SCOR model provides performance indicators to assess the sustainability of SCM called Sustainable SCOR (APICS, 2017a).

Research Methods

This research develops a sustainable model analysis of supply chain performance management for the Palmyra craft industry. The method used is system

dynamics modeling and SCOR 12 model. Three aspects of sustainability are analyzed: economic, social, and environmental. In the economic aspect, this research uses SCOR 12 performance attributes, which include reliability, agility, and cost performance attributes. In the environmental part, the performance attributes used are sustainable SCOR performance attributes. Meanwhile, performance attributes for social aspects are obtained through previous literature. The stages of this research include several processes as follows:

1. Identification of supply chain models and performance indicators.
   At this stage, this research identifies the existing supply chain system in the Palmyra craft industry. Then, identify the performance indicators in the supply chain of the Palmyra craft industry based on three aspects of sustainability: economic, environmental, and social. The economic and ecological aspects of the supply chain performance indicators use the SCOR model and Sustainable SCOR. In the social element using, indicators of worker welfare were adopted by the researchers (Immawan *et al*., 2015; Mubiena & Ma'Ruf, 2018).
2. Performance indicators validation.
   In this research, the performance indicator validation process aims to obtain performance indicators that represent the supply chain system of the Palmyra craft industry. This study's validation process is distributing a Likert scale questionnaire containing the identified performance indicators. The questionnaire was then distributed to experts directly involved in the supply chain system of the Palmyra craft industry. The data processing technique for the validation process uses the average processing method.
3. System dynamics modeling using causal-loop diagram.
   The next stage is system dynamics modeling. According to Walters, Archer, Sassenrath, Hendrickson, Hanson, Halloran, Vadas, and Alarcon (2016), two main stages are carried out in system dynamics modeling, including the qualitative and quantitative modeling stages. The qualitative modeling stage includes describing the system and building a causality model or causal loop diagram (CLD) (Walters *et al*., 2016). In contrast, the quantitative modeling stage includes building a stock and flow diagram (SFD) formulating the mathematical function of the model, and running simulations of the model that has been made (Walters *et al*., 2016). In this study, the system dynamics modeling carried out is qualitative modeling. System dynamics modeling was conducted based on validated performance indicators, and then a CLD diagram of the sustainable supply chain of the Palmyra craft industry was constructed.
4. Model verification.
   The model verification process aims to obtain a CLD diagram representing the natural system, namely the actual conditions of the Palmyra craft supply chain system. In the verification process, two techniques were used in this research: theoretical and expert verification. Theoretical verification is done by exploring theories relevant to the CLD model created, while expert verification is conducted through interviews and discussions with experts.
5. Analysis and strategy development.
   At this stage, this study analyzed the system dynamics model of the sustainable supply chain of the Palmyra craft industry. The analysis in this study uses descriptive analysis techniques and model polarity analysis. Descriptive analysis is an analysis technique that explains the CLD model in the form of narratives that describe the CLD model. At the same time, the polarity analysis of the model is an analysis technique that explains the CLD model components closely related to the model's behavior. The model's polarity analysis generally understands that several members are analyzed, including system-inhibiting variables, system success-driving variables, control and uncontrolled variables, and input and output variables. This step's main objective is to develop a relevant strategy for sustainable supply chain management in the Palmyra craft industry in Central Lombok. Relevant to the data analysis, in the other literature, (Suharti, Sirine, & Martono, 2023) explained that qualitative research usually provides a descriptive analysis of the research object. The researcher presented the narrative of the research findings.

Discussion

Model and Performance Indicators of Sustainable Supply Chain of Palmyra Handicraft Industry

The Palmyra craft industry is one of the MSME manufacturing sectors widely run by the community in Central Lombok regency. The processed products of Central Lombok regency handicrafts include Palmyra ropes, brooms, and roofs. In a supply chain management system, three central components flow along the supply chain: material, information, and financial. Figure 1 illustrates the supply chain model of the Palmyra craft industry.

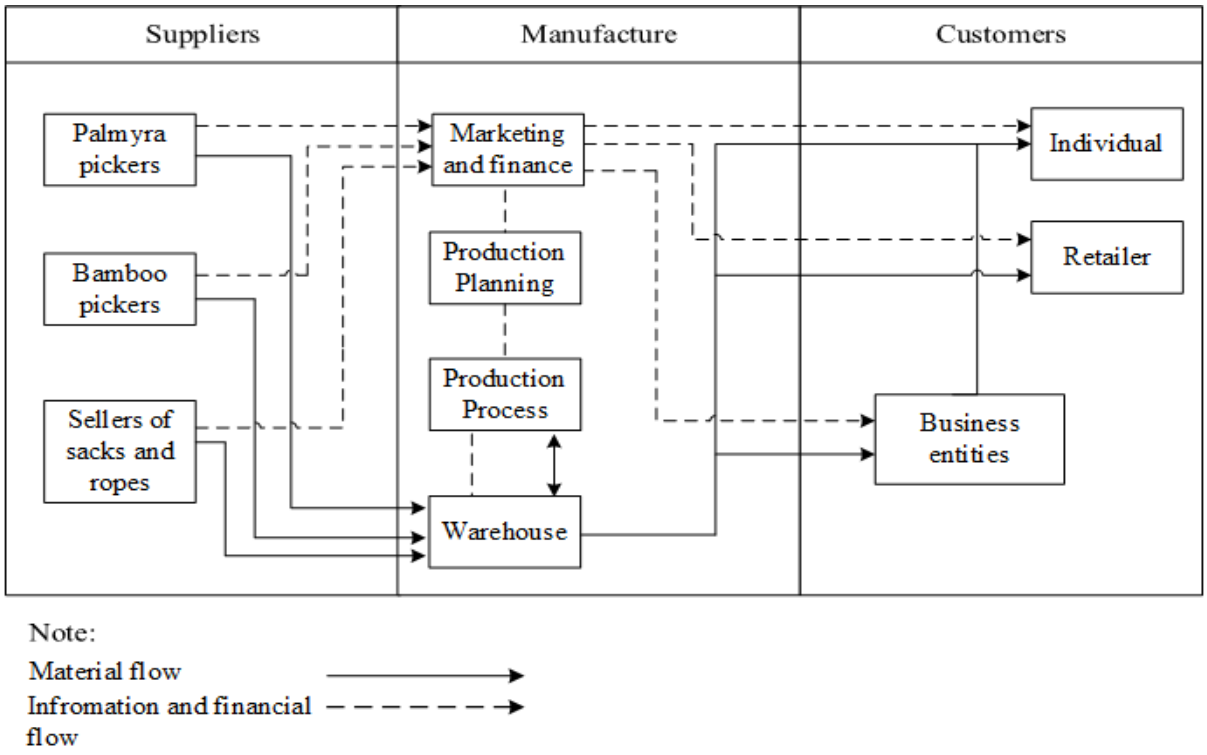

Figure 1. Supply chain scope of the Palmyra craft industry

Based on Figure 1, the Palmyra craft supply chain model comprises three actors: suppliers, manufacturers, and consumers. From the supplier side, three leading suppliers have been involved: Palmyra pickers, bamboo pickers, and sellers of sacks and ropes. The flow of materials, information, and finance flows from suppliers to manufacturers through two sections: the marketing and finance section receives information and finance, and the warehousing section receives material flow from suppliers. Then, from the manufacturing side, there are two main actors: collectors and artisans. The collectors are those who manage the overall supply chain activities, while the artisans are those who specifically carry out production activities. As for the consumer side, Palmyra craft products have three forms of consumers, namely individuals, retail, and business entities.

From a supply chain management perspective, there are three main activities: purchasing, production or processing, distribution, and sales. Purchasing activities occur in every supply chain actor. Purchasing activities start from consumers and then flow into supply chain management.

Upstream is at the supplier level. At the downstream level, purchasing activities occur when manufacturers distribute products to consumers. In this case, the relationship between consumers and manufacturers is limited to buying and selling, but consumers with business entities have an ongoing relationship with the manufacturer. As for the manufacturers with suppliers, the existing cooperation relationship is only limited to transactional cooperation, namely the buy and sell system. Manufacturers order Palmyra materials from pickers when needed. The material ordering process can be done through direct shipping and customer pickup. However, the method currently being carried out is the customer pickup method, namely, the manufacturer as a consumer places an order for material while picking up the junk material from the picker. In addition, the processing of Palmyra raw materials is still carried out manually by the skills of artisans. Due to the high difficulty level in the production process, there has yet to be an innovative machining tool that can facilitate the processing of Palmyra raw materials into finished products.

Regarding information and financial flows, it is known that the exchange of information between supply chain actors still uses the method through cellphone calls. Information exchange along the supply chain is not found in information systems due to several factors, such as low awareness and adaptability to the development of technology and information, low ability to manage business strategies, and the assumption that technology requires much financial investment.

Based on the analysis of the SCOR model, a detailed description of the Palmyra craft supply chain based on the processes that occur can be seen in Figure 2.

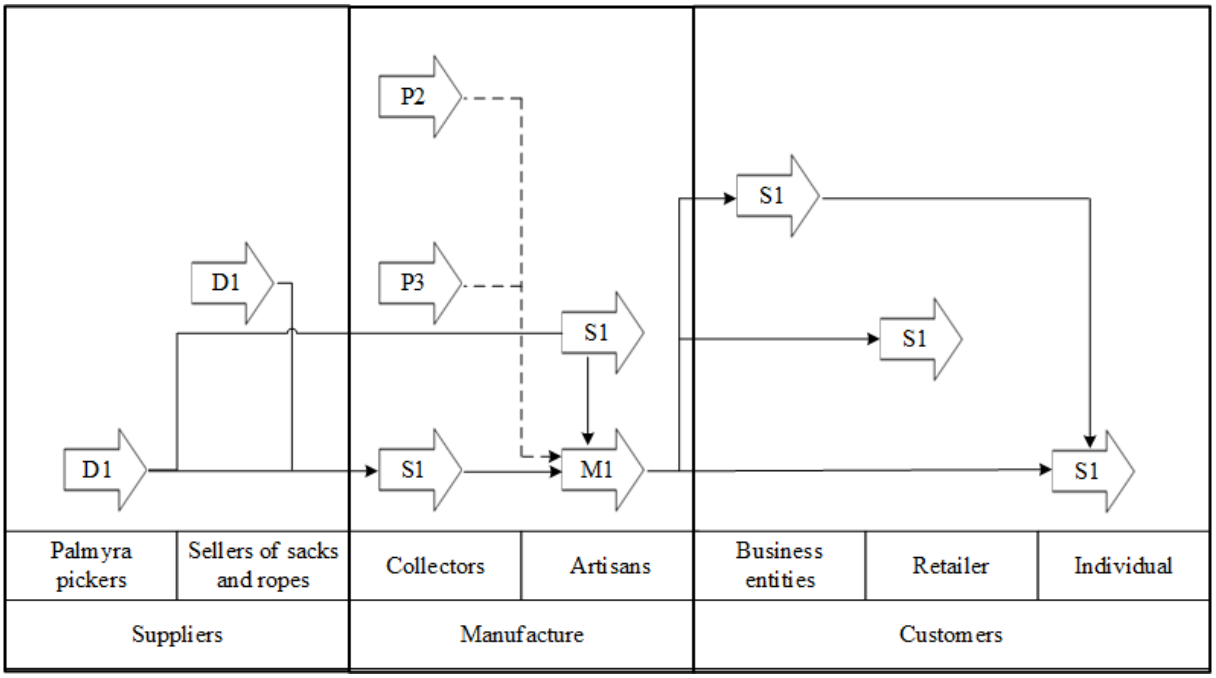

Figure 2. Business thread diagram of the Palmyra handicraft supply chain

The processes that occur along the supply chain of the Palmyra craft industry include three processes: plan, source, make, and deliver. Material flows from upstream to downstream levels, and there is no return process. In the planning process, the parties involved are collectors. There are two types of plan processes: plan to source (P2), a plan for procuring materials, and plan to make (P3), which is a plan for producing products. Then, in the sourcing process (S1), the parties involved are collectors, artisans, and customers. As for the production process, namely make to stock (M1), which craftsmen carry out. The delivery process in the Palmyra craft industry supply chain is to deliver stocked products (D1).

After obtaining the current supply chain model, the next step is to determine the performance indicators of the sustainable supply chain. Based on the identification results, 47 performance indicator metrics (level-1, level-2, and level-3) were obtained from the SCOR 12 model and previous literature. This step determined three attributes of economic aspects: reliability, agility, and cost. The level-1 obtained, reliability has one indicator, agility has two indicators, and cost has one indicator. Environmental aspects include total supply chain materials used and total supply chain GHG emissions. Then, the study's social aspect involved five indicators: worker income or salary, training, occupational health, occupational safety, and rewards. The following process was determining the metrics level 2 of each performance indicator. After that, a validation process is conducted. After validation, it was found that 22 performance indicator metrics were declared valid, as presented in Figure 3. In the economic aspect, 14 performance indicators include reliability (five metrics), cost (three metrics), and agility (six metrics) performance attributes. In the environmental aspect, there are three performance indicators: make materials used, source direct GHG emissions, and deliver direct GHG emissions. As for the social part, five performance metrics were obtained: worker income or salary, training, occupational health, occupational safety, and rewards.

System Dynamics Modeling Using Causal-Loop Analysis

In this section, Figure 3 shows the system dynamics model of sustainable supply chain management (SSCM) in the Palmyra craft industry. In Figure 3, two types of color lines connect the variables, where red means a negative (-) relationship and blue lines indicate a positive (+) relationship. In the model, seven performance attributes contribute to the sustainability of the Palmyra supply chain. The economic side represents the perfect order fulfillment (POF), upside supply chain adaptability (USCA), downside supply chain adaptability (DSCA), and cost of goods sold (COGS) indicators. On the environmental aspect, it represents the total materials used and total GHG emissions indicators. Meanwhile, the social element represents the employee welfare indicator.

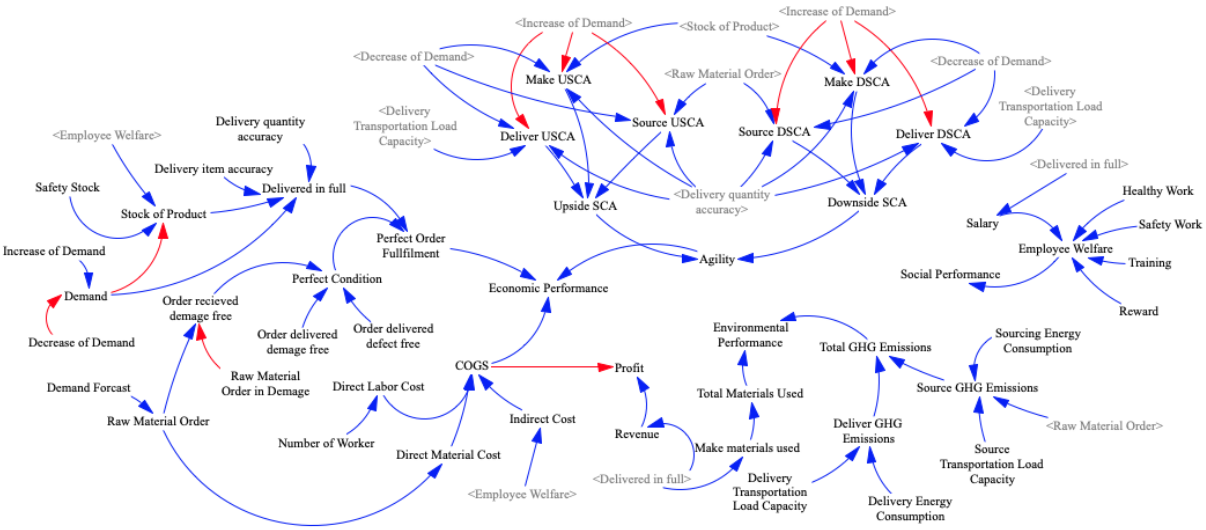

Figure 3. Causal loop diagram of the Palmyra handicraft sustainable supply chain performance management

Based on the CLD diagram in Figure 3, it can be understood that there are two types of variables: supporting and inhibiting. Supporting variables have a linear relationship with other variables, meaning that if a variable has a higher value, it will affect the value of other variables. Meanwhile, inhibiting variables are understood as variables that have a relationship with one another that is inversely proportional. If a variable has a more excellent value, the affected variable will be smaller. Several supporting variables drive the improvement of supply chain performance in the economic aspect; among others, from the perspective of supply chain reliability, based on Figure 3, there are indicators of the number of orders delivered in whole condition and the number of product conditions by quality. Therefore, in a natural context, the artisans should maintain the product quality and delivery time.

Supply chain reliability performance will be better if the products delivered are by the quantity and quality ordered by consumers. The factor that hinders the performance of supply chain reliability is the presence of damaged Palmyra raw materials. This condition will affect the quality of the products produced. In addition, product availability also affects the company's ability to meet demand. If product availability is maintained, it can encourage better customer satisfaction, but on the contrary, it can reduce customer satisfaction. Next, the worker welfare variable positively influences the company's ability to deliver products on demand. It can happen because worker welfare can encourage worker productivity.

Meanwhile, more products produced will be able to increase workers' income, which in turn will further affect indicators of worker welfare. This condition is referred to as a condition of mutual influence between variables positively (reinforcing). As for this point, it can also be seen that reliability performance in the economic aspect and worker welfare performance in the social element have a positive relationship. The reliability indicator must maintain three main variables: the ability to deliver products according to the number of orders, the company's ability to provide quality products, and workers' welfare.

From the agility performance perspective, there are two leading indicators: USCA and DSCA. The characteristics of the two indicators are that the greater the value, the better. If the indicator value is more excellent, the company can deal with demand uncertainty or adapt to external influences that disrupt supply chain operations. In this case, three main processes drive overall agility performance, including the ability to process procurement, production, and delivery. Based on the procurement process, two variables positively determine the USCA and DSCA indicators: the procurement capacity of Palmyra raw materials and product delivery capacity.

Regarding the production process, the variables that positively affect the agility indicator are product inventory and product order reduction. It means that when product inventory and order reduction occur, the company's ability to deal with unpredictable increases will be more extraordinary. At the same time, the company can quickly adapt amid uncertain demand. However, this is not necessarily beneficial for the company because the risk that can occur is an increase in product inventory, where the presence of high stock can indicate supply chain inefficiency, which could be better for the company's financial health. Meanwhile, the variable that negatively affects the agility indicator is an increase in product demand. In this case, it can be

understood that there is a trade-off between the reliability and agility indicators; namely, the company is expected to have high reliability and good adaptability to external threats.

Another performance indicator in the economic aspect is the cost of goods sold (COGS) indicator. COGS is a performance indicator that focuses on the internal performance of the supply chain. Cost performance is influenced by 3 level 2 metric variables, namely direct labor costs, direct material costs, and indirect costs associated with production. Direct labor costs are positively affected by the variable number of artisans employed, meaning that the more the number of artisans, the higher the direct labor costs. Then, the natural material cost variable is positively influenced by the presence of the raw material ordering variable in the reliability performance attribute. The amount of raw material orders is positively influenced by demand, which means that the higher the product demand, the higher the amount of raw material orders and the cost of ordering raw materials. In this case, forecasting demand is critical because it significantly affects the amount of raw material orders. In addition, indirect cost variables also positively affect supply chain cost performance—indirect cost components identified in this study include shipping costs and expenditures on worker welfare. Worker welfare variables positively impact the performance of indirect cost variables, such as spending on worker health, work facilities, rewards, and training. So, in this case, there is a trade-off between the goal of cost efficiency and the pursuit of worker welfare. To achieve the purpose of efficient supply chain costs, it must sacrifice the fulfillment of worker welfare. However, on the other hand, workers' welfare has an essential role in the performance of supply chain reliability through the indicator of fulfilling the number of consumer orders that will affect the achievement of profits but can negatively affect cost performance.

In the environmental aspect, there are two leading indicators: total material usage and total Carbon Dioxide (CO_2) emissions. Total material usage and total CO_2 emissions are expected to have smaller values, better representing environmental sustainability. Actual material use highly depends on the amount of material used in production. It means that if more and more are produced, the entire material used and the need for supply of Palmyra raw materials will be more excellent. It can threaten the decreasing capacity of Palmyra land.

Meanwhile, the total CO_2 emission indicator highly depends on raw material procurement and product delivery activities. Both activities require energy consumption and produce CO_2 gas due to transportation. In this regard, there is a close relationship between energy consumption and consumer demand. The higher the consumer demand, the more energy consumption will increase for the logistics of raw materials and products to consumers. At this point, a strategy is needed to bring together economic goals and environmental sustainability, namely the design of a logistics strategy.

In the social aspect, this research uses the performance attribute of the welfare of workers or artisans. Five metrics are used to determine the performance of worker welfare: artisans' income, training, occupational health insurance, safe work facilities, and rewards. In this case, each metric has a relationship that is in line with the indicators of worker welfare, which means that to improve worker welfare, companies need to fulfill worker satisfaction, which includes adequate income, training to enhance competence and innovation, facilitating a healthy and safe work environment, and providing work appreciation in the form of rewards to motivate workers. On the other hand, the performance attribute of worker welfare is related to economic aspects of the reliability and cost performance attributes. Worker welfare can improve reliability performance but can be a cost burden for internal companies. Therefore, a design strategy for supply chain management is needed to bridge the objectives of each aspect of sustainability.

Supply Chain Strategy Development

Based on the analysis of the CLD diagram in Figure 3, several sustainable supply chain performance strategies for the Palmyra craft industry can be formulated. The strategies in question are tactical-level strategies that are described as follows:

At the strategic level, sustainable inventory management (SIM) has helped management deal with trade-offs in the sustainability of supply chain performance. Simply put, SIM is a new approach to inventory management that adds new criteria to the traditional inventtory management model, namely standards that include environmental aspects (Becerra, Mula, & Sanchis, 2021). In a similar definition, SIM can be understood as an attempt to make decisions regarding inventory management, storage, and control of materials in a way that reduces adverse impacts on ecological health, has economic value, and has a positive social impact.

SIM is an effort to manage economically, socially, and environmentally sustainable inventory. Economically, the SIM strategy aims to obtain economic stock through reduced costs. Then, socially, SIM seeks

to achieve social welfare, for example, by lowering work risk, increasing rewards, and others. As for the environmental aspect, SIM was implemented to reduce the negative impact of supply chain activities, especially on material procurement activities; in the context of this research, the implementation is to minimize the output of CO_2 emissions from shipping and procurement activities.

The other suggested strategy is implementing sustainable economic quantity order (S-EOQ). This proposal's S-EOQ strategy is based on achieving low prices and emissions while maintaining social sustainability. In inventory management activities, industry players must consider the balance between inventory and demand to avoid excess material orders. Because if there are extra material orders, it will impact financial health, which is included in the waste category. On the other hand, in this aspect, business actors must also redefine the raw material procurement strategy, for example, by determining the central warehouse as a storage and distribution center for materials and products. Because the current condition is that business actors procure materials and distribute products using the artisans' own homes with limited space, the capacity of products and materials is limited. In terms of the environment, it is also affected by the current conditions. Carbon emissions come from the number of artisans who use motorbikes to buy Palmyra raw materials from suppliers. The more and farther the artisans travel to suppliers, the more carbon emission output will increase for the environment. Of course, this can also increase the expenditure of Palmyra artisans for fuel needs, so the current condition needs to design a new strategy by implementing a centralized procurement strategy.

Conclusion and Implications

The research aims to identify sustainable performance indicators in the supply chain of the Palmyra handicraft industry. Performance indicators in this study involve economic, social, and environmental aspects. The research finds that the economic objectives still become the primary attention of the business actors. On the other side, environmental and social issues are also offered in this study. However, they are limited to the total emissions output of the supply chain activities and internal social welfare. The performance indicators of sustainable attributes were validated. The research result provided valuable insight into the critical factors affecting supply chain performance and presented the managerial approach to face the trade-off between business objectives and sustainability. As a small-scale industry, the challenges faced are not only in economic scope but also required to enter into a sustainable business atmosphere. Evaluating the extent of achievement and current conditions of supply chain management performance is necessary to improve performance. It then requires a performance measurement to understand which aspects need improvement.

On the other hand, the output of this research has a significant role because Indonesia has the potential for small industry development for economic growth. The study contributes to the existing research in supply chain management and sustainability, especially in a small industry context. The academic institution, government, and business actors can formulate a strategy to gain sustainable development goals by analyzing the sustainable performance attributes. The small industry generally focuses on short-term decisions. At the same time, the research offers valuable insight for business actors and stakeholders to formulate strategic planning to face the uncertainty in reality. The most important for sustaining the competition is to plan and control the whole supply chain process. The research output presents the critical factors influencing supply chain sustainability performance from economic, environmental, and social views.

The practical implication of this study is that all supply chain parties should improve the operational business by evaluating the performance of each supply chain performance indicator. The study supports the local government in making any decision for artisans to provide good quality material supply or suitable suppliers, increase the market share, and support the operational manufacturing line of artisans. However, the result of this study is presented qualitatively. The following research should also consider the current dimension of sustainability, especially relevant to social sustainability, such as Field's research conducted by Sherlywati and Simangunsong (2023). The attention to young entrepreneurship is essential in the current business competition.

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