Management Analysis Journal 12 (3) (2023)

http://maj.unnes.ac.id

MITIGATING DISRUPTION FROM GLOBAL INCREMENT PRICE OF MATERIAL IN CAR MANUFACTURE INDUSTRY: ANALYSIS OF SUPPLY CHAIN BUSINESS PROCESS ANALYSIS, AND PROCESS RE-ENGINEERING

Oky Dzulqarnain[1]✉, **Nurmala**[2]

[1,2]Universitas Indonesia, Jakarta, Indonesia

Article Information

History of article:
Accepted July 2023
Approved September 2023
Published September 2023

Keywords:
SCOR Framework, BPMN, Mitigate Disruption, Supply Chain Performance, Supply Chain Strategy

Abstract

The existence of raw materials is crucial for Car Manufacturers and their suppliers in the production process. The Covid-19 pandemic has affected the global economy and led to a global increase in material prices. This has had a significant impact on production costs and the competitiveness of companies. In order to maintain competitiveness, companies need to implement the appropriate supply chain management strategies. This research utilizes the SCOR Framework and BPMN to evaluate and enhance the supply chain operations performance in Car Manufacturing companies. The purpose of this study is to evaluate the current supply chain performance and provide recommendations for the appropriate supply chain business processes in addressing the phenomenon of global material price increases. This research is conducted through qualitative and exploratory quantitative methods using the SCOR framework and BPMN. The research findings indicate that the supply chain performance is still lacking in the procurement area. Therefore, business process re-engineering needs to be conducted by transforming the current supplier-led raw material purchasing into self-purchase by the Car Manufacturer. The recommendation for the new business process is for the Car Manufacturer to directly purchase the raw materials for the supplier's needs, thereby eliminating the handling fee charged by the supplier.

✉correspondence Address:
Kampus Baru Depok, Universitas Indonesia, Jawa Barat 16424 Indonesia
E-mail: oky.dzulqarnain@gmail.com

e-ISSN 2502-1451

INTRODUCTION

In the automotive industry, particularly in the automobile assembly sector, car assembly companies do not produce all the components of a car in their production process. Car assembly companies seek out suppliers who can manufacture the required car components according to specifications and needs (Ambarwati & SE, 2020).

In every manufacturing process, raw materials are crucial because every product to be manufactured requires raw materials as the base material before becoming a finished good. This applies to the production of car components as well, which cannot be separated from the need for raw materials. In fact, in the cost structure of a car component, materials account for a significant portion, along with development and process costs (David & David, 2017).

The Covid-19 pandemic has significantly affected the global economic conditions. It has also had a considerable impact on the global prices of materials. For example, refer to Figure 1.1 below. Figure 1.1 shows the movement of Hot Rolled Coil (HRC) material prices from the beginning of 2020 to June 2022. HRC is one of the materials extensively used in car components that undergo the pressing process. HRC is among the materials that have experienced a global price increase (Christopher & Holweg, 2011). In Figure 1.1, it can be observed that HRC prices began to surge in 2020 and continued to rise until approaching the end of 2021. Although the price of HRC material started to decline afterward, it

remained significantly higher than the pre-Covid-19 pandemic conditions

.

Figure 1. Fluctuation in Steel HRC Material Prices

The price increase situation will undoubtedly impact the business conditions both for car manufacturers and the appointed suppliers of car components. The significant portion of material costs in the component's cost structure will also result in price increases for the components. If car manufacturers reject the component price increases caused by the global rise in material prices, it can lead to profit loss for the suppliers and pose the risk of bankruptcy (Florén et al., 2013). On the other hand, the component price increases will directly result in higher production costs for car manufacturers. This dilemma should be addressed with the right strategy to minimize the negative impact (Dumas et al., 2018).

Generally, a company's strategy is developed with specific goals in mind, and it is necessary to achieve those goals. Strategy is a tool for achieving the long-term objectives of a company, according to (David & David, 2017). Companies must strive to achieve sustainable competitive advantages, which include (1) continuously adapting to changes in external and internal trends, capacities, capabilities, and resources, and (2) effective planning, implementation, and evaluation of strategies playing a significant role.

METHOD

This research utilizes both qualitative and quantitative research methods. The qualitative research is conducted through interviews with experts using the Delphi method to obtain consensus on proposed strategies that can potentially be implemented to address the existing issues. The quantitative research is carried out by formulating the current business process and the proposed business process using BPMN (Business Process Model Notation). Subsequently, the research is conducted by comparing the current business process with the proposed business process to assess the benefits of the proposed process.

RESULT AND DISCUSSION

Current BPMN (As-is)

On the current supply chain at PT. ABC, the 1st-tier supplier obtains the raw materials they need to produce car components through their material supplier (Material Maker). In acquiring the raw materials from the material maker, the 1st-tier supplier engages in business contracts and direct purchases from the material maker, also known as self-purchased, making the entire raw material procurement activities the responsibility of the 1st-tier supplier. Generally, the current business flow is shown in Figure 4, and the current Business Process Model is depicted in Figure 2 below.

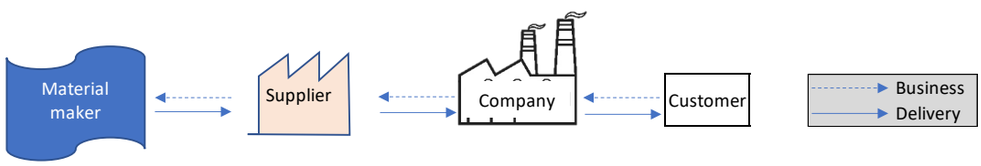

Figure 2. Current Flow Business PT. ABC

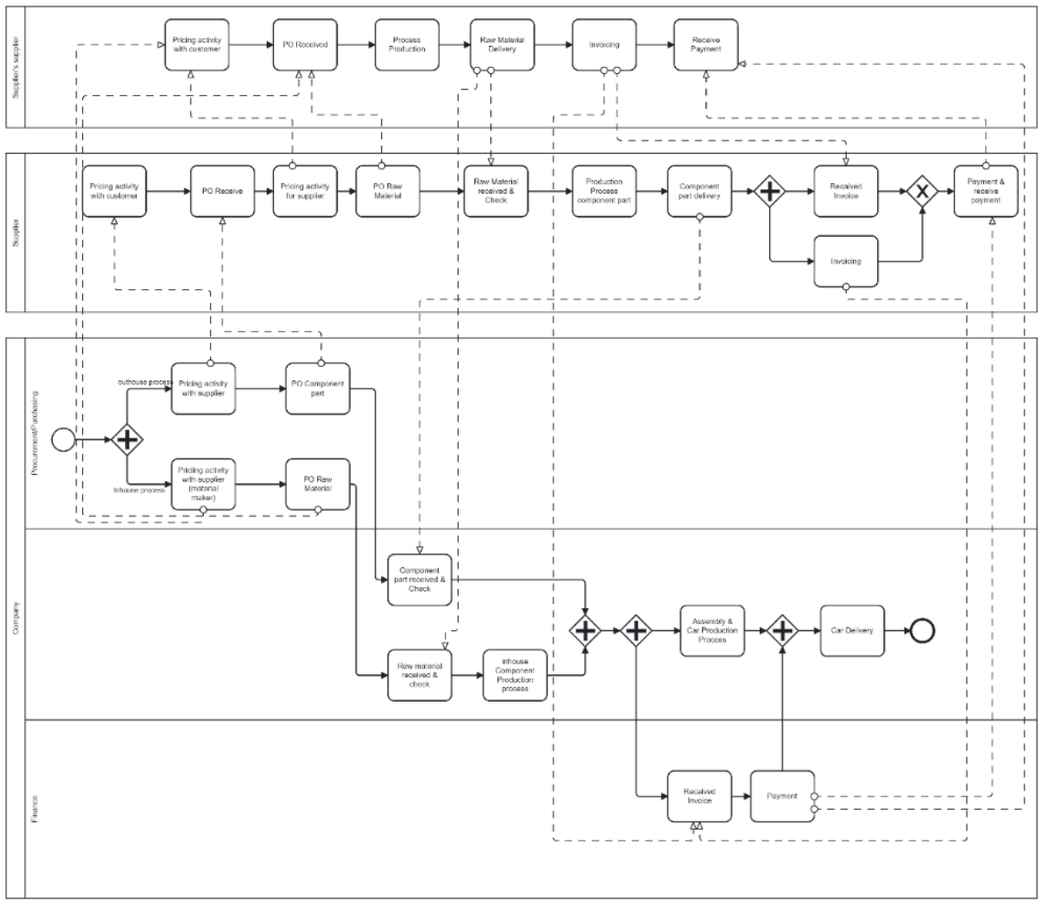

Figure 3. Current Bpmn Model Supply Chain PT. ABC

SCOR Level 1 Model

In the SCOR model at level 1, companies make strategic decisions. In this case, ABC needs to define the activities that occur in the company's supply chain, particularly the material supply chain. Essentially, the SCOR process is divided into six main processes at the first level: Plan, Source, Make, Deliver, Return, and Enable. Every supply chain involves the Enable process, but in the SCOR model, the Enable process is not included. This fact is based on several journals that have modeled supply chains in companies using SCOR (Cheng et al., 2021). Therefore, there are five types of processes that apply in the company's supply chain environment: Plan, Source, Deliver, and Return.

The supply chain activities at ABC include the Plan process, which explains the overall planning for the company's supply chain; the Source process, which describes the sourcing of materials or components from suppliers; the Deliver process, which explains the delivery of cars to customers; and the Return process, which describes the activities related to the return of cars due to production errors (Wibowo & Wirangga, 2019).

Global increases in material prices will affect the prices of components supplied by suppliers to ABC. Thus, this issue, when viewed in the context of SCOR, falls within the Plan and Source areas. By identifying the problem area, the problem-solving efforts can be more focused on the affected areas, in this case, Plan and Source (Kumar & Suresh, 2009).

SCOR Level 2 Model

The second Supply Chain Process Modeling to be conducted is the SCOR Model Level 2. At this level, we will provide detailed process categories from the previous level. For example, the Plan activity can explain the planning activities performed in Plan Supply Chain, Plan Source, Plan Make, Plan Deliver, and Plan Return. In this case, each Process Type in Level 1, namely Plan, Source, Deliver, and Return, has its own respective categories. Table 1 highlights the identified Process Categories used in the SCOR Model Level 2 for PT. ABC's supply chain.

Table 1 Scor Level 2 in PT. ABC

L1	L2		Remark
	Code	Process	
sP - Plan	sP1	Plan Supply Chain	

	sP2	Plan Source	
	sP3	Plan Make	
	sP4	Plan Deliver	
	sP5	Plan Return	
sS - Source	sS1	Source Stocked Product	
sM - Make	sM1	Make to Stock	Company Business Process
	sM2	Make to Order	Supplier Business Process
sD - Deliver	sD1	Deliver Stock Product	Company Business Process
	sD2	Deliver Make-to-Order Product	Supplier Business Process
sR - Return	sSR1	Source Return Defective Product	
	sDR1	Deliver Return Defective Product	

In the table above, the SCOR Model and flow at Level 2 have been detailed. The process begins with planning, specifically the sP1 process, which is Supply Chain Planning. In this phase, processes related to determining the requirements to achieve PT. ABC's supply chain goals are designed, allowing for further elaboration in subsequent planning. The next planning to be conducted relates to procurement activities, outlined in sP2 or Sourcing Planning. In this process, PT. ABC will develop and establish activities over a specific period for supplier search, determining business flows, and making component forecasts. The next process is sP4 or Delivery Planning, which includes the actions required to supply purchased cars to customers, ranging from inventory management to car delivery. The final planning process to be conducted is sP5 or Return Planning. In this planning process, PT. ABC needs to plan the return process for defective cars due to production errors (Page, 2010).

After planning, the execution process continues with the Sourcing process, specifically sS1, which is Sourcing Stocked Products. In the automotive manufacturing industry, most component purchases are made for stock. Since cars are not made to order but are stocked first and then marketed to potential customers. During the sourcing process or sS1, PT. ABC orders a specific quantity of required components and performs quality inspections on the received components (Porter, 2002).

Considering the existing issue, which is the global increase in material prices that will impact the increase in component prices purchased by PT. ABC from suppliers, the issue falls within the SCOR Sourcing Planning (sP2) and Sourcing Stocked Product (sS1) areas.

Formulating Recommendations for a Business Process Model through the Delphi Method

After identifying problem areas using the SCOR Framework, the next step is to determine improvement recommendations for the existing business processes. In this case, the researcher utilizes the Delphi method to gather ideas that can be used as improvement recommendations in the business model. The Delphi method is employed to collect the perspectives and knowledge of experienced experts in this field. This process involves several rounds of questionnaires to reach a consensus on the existing problems (Konečný, n.d.).

Once the respondents, who are experts in this field, are identified, the researcher proceeds to distribute questionnaires to them for the first round of the Delphi method. The experts answer the questionnaires without knowing the answers of other experts. This is done to ensure that the provided answers are not influenced by external factors, including the dominance of opinions from certain parties. The questions in the questionnaire are about the steps that companies should take to maintain their profitability amidst the global increase in material prices.

Based on the experts' answers in the first round, further analysis is conducted to serve as the basis for the questions in the second round in order to obtain consensus. Some of the experts' answers can be simplified based on shared ideas. Subsequently, the set of responses from the experts is redistributed to them with the aim of obtaining a consensus from their answers (Sucahyowati, 2011).

The next step is to formulate questions to obtain improvement recommendations. The results of the experts' answers in the third round of the Delphi questionnaire are presented in the table below (Stevenson et al., 2014).

Table 2 Results Of Expert Recommendations Through Delphi Method

Question	The current situation is that 1st tier suppliers buy the raw materials they need themselves from material suppliers or material makers. The problem that is currently emerging is that raw material prices are increasing globally. This will increase the selling price of 1st tier supplier products to ABC. What improvements can the company make in the procurement/purchasing area to reduce the increase in material prices?
Answer 1	Look for potential changes to cheaper materials. Negotiating component prices.
Answer 2	Renegotiation of component prices to offset material increases.

Answer 3	Modifying the current business route, ABC can purchase raw materials directly from the material maker, so that 1st tier suppliers do not make self-purchases.
Answer 4	Looking for cheaper material makers and recommending them to 1st tier suppliers.
Answer 5	Looking for the possibility of buying raw materials and then supplying them to suppliers.
Answer 6	Eliminate supply chains by making contracts with material makers directly, so that raw material purchases can be combined with in-house production needs to get more competitive prices.
Question	Based on the current ABC Business Process (Figure attached), which areas should be the focus of attention so that the company can maintain profitability amidst rising material prices globally?
Answer 1	Procurement/purchasing
Answer 2	Procurement & Production
Answer 3	Procurement
Answer 4	Procurement & Production
Answer 5	Procurement
Answer 6	Procurement

Based on the results from the questionnaire in the third round using the Delphi method, several improvement recommendations were obtained that can be implemented by PT ABC to mitigate the impact of the global increase in material prices. The most dominant recommendation is to modify the material procurement business flow. Subsequently, based on these recommendations, business process re-engineering can be conducted to incorporate the proposed improvements from the experts.

Quantitative Analysis

With the implementation of the Business Process changes in the procurement area, PT ABC will benefit from cost reduction due to the elimination of profit margin or handling fees charged by suppliers on material prices. This allows the company to mitigate the cost increase resulting from the global rise in material prices (Tampubolon et al., 2017).

Table 3 below represents the cost structure that emerges in the pre-improvement business process. The cost structure indicates that the Material cost is borne by the component suppliers along with the accompanying profit (including material handling fees).

Table 3 Cost Structure Before Business Process Improvement

Supplier	Material cost (A)	Rp. A
	Material cost (B)	Rp. B
	Process cost	Rp. C
	Sub total	A + B + C
	Profit & ABCin (12%)	15% (A+B+C)
	others	Rp. D
	Total Component Cost	Rp. A+B+C+(15%(A+B +C))+D
ABC	Inhouse Cost	Rp. Z
	Total cost (Component cost + Inhouse cost)	Rp. A+B+C+(15%(A+B +C))+D+Z

By conducting business process re-engineering through the transfer of pricing activities from suppliers to the Procurement department of PT ABC, the cost structure will be as shown in Table 4 below.

Table 3 Cost Structure After Business Process Improvement

Supplier	Material cost (A)	Rp. 0
	Material cost (B)	Rp. B
	Process cost	Rp. C
	Sub total	B + C
	Profit & ABCin (12%)	15% (B+C)
	others	Rp. D
	Total Component Cost	Rp. B+C+(15%(B+C))+D
ABC	Inhouse Cost	Rp. Z
	Material cost (A)	Rp. A

Total cost (Component cost + Inhouse cost)	Rp. B+C+(15%(B +C))+D+Z+A

The Material cost (assuming Material A) at the supplier will be eliminated and transferred into the cost structure at ABC. It can be seen in the table that the total component cost will change with the elimination of the Material A cost and the related profit and ABCin costs.

Next, we can assess the benefits by reducing the total cost before improvement with the total cost after improvement.

= Total Cost Before Improvement – Total Cost After Improvement

= Rp. (A+B+C+(15%(A+B+C))+D) – (B+C+(15%(B+C))+D+Z+A)

= Rp. 15%A

.

With the implementation of these business process changes, ABC will gain a benefit of Cost Reduction amounting to Rp. 15%A.

Business Process Model Improvement

Based on the improvement proposals obtained through the Delphi method and SCOR Framework, involving experts and quantitative analysis comparing costs, the suggested improvement for the supply chain business process of PT ABC will focus on the procurement/purchasing area. The new recommended Business Process is depicted in the figure below

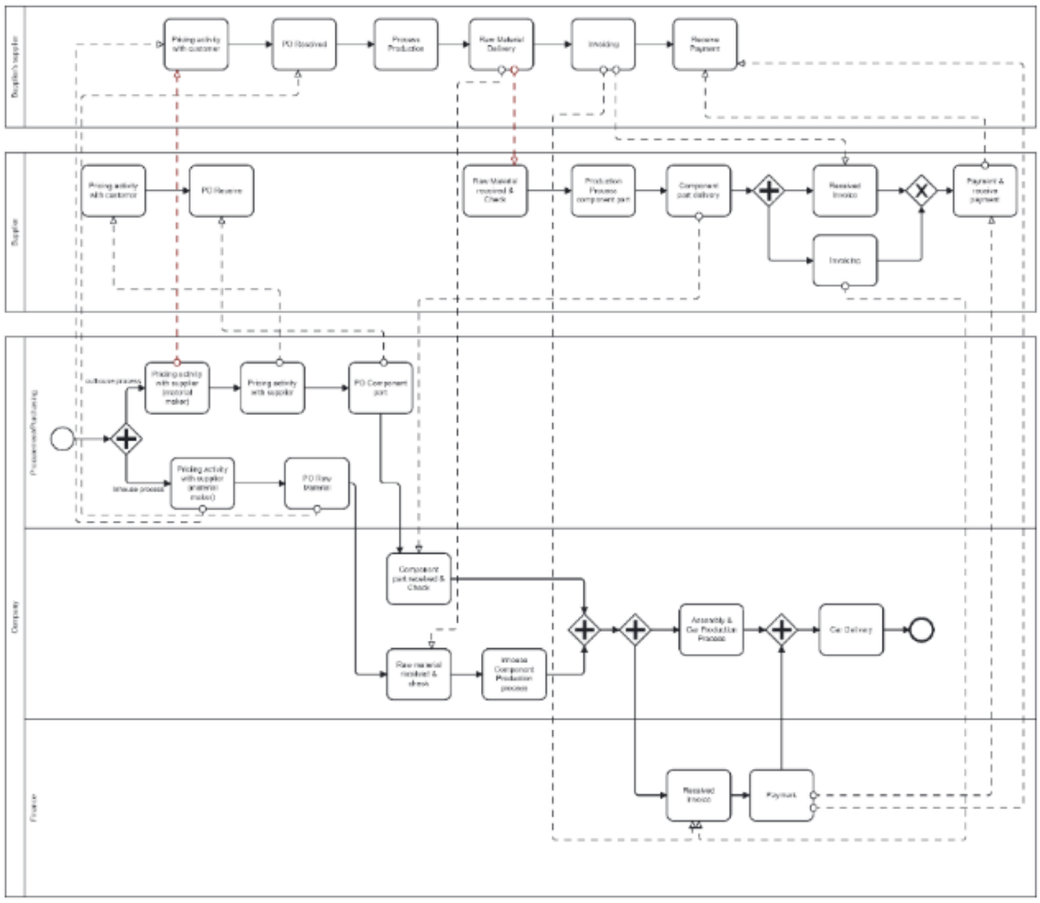

Figure 4. BPMN Recommendations ABC Supply Chain Model

In the proposed new business process, we can see that the recommended improvement is in the procurement area. The suggested recommendation is to modify the business route for purchasing raw materials, shifting from self-purchase by the component supplier to direct purchase by PT. ABC from the material maker. The changes in the business process can be observed in the procurement/purchasing area, indicated by the red dashed line. The overall flow of PT. ABC's business based on the provided recommendations can be seen in the figure below.

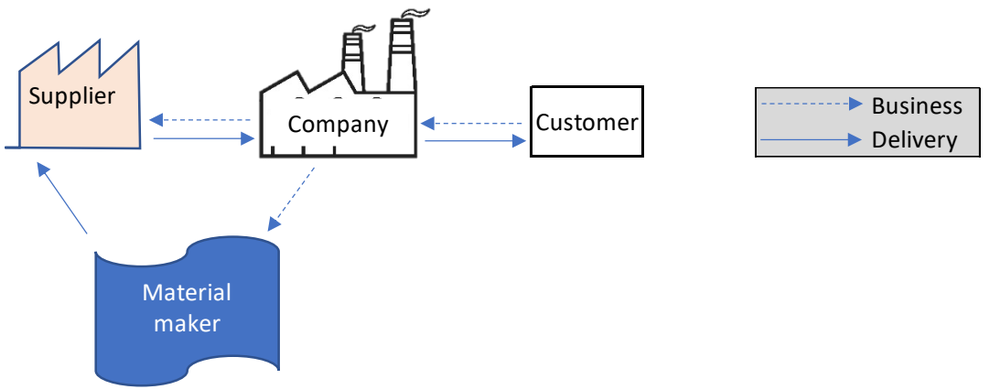

Figure 5. Business Flow Recommendations PT. ABC

CONCLUSSION AND RECOMMENDATION

Based on the analysis conducted in this research, it is evident that the business process within the supply chain of PT ABC can be improved to address the threat of global material price increases. Based on the interviews conducted and quantitative analysis comparing the current business process with the recommended supply chain strategy, the following conclusions can be drawn. First, The proposed supply chain strategy improvement in dealing with global material price increases can focus on the procurement/purchasing area. The improvement involves a change in the outhouse process flow, specifically the pricing activity and raw material purchasing. These activities, which were initially carried out by the 1st-tier supplier, will be directly handled by PT ABC in terms of pricing and purchasing from the material maker. Second, By implementing the revised business process, PT. ABC will benefit from cost savings amounting to Rp. 15%A, where A represents the value of the material cost. Consequently, the company can mitigate the cost impact of global material price increases. Third, Additionally, PT. ABC will also benefit from the certainty and clarity of material prices as the pricing activity is performed internally by the company itself.

By implementing these recommended changes, PT. ABC can enhance its supply chain resilience and better navigate the challenges posed by global material price fluctuations.

REFERENCES

Ambarwati, R., & SE, M. (2020). Buku Ajar Manajemen Operasional Dan Implementasi Dalam Industri. *Umsida Press*, 1–947.

Cheng, C.-C., Chang, Y.-Y., & Chen, C.-T. (2021). Construction of a service quality scale for the online food delivery industry. *International Journal of Hospitality Management*, *95*, 102938.

Christopher, M., & Holweg, M. (2011). "Supply Chain 2.0": Managing supply chains in the era of turbulence. *International Journal of Physical Distribution & Logistics Management*, *41*(1), 63–82.

David, F. R., & David, F. R. (2017). Strategic Management A Competitive Advantage Approach, Concepts and Cases. Sixteenth, Strategic Management. Sixteenth. England. *Pearson Education. Doi*, *10*, 973–978.

Dumas, M., La Rosa, M., Mendling, J., & Reijers, H. A. (2018). *Fundamentals of business process management* (Vol. 2). Springer.

Florén, H., Frishammar, J., Lee, C., Ericsson, M., & Gustafsson, S. (2013). A framework for raw materials management in process industries. *R&D Management Conference, Manchester, UK, June*, 26–28.

Konečný, B. A. (n.d.). *ZAVEDENI PRVKU LEAN MANAGEMENTU V PODNIKU XY*.

Kumar, S. A., & Suresh, N. (2009). *Operations Management, New Delhi: New Age International (P) Ltd*. Publishers.

Page, S. (2010). The power of business process improvement: 10 simple steps to increase effectiveness. *Efficiency, and Adaptability, AMACOM, New York*.

Porter, R. C. (2002). The economics of waste. Resources for the Future, Washington, DC. *Resource Policy*, *30*(2), 141–142.

Stevenson, W. J., Hojati, M., & Cao, J. (2014). *Operations management*. McGraw-Hill Education New York.

Sucahyowati, H. (2011). Manajemen Rantai Pasokan (Supply Chain Management). *Majalah Ilmiah Gema Maritim*, *13*(1), 20–28.

Tampubolon, J., Ginting, A., Nainggolan, H. L., & Aritonang, J. (2017). North Sumatra's export performance and competitive advantages in the implementation of ASEAN Economic Community (AEC). *International Journal of Advance Agricultural Research*, *5*(2017), 61–65.

Wibowo, S. S. A., & Wirangga, A. (2019). Supply chain performance dan kinerja perusahan. *Journal of Applied Managerial Accounting*, *3*(1), 116–125.