COST ANALYSIS OF SUPPLY CHAIN MANAGEMENT IN THE STEEL MANUFACTURING INDUSTRY USING THE SUPPLY CHAIN OPERATIONS REFERENCE 12.0 VERSION APPROACH

UNDERGRADUATE THESIS

Submitted to the International Undergraduate Program in Industrial Engineering in Partial Fulfilment of Requirement for the Degree of Sarjana Teknik at the Faculty of Industrial Technology Universitas Islam Indonesia

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COST ANALYSIS OF SUPPLY CHAIN MANAGEMENT IN THE STEEL MANUFACTURING INDUSTRY USING THE SUPPLY CHAIN OPERATIONS REFERENCE 12.0 VERSION APPROACH

Yogyakarta, June 14th, 2024

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COST ANALYSIS OF SUPPLY CHAIN MANAGEMENT IN THE STEEL MANUFACTURING INDUSTRY USING THE SUPPLY CHAIN OPERATIONS REFERENCE 12.0 VERSION APPROACH

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DEDICATION PAGE

To my family, whose unwavering support and encouragement have been my constant companions throughout this journey; to my friends, for their endless patience and understanding during the countless late nights and early mornings; and to my professors, whose guidance and wisdom have shaped my academic path, this thesis is dedicated to all of you. Your belief in me has been the driving force behind my perseverance, and for that, I am eternally grateful. This accomplishment is as much yours as it is mine. Thank you for being my pillars of strength and inspiration.

MOTTO

"Whoever follows a path in the pursuit of knowledge, Allah will make a path to Paradise easy for him."

- The Prophet Muhammad (Sahih Muslim, 6618)

PREFACE

Assalamualaikum Warahmatullahi Wabarakatuh,

Alhamdulillah, all praise to Allah SWT, because only with his permission the author can finish the undergraduate thesis, Shalawat, and greetings to the prophet Muhammad SAW, who has saved mankind from jahiliyyah era to the Islamiyah era, and give syafaat in yaumul akhir.

This report was made to fulfill the requirements for completing a degree in Industrial Engineering at Universitas Islam Indonesia. The author realizes that he cannot finish this project without the help of their teammate. The author also says thanks for all the support, prayers, and motivation for all families that have already supported the author to finish this undergraduate thesis. Thus, the author would like to thank:

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In crafting this undergraduate thesis, the author acknowledges the impossibility of achieving perfection. Instead, the author invites readers to engage with the work critically, offering constructive critiques and valuable recommendations. The ultimate goal is to ensure that this report provides substantial benefits to all parties involved.

Wassalamualaikum Warahmatullahi Wabarakatuh.

Yogyakarta, May 28, 2024

Kinan Wira Prastha

ABSTRACT

The vision of "Golden Indonesia 2045" emphasizes significant progress through fair and comprehensive development across various sectors, with the steel industry identified as a cornerstone for this advancement. Reflecting on this mission, the Indonesian Iron and Steel Industry Association (IISIA) reports a steady increase in national steel consumption, rebounding from the 2020 pandemic decline. By 2023, projections indicate a 6.17% growth in steel consumption, alongside an anticipated 7.14% increase in domestic production. Despite these positive trends, the ASEAN region remains a significant steel importer, facing challenges such as excess capacity and the need to mitigate unfair trade practices. In the competitive landscape, companies like PT. XYZ must enhance efficiency and effectiveness to gain market share and profitability. This thesis utilizes the Supply Chain Operation Reference (SCOR) 12.0 Version to identify performance metrics that impact supply chain costs at PT. XYZ. The research focuses on reliability attributes, specifically targeting metrics such as the Cost of Goods Sold, Direct Material Cost, and Indirect Costs related to production. The findings reveal that the primary areas contributing to inefficiencies are Direct Material Cost and Indirect Cost Related to Production. By addressing these gaps, PT. XYZ can enhance its competitive edge and profitability. The study aims to provide actionable strategies for PT. XYZ to optimize its operations, aligning with the broader goal of fostering a robust and self-sufficient steel industry in Indonesia and the ASEAN region. Key objectives of this research include identifying loss-incurring variables at PT. XYZ and proposing actionable plans to enhance profitability. The outcomes will guide PT. XYZ in improving supply chain performance and achieving a competitive advantage in the increasingly dynamic steel industry.

Keywords: Steel Industry, Supply Chain Operation Reference (SCOR) 12 Model, Cost

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CHAPTER I
INTRODUCTION

1.1 Research Background

The intention and mission of the Indonesian state in "Golden Indonesia 2045" is to focus on progress. One of the important aspects supporting the dream of progress is good and fair development in all aspects of the state. The Coordinating Minister of Economy of the Republic of Indonesia emphasized that the steel industry is one of the main pillars for the development of advanced Indonesia.

This is in line with data showing that national steel demand is gradually increasing from the decline happened in 2020 caused by the pandemic that occurred at that time, the data of which can be seen in the graph below which is sourced from IISIA.

Figure 1. 1 Indonesian Steel Consumption 2015-2023

The Indonesian Iron and Steel Industry Association (IISIA), projects that steel consumption in Indonesia will reach 16.2 million tons throughout 2022. This amount has increased by 4.52% compared to the realization in the previous year of 15.5 million tons. With this amount, per capita steel consumption is estimated to reach 58.7 kg in 2022. The value also increased by 3.89% compared to the previous year which was 56.6 kg. Looking at the trend, national steel consumption decreased in 2020 due to the Covid-19 pandemic. However, the numbers have risen again this year, in line with the slowdown in the country. IISIA also projects

national steel consumption to reach 17.2 million tons this year. This number is 6.17% greater than the projection for 2022. Meanwhile, the country's steel production is estimated to reach 15 million tons in 2022. The amount is an increase of 7.14% compared to the realization a year earlier which was recorded at 14 million tons.

CEO of PT. XYZ and President of the Southeast Asia Iron and Steel Institute (SEAISI), Purwono Widodo, presented forecasts for the global and ASEAN steel industry at the SEAISI 2023 Conference and Exhibition in Manila, Philippines. He revealed that the World Steel Association forecasts that global steel demand in 2023 will increase by at least 1.1% to about 1.8 billion tons.

Meanwhile, steel demand in the ASEAN region is expected to reach 77.9 million tons, up 3.5 million tons from the 2022 requirement of 75.3 million tons. Despite the positive growth in demand, it is important to note that ASEAN has been a major steel importer for many years, and by 2022, ASEAN's steel imports will reach 44.5 million tons, or more than 57% of ASEAN's steel demand. However, according to him, all these positive notes bring unique challenges to the ASEAN region. For example, reduce import levels as much as possible and increase steel production in the ASEAN region. In addition, the ASEAN steel industry also faces other challenges such as potential excess capacity.

SEAISI estimates that additional steel capacity in ASEAN will reach 90 million tons in the next 5-10 years, mainly due to Chinese investment. This extra capacity is significant compared to the growth rate of ASEAN's steel demand. For this reason, the ASEAN steel industry must work together to protect the regional market from unfair trade practices stemming from excess capacity at low import prices, which harm the domestic ASEAN steel industry.

Therefore, every country, especially Indonesia, must protect the iron and steel industry so that it continues to exist and develop. For example, China is very concerned about the existence of the iron and steel industry in the country. At present, China is the world’s largest steel producer and has controlled more than 34% of world steel production since 2006 until now. Although, China has become the world's largest producer, it still needs to provide various incentives for its iron and steel industry. Thanks to these incentive policies, the production cost of this industry can be cheaper, so the iron and steel industry from China becomes more vulnerable to dumping accusations where Chinese iron and steel products are marketed, including in Indonesia. At present, the main problem is that Indonesia's national iron and steel production level has also not been able to meet all national iron and steel needs. Therefore, Indonesia must import iron and steel products from abroad, especially from China and India.

Even though the products are not necessarily of the same quality as the products from PT.XYZ. As a result of the easy import of foreign steel products into Indonesia, many of Indonesia's domestic steel industries have gone bankrupt due to competition with similar products from other countries, especially China. Indications of bankruptcy in 2019 were marked by massive layoffs of more than 2000 organic employees.

The condition of the industrial structure of PT.XYZ as one of the largest iron-steel industries in Indonesia is experiencing fragility problems and is vulnerable to bankruptcy, due to a lack of capital. This means that the various problems of the steel industry are fundamental enough that they must be handled more seriously so that the negative multiplier effect of the existence of the national steel industry is not prolonged.

Based on the above phenomenon, it is actually an opportunity as well as a challenge for the growth and development of the national iron and steel industry, the production of the iron and steel industry must be increased and given various intensive policies, including protection through increased import tariffs, so that the existence of the Indonesian iron and steel industry can still exist and be able to compete with the steel industry from abroad. The fundamental problem that still needs to be studied more deeply is whether Indonesia is able and serious in handling the steel industry. The purpose of the study in this report is to examine the performance of the supply chain management of the steel industry specifically to explain the industrial market structure and productivity performance as well as the competitiveness performance of the Indonesian steel industry. Specifically, the purpose of this report is to define the level of supply chain management performance, especially in the field of production.

The use of the SCOR model in building the concept of supply chain cost-related performance measurement based on the process at PT.XYZ, makes the company able to evaluate supply chain cost performance holistically to conduct monitoring and control, communicate organizational goals to functions in the supply chain, find out where an organization is relative to competitors, and determine the direction of improvement for creating competitive advantage.

1.2 Problem Formulation

Companies must have competitive advantages in similar industries so that the company can capture market share and gain profit. Competition lies in how companies implement processes in producing products or services that are better, cheaper, and faster than their competitors. Therefore, in facing business competition in various industries, a strategy is needed in the form of efficiency and effectiveness. Currently, the competition in the business world is so tight, that all companies compete to market their products with various types of promotions and the best service. In an internet age, especially since the world is hit by the COVID-19 pandemic, businesses today lie in how a company can create products or services that are cheaper, more qualified, and faster available compared to its business competitors. So, it forces the company to improve the performance of its company to be able to provide satisfactory service to all its customers, in other words, if the company can meet the wishes of customers, then the company will be superior. Aside from the quality, price, and suitability of goods shipped a factor that is often complained by customers. This is also the case with PT. XYZ as a steel-making company, often gets complaints about.

From the explanation of the research background above, the research problems can be formulated as follows:

1. What causes that makes PT. XYZ losses?
2. What kind of best practices (BP) that PT. XYZ should optimize?
3. What kind of the most suitable plan PT. XYZ to gain profit?

1.3 Research Objective

The research objectives related to overcoming the problem formulation above are as follows:

1. To find and explain what are the variables that make losses in PT. XYZ.
2. To optimize the project from selected best practices in PT. XYZ.
3. To determine the most suitable plan actions that PT. XYZ to make more profit.

1.4 Scope of Research

To limit the scope in this research, the limitations for the problem given are as follows:

1. The research was conducted at PT. XYZ.
2. The data were taken from November to December 2023.
3. This research focuses on cost management strategies that can be implemented to reduce losses at PT. XYZ.
4. This study uses the SCOR 12.0 version method.

1.5 Research Benefit

This research is expected to provide benefits to all parties, including:

1. For the researchers to compare knowledge from theory and reality in the field, it is a requirement for the writer to obtain a bachelor's degree in industrial engineering from Indonesia Islamic University.
2. For the company, this research is expected to be a reference for making improvements in various aspects so that the company can gain more profit and use the result of this research as a consideration of system change in the field of business management. The company is also able to know what aspects that still need improvement.
3. For further researchers, this research can be used as a reference and source of information in conducting research related to these topics, either continuing or complementary.

1.6 Systematic Writing

The strategies for writing this research are as follows:

CHAPTER I INTRODUCTION

Explaining background about Indonesia dream about golden Indonesia 2025 but still facing external and internal problems with raw material procurement for steel production with its competitor and author questioning what makes PT.XYZ losses and how to make improvement, having scope of the study explaining PT.XYZ become the place of the research in the range of November until December 2023, implementing SCOR 12.0 version method to answer each problem formulation and author hope with this research the company able to make some improvement and gaining some profit after implementing the recommendations.

CHAPTER II LITERATURE REVIEW

This chapter contains literature review and empirical studies, in which a literature review has previous research related with supply chain operations reference, which is used as a reference for conducting research. At the same time, the empirical studies contain the theories supporting the research.

CHAPTER III METHODOLOGY

This chapter contains the research objects which is PT.XYZ production performance, implementing supply chain operations reference 12 version to be the method, with primary (interview) and secondary data (CRU), and the flow of research carried out from the beginning of the study to the end.

CHAPTER IV DATA COLLECTION AND PROCESSING

This chapter contains data collection and processing of data obtained by a predetermined method and comparing it with the competitor, and then the processed data is analyzed with tools such as fishbone diagram, 5W+1H, and SWOT analysis to achieve research objectives.

CHAPTER V DISCUSSION

This chapter contains an explanation of the analysis obtained in detail with the suitability of the results of the research objectives via best practices so that they can provide recommendations for improvements.

CHAPTER VI CONCLUSION AND SUGGESTION

This chapter contains the conclusions from the research that has been carried out and provides recommendations for suggestions for improvements to the results obtained by the formulation of the problem that has been determined so that it is hoped that it can be studied further in further research.

CHAPTER II
LITERATURE REVIEW

2.1 Literature Review

Yuniaristanto, N Ikasari, W Sutopo, R Zakaria (2020) reviewed the performance of the supply chain in the UNS Lithium Battery Factory using the SCOR model to determine an improvement plan for the company. The battery supply chain performance is measured using the SCOR model with the following steps: (i) identifying supply chain performance metrics, (ii) validating metric level 1 as KPI, (iii) performance measurements using metrics level 1 and level 2, and (iv) normalization using Snorm de Boer formula. Based on the monitoring system of the performance indicators, the performance of reliability and cost is categorized as good while the performance of responsiveness, agility, and asset management efficiency is categorized as average.

David Sinaga, Sugiyono Madelan, and Ahmad Badawi (2021) reviewed supply chain management analysis at PT.Pola Petro Development (PT.PPD) as a distributor of compressor machines must improve its services in line with complaints from customers such as delays in requested items and goods sent do not match what was ordered. This research aims to determine supply chain performance at PT.PPD by the Supply Chain Operation Reference (SCOR) method. The analysis technique used in this study uses a metric system to assess the performance of the supply chain consisting of level 1, level 2 and level 3. This research shows that supply chain performance is not efficient because the results of level 1 metric measurement are Perfect Order Fulfillment (POF) and Order Fulfillment Cycle Time (OFCT) below the set benchmark value. The actual POF value was 89.98% under the superior benchmark value of 98% and OFCT actual 89 days is below the superior benchmark value of 60 days. Analysis to find the root of the problem using a fishbone diagram and identify solutions to problems that occur.

Prasadja Ricardianto, et, al. (2022) evaluated supply chain management on fuel oil to optimize improvement strategies that can be applied to ConocoPhillips companies in Indonesia. Effective and efficient supply chain management is one of the goals to achieve the company's business stability in the fuel oil supply chain. Fuel oil is a very complex basic need for companies in carrying out industrial and transportation activities. The research method is measuring and evaluating company performance through a combination of the Supply Chain Operation Reference (SCOR) model and the Analytic Hierarchy Process. Research respondents through interviews with four informants from the company ConocoPhilips. Based on the SCOR

Version 11.0 model, in this study the SCOR measurement is divided into four perspectives, namely Plan, Source, Deliver and Return. Furthermore, through the measurement of Key Performance Indicators, it is classified using five supply chain dimensions, namely reliability, responsiveness, agility, costs, and assets. The research resulted in the final value of supply chain performance of 74,992 which can be categorized as a moderate or intermediate level, this implies that the existence of an assessment system or measurement of supply chain performance on an ongoing basis can be used as a consideration in determining the optimal strategy. Research findings, improvements, and strategies are needed, especially in the perspective of delivering which has the lowest score.

E Kusrini et al (2019) reviewed that the leather industry is one of the basic ingredients in fashion and textile/apparel that has good development potential. This can be used to take advantage of the opportunity for the leather industry which is still importing 60-70%. Supply chain measurement is needed to determine production capability and to benchmark for its company, government, and academics. Measurement of supply chain performance is carried out using the newest SCOR 12.0 method with a performance and processes approach. The study was conducted on XYZ SME and limited to bag products which is one of the largest leather industries in the Bantul area, Special Region of Yogyakarta. The value of supply chain performance is 54.29, which is based on performance indicators. This value is included in the average category. It can be inferred as the benchmark for the leather industry around areas to improve supply chain performance.

Zulfa Fitri Ikatrinasaria, Nanang Harianto and Eka Indah Yuslistyari (2020) reviewed the supply chain at PT. EJI is a printing and merchandising Services Company that has several suppliers and almost all processes are inseparable from the supply chain system. Supply chain problems at PT EJI are in the production process, delivering orders, PO In and PO Out. Repairing the supply chain can be accomplished through the Supply Chain Operation Reference (SCOR) Method. This study recommends improving the supply chain based on the results of performance measurement with the SCOR method which consists of 4 performance criteria, namely: 1) Reliability Criterion: Perfect Order Fulfillment (POF); 2) Responsiveness Criterion: Order Fulfillment Cycle Time (OFCT); 3) Cost Criterion: Cost of Goods Sold (COGS); 4) Assets Criterion: Cash to Cash Cycle Time (CTCCT). The results of the performance measurement show that the delivery process was 80.0, which is the lowest compared with other metrics, namely Make 99.0 and Source 95.0. Supply Chain improvement recommendations are shipping improvements (delivery) through the separation of shipping routes for shipping Online and Offline, checking the quality of invoice documents to avoid

incomplete documents, making SOPs for shipping, and providing dietary at the time of delivery to avoid mismatching goods.

E Kusrini, M A B Rifai, S Miranda (2019) found that performance measurement can be used as a reference to improve performance in order to compete in the market. This study aims to measure the supply chain performance in a small and medium enterprise (SME) producing sports clothes in Yogyakarta. This research utilizes the performance attributes from the Supply Chain Operation Reference Model (SCOR). The business process is identified as the baseline to determine performance metrics on each process (plan, source, make, deliver, return, and enable) and performance attributes, i.e. reliability, responsiveness, agility, cost, and asset management efficiency. According to the experts within the company, there are only 27 of the 40-performance metrics obtained valid. The overall performance score is at a good level with a value of 77.89. Among the metrics, it found 9 metrics at marginal and average levels while the remaining metrics gained a value of more than 70. This supply chain performance analysis can support the company's decision-making to improve its performance at an excellent level.

Amine Belhadi et, al. (2021) found that there has been an increased interest among scholars to investigate supply chain resilience (SCRes) in manufacturing and service operations during emerging situations. Grounded in the SCRes theory, this study provides insights into the impact of the COVID-19 outbreak on the automobile and airline supply chain. Both the short and long-term response strategies adopted by the two supply chains are assessed, using a combination of qualitative and quantitative techniques in three distinct phases. In phase one, we use a sequential mixed-method for resilience evaluation, integrating Time-to-Recovery (TTR) and Financial Impact (FI) analysis. In phase two, we conduct an empirical survey involving 145 firms to evaluate the short-term SCRes response strategies. In the third phase, we conduct semi-structured interviews with supply chain executives both from the automobile and airline industries to understand the long-term SCRes response strategies. Our findings indicate that: (i) the automobile industry perceived that the best strategies to mitigate risks related to COVID-19, were to develop localized supply sources and use advanced industry 4.0 (I4.0) technologies. (ii) The airline industry on the other hand, perceived that the immediate need was to get ready for business continuity challenges posed by COVID-19, by defining their operations both at the airports and within the flights. (iii) Importantly, both sectors perceived Big Data Analytics (BDA) to play a significant role by providing real-time information on various supply chain activities to overcome the challenges posed by COVID-19. (iv) Cooperation among supply chain stakeholders is perceived, as needed to overcome the challenges of the pandemic and to accelerate the use of digital technologies.

Nurhayati Kamarudin and Nurul Zarirah Nizam (2022) This study examines potential for future extensions of the model. By analysis of 158 samples for this study. This study investigates the level of SCOR Model practices in Supply Chain performance and investigates the relationship between SCOR Model effect by mediating of Just-In-Time (JIT) and supply chain performance in Malaysia manufacturing industry based on the five decision areas provided in SCOR Model Version 10.0 (PLAN, SOURCE, MAKE, DELIVER, RETURN) and five key supply chain performance derived from supply chain business management. The questionnaire tool by SCC is used to analyze requirements on modeling tools to support the application of a respective extended SCOR Model. The results showed that planning processes are important in all SCOR supply chain planning decision areas. Collaboration was found to be most important in the Plan, Source, and Make planning decision areas while teaming was most important in supporting the Plan and Source planning decision areas. Process measures, process credibility, and process integration were found to be most critical in supporting the delivery planning in the decision area. Based on the result of the regression models it can be concluded that the SCOR Model to some extent contributes significantly and positively towards firm SC performance and various components of performance measurements. Using these results, the study discusses the implications of the findings and suggests several venues for future research that contribute to the new version of the SCOR Model and for future reference on improved performance in industry and society.

Panji Dewa Jayeng Raga, Ahmad H. Sutawijaya, Lenny C. Nawangsari (2021) reviewed in improving the performance of pharmaceutical companies, it is necessary to implement a green supply chain using the Supply Chain Operation References (SCOR) method. Several pharmaceutical KPI deviations during 2016-2018 such as Supplier Irregularities, Documentation Errors, CO2 Energy complaints, Water-H2 O complaints, and Waste. Therefore, green manufacturing is a production process that uses inputs with relatively low environmental impact, is efficient and produces little waste or pollution. This study aims to analyze the performance of the Green Supply Chain in pharmaceutical companies in Jakarta by using SCOR. This study uses quantitative methods and qualitative methods with a focus on measuring the performance of green manufacturing. The population and samples in this study were all sales and operating planning divisions, supply chain divisions, logistic divisions, commercial divisions, production divisions, procurement divisions, engineering and health divisions, and environmental safety divisions. The results of research using green SCOR show that the performance value of green pharmaceutical manufacturing is 96.506 (very good) and is a new way of monitoring the performance of pharmaceutical companies.

I S Fauziyah, A Y Ridwan and P S Muttaqin (2020) reviewed food and beverage companies should be able to maintain and measure their performances to survive while the business competition condition is very dynamic. This study was conducted to design a performance measurement system for food production that combines the halal factors in its business process. Halal means authorized, legal, permitted, and allowed to any object or activity that is used or implemented in Islam. Therefore, designing and measuring the performance in this study will use the Supply Chain Operation Reference (SCOR) model and Analytical Hierarchy Process (AHP). By using the SCOR model, we will get performance metrics that serve as indicators to observe and maintain the company's performance. Meanwhile, by using AHP, we will get the importance weight of each metric toward the company's performance score. The results of this study obtained 15 metrics with 3 halal metrics. The 15 metrics are divided into three performance attributes, which are 5 metrics in the reliability attribute, 9 metrics in the responsiveness attribute, and 1 metric in the cost attribute. The results of the overall performance score are 72.73. Those metrics are useful to maintain and improve the company's performance.

Table 2. 1 Literature Review

No	Author	Title (Year)	Object	Method
1	Yuniaristanto, N Ikasari, W Sutopo, R Zakaria	Performance Measurement in Supply Chain Using SCOR Model in The Lithium Battery Factory (2020)	Supply chain performance in UNS Lithium Battery Factory.	Supply Chain Operation Reference (SCOR) Method.
2	David Sinaga, Sugiyono Madelan, Ahmad Badawi	Analysis Supply Chain Management Performance Using SCOR Method in Compressor Distributor	Supply chain performance at PT.PPD.	Supply Chain Operation Reference (SCOR) Method.

No	Author	Title (Year)	Object	Method
		Company at PT. Pola Petro Development (2021)		
3	Prasadja Ricardianto, et, al.	Supply chain management evaluation in the oil and industry natural gas using SCOR model (2022)	Supply chain performance at ConocoPhillips companies.	Supply Chain Operation Reference (SCOR) Method.
4	E Kusrini et al	Supply Chain Performance Measurement Using Supply Chain Operation Reference (SCOR) 12.0 Model: A Case Study in A Leather SME in Indonesia (2019)	A Leather SME in Indonesia.	Supply Chain Operation Reference (SCOR) method with a performance and processes approach.
5	Zulfa Fitri Ikatrinasaria, Nanang Harianto and Eka Indah Yuslistyari	Improvement of supply chain performance of printing services company based on supply chain operation references (SCOR) model (2020)	PT. EJI a printing and merchandising Services Company.	Supply Chain Operation Reference (SCOR) Method.
6	E Kusrini, M	Performance	Supply chain	Supply

No	Author	Title (Year)	Object	Method
	A B Rifai, S Miranda	measurement using supply chain operation reference (SCOR) model: a case study in a small-medium enterprise (SME) in Indonesia (2019)	performance in a small and medium enterprise (SME) producing sports clothes in Yogyakarta.	Chain Operation Reference (SCOR) Method.
7	Amine Belhadi et, al.	Manufacturing and service supply chain resilience to the COVID-19 outbreak: Lessons learned from the automobile and airline industries (2021)	The impact of the COVID-19 outbreaks on the automobile and airline supply chain.	Mixed-method, integrating Time-to-Recovery (TTR) and Financial Impact (FI) analysis.
8	Nurhayati Kamarudin and Nurul Zarirah Nizam	The Mediating Effect of JIT on The Relationship Between SCOR Model and Supply Chain Performance (2022)	Supply chain performance in Malaysia manufacturing industry.	Supply Chain Operation Reference (SCOR) Method.
9	Panji Dewa Jayeng Raga, Ahmad H. Sutawijaya,	The Analysis of Green Supply Chain to Improve Performance	The performance of the Green Supply Chain	Supply Chain Operation Reference

No	Author	Title (Year)	Object	Method
	Lenny C. Nawangsari	Solid Product Using SCOR Analysis at Pharmaceutical Company, Jakarta (2021)	in pharmaceutical companies in Jakarta.	(SCOR) Method.
10	I S Fauziyah, A Y Ridwan and P S Muttaqin	Food production performance measurement system using halal supply chain operation reference (SCOR) model and analytical hierarchy process (AHP) (2020)	Performance measurement system for food production that combines the halal factors in its business process.	Halal supply chain operation reference (SCOR) model and analytical hierarchy process (AHP)

In this research, companies like PT. XYZ must enhance efficiency and effectiveness to gain market share and profitability. This thesis utilizes the Supply Chain Operation Reference (SCOR) 12.0 Version to identify performance metrics that impact supply chain costs at PT. XYZ. The research focuses on reliability attributes, specifically targeting metrics such as the Cost of Goods Sold, Direct Material Cost, and Indirect Costs related to production. The findings reveal that the primary areas contributing to inefficiencies are Direct Material Cost and Indirect Cost Related to Production. By addressing these gaps, PT. XYZ can enhance its competitive edge and profitability. The study aims to provide actionable strategies for PT. XYZ to optimize its operations, aligning with the broader goal of fostering a robust and self-sufficient steel industry in Indonesia and the ASEAN region. Key objectives of this research include identifying loss-incurring variables at PT. XYZ and proposing actionable plans to enhance profitability. The outcomes will guide PT. XYZ in improving supply chain performance and achieving a competitive advantage in the increasingly dynamic steel industry.

2.2 Empirical Study

2.2.1 Supply chain management

Supply Chain Management (SCM) is the discipline that encompasses the end-to-end business activities carried out in any business, independent of the manufacturing or service sectors. In fact, it is the only way today in which business needs to be carried out, (RV Altekar, 2023).

SCM evolved over the years from multiple business streams. One stream runs right from traditional transport management, distribution management, and sales management, up to the latest discipline called logistics management, whereas the other stream runs from traditional purchase management to materials management and up to procurement or sourcing management. The third stream can be referred to as manufacturing management where it has evolved from mass production to mass customization or lean production system including agile or flexible and quick response manufacturing management. All these branches of business management ultimately converged into a new management philosophy called supply chain management. It talks about the integration and interdependent decision-making between all the trading partners like the manufacturing firm, their suppliers, supplier's suppliers, and also the dealers, wholesalers, retailers, or even the final consumers (RV Altekar, 2023).

Supply chain management is one of the many important activities that companies need to carry out optimally. Naturally, companies want to handle all business processes as efficiently as possible. Proper supply chain management can ensure that the entire product manufacturing process, from raw material processing to finished goods, is carried out in the shortest possible time and with the best quality.

2.2.2 Supply chain management performance

Performance management and continuous improvement is one of the fundamental aspects of SCM. Therefore, a company or organization needs a measurement system that can comprehensively assess the performance of the company's or organization's supply chain (Rachman et. al, 2020).

In carrying out a business activity, an SCM performance measurement system is needed to:

a. Carrying out monitoring and control.

b. Communicate organizational goals to functions in the supply chain.

c. Know where you are relative to competitors and goals to be achieved.

d. Determine the direction of improvement to create a competitive advantage.

When creating an SCM performance measurement system, the following are several things that need to be considered:

a. Determine what will be measured and monitored to create conformity between SCM strategy and measurement metrics.
b. Every several periods measurements are carried out.
c. How important is the size of one relative to the other.
d. Who is responsible for a certain measure.

A performance measurement system requires measuring instruments that can be used to collaboratively monitor performance between organizations in an SCM network.

2.2.3 Supply Chain Operation Reference (SCOR) Digital Standard

The Supply Chain Operations Reference Digital Standard (SCOR DS) is a model that provides methodology, diagnostic, and benchmarking tools that help organizations make dramatic and rapid improvements in supply chain processes. The world of supply chain management never stops advancing, and neither do supply chain professionals and their organizations. Supply chains require savvy operators, supervisors, and leaders with knowledge about the global standards and practices that move the needle on supply chain performance. ASCM is the global leader in supply chain organizational transformation, innovation and leadership that develops supply chain talent and elevates end-to-end supply chain performance. From education and certification to benchmarking and best practices, ASCM sets the industry standard. The SCOR Digital Standard is a part of the ASCM body of knowledge used to foster the advancement of end-to-end supply chain management (ASCM, 2023).

The Supply Chain Operations Reference Digital Standard (SCOR DS) model is the product of ASCM (formerly APICS) following the merger of the Supply Chain Council and APICS in 2014. The SCOR model was established in 1996 and has been updated regularly to adapt to changes in supply chain business practices. SCOR remains a powerful tool for evaluating and comparing supply chain activities and performance. SCOR captures a consensus view of supply chain management. It provides a unique framework that links business processes, metrics, best practices, and technology into a unified structure to support communication among supply chain partners and to improve the effectiveness of supply chain management and related supply chain improvement activities.

The ASCM member base represents a broad cross-section of industries, including manufacturers, distributors, and retailers. The vast ASCM network also is composed of technology suppliers and implementers, academics and government organizations that

participate in ASCM activities and the development and maintenance of the SCOR Digital Standard model.

ASCM is interested in providing the widest possible dissemination of SCOR because the widespread use of the model enables communication using common definitions and measurements. It also results in better customer-supplier relationships, software systems that better support members using common measurements and terms, and the ability to rapidly adopt common practices.

The SCOR model has been developed to describe the business activities associated with all phases of satisfying customer demand. The model itself contains multiple tabbed sections and is organized around the seven primary management processes of Orchestrate, Plan, Order, Source, Transform, Fulfill, and Return. (See Graphic 1.) By using these process building blocks, the model can describe supply chains that are very simple or very complex using a common set of definitions. As a result, disparate industries can be linked to describe the depth and breadth of nearly any supply chain. The model has been able to successfully describe and provide a basis for supply chain improvement for global projects as well as site-specific projects.

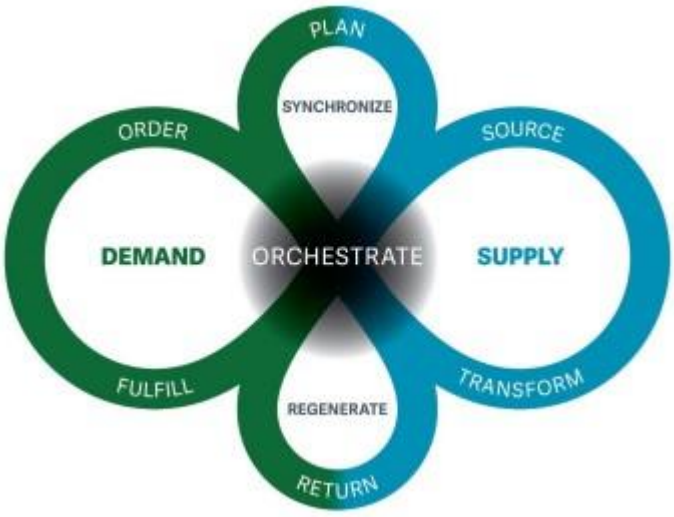

Figure 2. 1 Illustration of SCOR-DS

The graphic illustrating the SCOR-DS model is a double infinity diagram, representing today's supply chain's looped, continuous, and connected nature and the seven critical processes within every supply chain. The SCOR-DS graphic displays the balance of Supply and Demand in a horizontal infinity loop and Synchronize and Regenerate in a vertical infinity loop.

SCOR spans all customer interactions from order entry through paid invoice; all physical material transactions that occur from the supplier's supplier to the customer's customer,

including transactions for equipment, supplies, spare parts, bulk products, and software; and all market interactions from the understanding of aggregate demand to the fulfillment of each order. It does not attempt to describe every business process or activity. Specifically, SCOR does not address sales and marketing, including demand generation; product development; or research and development.

As shown in Figure 2.2, the model is designed to support supply chain analysis at multiple levels. ASCM has focused on process levels 0 to 3, which are industry-neutral. SCOR does not attempt to prescribe how an organization should conduct its business or tailor its systems and information flow. Every organization that implements supply chain improvements using SCOR will need to extend the model, at least to level 4, using industry, organization, and location-specific processes, systems, and practices.

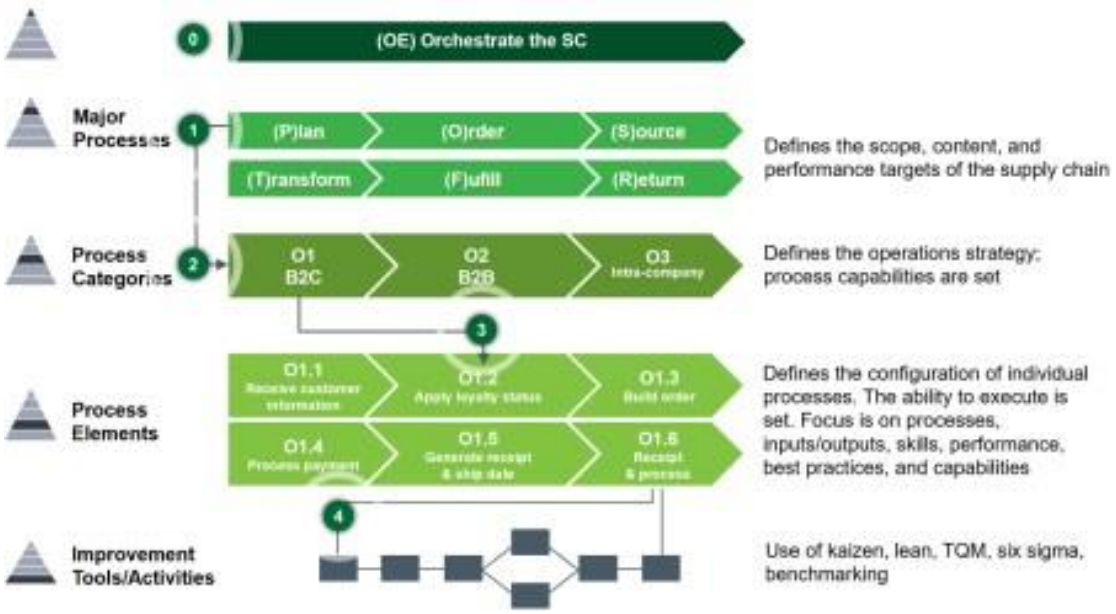

Figure 2. 2 Multiple levels of supply chain analysis

SCOR is a process reference model. The purpose of a process reference model, or business process framework, is to define process architecture in a way that aligns with key business functions and goals. The architecture here is defined as references on how processes interact and perform, how these processes are configured, and the skills requirements for the staff operating the processes.

The SCOR reference model consists of four major sections:

- Performance includes standard metrics to describe process performance and define strategic goals.
- Processes offer standard descriptions of management processes and process relationships.
- Practices explain management practices that produce significantly better process

performance.

- People comprise standard definitions for skills required to perform supply chain processes.

The Performance section of SCOR focuses on the measurement and assessment of the outcomes of supply chain process execution. A comprehensive approach to understanding, evaluating, and diagnosing supply chain performance consists of three elements: performance attributes, metrics, and process or practice maturity. These elements, as distinct from the levels in the Process and metrics hierarchies, describe different aspects or dimensions of performance:

- Performance attributes are strategic characteristics of supply chain performance used to prioritize and align the supply chain's performance with the business strategy.
- Metrics are discrete performance measures that are composed of levels of a connected hierarchy.
- Process or practice maturity is a reference tool based on objective, specific descriptions that can be used to evaluate how well supply chain processes and practices incorporate and execute accepted best-practice process models and leading practices.
- SCOR recognizes three performance categories and eight performance attributes as shown in Figure 2.3.

	Performance Attributes	Definition
Resilience	**Reliability (RL)**	The ability to perform tasks as expected. Reliability focuses on the predictability of the outcome of a process. Typical metrics for the Reliability attribute include delivering a product on time, in the right quantity, and at the right quality level.
	Responsiveness (RS)	The speed at which tasks are performed and the speed at which a supply chain provides products to the customer. Examples include cycle-time metrics.
	Agility (AG)	The ability to respond to external influences and marketplace changes to gain or maintain a competitive advantage.
Economic	**Costs (CO)**	The cost of operating the supply chain processes. This includes labor costs, material costs, and management and transportation costs.
	Profit (PR)	The Profit attribute describes the financial benefit realized when the revenue generated from a business activity exceeds the expenses, costs, and taxes involved in sustaining the activity.
	Assets (AM)	The ability to efficiently utilize assets. Assets' strategies in a supply chain include inventory reduction and insourcing rather than outsourcing.
Sustainability	**Environmental (EV)**	The Environmental attribute describes the ability to operate the supply chain with minimal environmental impact, including materials, water, and energy.
	Social (SC)	The Social attribute describes the ability to operate the supply chain aligned with the organization's social values, including diversity and inclusion, wage, and training metrics.

Figure 2. 3 Performance categorists and performance attributes

Reliability, Responsiveness, and Agility are considered customer (resilience) focused. Cost. Profit and Assets are considered internally (economically) focused. Environmental and Social are outward (sustainability) focused. All SCOR metrics are grouped within one of the performance attributes.

Each Performance attribute has at least one level-1 or strategic metric. These level-1 metrics are the calculations by which an organization can measure how successful it is in achieving its desired positioning within the competitive marketspace.

	Performance Attributes	Definition
Economic	**Reliability (RL)**	Perfect Order Fulfillment **(RL.1.1)** Perfect Supplier Order **(RL.1.2)** Perfect Return Order Fulfillment **(RL.1.3)**
	Responsiveness (RS)	Order Fulfillment Cycle Time **(RS.1.1)**
	Agility (AG)	Supply Chain Agility **(AG.1.1)**
Economic	**Costs (CO)**	Total Supply Chain Management Costs **(CO.1.1)** Cost of Goods Sold (COGS) **(CO.1.2)**
	Profit (PR)	Earnings Before Interest and Taxes (EBIT) as a Percent of Revenue **(PR.1.1)** Effective Tax Rate **(PR.1.2)**
	Assets (AM)	Cash-to-Cash Cycle Time **(AM.1.1)** Return on Fixed Assts **(AM.1.2)** Return on Working Capital **(AM.1.3)**
Sustainability	**Environmental (EV)**	Materials Used **(EV.1.1)** Energy Consumed **(EV.1.2)** Water Consumed **(EV.1.3)** GHG Emissions **(EV1.4)** Waste Generation **(EV.1.5)**
	Social (SC)	Diversity and Inclusion **(SC.1.1)** Wage Level **(SC.1.2)** Training **(SC.1.3)**

Figure 2. 4 SCOR performance attribute metrics

The SCOR metrics are organized in a hierarchical structure. SCOR describes level-1, level-2, and level-3 metrics. The relationships between these levels are diagnostic. Level-2 metrics serve as diagnostics for level-1 metrics. This means that by looking at the performances of the level-2 metrics, performance gaps or improvements for level-1 metrics can be explained. This type of analysis of the performance of a supply chain is referred to as metric decomposition or Economic Sustainability root-causing. Similarly, level-3 metrics serve as diagnostics for level-2 metrics. The level of a metric is included in the codification of the metric itself.

Metrics codification starts with the performance attributes: Reliability is RL, Responsiveness is RS, Agility is AG, Profit is PR, Cost is CO, Assets is AM (for Assets Management), Environmental is EV, and Social is SC. Each metric starts with a two-letter code, followed by a number to indicate the level, and then a unique numerical identifier. For example, Perfect Customer Order Fulfillment (RL.1.1) is a level-1 metric within the Reliability attribute. Customer Order Perfect Condition (RL.2.4) is a level-2 Reliability metric.

Process or practice maturity provides a qualitative comparison of supply chain processes and practices to descriptive representations of different levels of process and practice adoption and implementation. This evaluation measurement of supply chain process and practice

effectiveness typically follows widely used models for practice maturity, which sometimes are referred to as capability maturity models. Numerous maturity models exist for supply chain management, and they typically follow a stage of maturity scale. On these types of scales, high-maturity processes employ, and often extend, best practices and are implemented with a high degree of discipline and compliance. By comparison, low-maturity processes are characterized by outdated practices or a lack of discipline and consistency. SCOR currently does not embed a prescribed maturity model framework and content directly into the SCOR model document. The Performance section provides an overview of this important element of supply chain performance, and SCOR users are encouraged to draw upon existing maturity models to develop and tailor the content to their industries and companies.

2.2.4 SWOT

A SWOT (strengths, weaknesses, opportunities, and threats) analysis identifies the internal and external factors that can affect the investigated process or structure, which, in the present case, is the impact evaluation of quality management in complex social organizations, particularly HEIs. The field of QA can be argued to be very relevant for the application of a SWOT analysis due to the many actors involved, both in the higher education sector in general and inside HEIs in particular, making the design and implementation of QA a very complex issue. A SWOT analysis may help to reduce this complexity and provide a more simplified picture concerning the actors and dilemmas involved and the key choices to make.

The strengths and weaknesses of the examined process or structure are, by definition, primarily internal factors, the threats and opportunities are primarily external factors, which exist independently of the analyzed issue. The main goal of a SWOT analysis is to establish a systematic assessment of the issue which would support decision-making related to strategic dimensions of the issue.

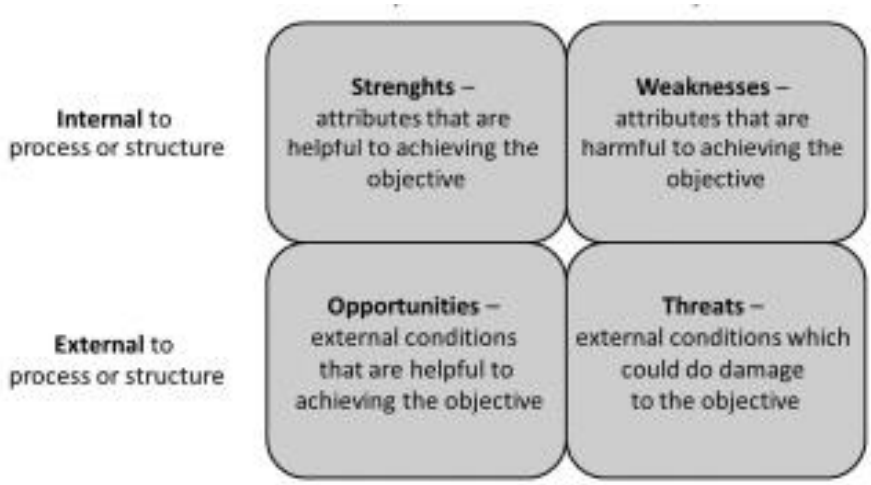

Figure 2. 5 SWOT analysis, schematic representation

a. Strengths

   Is a condition of strength that exists in an organization, project, or existing business concept. The strengths analyzed are factors that are found in the body of the organization, project, or business concept itself.

b. Weakness

   Is a condition of weakness that exists in an organization, project, or existing business concept. The weaknesses analyzed are factors that are found in the body of the organization, project, or business concept itself.

c. Opportunities

   It is a condition where opportunities for future development occur. The conditions that occur are opportunities from outside the organization, project, or the business concept itself. for example, competitors, government policies, and conditions surrounding the environment.

d. Threats

   It is a condition that threatens from the outside. These threats can be annoying organization, project, or business concept itself.

2.2.5 Fish Bone Diagram

Fishbone diagrams (also known as Ishikawa diagrams or cause and effect diagrams) are a graphical technique for showing several causes of a particular event phenomenon. Fishbone diagrams (which resemble a fish skeleton in shape) are a common tool used in cause-and-effect analysis to identify complex cause-and-effect relationships of a particular problem or event. This causal diagram was created by Ishikawa in 1990 in the field of management research (Coccia, 2005).

2.2.6 5W + 1H

5W + 1H is a way to make various kinds of improvements due to errors that occur or the desire to innovate in some way (Faizah, 2015). This 5W 1H method lays the foundation as a problem-solving approach, helping each W and H solve problems from different angles and find the desired solution. In this research, 5W+1H acts as a method that assists in the repair process, by clarifying each element such as (why) why it needs to be repaired, (what) what will be repaired, (when) when it will be repaired, (where) where it will be repaired, (who) who will repair it, (How) how will be fixed.

CHAPTER III
RESEARCH METHOD

3.1 Research subject and object design

According to KBBI Dictionary subject is the subject of discussion or subject matter and the subject of this research is SCOR variables at PT. XYZ. And focuses on reliability and cost aspects. Objects according to the KBBI Dictionary are objects, things, and so on that are targeted for research and attention. In this study, the company that became the research object was PT. XYZ, which is located on Jl. Asia Raya, Cilegon, Banten.

3.2 Data Collection Method

The following are the two types of data used in this research.

1. Primary Data

Primary data is obtained from sources through direct field observations and interviews. According to Smith (2020), primary data is data collected directly by the researcher using methods such as surveys, interviews, and experiments, as opposed to data that has previously been published or collected by others. In this research, primary data were obtained through Interviews. The 5W+1H interview was conducted directly with the Industrial Engineering department to collect the production failures (cost) data since this method poses six questions that cover all aspects of a problem: why (reason), who (personnel), what (object), when (time), where (location), and how (method). It has been applied in many different industries (Xing and Su, 2019).

Table 3. 1 Interview Questions

No	Questions
1	• Who is the key decision-makers within the company regarding financial management and strategic planning? • Who are the main competitors of PT. XYZ in the steel industry, particularly those from China?
2	• What financial metrics are being used to measure losses (e.g., revenue, profit margin, operational costs)? • What specific products or segments of PT. XYZ's business are being affected by competition from Chinese steel manufacturers?
3	• When are these losses most pronounced (e.g., specific times of the

No	Questions
	year, economic cycles)? • When did PT. XYZ first notice increased competition from Chinese steel manufacturers?
4	• Where are the competitors outperforming PT. XYZ and what factors contribute to their success? • Where in the market is PT. XYZ facing the most significant competition from Chinese steel products (e.g., domestic market, export markets)?
5	• Why are customers or clients choosing competitors over PT. XYZ? • Why has PT. XYZ struggled to effectively compete with Chinese manufacturers?
6	• How does PT. XYZ currently analyze and monitor its financial performance? • How are Chinese steel manufacturers able to offer products at competitive prices compared to PT. XYZ?

2. Secondary Data

Secondary data is data that is directly involved in data processing in this study. Secondary data is obtained directly from the object and through other sources, both orally and in writing. These data are obtained from reliable market and business analysis (CRU), likewise with materials related to literature about supply chain, performance measurement, and Supply Chain Operation Reference (SCOR) from journals and websites.

Table 3. 2 HRC Production Cost 2023 Data

HRC Production Cost 2023 Data		Unit	PT. XYZ
HR mill	Raw Material Cost	$/ t	544,18
	Variable Cost	$/ t	44,46
	Overhead Cost	$/ t	13,87
	Total Cost	$/ t	602,52
HR Skinpass	Raw Material Cost	$/ t	606,60
	Variable Cost	$/ t	16,16
	Overhead Cost	$/ t	19,47
	Total Cost	$/ t	642,23

3.3 Research Flow

Below is the research flow:

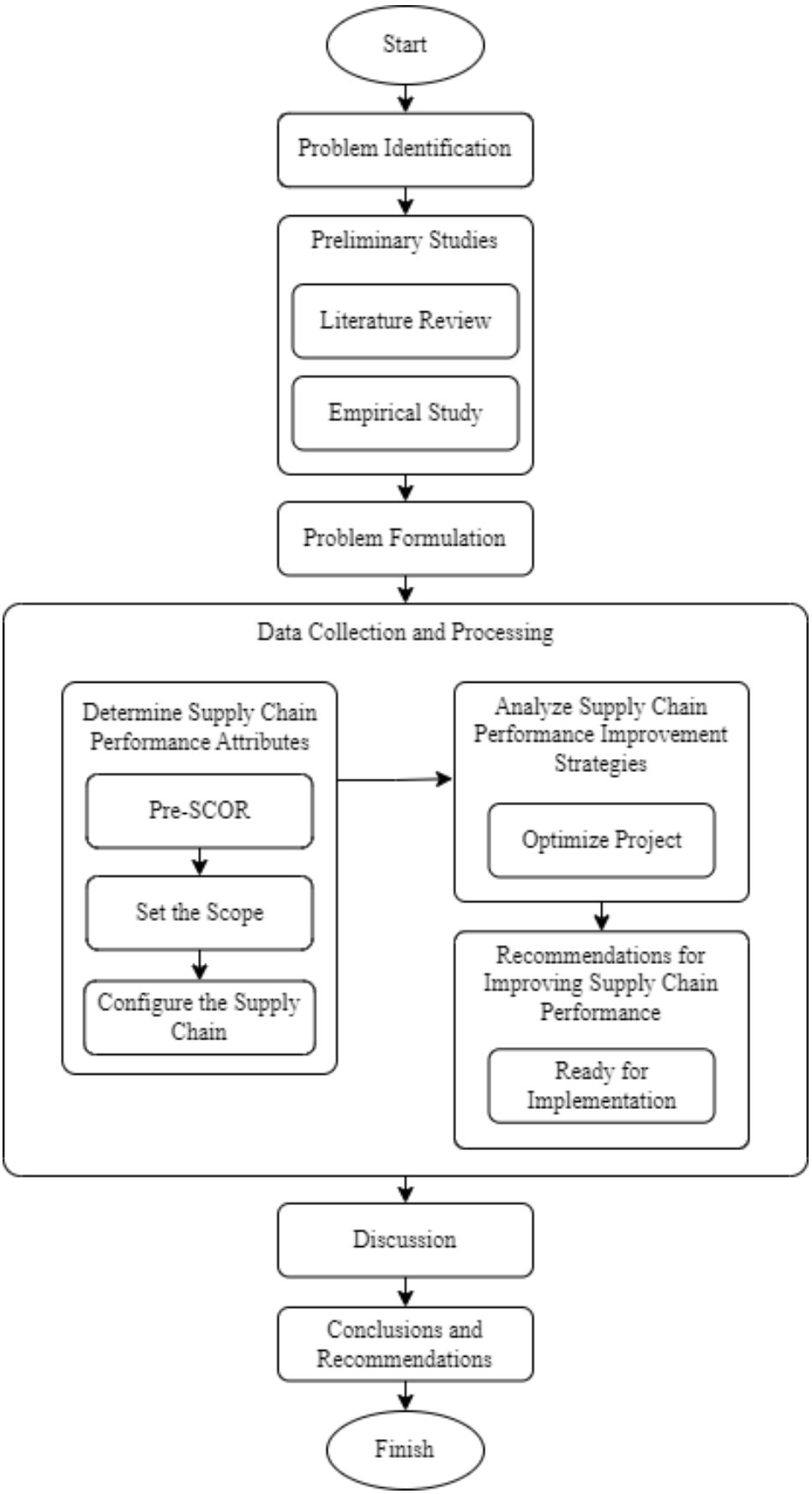

Figure 3. 1 Research flow

The following is an explanation of the research flow diagram in Figure 3.1 above.

1) Problem Identification

   At this stage, the researcher made direct observations in the industrial engineering department of PT. XYZ. Identifying the problems to be solved regarding the existing supply chain will be concluded as a problem formulation and will be continued as a problem objective.

2) Preliminary Study

   The preliminary study is divided into two parts, namely inductive study, and deductive study. Carrying out a study by looking at previous journals as a reference in conducting research and supporting the preparation of reports, is the term for inductive study. Meanwhile, the deductive study contains knowledge or understanding of Supply Chain Management, performance measurement, the Supply Chain Operation Reference, SWOT, Fishbone Diagram, and 5W+1H methods obtained through books or other sources.

3) Problem Formulation

   After getting information about the existing issues, then formulate the correct issues and follow what is happening with PT. XYZ. This formulation will later become the basis for determining the objectives and benefits of this research.

4) Data collection and processing

   Data processing carried out in this research consists of processing observations obtained and the results of interviews with experts, determining performance indicators, measuring using the SCOR method, normalizing the actual value of the measurement, and calculating the final value of the measurement.

a. Pre SCOR-Program Steps

   The company's initial preparation consists of identifying problems or issues that arise in PT. XYZ. logistics process based on performance level. The aim is to find out what needs to be developed at the performance level based on the appropriate development method. The following are the stages of the Pre SCOR-Program Steps process:

   1. Identify Improvement Motivation

      The researcher decides what to develop together with one of the employees of the industrial engineering department. In addition, the methods used to support this research are also determined.

2. Identify SCOR Program Organization

   Create a team to carry out the designed project. Organizational members of all components involved in the industrial engineering department at PT. XYZ. according to their areas of expertise and competency. The result of the formation of the organization is the achievement of the expected project success and the monitoring function during the conception, implementation, and evaluation of the project.

3. Plan For the Next Phase

   Once the concept team and support team are assembled, the next step is to decide whether the project needs to be implemented. The decisions involved in calculating the above components need to be calculated to make decisions using a project management approach. After careful analysis and calculations, it is hoped that a decision can be made regarding the sustainability of the project.

b. Set The Scope

It is a process of understanding the business environment and determining the scope of the supply chain for improving the SCOR program. The following are the process stages at this stage:

1. Context Description

   Using SWOT analysis to understand the position of a business or within the supply chain. SWOT analysis can tell how strong a company's business is and where its dominant sources are.

2. Supply Chain Documentation

   The supply chain mapping process is to find out who the customers and markets are, what the products and services are, who the suppliers are and who are the channel partners, what the marketing organizational structure is like, the organizational structure of logistics, the types of products or services requested from customers.

3. Prioritizing the Supply Chain

   The purpose of prioritizing the supply chain is for the SCOR team to realize that not all supply chains provide value or benefits for the company. Some supply chain networks are generating very high revenues, and some supply chain networks that are not very profitable because sorting by relevance requires prioritization.

4. Geographical Map Depiction

   The purpose of drawing a geographic map is to visualize all business activities. Enables visualization of inventory and information flow between various entities in the supply chain. You can identify which product or service packages are sold to which channel entities. Adding financial data can help you identify where the greatest revenue and profitability occurs in your supply chain. The SCOR process can be linked to units in the supply chain.

5. Collecting Performance Data (high-level data)

   Collecting data that is appropriate and related to the supply chain improvement program and finding performance gaps. Where is the gap itself in which position in this program.

6. Defining the Scope of the Improvement Program

   Obtaining the agreement as intended is an agreement resulting from the supply chain conditions. The current state of the supply chain is taken from the current performance metrics, from which the gaps are derived.

7. Validation

   The process of approving whether this research is approved or not by the research team (go, no go decision), to decide on further research or not because it has found areas for improvement.

c. Configure the Supply Chain

   The process of determining performance from performance metrics and the process of the SCOR improvement program. The following are the stages of the process of configuring the supply chain:

   1. Improvement Program Kickoff

      The goal is to generate motivation and enthusiasm and provide the organization with a general understanding of the SCOR program. The scope is determined in the previous stage. Then it starts at this stage. At the initial meeting, presentations such as motivation, reasons for creating SCOR, commitment, structure, scope overview, etc. were created and presented to management.

   2. Selection of SCOR performance attributes

      The aim of selecting a SCOR facility is to gain support and commitment from internal and external stakeholders. After kickoff, the next step is to select the SCOR

performance. This allows you to select from performance gaps (that you have previously identified) so that when you select performance gaps, you can select gaps based on consensus or norms. The goal is to identify and select metrics to use for improvement. The first thing to do is train your team. Metrics may differ between SCOR 12.0 and your company's supply chain. Therefore, the definition, calculations, and model of SCOR 12.0 must be understood first to obtain the correct baseline when taking measurements. The team then adapted the SCOR criteria to conditions in the field. So, there is agreement between the internal metrics and the SCOR model metrics. If not, it must be adjusted. B. SCOR is general and not calibrated, so there are some changes. Second, when determining performance, comparisons are also made with competitors by comparing data with benchmarks or comparing with existing standards. However, we recommend that you improve no more than 3 metrics in Tier 1. The selection of indicators is then made based on the competitiveness of the supply chain you want to address or based on management suggestions and consensus. In addition, you can use benchmarks from internal company expectations. Next, identify the biggest gaps you want to improve. Data must be collected from Level 2 during selection. Level 1 is selected and level 2 is measured. Level 2 is measured to determine what the percentage is Level 1.

3. Collect data in detail

   Identify the data owner, collect level 2 data, then calculate to see the level 1 percentage visible in the Metrics Data Collection table. The value for level 1 is taken from the minimum value for level 2.

4. Benchmarking

   The next stage is the benchmarking process against competitors or other standards. The goal is to determine internal targets or compare performance between comparable industry organizations and organizations with similar processes.

5. Gap Analyze

   This phase is used to determine the current position of the supply chain. The goal is to run a process to select preferred metrics for the remediation process to perform. Next, modeling level 3 workflow processes, Fishbone Diagrams to identify the causes of gaps, compiling detailed gap metrics.

6. Plan for The Next Phase

   During this phase, the team must go through a detailed decision-making process and agree on activities and resources that need to be increased.

d. Optimize Project

   Determine a project portfolio that includes process scope, priorities, and expected benefits. In this phase, identify a list of all improvement projects implemented in the previous phase, assess the cost benefits of these projects, identify the SCOR Level 3 process, then relate performance gaps to the projects and document any benefits or opportunities for what is expected next. For each project, the next goal is to prioritize projects that need improvement. The results of this phase are the Initial project portfolio, project portfolio, Final Phase Plan, and then ready for implementation.

e. Ready For Implementation

   Implement the projects in the portfolio and start realizing the benefits. Develop baseline metrics selected as best practices from a combination of Level 3 and Level 4 processes and finalize them in the design form selected for use as a test, pilot, and deployed solution. Once the project team itself approves the project, the team enters the pre-implementation phase, mainly because the benefits and impact are high, and the schedule and priorities have already been established.

5) Discussion

   All data that has been processed is then analyzed and discussed to determine the results to determine the performance status of PT. XYZ. supply chain. The analysis will be based on the indicators obtained and the performance value of PT. XYZ. supply chain performance.

6) Conclusions and suggestions

   Conclusions and suggestions are the final part of this research. In this section, the researcher draws final conclusions from the results of the analysis and discussion carried out to answer the initial objectives of this research. This conclusion is also used by researchers as a basis for recommendations for PT. XYZ.

CHAPTER IV
DATA COLLECTING AND PROCESSING

4.1 Pre-SCOR Program Steps

4.1.1 Company Profile

PT. XYZ officially changed its company logo from red to blue dominance. The new PT. XYZ logo was launched in Jakarta on 28 August 2020, ahead of the steel company's 50th anniversary. Ex-President Director of PT. XYZ, Silmy Karim, said that the new logo is in the form of the letter K, which consists of three meaning components, namely progressive, collaborative, and robust. As a company that carries progressive values, the company continues to strive to progress and develop.

To generate new ideas that support company performance, innovation is very important. While the innovation step is carried out by utilizing PT. XYZ partner factories, the raw materials are still from PT. XYZ. This step is a breakthrough to minimize investment costs and expand PT. XYZ product variants. For collaborative value, this SOE upholds its commitment as partners and partners and enhances its potential. With digitalization and the use of technology, collaboration becomes easier, and the impact is greater. While robust means strong and sturdy.

4.1.2 Product

The Company is the largest producer of hot rolled coils (HRC) and cold rolled steel (CRC) and the second largest producer of steel wire rods (WR) in Indonesia. This positions the Company as the largest steel producer in Indonesia and an important steel player in the Southeast Asia region. Integrated steel production facilities owned by the Company include ironmaking production facilities in the form of Direct Reduction Plant, steelmaking which consists of 10 (ten) electric arc furnaces (EAF) and 5 (five) continuous casting facilities machine, steel rolling mill (rolling mill) consisting of hot strip mill, cold rolling mill, wire rod mill, steel bar mill, profile steel mill (section mill) and steel pipe mill (pipe mill).

For the period ended December 31, 2015, and the 6 (six) month period ended June 30, 2016, the Company produced 1,468,329 tons and 955,650 tons of HRC products, 559,450 tons and 267,078 tons of CRC products, 134,595 tons and 83,978 tons of stem products. steel wire (WR), 66,077 tons and 33,571 tons of steel sections, 124,481 tons and 46,830 tons of steel bars, and 71,802 tons and 34,512 tons of steel pipes. The company uses HRC which is used as a raw material for making CRC and steel pipes in large quantities. The Company sells most of its

products in Indonesia, especially to the Company's customers in Jakarta and its surroundings, and Surabaya, East Java.

The Company's production facilities are located in Cilegon City, Banten Province, with the main market for the Company's products in Jakarta which can be reached via toll road access of 94 kilometers. The Company's operational activities are supported by various supporting infrastructure and utility supplies provided by the Company's subsidiaries, namely: power plants, port services, and water treatment facilities. Cigading Port which is located in the Sunda Strait is the Company's main access to domestic customers outside Java, export markets, as well as supplies of raw materials from within and outside the country.

In order to reduce production and business development costs by increasing the supply of HRC products, the Company has started implementing the Blast Furnace Complex construction program which will produce 1.2 million tons of molten iron per year as well as a new hot strip mill with a capacity of 1. 5 million tons per year. The Blast Furnace Complex plant is planned to start operating in December 2016, while the construction of HSM #2 is planned to be completed in 2019. The Company plans to use the proceeds from the Limited Public Offering to fund several projects included in the Company's business development, namely increasing production capacity in sheet steel manufacturing facilities hot strip mill and the construction of a 1x150 MW coal-fired power plant.

Total consolidated sales of the Company for the years ended December 31, 2014, and 2015 amounted to USD 1,868,845 thousand and USD 1,321,823 thousand, respectively. Meanwhile, for the 6 (six) months period ended June 30, 2015, and 2016, they were USD 677,238 thousand and USD 659,121 thousand, respectively.

Figure 4. 1 Hot Rolled Coil (HRC)

4.1.3 Vision & Mission

The following is the Vision and Mission of PT. XYZ.

Vision:

"To become a competitive, profitable and trusted corporation"

Missions:

1. Realizing productive and efficient operational performance to produce profitable quality products and services.
2. Developing steel business through mutually beneficial cooperation with strategic partners.
3. Developing application of steel solutions and downstream steel products to increase added value and customer satisfaction.
4. Increasing the business value of the group to make a positive contribution and optimize the supply chain.
5. Developing the best talents to be able to contribute optimally in all business processes.

4.1.4 System and Operation Management

At the company PT. XYZ has 2 steel smelting plants namely SSP 1 and SSP 2. SSP 1 began operating in 1983 with 4 electric arc furnaces namely EAF V, VI, VII, and VIII with each electric arc furnace supplied power by a melting transformer with a capacity of 60/66 MVA. Slab Steel Plant 1 (SSP-1) was established by SMSDemag (Germany) in 1982 and then commissioned in 1983. SSP-1 initially had a production capacity of 1,000,000 tons of Slab Steel/year, and since the revamping of machines was held in 2002 – 2003 capacity increased to 1,200,000 tons of steel slab/year.

The SSP 2 factory started operating in 1993 and was built by VAI Austria. This factory has 2 electric furnaces namely EAF IX and EAF X with each electric arc furnace supplied with power from a smelting transformer with a capacity of 93.5 / 103 MVA, where the smelting furnace uses a power system. computer automation level 1 and level 2. production capacity is 850,000 tons per year, with the resulting slab size being 200 mm thick, 800-900 mm wide, and 6000-12000 mm long.

In 2001, there was a reduction in the number of annual productions of SSP-1 and SSP-2 (Ton Slab Total) due to a reduction in the amount of production due to the economic crisis, but in 2004 production began to increase although the amount did not reach the same level as in 2000 and above.

4.1.5 Business process

The business process unfolds with the logistics department orchestrating the smooth import of materials from diverse countries, laying the foundation for the establishment of a dedicated logistics division. This division becomes the logistical backbone, efficiently managing the inbound flow of goods. Once the materials reach the warehouse, the process seamlessly transitions into the manufacturing phase. Within the warehouse, a symbiotic relationship is established with the Production Planning and Control (PPC) division, ensuring that the manufacturing process is aligned with optimized planning and resource utilization. Simultaneously, the Sales & Marketing division contributes critical insights, shaping manufacturing priorities based on customer demand, market trends, and strategic objectives.

As the manufacturing phase concludes, the finance division takes the reins, addressing financial intricacies and ensuring fiscal responsibility. This pivotal stage establishes a direct connection between financial decisions and the overarching goals of production and sales. The financial alignment ensures that the business operates within budget constraints and capitalizes on opportunities presented by the market. The finance division also plays a crucial role in tailoring financial strategies to meet customer expectations, linking the financial aspect directly to the desires and preferences of the customer base.

The seamless transition from manufacturing to finance sets the stage for the Final Product Distribution (FPD) division to take control. FPD oversees the outbound logistics, ensuring timely and accurate shipment of products to customers. In tandem, the division manages the generation of invoices and diligently collects payments, closing the loop in the end-to-end business process. The integration of shipment control, invoicing, and payment collection under the purview of the FPD division ensures a cohesive and customer-centric approach to the final stages of the business process. This comprehensive flow underscores the interconnectedness of logistics, manufacturing, finance, and customer satisfaction, creating a robust and efficient business operation.

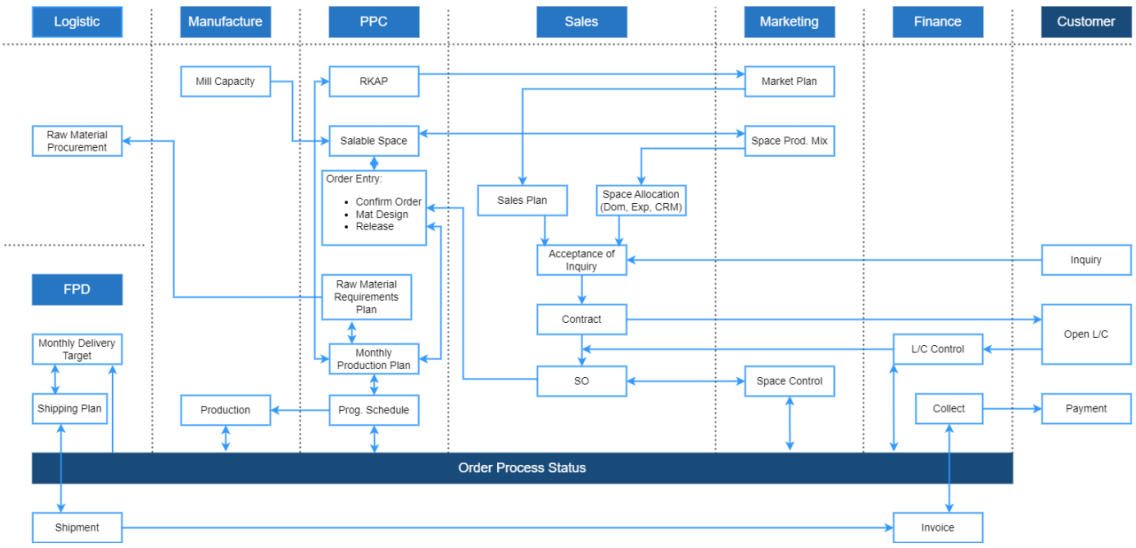

Figure 4. 2 Business Process Flow

4.2Set the Scope

4.2.1 SWOT Analysis

SWOT Analysis (short for strengths, weaknesses, opportunities, threats) is a business strategy tool to assess how an organization compares to its competition. The strategy is historically credited to Albert Humphrey in the 1960s, but this attribution remains debatable. Also known as the SWOT Metric, it has achieved recognition as useful in differentiating and establishing a niche within the broader market. Beyond the business world, SWOT Analysis can also be applied to the individual-level to assess a person's situation versus their competition further. There are both internal and external considerations built into the tool. "Strengths" and "weaknesses" are internally related. The former represents a facet of an organization/entity that lends it an advantage over the competition. The latter is characteristic of that same entity, which leads to a relative disadvantage against the competition. Regarding externally related, "opportunities" are realities in the greater environment that can be exploited to benefit the entity. On the other hand, "threats" are realities in the greater environment, which might lead to problems for the entity (D Leigh, 2019).

a. Internal Factor Analysis Strategy (IFAS)

The purpose of evaluating a company's internal factors is to determine the company's strengths and weaknesses. The IFAS (Internal Factor Analysis Strategy) table is designed to put these internal strategic factors into context for the company's strengths and weaknesses. After undertaking analyses and interviews, the following are the IFAS influences in the PT. XYZ. showed in table 4.1 below:

Table 4. 1 Internal Factor Analysis Strategy IFAS

No	Strength
1	Clearly measurable Vision & Mission
2	It is the only integrated steel industry in Indonesia
3	Product variety and quality excellence
4	Management system based on SMKS
5	Synergy between companies in the KS group
No	**Weakness**
1	Inefficient process
2	High-cost Production (Cost competitive)
3	Obsolete equipment & infrastructure systems
4	Unbalanced capacity (upstream – downstream)
5	Low productivity
6	Implementation of company culture and values

b. External Factor Analysis Strategy (EFAS)

EFAS analyzes external conditions from all aspects, at least based on political, economic, social, cultural, and security factors from the external environmental conditions of the company (state or local government). Following are the EFAS factors in PT. XYZ. after conducting observations and interviews as in table 4.2 below:

Table 4. 2 External Factor Analysis Strategy (EFAS)

No	Opportunity
1	GDP growth is quite promising
2	Steel consumption is steadily increasing
3	Macro-economics, politics and security are quite stable
4	Improving regulations in the steel industry
5	Risk management
No	**Threat**
1	Steel business competitors are increasing
2	Unfair trade practice (dumping)
3	Unclear legal regulations and rules
4	High unemployment rate
5	High price & availability or energy

6	Dependent to import raw material
7	Low product development & innovation
8	The influence of external interests on the consistency of implementation of management decisions

4.2.2 Document Current Supply Chain

Documenting the current supply chain is a process for documenting and visually mapping the end-to-end supply chain. undertaking this step is critical to determining the scope of the SCOR improvement program. This step requires gathering information about customers and markets, products and services, and suppliers and channel partners.

a. Data Sourcing

1) Customer and Markets

   Customers from PT. XYZ. Come from national and international, there are Tangerang, Jakarta, Bekasi, Karawang, Surabaya, and Pasuruan for the domestic market and Malaysia, Australia, Italy, and Spain for the international market.

2) Product

   PT. XYZ. produces various kinds of steel products including.

Table 4. 3 Product specification

No	Product	Dimension		Application	
1.	Hot Rolled Coil (HRC)	Thickness : 1,4 – 25.0mm Width : 600 – 2000mm Coil ID : 760mm Coil Weight : 30MT (max)		- Oil & Gas Pipes - Boiler & Pressure Vessel - Gas Cylinders/ LPG Bottle - General & Welded Structures - Automative Structures & Parts - Ship plate	- Weathering Corrosion Resistant Steel - Containers - Heavy duty vehicle - Military purpose
2.	Cold Rolled Coil (CRC)	Thickness : 0.2 – 3.0mm Width : 655 – 1250mm Coil ID : 508mm Coil Weight : 20MT (max)		- General Purposes - Galvanized & Galvalume Sheet - Pipe & Tubes - Automotive Body & Part - Tin Mill Black Plates	- Enameled Wares - Steel Frame Housing - Home & Office Appliances - Drum
3.	Wired Rod	Thickness : 5.5 – 20.0mm Width : 860mm Coil ID : 1250mm Coil Weight : 2.2MT (max)		- General Wire & Nail - Bolt & Nut - High Carbon Application - Shafting Bar	- Grinding Ball - Spring - Spoke Wire - Deformed Bar in Coil

3) Suppliers and Channel Partners

PT. XYZ a prominent steel producer, sources its raw materials from diverse regions worldwide. Its iron ore pellets are primarily sourced from Chile, Brazil, Saudi Arabia, and India, ensuring a consistent quality supply. Additionally, scrap metal, vital for steelmaking, is obtained from Spain and Australia, contributing to the company's sustainable practices. Spons, another crucial ingredient, are acquired from Oman and Malaysia, further enhancing production efficiency. Lastly, the company imports slabs from various countries including Germany, Africa, Australia, and South Korea, maintaining a robust supply chain to meet its manufacturing demands effectively.

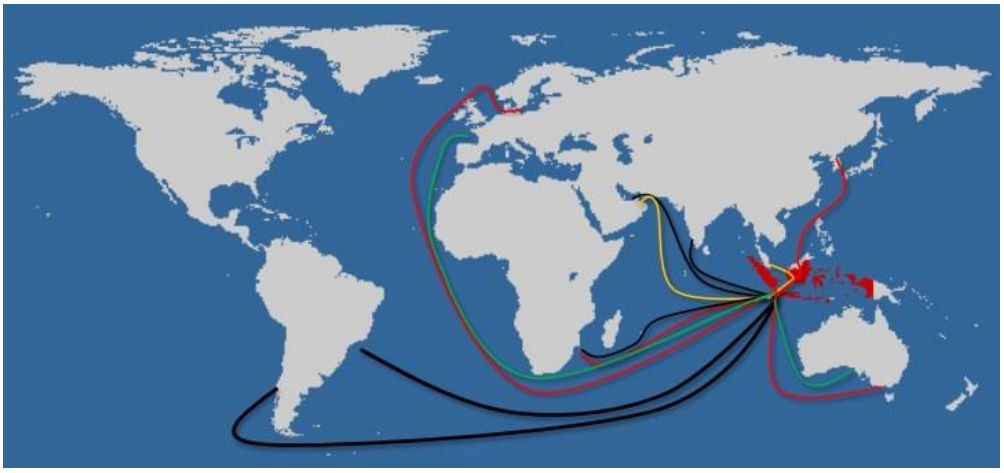

Figure 4. 3 Supplier and Channel Mapping

4) Geography

PT. XYZ's geographical presence is strategically distributed across Indonesia. Its main office is situated in Jakarta, specifically at Gedung XYZ on Jl. Jend. Gatot Subroto Kav. 54, Jakarta Selatan. This location serves as a central hub for administrative and operational activities. The headquarters, located at Gedung Teknologi Plant Site XYZ on Jl. Asia Raya in Cilegon, oversees the manufacturing processes and technological advancements crucial for steel production. Additionally, the company extends its reach to Surabaya, with a representative office located at Jl. KH. Mas Mansyur No. 229. This regional office facilitates efficient communication and coordination with stakeholders in the eastern part of Indonesia, supporting the company's objectives of serving

diverse markets and fostering regional partnerships.

Figure 4. 4 Geography Office Mapping

b. Supply Chain Definition Metrics

Table 4. 4 Supply Chain Definition Metrics

Suppliers	**PT. XYZ.**	**Customers**
PT. XYZ(Persero) Tbk. a prominent steel producer, sources its raw materials from diverse regions worldwide. Its iron ore pellets are primarily sourced from Chile, Brazil, Saudi Arabia, and India, ensuring a consistent quality supply.	<u>Office</u> main office is situated in Jakarta, specifically at Gedung XYZ on Jl. Jend. Gatot Subroto Kav. 54, Jakarta Selatan. This location serves as a central hub for administrative and operational activities. <u>Factory</u>	Most of the customers comes from subsidiary and state-owned company, such as; Krakatau Engineering & Construction, Krakatau Pipe & Coating, Krakatau Steel Construction Industries, Krakatau Industrial Port, Krakatau Energy Solution,

Additionally, scrap metal, vital for steelmaking, is obtained from Spain and Australia, contributing to the company's sustainable practices. Spons, another crucial ingredient, are acquired from Oman and Malaysia, further enhancing production efficiency. Lastly, the company imports slabs from various countries including Germany, Africa, Australia, and South Korea, maintaining a robust supply chain to meet its manufacturing demands effectively.	The headquarters, located at Gedung Teknologi Plant Site XYZ on Jl. Asia Raya in Cilegon, oversees the manufacturing processes and technological advancements crucial for steel production. **Channel Partner** <u>Market place</u> PT. XYZ. Provide ordering information on their official website with several points that prospective buyer should do. <u>Expedition</u> PT. XYZ. Use several companies to ship their product, such as; Krakatau Jasa Logistic, Buana Citra Swakarsa and Sepakat Kerja Sejahtera.	Krakatau Sarana Infrastruktur, Krakatau Information Technology, Krakatau Water Solution, Krakatau Posco, PT. Pindad, Sentra Usahatama Jaya, Krakatau Nippon Steel Synergy, PT. Adhi Karya, PT. INKA, PT. PLN, Indonesia Power. Wika, PT. Lestari Banten Energi, Holcim, Indorama, Krakatau Osaka Steel, Kereta Api, BCS Logistic, PT. Pelabuhan Indonesia II, SMS Siemag, Krakatau Semen Indonesia, Barata Indonesia, Chandra Asri, Dayamitra Telekomunikasi, Thermax International Indonesia, PT. CT Advance Technology.

c. Prioritizing the Supply Chain

The primary focus of this research lies in the production or manufacturing process. The production process is integral to the steel business, impacting the company's financial performance. Ineffective and inefficient production processes can directly

lead to financial issues for the company. Naturally, the continuum from upstream to downstream processes holds significant influence.

4.2.3 Geographical Mapping

PT. XYZ., is a pivotal player in the steel production sector also known as the "mother of industries,", having a comprehensive customer, situated across Java Island in Indonesia, particularly in Jakarta Province and Karawang, it also extends to markets in East Java Province, including Surabaya, Pasuruan, Malang, Gresik, and Madiun. While its domestic presence is robust, PT. XYZ. also caters to international markets with a discerning clientele worldwide. Its steel products find extensive application in diverse sectors such as infrastructure development, construction projects, manufacturing industries, and defense applications. With a global footprint and a focus on quality, PT. XYZ. continues to solidify its position as a leading supplier in the steel industry, serving the needs of both domestic and international customers alike.

Figure 4. 5 Customer Mapping

4.2.4 Define the Scope

Based on the previous discussion, the scope of this study was formulated, namely Hot Rolled Coil (HRC) Production, which is currently becoming the largest sales and production priority at PT. XYZ.

4.3 Configure the Supply Chain

4.3.1 Selection SCOR Performance Attribute

Based on interviews and analysis of existing data, the production process in general is the main problem that exists at PT. XYX. Follow-up actions to find solutions to the problems above need to be carried out to improve supply chain performance at PT. XYZ. In this case, the performance attribute of SCOR Racetrack version 12.0 that is appropriate for the problem above is the Cost (CO) attribute. The Cost (CO) attribute has 2 level metrics, namely CO.1.1 Total SC Management Cost which means the sum of the costs associated with the SCOR Level 2 processes to Plan, Source, Deliver, and Return and CO.1.2 Cost of Goods Sold which means the costs associated with purchasing raw materials and producing finished goods. This cost includes direct costs (labor, materials) and indirect costs (overhead). therefore the CO.1.2 level metric is more appropriate to use in this study. The following is a selection of attributes at level 1:

Table 4. 5 Level 1 Strategic Metrics

Attribute	**Level 1 Strategic Metrics**	
Reliability	RL. 1.1	Perfect Order Fulfillment
Responsiveness	RS. 1.1	Order Fulfillment Cycle Time
Agility	AG. 1.1	Upside Supply Chain Adaptability
	AG. 1.2	Downside Supply Chain Adaptability
	AG. 1.3	Overall Value-at-Risk (VaR)
Cost	CO.1.1	Total SC Management Cost
	CO.1.2	Cost of Goods Sold (COGS)
Asset Management Efficiency	AM.1.1	Cash to Cash Cycle Time
	AM.1.2	Return on Fixed Assets
	AM.1.3	Return on Working Capital

The CO.1.2 metrics, namely Cost of Goods Sold, has 3 matrices at level 2, namely CO.2.7 Direct Labor Cost, CO.2.8 Direct Material Cost, and CO.2.9 Indirect Cost Related to Production. Then the entire level 2 metrics in CO.1.2 Cost of Goods Sold was selected and will be followed up in more depth. The selection of these metrics was obtained through field observations, interviews with related parties, and data provided by the company. The following is a selection of the level 2 metrics Table 4.6:

Table 4. 6 Level 2 Strategic Metrics

Performance Attribute	Level 1	Level 2
Cost (CO)	CO.1.2 Cost of Goods Sold	CO.2.7 Direct Labor Cost CO.2.8 Direct Material Cost .2.9 Indirect Cost Related to Production

The CO.2.7 Direct Labor Cost, CO.2.8 Direct Material Cost, CO.2.9 Indirect Cost Related to Production matrices have the same 1 performance metric at metric level 3, namely CO.3.11 Direct Material Cost, CO.3.12 Indirect Cost Related to Production and CO.3.13 Direct Labor Cost. Then data processing and level 3 performance metric analysis are carried out in the production process. The following is an explanation of level 3 performance metrics in Table 4.7 below:

Table 4. 7 Metrics Performance Level 3

Metric (Level 1)	Metric (Level 2)	Metric Performance (Level 3)	Definition	Process
CO.1.2 Cost of Goods Sold	CO.2.7 Direct Labor Cost	CO.3.13 Direct Labor Cost	Direct cost spent on production labor.	sEM.2 Manage Production Performance
	CO.2.8 Direct Material Cost	CO.3.11 Direct Material Cost	Direct cost spent on material for production.	
	CO.2.9 Indirect Cost Related to Production	CO.3.12 Indirect Cost Related to Production	Indirect costs incurred in production indirectly.	

4.3.2 Collection Detail Data

Then process the Collection detail data which will explain performance at level 3. The data required is production cost level 3. In this research, 3 metrics will be used. Calculations for the metric were obtained from interviews and observations with industrial engineering department staff at the PT. XYZ. in Table 4.8 below:

Table 4. 8 HRC Production Cost 2023 Data

HRC Production Cost 2023 Data		Unit	PT. XYZ
HR mill	Raw Material Cost	$ / t	544,18
	Variable Cost	$ / t	44,46
	Overhead Cost	$ / t	13,87
	Total Cost	$ / t	602,52
HR Skinpass	Raw Material Cost	$ / t	606,60
	Variable Cost	$ / t	16,16
	Overhead Cost	$ / t	19,47
	Total Cost	$ / t	642,23
Total Cost 2023 Data Average *HR Mill & HR Skinpass		$ / t	622.37

4.3.3 Benchmarking

Benchmarking is carried out by applying gap analysis to the SCOR model. Gap analysis is obtained from the difference between the company's average production costs and the average production costs of competitors. The percentage of a company's production performance is measured from the average actual production costs compared to the average production costs of competitors. The table below presents a comparison between the competitor that the company wants to achieve and the actual data.

Table 4. 9 HRC Data 2023 Comparison

Data 2023 Comparison		Unit	China - Baoshan	PT. XYZ	Gap	
HR mill	Raw Material Cost	$ / t	367,30	544,18	176,88	48%
	Variable Cost	$ / t	48,57	44,46	-4,10	-8%
	Overhead Cost	$ / t	10,64	13,87	3,24	30%
	Total Cost	$ / t	426,51	602,52	176,01	41%

HR Skinpass	Raw Material Cost	$ / t	428,42	606,60	178,18	42%
	Variable Cost	$ / t	14,82	16,16	1,34	9%
	Overhead Cost	$ / t	38,75	19,47	-19,28	-50%
	Total Cost	$ / t	481,99	642,23	160,24	33%

Table 4. 10 Total Cost Comparison 2023 Data Average

Total Cost Comparison 2023 Data Average	**China - Baoshan**	**PT. XYZ**	**Gap**	
*HR Mill & HR Skinpass	454,25	622,37	168.13	37%

4.3.4 Fish Bone Diagram

The use of fishbone diagrams in this research is to analyze and find out the source or root of CO.3.11 Direct Material Cost and CO.3.12 Indirect Cost Related to Production metric problems as two main factors that result in high gap performance with the competitor. The results of the fishbone diagram were obtained through interviews with the Industrial Engineering department staff at PT. XYZ. The following is a fishbone diagram in Figures 4.7 and 4.8:

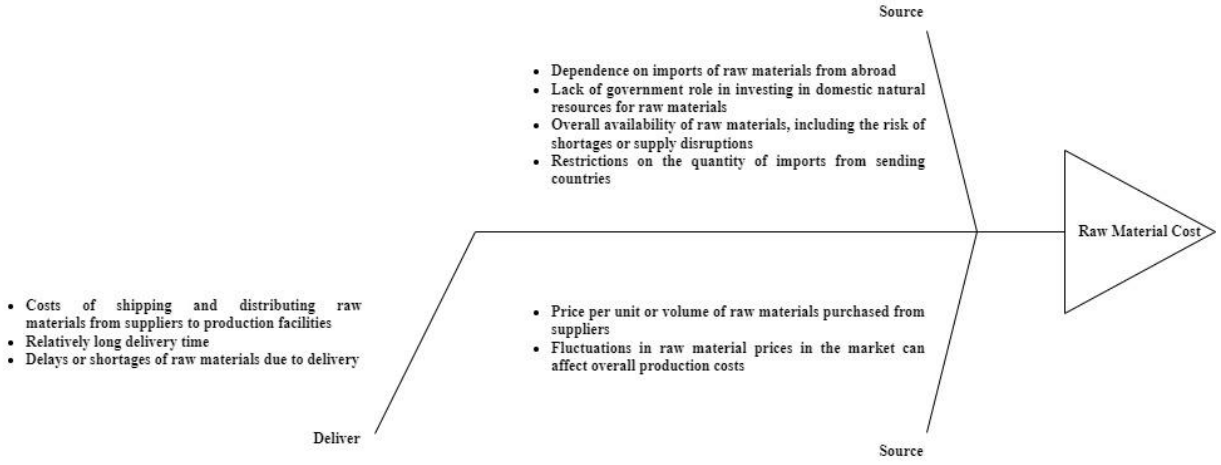

Figure 4. 6 Fish Bone Diagram Raw Material Cost Root Cause

Based on the results of an interview with one of the industrial engineering department staff at PT. XYZ. In terms of the high raw material costs experienced by the company, it can be concluded with 3 processes, namely; Plan, Source, and Deliver.

a. Plan

Table 4. 11 Plan Problem's Hierarchy Code

Problem	Hierarchy Code
Planning the purchase of raw materials which still depends on supplying semi-finished raw materials from China	sP2.4 Establish Sourcing Plan
Restrictions on the quantity of imports from sending countries	sP2.3 Balance Product Resources with Product Requirements

b. Source

Table 4. 12 Source Problem's Hierarchy Code

Problem	Hierarchy Code
Dependence on imports of raw materials from abroad	sS2.2 Receive Product
Overall availability of raw materials, including the risk of shortages or supply disruptions	sS2.4 Transfer Product
Price per unit or volume of raw materials purchased from suppliers	sS2.5 Authorize Supplier Payment
Fluctuations in raw material prices in the market can affect overall production costs	sS2.5 Authorize Supplier Payment

c. Deliver

Table 4. 13 Deliver Problem's Hierarchy Code

Problem	Hierarchy Code
Costs of shipping and distributing raw materials from suppliers to production facilities	sD1.7 Select Carries and Rate Shipment
Relatively long delivery time	sD1.12 Ship Product
Delays or shortages of raw materials due to delivery	sD1.3 Reserve Inventory and Determine Delivery Date

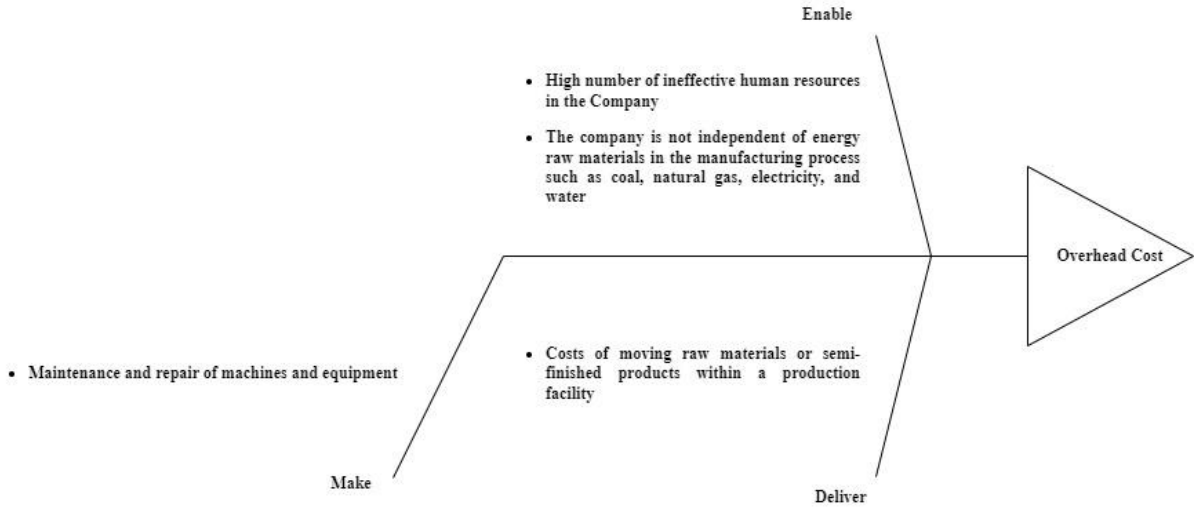

Figure 4. 7 Fish Bone Diagram Overhead Cost Root Cause

Based on the results of an interview with one of the industrial engineering department staff at PT. XYZ. In terms of the high Overhead costs experienced by the company, it can be concluded with 3 processes, namely; Enable, Deliver, and Make.

a. Enable

Table 4. 14 Enable Problem's Hierarchy Code

Problem	Hierarchy Code
High number of ineffective human resources in the Company	sE4.1 Identify Skills/Resource Requirement
The company is not independent of	sE5.4 Install and Configure

energy raw materials in the manufacturing process such as coal, natural gas, electricity, and water supply.	

b. Deliver

Table 4. 15 Deliver Problem's Hierarchy Code #2

Problem	Hierarchy Code
Costs of moving raw materials or semi-finished products within a production facility	sD1.7 Select Carries and Rate Shipment

c. Make

Table 4. 16 Make Problem's Hierarchy Code

Problem	Hierarchy Code
Maintenance and repair of machines and equipment	sE5.3 Inspect and Troubleshoot

4.4 Define Project

4.4.1 Project Portfolio

The project portfolio is intended to create an indicator improvement program that shows the problems identified in the previous phase. The improvement program is the level 4 (best practice) metric in the SCOR racetrack dictionary version 12.0. The following is the cause of the gap and an explanation of best practices from the CO.3.11 Direct Material Cost and CO.3.12 Indirect Cost Related to Production matrices. at PT. XYZ. shown in the table 4.17:

Table 4. 17 Project Portfolio

Level 1 (Strategic Metric)	Level 2 Metric	Level 3 (Performance Metric)	No	Problem	Hierarchy Code	Level 4 Metric (Best Practice)
Cost (CO) CO.1.2 Cost of Goods Sold	CO.2.8 Direct Material Cost	CO.3.11 Direct Material Cost	#1	Planning the purchase of raw materials which still depends on supplying semi-finished raw materials from China	sP2.4 Establish Sourcing Plans	BP.097 Supplier Research
			#2	Restrictions on the quantity of imports from sending countries	sP2.3 Balance Product Resources with Product Requirements	BP.024 Supply Chain Optimization (SCO)
			#3	Dependence on imports of raw materials from abroad	sS2.2 Receive Product	BP.069 Raw Material Receiving Process
			#4	Overall availability of raw materials, including the risk of shortages or supply disruptions	sS2.4 Transfer Product	BP.011 Production Line Sequencing
			#5	Price per unit or volume of raw materials purchased from suppliers	sS2.5 Authorize Supplier Payment	BP.148 3-Way Delivery Verification
			#6	Fluctuations in raw material prices in the market can affect overall production costs	sS2.5 Authorize Supplier Payment	BP.148 3-Way Delivery Verification
			#7	Costs of shipping and distributing raw materials from suppliers to production facilities	sD1.7 Select Carries and Rate Shipment	BP.046 Expedite Outbound Customer Shipments
			#8	Relatively long delivery time	sD1.12 Ship Product	BP.176 Omni-channel
			#9	Delays or shortages of raw materials due to delivery	sD1.3 Reserve Inventory and	BP.176 Omni-channel

Level 1 (Strategic Metric)	Level 2 Metric	Level 3 (Performance Metric)	No	Problem	Hierarchy Code	Level 4 Metric (Best Practice)
					Determine Delivery Date	
	CO.2.9 Indirect Cost Related to Production	CO.3.12 Indirect Cost Related to Production	#10	High number of ineffective human resources in the company	sE4.1 Identify Skills/Resource Requirement	BP.113 Cross Functional Teams
			#11	The company is not independent of energy raw materials in the manufacturing process such as coal, natural gas, electricity, and water supply	sE5.4 Install and Configure	BP.104 Facility Master Planning
			#12	Costs of moving raw materials or semi-finished products within a production facility	sD1.7 Select Carries and Rate Shipment	BP.046 Expedite Outbound Customer Shipments
			#13	Maintenance and repair of machines	sE5.3 Inspect and Troubleshoot	BP.133 Total Preventive Maintenance Program

In Table 4.17 several problems originate from 2 level 3 metrics. Then there are only 4 level 4 metrics (best practice) which will later be used as a source for program improvement. Best Practice (BP) can be determined through the SCOR 12.0 Racetrack Book dictionary which is based on the practices CO.2.8 Direct Material Cost and CO.2.9 Indirect Cost Related to Production. Best Practice provides a collection of industry-neutral practices that companies recognize for their value. A practice is a unique way to configure a process or set of processes.

4.4.2 Grouping Issues

Grouping issues is a metric grouping process based on processes and problem similarities. In the production process at PT. XYZ. There are gaps grouped in the production divisions. In grouping issues there is a process of plan, source, make, deliver, return, and enable. The following is a metric grouping table which can be seen in Table 4.18 below:

Table 4. 18 Grouping Issues

Group	Plan	Source	Make	Deliver	Return	Enable
Production	#1 #2	#3 #4 #5 #6	#13	#7 #8 #9 #12		#10 #11

4.4.3 Project List

The project list aims to provide suggestions for improvements to the source of the gap. There are several proposals for the level 4 metric (best practice) that emerged based on the causes of the gap that occurred for the level 3 metric (performance metrics). In this research, 4 level 4 matrices will be included in the project list for improvements to the goods delivery process at PT. XYZ. in Table 4.19:

Table 4. 19 Project List

Project #	Project Description (Level 4)	Performance Metric (Level 3)
1	BP.097 Supplier Research	CO.3.11 Direct Material Cost
2	BP.046 Expedite Outbound Customer Shipments	
3	BP.113 Cross Functional Teams	CO.3.12 Indirect Cost Related to Production
4	BP.133 Total Preventive Maintenance Program	

Based on the table above, four projects have been identified that are ready to enter the final implementation stage of the SCOR racetrack version 12.0 program or can be called ready for implementation.

4.5 Ready for Implementation

Ready for Implementation is the final stage of the SCOR Racetrack before the implementation of the project that was compiled in the previous stage. Here are the steps for the stage of Ready for Implementation:

4.5.1 Implementation Project Charter

The Implementation Project Charter is a complete and concise collection of documents regarding the level 3 metric (performance metrics) which consists of metrics, cases, improvement plans and benefits. Table of Implementation Project Charter in the goods delivery process at PT. XYZ. in Table 4.20:

Table 4. 20 Implementation Project Charter

Performance Metric	Case	Plan Improvement	Benefit
CO.3.11 Direct Material Cost	Planning the purchase of raw materials which still depends on supplying semi-finished raw materials from China	#1 BP.097 Supplier Research	The purchaser/project team can determine risk and actions required through the planning phase before formal sourcing actions are implemented.
	Costs of shipping and distributing raw materials from suppliers to production facilities	#2 BP.046 Expedite Outbound Customer Shipments	Analysis of inventory maintenance costs and transportation costs to look for opportunities to optimize total costs.
CO.3.12 Indirect Cost Related to Production	High number of ineffective human resources in the company	#3 BP.113 Cross Functional Teams	self-directed teams responding to broad but not specific directives. Decision making within a team may depend on consensus but often is led by a

			manager/coach/team leader.
	Maintenance and repair of machines	#4 BP.133 Total Preventive Maintenance Program	Preventive maintenance is performed periodically to reduce the incidence of equipment failure and the costs associated with it.

4.5.2 Prioritization Metric

Based on the results of the previous analysis, researchers will prioritize improvements based on observations and hearing internal opinions from the warehousing division of PT. XYZ. Is based on effort and results. The following are the results of the prioritization metrics analysis which were discussed on-site with industrial engineering division staff at PT. XYZ. in Table 4.21.

Table 4. 21 Prioritization Metric

	Production	**Result**				
		1 (low)	2	3	4	5 (high)
Effort	1 (low)		#4			
	2					
	3					#2
	4			#3		
	5 (high)					#1

Based on the analysis results, the main priority project is implementing #1 which is BP.097 Supplier Research. The next priority is project #2, namely BP.046 Expedite Outbound Customer Shipments. the next priority is project #3, namely BP.113 Cross Functional Teams and the last priority is project #4 in the form of BP.133 Total Preventive Maintenance Program.

4.5.3 Program Improvement

The Improvement Program is a level 4 (best practice) metrics project from SCOR racetrack version 12.0 which is used as a program to improve performance metrics. The following are details of the improvement program project based on best practices contained in SCOR racetrack 12.0:

1. Supplier Research

   The practice of identifying suitable suppliers who are able to meet the planned requirements. Consideration is usually given to the following points;

- Is the supplier approved to supply product (aerospace/wind energy/automotive industry driven)?
- Does the supplier have the capability (new opportunity)?
- Does the supplier have capacity?
- What are the current supplier lead times?
- Does the supplier have an acceptable performance history?
- Will the supplier need to be qualified?
- What are the indicative prices (this is research and assumes no negotiation)

Once the answers to these questions are determined the purchaser/project team can determine the risk and actions required through the planning phase before formal sourcing actions are implemented. Based on metrics from best practice BP.097 Supplier Research on SCOR racetrack version 12.0, can be seen in Table 4.22:

Table 4. 22 5W+1H Identification BP.097

5W +1H	**Action**
What	Ensuring supplier approval, capability, capacity, qualification, and indicative prices from potential suppliers
Why	Company can mitigate the risk and actions required through the planning phase
Where	Logistic and PPC Department
When	Every time before carrying out the process of ordering raw materials
Who	The head of the Logistic and PPC division as the authorized party
How	Checking supplier approval, capability, capacity, qualification and make sure the indicative prices.

The improvements obtained from the 5W+1H analysis of the BP.097 Supplier Research metrics are with (what) the aim of making recommendations for improvements, namely to ensure supplier approval, capability, capacity, qualification, and indicative prices for potential suppliers. (why) with the reason for doing so, namely that the company can mitigate the risk and actions required through the planning phase. (where) carried out in the Logistics and PPC division of PT. XYZ. (when) Every time before carrying out the process of ordering raw materials. (who) responsibility is given by the Head of the Logistics and PPC division of PT. XYZ. (how) The method used is checking supplier approval, capability, capacity, and qualification and making sure the indicative prices are with Supplier Research.

Finding new, creative ways to improve the performance of their supply chains is one of the biggest problems that manufacturing organizations confront in the age of globalization and competition. To achieve better performance, companies should engage in networking activities such as integrating with other supply chain participants. Manufacturing businesses also face sustainability issues caused by suppliers' practices that fail to meet sustainability criteria. In this sense, developing a collaborative relationship with a supplier is essential for successfully implementing sustainable practices and gaining a competitive edge. Therefore, it is imperative for manufacturing companies to effectively manage their relationships with their suppliers by strengthening their suppliers' commitment to sustainability. The concept of sustainable supplier collaboration (SSC) emerges from the combination of sustainability and supplier relationship building. SSC, in general, broadens the traditional supplier management system by incorporating long-term partnerships into sustainable aspects (K Govindan, 2024).

2. Expedite Outbound Customer Shipments

The practice of analyzing the cost of maintaining inventory vs. the cost of transportation for opportunities to optimize total cost. Specific opportunities are likely more pronounced for final leg shipments (more quickly transferring product ownership to the customer and higher potential for storage costs). Total costs should include transport costs, inventory carrying costs, storage costs and throughput costs (handling costs). Based on metrics from best practice BP.046 Expedite Outbound Customer Shipments on SCOR racetrack version 12.0, it can be seen in Table 4.23:

Table 4. 23 5W+1H Identification BP.046

5W +1H	Action
What	Analyzing the cost of maintaining inventory vs. the cost of transportation for opportunities to optimize total cost
Why	Opportunities to optimize total cost
Where	Logistic and PPC Department
When	Every time before carrying out the process of ordering raw materials
Who	The head of the Logistics and PPC division as the authorized party
How	Analyzing total cost that should include transport cost, inventory carrying cost, storage cost and throughput costs (handling costs) with Expedite Outbound Customer Shipments

The improvements obtained from the 5W+1H analysis of the BP.046 Expedite Outbound Customer Shipments metrics are with (what) the aim of making recommendations for improvements, namely to make the cost of maintaining inventory vs. the cost of transportation for opportunities to optimize total cost. (why) with the reason for doing so, namely that the company can optimize total cost. (where) carried out in the logistics and PPC division of PT. XYZ. (when) Every time before carrying out the process of ordering raw materials. (who) responsibility is given by the Head of the Logistics and PPC division of PT. XYZ. (how) The method used is analyzing total cost which should include transport cost, inventory carrying cost, storage cost and throughput costs (handling costs) with Expedite Outbound Customer Shipments.

3. Cross-Functional Teams

A cross-functional team is a group of people with different functional expertise working toward a common goal. It may include people from sales and marketing, finance, operations, human resources, and IT departments. Typically, it includes employees from all levels of an organization. Members may also come from outside an organization (from

suppliers, key customers, or consultants).

Cross-functional teams often function as self-directed teams responding to broad but not specific directives. Decision-making within a team may depend on consensus but often is led by a manager/coach/team leader. Based on metrics from best practice BP.046 Expedite Outbound Customer Shipments on SCOR racetrack version 12.0, it can be seen in Table 4.24:

Table 4. 24 5W+1H Identification BP.046

5W +1H	Action
What	Cross-functional teams often function as self-directed teams responding to broad but not specific directives
Why	Company can mitigate ineffectiveness and inefficient human resource
Where	Human Resources Department
When	Company able to implement this technic once a year to maintain the human resource performance with monthly evaluation
Who	The head of the Human Resources division as the authorized party
How	Developing a group of people with different functional expertise working toward a common goal with effective and efficient amount of people with Cross Functional Teams

The improvements obtained from the 5W+1H analysis of BP.113 Cross Functional Teams metrics are with (what) the aim of making recommendations for improvements, namely to make Cross-functional teams often function as self-directed teams responding to broad but not specific directives. (why) with the reason for doing so, namely that the company can mitigate ineffectiveness and inefficient human resources. (where) carried out in the Human Resources division of PT. XYZ. (when) once a year to maintain the human resource performance with monthly evaluations. (who) responsibility is given by the Head of the Human Resources division of PT. XYZ. (how) The method used is developing a group of people with different functional expertise working toward a common goal with an effective

and efficient amount of people with Cross-Functional Teams.

4. Total Preventive Maintenance Program

Total Preventive Maintenance (TPM) is a production management approach that places the responsibility for routine maintenance on the workers who operate the machinery rather than employing separate maintenance personnel for that function. It encompasses both a breakdown maintenance policy that involves dealing with problems as they occur and attempting to reduce their impact on operations and a preventive maintenance policy that involves using such measures as inspecting cleaning adjusting and replacing worn parts to prevent breakdowns from occurring in the first place.

Preventive maintenance is performed periodically to reduce the incidence of equipment failure and the costs associated with it. It should be scheduled to avoid interfering with production. Common methods of planning preventive maintenance are based on the passage of time on the amount of usage the equipment receives and on an as-needed basis when problems are uncovered through inspections. Ideally preventive maintenance will take place just before failure occurs to maximize the time that equipment is in use between scheduled maintenance activities.

The decision of how much maintenance to perform involves the age and condition of the equipment the complexity of the technology used the type of production process and other factors. For example, managers tend to perform more preventive maintenance on older machines because new ones have only a slight risk of breakdown and need less work to stay in good condition. It is also important to perform routine maintenance prior to beginning a particularly large or important production run.

In TPM production employees are trained in both operating procedures and routine maintenance of equipment. They perform regular inspections of the machinery they operate and replace parts that have become worn through use before they fail. Since the production employees spend so much time working with the equipment, they are likely to pick up small signals that a machine needs maintenance. Among the main benefits of TPM is that employees gain a more complete understanding of the functioning of the system. TPM also gives them increased input into their productivity and the quality of their work. Based on metrics from best practice BP.133 Total Preventive Maintenance Program on SCOR racetrack version 12.0, can be seen in Table 4.18:

Table 4. 25 5W+1H Identification BP.133

5W +1H	Action
What	Production management approach that places the responsibility for routine maintenance on the workers who operate the machinery rather than employing separate maintenance personnel for that function
Why	Company can reduce the incidence of equipment failure and the costs associated with it
Where	Production Department
When	Periodically and every after each production process
Who	The head of the Production division as the authorized party
How	Carry out operating procedures and routine maintenance of equipment. They perform regular inspections of the machinery they operate and replace parts that have become worn through use before they fail with Total Preventive Maintenance Program

The improvements obtained from the 5W+1H analysis of BP.133 Total Preventive Maintenance Program metrics are with (what) the aim of making recommendations for improvements, namely, to be responsible for routine maintenance on the workers who operate the machinery rather than employing separate maintenance personnel for that function. (why) with the reason for doing so, namely that the company can reduce the incidence of equipment failure and the costs associated with it. (where) carried out in the Production division of PT. XYZ. (when) Periodically and after each production process. (who) responsibility is given by the Head of the Production division of PT. XYZ. (how) The method used is to carry out operating procedures and routine maintenance of equipment. They perform regular inspections of the machinery they operate and replace parts that have become worn through use before they fail with Total Preventive Maintenance Program.

CHAPTER V
RESULT AND DISCUSSION

5.1 Analysis of Performance Attribute Selection Based on the SCOR 12.0 Racetrack

5.1.1 Pre- SCOR Analysis

At this stage, the researcher carried out the initial stage of identifying motivation for improvement from an organization and as a preparation stage for the organization in implementing SCOR racetrack 12.0. Researchers also carried out deeper identification regarding the structure of PT. XYZ. by looking directly or observing in the field, as well as interviews with PT. XYZ industrial engineering staff. Apart from that, researchers also provide information about the implementation of SCOR racetrack 12.0 intending to increase the value of company performance, especially in the company's supply chain department.

5.1.2 Set the Scope Analysis

The Set the Scope stage includes defining the scope of supply chain involvement in the company and presenting the actual situation of the production division at PT. XYZ. This stage begins by conducting a SWOT analysis of the company PT. XYZ. The results of the SWOT analysis were obtained through direct observation and interviews with PT. XYZ. industrial engineering staff. There are 2 factors contained in SWOT, namely internal company factors (strengths and weaknesses) and external company factors (opportunities and threats). For internal factors with strengths, namely Clearly measurable Vision & Mission, it is the only integrated steel industry in Indonesia, Product variety and quality excellence, the Management system based on SMKS, and Synergy between companies in the KS group. Weaknesses are Inefficient processes, High-cost Production (Cost competitive), Obsolete equipment & infrastructure systems, Unbalanced capacity (upstream-downstream), Low productivity, and Implementation of company culture and values. For external factors with opportunities, namely, GDP growth is quite promising, Steel consumption is steadily increasing, Macro-economics, politics, and security are quite stable, Improving regulations in the steel industry and Risk management. Meanwhile, the threats are Steel business competitors are increasing, Unfair trade practices (dumping), Unclear legal regulations and rules, High unemployment rate, High price & availability, or energy, Dependent on importing raw materials, Low product development & innovation, and the influence of external interests on the consistency of implementation of management decisions.

Furthermore, in the document of the current supply chain, this step gathers information about customers and markets that PT. XYZ. Originate from national and international, there are Tangerang, Jakarta, Bekasi, Karawang, Surabaya, and Pasuruan for the domestic market and Malaysia, Australia, Italy, and Spain for the international market. Continue with products and services that PT. XYZ. offer which is currently company produces Hot Rolled Coil (HRC), Cold Rolled Coil (CRC), and Wired Rod. lastly suppliers and channel partners that PT. XYZ. come from diverse regions worldwide. Iron ore pellets are primarily sourced from Chile, Brazil, Saudi Arabia, and India. Scrap metal from Spain and Australia. Spons are acquired from Oman and Malaysia and Slab from Germany, Africa, Australia, and South Korea.

Finally, in prioritizing the supply chain step, the researcher found that the primary focus of this research lies in the production or manufacturing process. The production process is integral to the steel business, impacting the company's financial performance. Ineffective and inefficient production processes can directly lead to financial issues for the company.

5.1.3 Configure the Supply Chain Analysis

Based on interviews and analysis of existing data, the production process in general is the main problem that exists at PT. XYZ. Follow-up actions to find solutions to the problems above need to be carried out to improve supply chain performance at PT. XYZ. In this case, the performance attribute of SCOR Racetrack version 12.0 that is appropriate for the problem above is the Cost (CO) attribute. The Cost (CO) attribute has 2 level metrics, namely CO.1.1 Total SC Management Cost which means the sum of the costs associated with the SCOR Level 2 processes to Plan, Source, Deliver, and Return and CO.1.2 Cost of Goods Sold which means the costs associated with purchasing raw materials and producing finished goods. This cost includes direct costs (labor, materials) and indirect costs (overhead). therefore the CO.1.2 level metric is more appropriate to use in this study.

The CO.1.2 metrics, namely Cost of Goods Sold, has 3 matrices at level 2, namely CO.2.7 Direct Labor Cost, CO.2.8 Direct Material Cost, and CO.2.9 Indirect Cost Related to Production. Then the entire level 2 metrics in CO.1.2 Cost of Goods Sold was selected and will be followed up in more depth. The selection of these metrics was obtained through field observations, interviews with related parties, and data provided by the company.

The CO.2.7 Direct Labor Cost, CO.2.8 Direct Material Cost, CO.2.9 Indirect Cost Related to Production matrices have the same 1 performance metric at metric level 3, namely CO.3.11 Direct Material Cost, CO.3.12 Indirect Cost Related to Production and CO.3.13 Direct Labor Cost. Then data processing and level 3 performance metric analysis are carried out in the production process.

Then process the Collection detail data which will explain performance at level 3. The data required is production cost level 3. In this research 3 metrics will be used. The product production price is obtained, in this case, the production of Hot Rolled Coil products which is divided into 2 production processes, HR mill and HR skinpass, in units of dollars per ton. Calculations for the metric were obtained from interviews and observations with industrial engineering department staff at the PT. XYZ.

The next process is the process of identifying the causes of several metrics having gap values. Metrics that do not meet the value of the company's internal targets will have their performance value increased through an improvement program. So, the metrics that do not meet the company's internal targets so that there is a gap value in these metrics are the metrics CO.3.11 Direct Material Cost and CO.3.12 Indirect Cost Related to Production. To find out the cause of the gap in these metrics, use a fishbone diagram. The data obtained to carry out the fishbone diagram analysis was obtained through interviews with industrial engineering department staff at the PT. XYZ. The following is an explanation of the causes of the gap in the CO.3.11 Direct Material Cost and CO.3.12 Indirect Cost Related to Production metrics:

1. Raw Material Supplier Factors

   Based on the results of data analysis and interviews there is a gap in terms of raw material costs which is quite far from its competitors. Based on the analysis carried out, the reasons why this could happen are found, one of which is that the company still supplies raw materials from abroad directly increasing shipping costs.

2. Shipping Factors

   Because the company is still dependent on supplying raw materials from abroad, this has resulted in swelling shipping costs which are not felt by its competitors who can supply their raw materials directly from their country.

3. Human Resources Factors

   Through interviews, it was also found that the reason why the overhead cost gap was quite high was due to the very high number of human resources in the Company compared to the production achievements within one year which could be maximized again.

4. Maintenance Factors

   As we all know, the steel production process cannot be separated from large machines that can produce good quality steel, but also require quite high repair and maintenance costs.

From the causes of the problems explained in the fishbone diagram, the data obtained came from observations in the field and interviews with industrial engineering division staff at PT. XYZ. From the results of the analysis, a project optimization process will then be carried out, where this process aims to determine priorities for improving performance and the benefits obtained if this project is carried out.

5.2 Analysis of Performance Improvement Based on the SCOR 12.0 Racetrack Method

After knowing the root cause of the production cost problem, the next stage is optimizing the project. Optimizing projects is the process of determining priorities for improving performance and the benefits that will be obtained from project implementation. The initial program of this process is a portfolio project which aims to be an indicator improvement program that shows the problems identified in the previous phase. The improvement program is a level 4 metric that contains best practices that are appropriate to the problem situation and how to resolve it as stated in the SCOR 12.0 Racetrack Dictionary. The level 3 metrics selected for improvement are only two metrics, namely CO.3.11 Direct Material Cost and CO.3.12 Indirect Cost Related to Production. The problems in CO.3.11 Direct Material Cost and CO.3.12 Indirect Cost Related to Production are quite complex, so there are 4 metrics at level 4 or best practice (BP), including:

1. BP.097 Supplier Research

   Problems that occur when procuring raw materials are, ensuring supplier approval, capability, capacity, qualification, and indicative prices from potential suppliers. Based on the best practices in the SCOR 12.0 Racetrack Dictionary, the selection of improvement programs is: BP.097 Supplier Research.

2. BP.046 Expedite Outbound Customer Shipments

   Problems that occur when shipping the raw materials are, the costs of shipping and distributing raw materials from suppliers to production facilities. Based on the best practices in the SCOR 12.0 Racetrack Dictionary, the selection of improvement programs is BP.046 Expedite Outbound Customer Shipments.

3. BP.113 Cross-Functional Teams

   Problems that occur in human resources are a high number of ineffective human resources in the company. Based on the best practices in the SCOR 12.0 Racetrack Dictionary, the selection of improvement programs is BP.113 Cross-Functional Teams.

4. BP.133 Total Preventive Maintenance Program

   Problems that occur in the maintenance are, maintenance and repair of machines. Based on the best practices in the SCOR 12.0 Racetrack Dictionary, the selection of improvement programs is: BP.133 Total Preventive Maintenance Program.

Determining the project list is the final sequence in the project optimization process to improve the performance of SCOR 12.0 Racetrack. The purpose of the project list is to provide suggestions for improvements to the causes of gaps. 4 best practice metrics are proposed for improvement, which originates from the causes of gaps in level 3 metrics. Best practices from the first improvement program are #1 1. BP.097 Supplier Research, #2 BP.046 Expedite Outbound Customer Shipments, #3 BP.113 Cross Functional Teams and #4 BP.133 Total Preventive Maintenance Program.

5.3 Analysis of Performance Improvement Recommendations using SCOR 12.0

The phase that selects the most appropriate recommendations to be implemented is the ready-for-implementation phase. The ready-for-implementation stage is the final stage of SCOR Racetrack 12.0 before it is implemented in the program or project that was planned in the previous stage. Then the metrics prioritization stage is carried out to prioritize improvements based on effort and results. The results of prioritization metrics were obtained through observations and interviews with industrial engineering division staff at PT. XYZ. The main priority for project implementation is project #1 BP.097 Supplier Research, #2 BP.046 Expedite Outbound Customer Shipments, #3 BP.113 Cross-Functional Teams, and #4 BP.133 Total Preventive Maintenance Program.

The improvement program is the final stage for selecting a program to improve Supply chain performance metrics contained in SCOR 12.0 Racetrack. The improvement program analysis process uses the 5W+1H method. The following is a list of improvement programs at PT. XYZ. in the production division:

1. BP.097 Supplier Research

   The improvements obtained from the 5W+1H analysis of the BP.097 Supplier Research metrics are with (what) the aim of making recommendations for improvements, namely to ensure supplier approval, capability, capacity, qualification, and indicative prices for potential suppliers. (why) with the reason for doing so, namely that the company can mitigate the risk and actions required through the planning phase. (where) carried out in the Logistics and PPC division of PT. XYZ (when) Every time before carrying out the

process of ordering raw materials. (who) responsibility is given by the Head of the Logistics and PPC division of PT. XYZ (how) The method used is checking supplier approval, capability, capacity, and qualification and making sure the indicative prices are with Supplier Research.

2. Expedite Outbound Customer Shipments

   The improvements obtained from the 5W+1H analysis of the BP.046 Expedite Outbound Customer Shipments metrics are with (what) the aim of making recommendations for improvements, namely to make the cost of maintaining inventory vs. the cost of transportation for opportunities to optimize total cost. (why) with the reason for doing so, namely that the company can optimize total cost. (where) carried out in the logistics and PPC division of PT. XYZ (when) Every time before carrying out the process of ordering raw materials. (who) responsibility is given by the Head of the Logistics and PPC division of PT. XYZ (how) The method used is analyzing total cost that should include transport cost, inventory carrying cost, storage cost and throughput costs (handling costs) with Expedite Outbound Customer Shipments.

3. Cross-Functional Teams

   The improvements obtained from the 5W+1H analysis of BP.113 Cross Functional Teams metrics are with (what) the aim of making recommendations for improvements, namely to make Cross-functional teams often function as self-directed teams responding to broad but not specific directives. (why) with the reason for doing so, namely that the company can mitigate ineffectiveness and inefficient human resources. (where) carried out in the Human Resources division of PT. XYZ (when) once a year to maintain the human resource performance with monthly evaluation. (who) responsibility is given by the Head of the Human Resources division of PT. XYZ (how) The method used is developing a group of people with different functional expertise working toward a common goal with an effective and efficient amount of people with Cross-Functional Teams.

4. Total Preventive Maintenance Program

   The improvements obtained from the 5W+1H analysis of BP.133 Total Preventive Maintenance Program metrics are with (what) the aim of making recommendations for improvements, namely to be responsible for routine maintenance on the workers who operate the machinery rather than employing separate maintenance personnel for that function. (why) with the reason for doing so, namely that the company can reduce the incidence of equipment failure and the costs associated with it. (where) carried out in the Production division of PT. XYZ (when) Periodically and every after each production

process. (who) responsibility is given by the Head of the Production division of PT. XYZ (how) The method used is to carry out operating procedures and routine maintenance of equipment. They perform regular inspections of the machinery they operate and replace parts that have become worn through use before they fail with the Total Preventive Maintenance Program.

In the preparation process PT. XYZ. For the improvement program, the Company will carry out four stages of the preparation process. The first is improvements related to the raw material procurement process. At this stage, the company will hold an internal meeting to implement the new company's SOP on the raw material procurement techniques including checking supplier approval, capability, capacity, and qualification and making sure the indicative prices. The second preparation is to maximize the process of sending raw materials to production facilities. The third preparation is implementing a comprehensive evaluation of human resources in the company and implementing SOPs for the maintenance and repair of machines or tools. By making improvements to the production process in general, it is hoped that supply chain performance in the production process can be improved.

CHAPTER VI
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

Based on the results of the analysis and discussions that have been carried out previously, in this research it can be concluded that:

1. Based on the problems that exist in the production division at PT. XYZ., the SCOR attribute selected in this research is cost, with metrics level 1 CO.1.2 Cost of Goods Sold, with metrics level 2 CO.2.8 Direct Material Cost and CO.2.9 Indirect Cost Related to Production, and level 3 metrics, namely CO.3.11 Direct Material Cost, CO.3.12 Indirect Cost Related to Production and CO.3.13 Direct Labor Cost. In this research, level 3 metrics that have a gap value between actual conditions and the company's internal targets are CO.3.11 Direct Material Cost and CO.3.12 Indirect Cost Related to Production.
2. From the research results, it was obtained that optimized projects based on the SCOR 12.0 Racetrack book include BP.097 Supplier Research, BP.046 Expedite Outbound Customer Shipments, BP.113 Cross-Functional Teams, and BP.133 Total Preventive Maintenance Program in the form of a project portfolio, grouping issues and project lists.
3. Recommended suggestions for improving supply chain performance based on the SCOR Racetrack 12.0 method, namely by carrying out the ready-for-implementation stage. The following are recommendations for improvement programs which has been obtained based on answers from the project list:
    a. Make an internal meeting to implement the new company's SOP on the raw material procurement techniques that include checking supplier approval, capability, capacity, and qualification and making sure of the indicative prices.
    b. Maximize the process of sending raw materials to production facilities.
    c. Implementing a comprehensive evaluation of human resources in the company.
    d. Implementing SOPs for maintenance and repair of machines or tools.

6.2 Recommendation

The following suggestions that the author can give regarding this research are as follows:

1. It is hoped that future researchers will carry out this research on a larger scale. Because the author in this research only discusses the Cost aspect of SCOR 12.0. It is hoped that future research will discuss more SCOR 12.0 attributes so that it can provide a clearer picture of the company's overall performance.
2. For companies, it is hoped that they can improve low-performance scores by carrying out several projects which are explained in the conclusion. Then it is also hoped that regular improvements will be made so that the performance value continues to get better.

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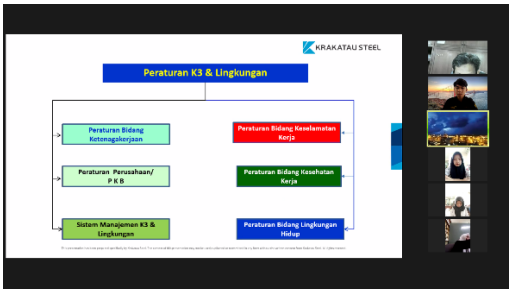
APPENDIX

OHS & Environmental Debriefing



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