

Managing Risk with the Concept of SCRM on Procurement and Warehouse Department

Tri Pujadi[†]

School of Information systems
Bina Nusantara University
Jakarta, Indonesia
tripujadi@binus.edu

Bahtiar H. Simamora

Department of Management - Binus Business School
Bina Nusantara University Jakarta, Indonesia
bsimamaora@binus.edu

Vikas Kumar

Bristol Business School
University of the West of England
Bristol, BS16 1QY, UK
vikas_kumar@uwe.ac.uk

Andreas AB. Hirawan, Angelia D. Suryawan, Arief Dwi Hartadi, Fenny

School of Information systems
Bina Nusantara University
Jakarta, Indonesia
aditya.budi@binus.ac.id, angellia@binus.ac.id, arief_dwi_hartadi@binus.ac.id,
fenny@binus.ac.id

Abstract

This study aims to identify risks that arise in the procurement and warehouse departments, determine the factors that contribute to the emergence of risks, obtain the right approach in managing risk as to the scope of the company's Supply Chain Management. This research was carried out in a manufacturing company; the data was obtained and analyzed using the FMEA (Failure Mode and Effect Analysis) method. This method is effective because it can provide a comprehensive picture of the process of risk arising in the supply chain. The approach used in managing risk will follow the Australian/New Zealand Risk Management Standard SA/NZS 4360:1999. The results showed that it is obtained that events that can become risks have a tremendous impact on company activities, especially the procurement and warehouse departments if they do not get attention in the management process. The risks that arise are strategic, technical, and operational and can be managed by treating Mitigate Risk, Transfer Risk, Avoid Risk, and Retain Risk with a Supply chain Risk Management approach.

Keywords –

Risk, procurement, supply chain, failure mode effect analysis, mitigate risk, scrm

1. Introduction

The global industrial environment has undergone a very drastic change. Several companies in their development face various complex problems, requiring industry managers to calculate carefully in every decision making. To manage the industry carefully and flexibly, which can contribute to the sustainability of an industry company. Practitioners

and academics also take approaches that combine various interests in one framework that can benefit the company through Supply Chain Management (SCM).

Uncertain natural conditions and the emergence of various obstacles in the form of uncertainty and failure that can lead to the possibility of the company experiencing losses have provided new awareness about the existence of other factors that affect supply chain management, which need to be considered, which becomes a problem or obstacle that can affect activities of the company's business, but this often does not get serious attention before the incident occurs (Larkin, P. *et al.*, 2019). The factor in question is risk in supply chain management activities, which is called Supply Chain Risk Management (SCRM).

Risk cannot be eliminated but can be processed based on the company's needs. Risk management carried out in a structured and comprehensive manner can improve the company's performance while increasing profits by reducing the occurrence of unexpected risk events in business activities (Ntwali et al, 2020). With the SCRM concept, it is hoped that future business challenges in uncertainty can be handled to produce a robust supply chain.

Expert attention to supply chain risks and how to deal with them has grown in recent years, but this issue is still very little discussed in the academic literature. In the industrial sector, especially industries that will use a longer supply chain (such as outsourcing) and face uncertainty, handling supply chain risk and distribution of risk along the supply chain is an important topic.

The problem in manufacturing companies with all activities, especially procurement and warehouse departments, is the scope of supply chain management (SCM). They range from shortages of raw material/spare parts supply delayed delivery, factories stop operating, lost goods, suppliers, terminate contracts, product quality is degraded, and so on. Therefore, with the emergence of these risks, parameters are needed to regulate and manage risks with the concept of supply chain risk management (SCRM) to realize the department's resilience.

Formulation of the problem

From this description, there will be problems that will be faced by top management in handling the procurement and warehouse departments as the scope of SCM (Leiss and Larkin, 2019) which can be formulated as follows:

1. What are the risks that could potentially occur in the procurement and warehouse departments?
2. How to conduct a risk assessment in the procurement and warehouse departments?
3. How to manage risk in procurement and warehouse department?
4. Determining priority actions against technical risks that occur in the procurement and warehouse departments?

2. Literature Review

The development of supply chain management has experienced rapid growth since it was introduced by Oliver and Webber in 1982 (Sorensen & Larsen, 2005). Not only in logistics, but supply chain management also then entered many scientific fields such as supply chain project management, supply chain human resources management, supply chain management, and other fields (Aven, 2016).

The development of the supply chain is increasing rapidly, where the risks that occur in the supply chain area have been considered to manage the concept of supply chain risk management. This concept has become a phenomenon of scientific progress that will make supply chain management more developed in the future, where the idea has been widely implemented in the industrial sector to win the tight competition among businesspeople (Birungi and Muthoni, 2021)

The security factor in the supply chain has received significant attention from the government and industry since the occurrence of various uncertain natural conditions, and the emergence of multiple obstacles in the form of uncertainty that can lead to the possibility of companies experiencing losses has given birth to a new phenomenon in the supply chain sector.

Manufacturing companies, in their business activities, especially in the procurement and warehouse departments as the scope of SCM, often encounter obstacles in the form of raw material supply, running out of spare parts, late

deliveries, factories stopping operations, lost goods, suppliers terminating contracts, damage to goods during storage and others especially consumable materials which can affect production activities.

Supply Chain Management Coverage Area

1. Procurement

Traditionally, the procurement department is considered a less strategic part. This section is often only associated with administrative activities such as requesting quotes from suppliers, printing purchase orders (POs), sending PO to suppliers, and many more. Today this assumption has changed a lot. The purchasing department is increasingly considered strategic by many companies, large and small, around the world. The procurement department can create competitiveness in the company or supply chain, not only from its role in obtaining raw materials at low prices but also to increase control over supply chain risks. Improve product quality by working with suppliers to run quality programs and increase responsiveness (by choosing suppliers that are cheap and responsive).

To be able to play such a strategic role, the procurement department can do administrative work (Leiss and Krewski, 2019). They are also required to have negotiating skills, translate their strategic objectives into a supplier selection and evaluation system, and many more. In addition to the routine tasks of purchasing raw materials, components, services, many more, this section expects to create long-term collaboration with relevant suppliers, involve them in designing new products, evaluating supply risk, and many more.

2. Warehouse

Warehousing functions to store goods and tools for production or production results in a certain amount and period, then distributed to the intended location on request. The constraints faced by the supply chain in warehouse management are the accuracy of the movement of goods and calculating the period of the goods stored. It takes control of the goods movement and documents to improve the efficiency of warehouse use so that the number and period of goods are kept at a minimum value or according to planning (Olobo et al., 2021).

Warehouse management system supported by information technology to assist in monitoring the movement of incoming goods, movements in the warehouse, and outgoing goods. Supervision using the system provides ease of management and added value to the warehouse, namely:

1. Make it easier for warehouse managers to provide information on the availability of an item to the production or delivery planning department so that the availability of goods remains at a safe level
2. Placement of goods determined by the system to facilitate storage, retrieval, and stock calculations
3. Reducing lead time from goods storage and delivery activities
4. The availability of various information regarding the level of goods and warehouse utility makes it easier for analysis to develop a more efficient warehouse use strategy

However, in managing the procurement and warehouse, it is realized or unconsciously that there are obstacles in the form of risks that must be considered, where strategic, technical, and operational things often occur. One approach that can provide a comprehensive solution to this problem is to use a supply chain risk management (SCRM) approach.

Supply Chain Risk Management

1. Supply Chain Management

Oliver and Weber first proposed the term supply chain management in 1982 (cf. Oliver & Weber, 1982; Lambert et al. 1998); if the supply chain is a physical network, companies involved in supplying raw materials, supporting materials, produce goods or deliver them to end-users.

A supply chain includes all parts of a process both directly and indirectly to meet consumer demand, not only for manufacturers and suppliers, but also including transportation, warehousing, retail, and consumers themselves (Goerlandt and Montewka, 2015).

Supply chain management is an effort to regulate and manage the stages contained in the supply chain to produce maximum profits. These stages include:

- Consumer

- Retail
- Wholesaler
- Manufacture
- Raw goods consumer supplier

Properly managing the flow of materials in the form of spare parts is one of the main objectives of the supply chain. The proper flow means it is not too late and not too early, the amount is correct, and it is delivered to where it is needed (Larkin, P. *et al.*, 2019).

Therefore, supply chain management is oriented to the company's internal affairs and external affairs concerning the relationship between partner companies. It takes coordination and collaboration between companies in the supply chain to satisfy the final component; they must work together to make inexpensive products delivered on time and of good quality. In essence, all companies have a method or approach in managing supply chains. However, not all of them apply an interactive and collaborative approach to ignore constraints or risks in supply chain management (Duramany-Lakkoh, 2021).

2. Risk Management

Risk is the probability of an event resulting in a loss when the event occurs during a specific period (Frosdick, 1997). The effect can be measured by multiplying the frequency of occurrence and the event's impact (Mills, 2001). Risk is always associated with uncertainty, but the risk is not always the same as uncertainty. Spekman and Davis (2004) provide a difference between risk and uncertainty, where risk is defined as the probability of loss from an event, while uncertainty is expressed as an exogenous disturbance.

Risk Management is the latest development we have seen around Supply Chain Management. Risk management is no longer only the responsibility of those whose duties are related to investment analysis but has penetrated the scope of the supply chain. One of the reasons is the emergence of various risks that can disrupt supply chain performance. Various risks can occur in the supply chain, ranging from raw material supply jams, delayed deliveries, factories stopping operations, lost goods, suppliers terminating contracts, product quality being suddenly degraded, and so on.

A systematic approach was then to make the risks clear, formally delineated, and make them manageable. This approach makes risk management a management tool that requires practical experience and training to use (Mills, A., 2001). The merging of supply chain management and risk management has become a new area of research for academics and has attracted the attention of practitioners. Supply chain risk management is a wedge between supply chain management and risk management. It is by Paulsson (Brindley, 2004), shown in the following figure:

Risk collaboration in the supply chain makes supply chain management more developed. If at first research on supply chain management was only classified into three categories, namely operational, technical, and strategic fields (Huan *et al.*, 2004), then with the risk research in the supply chain called supply chain risk management (SCRM), the categories were added to four, namely operational, technical, and strategic and risk.

In managing supply chain risk, the Australian New Zealand Standard for Risk Management AS/NZS 4360:1999 defines risk as "the chance of something happening that will impact objectives". This standard is more balanced, where we do not always associate risk with the negative things we receive. This standard has seen risks from both positive and negative sides. This will provide an opportunity to better identify and control risks to maximize profits and reduce losses.

Ziegenbein and Nienhaus (2004), propose 5 mechanisms that can be done to control supply chain management risk, namely:

- a. Take or accept risk
- b. Avoiding events that are a source of risk (oriented to the frequency of occurrence)
- c. Reducing the level of events that are a source of risk (oriented to the frequency of occurrence)
- d. Reducing the impact or influence that is the source of the risk (oriented to the impact or effect of the incident)
- e. Sharing or transferring risk (oriented to the impact or effect of the event)

In addition to the above mechanisms, control over supply chain risk can also be structured based on the level of planning within the organization, namely:

- Controls at the strategic level, namely long-term controls such as design decisions in the supply chain.

- Technical level, namely controlling risk for the medium term such as reducing the occurrence of lower maintenance risk and upper maintenance risk in the maintenance and planning of material requirements, especially the safety stock of consumable materials.

- Operational level, namely short-term risk control such as in the maintenance process and usage schedule.

The improvement process in supply chain risk management is efforts are being made to create a supply chain organization that is resilient to risks arising in existing business activities. The supply chain risk management (SCRM) approach is expected to provide awareness for businesspeople to make risk as one of the considerations that must be considered to prevent fragility in the supply chain.

The correct basic principle to be applied in determining the best strategy to obtain maximum results in this improvement process is to follow the following steps (Chopra & Meindl, 2004):

1. Knowing consumer needs and uncertainties in supply chain management
2. Knowing supply chain capabilities
3. Get the best strategy

f. Monitor and Review

Risk and the effectiveness of its measures need to be monitored to ensure changing circumstances do not change priorities. Risk management can be applied at all levels within an organization, both strategic and technical and operational levels.

To identify, analyze and assess risk, several techniques are used: (Frosdick, 1997: Shafer 2004: Norrman and Jansson, 2004; Brindley, 2004), one of which is Failure Mode and Effect Analysis (FMEA) where:

- The procedure is step by step to identify the failure mode for the consequences of the failure
- The failure level is qualified by an RPN (Risk Priority Number) value which is the product of the impact, frequency of occurrence and detection of those occurrences.

Supply chain risk can cover several different issues from a theoretical and practical point of view. The following three dimensions are an initial framework for researching this area, supply chain analysis units, types of risk, and stages of risk management, as in the picture.

The unit of supply chain analysis focuses on a single company (or even the impact of a single logistics activity), more complex relationships such as buyer-seller relationships or chains/networks of three or more companies.

Risk types can have different types and scopes. The magnitude of the risk, for example, can be calculated as the product of frequency/probability (rare, often, or very often) and consequences (small, large, or damaging).

A preliminary way to categorize risk types is to distinguish between strategic, operational, and technical risk, which can have deleterious consequences based on uncertain scenarios.

The stages of risk management can differ from risk analysis through risk assessment of different ways of managing risk (such as avoiding, mitigating, transferring, or sharing risk).

Supply Chain Risk Management (SCRM) Category

Supply chain management as a unit interconnected between components with other components has random variations that can affect the performance of a chain. Supply chain risk can arise in the form of scheduling, technology, or cost uncertainty. The purpose of risk analysis in the supply chain is to develop a structure that can define, identify, assess and reduce supply chain risks (Sinha et al., 2004).

In general, supply chain risk tends to be managed separately based on the type of risk perception that exists (Bailey and Thomas, 2004):

- Security – focus on theft cases
- Fire protection – focus on firefighting standards
- Workforce – focus on HR
- Information technology – focus on computer needs
- Safety – focus on applicable laws
- Insurance – focus on meeting insurance needs

These perceptions can vary based on the point of view of each author, so that from some literature, different views are obtained.

Christopher and Peck (2003) assign risk categories in the supply chain into three main categories and divide them into subcategories so that five categories are obtained, namely:

- Company's internal risk:
 - o Process risk
 - o Control risk
- External supply chain risk

- o Demand risk
- o Supply risk
- Company external risk
- o Environmental risk

The five risk categories are described as follows:

- Process risk is the risk that arises from operational and managerial activities due to disruption of a process.
- Control risk is the risk that arises due to the wrong implementation of the rules set by the company, such as the size of orders, safety stock policies, transportation.
- Demand risk is the potential risk arising from the disruption of product and information channels that are specifically related to downstream processes, controls, assets, and infrastructure.
- Supply risk is a potential risk like demand risk but upstream due to product or information flow disruption.
- Environment risk is the risk due to disturbances that can directly affect the upstream direction—alternatively, the downstream direction of processes such as contaminated products or extraordinary events or natural disasters.

Other authors, Bailey, and Thomas (2004), provide supply chain risk categories into 3, namely:

1. Global risks, international events that may pose a risk to the business
 - Government risk, the risk caused by government
 - Economic risk, economic factors due to the local and global economy
 - Business sector risks, trends, and events in the business sector both locally and internationally
 - Utility risk, risk due to lack of water, electricity, sewer, and local services.
 - Environmental risks, pollution, small fires
2. Natural disaster risk:
 - Fire, the total damage to the environment
 - Other disasters, extraordinary events, such as earthquakes, tsunamis, and typhoons
3. Operational risk
 - Company internal risks, actions, and corporate strategies that can increase supply chain risk
 - Supplier risk, supplier failure to provide goods and services on time, at the right price and good quality
 - Consumer risk, service failure to misunderstand consumer needs
 - Security risks: robbery, sabotage, violent crime, spying and business crime
 - Production risk, inability to produce according to consumer needs or excess that creates excess stock
 - Information technology system risk, failure of information technology systems that do not function as needed
 - Labor/labor; decreased productivity, loss of key staff in critical positions, inability to compete
 - Diseases and accidents: AIDS, bird flu, anthrax, environmental damage
 - Technology risk, a new technology that does not operate or does not work according to specifications
 - Spying, loss of information or resources due to other parties
 - Product damage: failure to sell the product, expiration, stockpiling of goods, packaging damage, inability to support the product.

To make it easier in categorizing supply chain risks, in this study, the risks are divided based on the division made by Cranfield, namely:

a. Internal supply chain risk.

Derived from interactions between parts of the supply chain, caused by a lack of interaction and cooperation with existing supply chain components. Occurs due to lack of visibility, sense of belonging, self-imposed 'chaos' just in time practice and inaccurate forecasting.

b. External risk.

Derived from interactions between the supply chain and its environment, including disruptions caused by terrorist attacks and natural disasters.

Failure Mode and Effects Analysis (FMEA) Method

One method that can be used in assessing risk is Failure Mode and Effect Analysis (FMEA). FMEA was first used in the 1960s in the aerospace industry and in the American automobile industry in the 1970s, which is now recognized as a fundamental tool in engineering (Cook, 2005). FMEA aims to determine possible failure modes and determine the effect of failure on a product.

FMEA, more broadly, can be used as a quality improvement tool, which can be applied to physical systems such as vehicles, aircraft, electronic equipment, etc. It can also be used on non-physical systems, such as the supply chain management process (Cristopher et al., 2003).

The benefits of FMEA that can be provided are in the form of:

- Able to provide good identification of the possibility of failure in the supply chain process.

- Can determine the effect of the loss.
- Failures can be ranked based on the frequency of occurrence, the effect of the incident and the detection of possible repair efforts made from the incident.

The FMEA assessment is based on the potential risk or failure which is determined by 3 factors, namely:

- Severity (S) is the effect or impact caused by the failure mode.
- Occurrence (O) is the probability or frequency of failure.
- Detection (D) is the ability to detect failures before the effects of the failure occur.

Based on the ranking assessment given by each of these factors, it can also be seen that the greatest potential risk caused by the failure mode. The higher the score obtained from this ranking, the more important it is to take corrective action against these failures.

The ranking in FMEA uses multiple scales. Various organizations use a scale of 1 to 10, or to 5 to describe the level of risk or frequency of occurrence. This study uses a scale of 1 to 10 to get a more representative value from the existing risk assessment.

FMEA is a group-oriented method, so doing it requires a team consisting of several people with various aspects of knowledge, both in the process and in evaluation (Spath, 2003). The process is carried out by holding meetings and expressing opinions/brainstorming on various modes of potential failure in the process or product, identifying the causes of failure, the effects of the failure and the controls that existed at the scene before the failure occurred.

After all potential failures are identified based on their causes, effects and direct control, FMEA will provide an assessment of their impact (Severity-S), Frequency of occurrence (Occurance-O) and the existence of detection of the failure (Detection-D). The accumulated value of each potential failure is called the RPN (Risk Priority Number) value. As in the following formula:

3. Methodology

The methodology in this research is descriptive analytic. Research is carried out in the unit in charge of supply chain management. Figure 1 describes the sequence of activities in this study.



Figure 1. Methodology Research

The framework for the risk management process using Australian standards is shown in Fig. The explanation of the main elements in the Risk Management process sourced from Standard Australia/New Zealand (AS/NZS) 4360:2004 is as follows:

a. Setting the scope (Establish the context)

At this stage, the organization's scope is determined, the relationship between the organization and its external and internal environment, the goals, and strategies of the organization. Then also determine the scope that is the object of risk management which includes targets, objectives, strategies, scope, and parameters of the organization's activities. The risk management process can run more targeted and on target. The decision about what risks is acceptable or unacceptable depends on the organization itself.

b. Risk Identification

Identify risks with questions: what can go wrong? probability (C/O/R); (C=Common, O=Occasional, R=Rare), Consequences what could happen/failure? probability (C/O/R); standard, occasionally, rarely, Consequences, events that can hinder, reduce, delay the achievement of goals. At this stage, the risks faced and how they can occur will be identified. Risk identification can be obtained through a questionnaire.

c. Risk Analysis

The purpose of risk analysis is to separate significant risk and negligible risk, which includes consideration of risk sources, identifying and evaluating controllable risks (event risk), determine the impact or effect of risk (consequences) and probability of occurrence (likelihood) and levels of risk. This analysis should consider the limits of the potential impact and how this might occur.

To avoid subjective assessment of the consequences and likelihood determination, the best sources of information and competent tools are used, namely: Techniques used to analyze risk are brainstorming and interviews with top management with focus groups, individual evaluations with questionnaires.

d. Risk Evaluation

Risk evaluation compares the level of risk that is expected to occur with the determination of the previous criteria and considers the balance between potential benefits and adverse outcomes—the possibilities of the decision made regarding the required natural development and treatment and priorities. The risk evaluation result is in the form of a risk priority number (RPN) for further action.

e. Control/Risk treatment (Threat risk)

Risk control is the determination of what will be done to respond to the identified risks. Several options that can be done for risk control according to Australian New Zealand Standard (AS/NZS) 4360: 2004, namely: avoiding risk (avoid risk), reducing the likelihood of risk occurrence, reducing consequence, transferring risk (transfer the risk) and controlling risk (retain the risk).

Based on the processing process as discussed above, three written risk treatments are obtained, and one that is not written in detail, namely the treatment of risks that accept existing risks. Briefly, the four risk treatments can be explained as follows:

- 1) Mitigate risks; It is a risk treatment in which the impact and frequency of occurrence of the risk will be reduced so that the contribution due to the risk is no longer significant.
- 2) Transfer risk: It is a risk treatment in which the risk is transferred to another party so that the risks that arise are no longer the department's responsibility but are the responsibility of the other party.
- 3) Avoid risk; This is an unacceptable risk and should be avoided as much as possible. Failure to deal with this type of risk will have enormous consequences.
- 4) Retain risk; Is the risk that is accepted when the risk treatment processes have been carried out. Of course, this risk is a very minimal risk, both in terms of the frequency of occurrence and the impact of the incident, because it has experienced the maximum possible risk treatment.

4. Result And Discussion

Procurement and warehousing management, ensuring the availability of raw materials. Determination of safety stock is an activity that needs to be considered to reduce this risk. This research focuses on procurement and warehousing, and it is important to determine safety stock. Safety stock serves to protect against errors in predicting demand during lead times. Safety stock will function if the actual demand is greater than the average value. To understand how uncertain demand is during the lead time, companies need to collect data to get their distribution.

Determination of Safety Stock

Safety stock or safety stock serves to protect against errors in predicting demand during lead times. Safety stock will function if the actual demand is greater than the average value. Figure 2 to understand how uncertain demand is during the lead time, companies need to collect data to get their distribution. For example, if the demand data during the lead time is normally distributed, then the safety stock calculation can be done quickly. You need to know the standard deviation of demand during the lead time and a value of the standard regular distribution table that correlates with a certain probability (Z). The Z value is usually translated from Management decisions. If management tolerates a shortage of 5 times for every 100 order cycles, the desired service level is 95%. The Z value that correlates with the 95% service level is 1,645. The amount of safety stock (SS) in general can be formulated as follows:

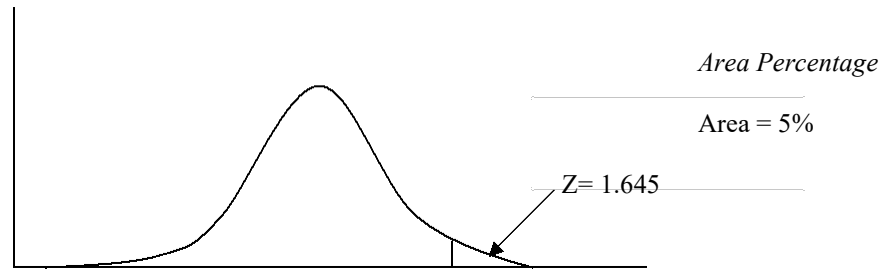


Figure 2 determine of safety stock

The value of the safety stock depends on the uncertainty of supply and demand. In typical situations, demand uncertainty is usually represented by the standard deviation of demand per period. If demand per period and lead time are constant, safety stock is not required because demand during the lead time has zero standard deviation. The value of the standard deviation of the demand is calculated by the value of the variance, where the value of the variance is the mean of the difference squared or the square of the deviation of all data values to the calculated mean. The variance for the sample is denoted S. The formula for the variance is:

$$S = \frac{\sum (X - \bar{X})^2}{n-1} \dots\dots\dots(2)$$

The variance is directly related to the standard deviation. Where the standard deviation is the square root of the variance. The standard deviation is often called the standard deviation. Thus, the standard deviation formula is:

$$\sigma = \sqrt{\frac{\sum (X - \bar{X})^2}{n-1}} \dots\dots\dots(3)$$

However, we can determine the standard deviation value for determining safety stock with the help of SPSS software. Thus, to calculate the value of safety stock can be done by knowing the average demand (x) and the standard deviation of demand (σ) with the formula:

$$SS = Z \cdot \sigma \dots\dots\dots(4)$$

For the allowable stock out value = 5% (in other words, service level = 95%) the normal curve approach is used then:

$$Z = \frac{X - \alpha}{\sigma} , \text{ where } Z = 1,645 \dots\dots\dots(5)$$

$$SS = Z \cdot \sigma$$

$$= 1,645 \alpha.$$

Where: SS = safety stock
 σ = Standard deviation

5. Conclusion

The factors that contribute to the emergence of risks, obtain the right approach in managing risk as to the scope of the company's Supply Chain Management. This research was carried out in a manufacturing company; the data was obtained and analyzed using the FMEA (Failure Mode and Effect Analysis) method. This method is effective because

it can provide a comprehensive picture of the process of risk arising in the supply chain. The approach used in managing risk will follow the Australian/New Zealand Risk Management Standard SA/NZS 4360:1999. The results showed that it is obtained that events that can become risks have a tremendous impact on company activities, especially the procurement and warehouse departments if they do not get attention in the management process. The risks that arise are strategic, technical, and operational and can be managed by treating Mitigate Risk, Transfer Risk, Avoid Risk, and Retain Risk with a Supply chain Risk Management approach.

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Biography

Tri Pujadi is a lecturer, in Information Systems in the School of Information Systems of Bina Nusantara University, Jakarta, Indonesia. He received the B.S. and M.S. degrees in information system management from the Bina Nusantara University, Indonesia, in 1998. From 2012 to 2019, he was a Research Coordinator with the School of Information Systems – BINUS University. Since 2010, he has been an Assistant Professor with expertise in Information Systems Plan and Design. His research interests include database management, e-commerce and e-business, disaster management.

Vikas Kumar is an Associate Professor in Enterprise Operations Management at Bristol Business School, University of the West of England. He has published more than 150 articles in leading international journals and international conferences. He serves on the editorial board of six international journals and serves on several scientific, technical, and programmed board committees of several international conferences. He is also co-founder and co-editor of the Int. J. of Supply Chain and Operations Resilience (Inderscience). His current research interests include sustainable supply chain management, process modelling, and service operations management.

Andreas Aditya Budi Hirawan is a lecturer, in Information Systems in the School of Information Systems of Bina Nusantara University, Jakarta, Indonesia. He received the B.S. and M.S. degrees in computer science management from the Nanyang Technological University, Singapore, in 2010. From 2012 he was a Lecturer with the School of Information Systems – BINUS University with expertise in enterprises Systems. His research interests include enterprises system, e-commerce, and e business.

Angellia Debora Suryawan is a lecturer, in Information Systems in the School of Information Systems of Bina Nusantara University, Jakarta, Indonesia. She received the B.S. and M.S. degrees in information management from the Bina Nusantara University, Indonesia, in 2006. From 2016 she was a Lecturer with the School of Information Systems – BINUS University with expertise in Data Base Management Systems. Her research interests include database management, e-commerce, and e business.

Arief Dwi Hartadi is a lecturer, in Information Systems in the School of Information Systems of Bina Nusantara University, Jakarta, Indonesia. He received the B.S. and M.S. degrees in information management from the Bina Nusantara University, Indonesia, in 2006. From 2011 she was a Lecturer with the School of Information Systems – BINUS University with expertise in Data Warehouse Systems. His research interests include database management, data warehouse and data mining.

Fenny is a lecturer, in Information Systems in the School of Information Systems of Bina Nusantara University, Jakarta, Indonesia. She received the B.S. and M.S. degrees in information management from the Bina Nusantara University, Indonesia, in 2010. From 2014 she was a Lecturer with the School of Information Systems – BINUS University with expertise in Digital Technology. Her research interests include digital marketing, e-commerce, and e business.