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Enhancing Inbound Logistics Performance for Steel Coil Materials Through Risk Assessment: A Case Study at PT MIH

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***Abstract*—** Risks associated with inbound logistics activities can hinder the achievement of optimal performance at PT MIH. PT MIH has experienced the impact of over cost losses due to decreased inbound logistics performance during the import clearance process. It is necessary to develop risk management and root cause analysis to get a proposed risk control program that can help improve the inbound logistics performance of PT MIH. This research uses qualitative research methods with a case study approach. Data was collected through field observations, in-depth interviews, questionnaires, and Forum Group Discussions. The results of risk identification obtained 48 sources of risk then risk analysis obtained a risk rating of 7 low risks, 16 medium risks, 21 high risks and 4 extreme risks. Risk evaluation is carried out on extreme risk rankings and gets a proposed risk management program. With the preparation of risk management, it is expected that the performance of inbound logistics at PT MIH in the future will be better.

***Keywords*—** Inbound Logistics, Performance, Risk Management.

I. INTRODUCTION

Risks related to inbound logistics can affect the performance of PT MIH as a distributor of Cold Rolled Steel Coils (CRC). Because risk often accompanies the growth of a company [1]. PT MIH has a warehouse to store and serve CRC steel coil orders located in Dadap, Banten. Initial interviews with the company director and logistics manager revealed that PT MIH had not yet adopted risk management in the company's management, risking a decline in inbound logistics performance. The initial observation found four inbound logistics activities at PT MIH that have a risk of performance decline, namely shipping activities, receiving activities, storage activities and return activities.

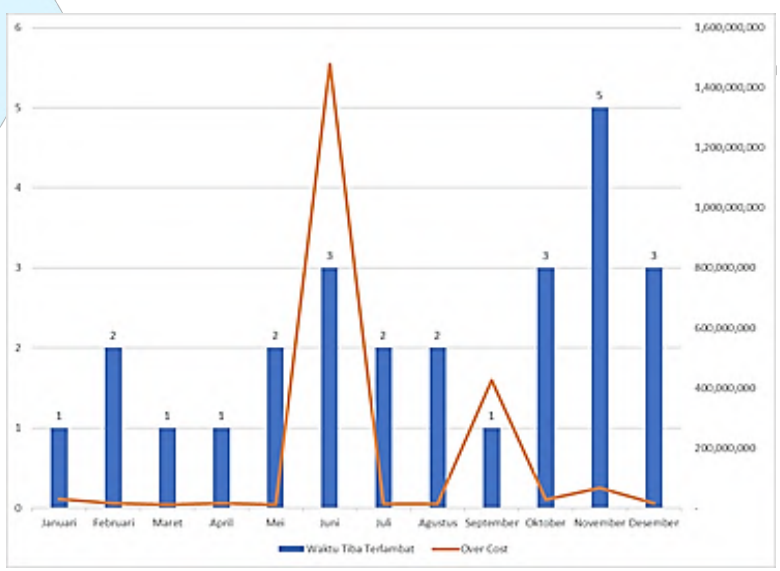

Fig. 1. *Delay in the clearance process.*

Fig. 1 explains that the risk in inbound logistics activities results in a decrease in performance during the import clearance process, resulting in the highest Overcost loss in May of Rp 1,479,224,000.00 that the company must bear. The problem of decreased inbound logistics performance at PT MIH is formulated by identifying what risks exist in each shipping, receiving, storing, and returning activity. Then, risk analysis in the form of

measuring the risks that have been identified. risk evaluation by determining the priority of risk ratings. Find appropriate risk management program proposals by root cause analysis.

Previous research on risk management in inbound logistics has been conducted and shows that the highest risk can be mitigated by sharing risk [15]. And more recent research was conducted by [8] It was found that the highest risk in inbound logistics can be reduced through risk treatment measures through the proposed program. [2] examined the relationship between risk management and company performance, the results have a positive role. Previous research confirms that the problems that exist in inbound logistics can be solved by risk management, so this research is expected to help the management of PT MIH in particular the inbound logistics process in reducing risks in activities to improve performance.

II. LITERATURE REVIEW

Risk is an event with the ability to affect (hinder, increase, or cause doubt) the mission, strategy, project, routine operations, objectives, core processes, key dependencies and/or expectations of stakeholders [5]. Recognizing the types of potential risks is a crucial step to ensure that they can be mitigated, or the negative impacts addressed.

Operational risk according to Basel II (the international banking regulatory body) is the risk of loss resulting from the inadequacy or failure of internal processes, people, and systems or from external events. Due to the diverse and complex sources of risk, operational risk can occur in all industries, not just in the banking industry [7].

[13] Risk management is an effort to minimize uncertainty so that losses incurred can be eliminated or minimized by identifying the risks faced, measuring and determining the magnitude of these risks, and developing strategies to minimize or manage risks. The risk management process scheme carried out by this research is based on SNI ISO 31000 which is shown in Figure 2.

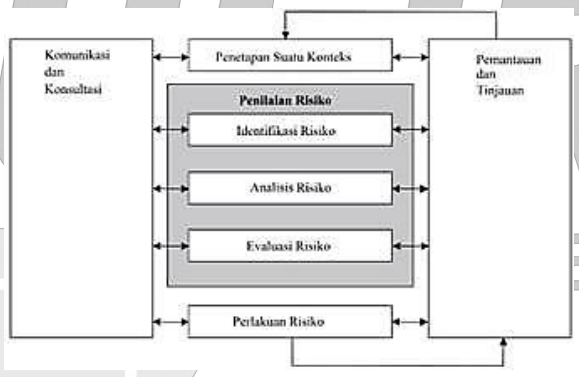

Fig 2. *Risk Management Process SNI ISO 31000 [16]*

Where the main stages of the risk management process consist of communication and consultation, context setting, risk assessment (risk identification, risk analysis, risk evaluation), risk treatment, monitoring, and review. This research uses the supporting technique of root cause analysis for risk assessment in identifying the causes of problems and possible interactions between factors that affect the occurrence of risks.

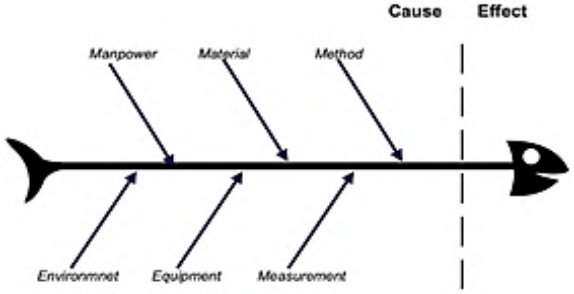

Fig. 3. *Fishbone Diagram*

Fishbone diagram is a useful tool for conducting root cause analysis. It helps focus the attention and review of key informants towards a problem. A fishbone diagram (also called an Ishikawa diagram or cause-effect diagram) is a visual cause-and-effect analysis tool used to identify complex causal interactions of a particular event or phenomenon [3].

Inbound logistics is the first step in the supply chain that involves the flow of materials into the company. Controlling the raw materials that enter the company affects the final product. In the iron and steel industry, inbound logistics activities are considered to greatly affect the final product [10] and have a major impact on company performance [6]. It is based on the value-added chain introduced by Michael E. Porter and has an important role in increasing the competitive advantage of a company in selling products or serving its customers [9]. [4] cites Bowersox (2010) that from an inbound logistics perspective there are three factors that affect performance, namely cost, speed and consistency of delivery.

III. METHOD

A. Data Collection Methods

This research conducted qualitative research using a case study approach. To collect data, field observation, in-depth interviews, questionnaires, and Forum Group Discussion (FGD) were used. In-depth interviews were used to identify risks occurring in the shipping, receiving, storage and return activities of the inbound logistics process at PT MIH. The questionnaire helped the Risk Analysis stage by calculating the factor of each risk from the likelihood scale and consequences scale of the risk. The result of this risk analysis is a risk rating that is mapped (risk map) and then risk response planning is determined. FGDs are used at the risk evaluation stage where risk sources with extreme levels need risk response planning using the fishbone diagram method.

To find data sources in social situations, researchers use purposive sampling techniques. Purposive sampling technique is a technique by determining certain criteria on the sample [14]. The reason researchers use purposive sampling is that it allows researchers to select informants with the consideration that they are considered to know best or hold positions, so that they can provide the most relevant information about inbound logistic at PT MIH. For this study, the samples selected were employees who worked in the logistics and warehouse division of PT MIH.

B. Framework

The framework in this study can be seen in Fig. 4.

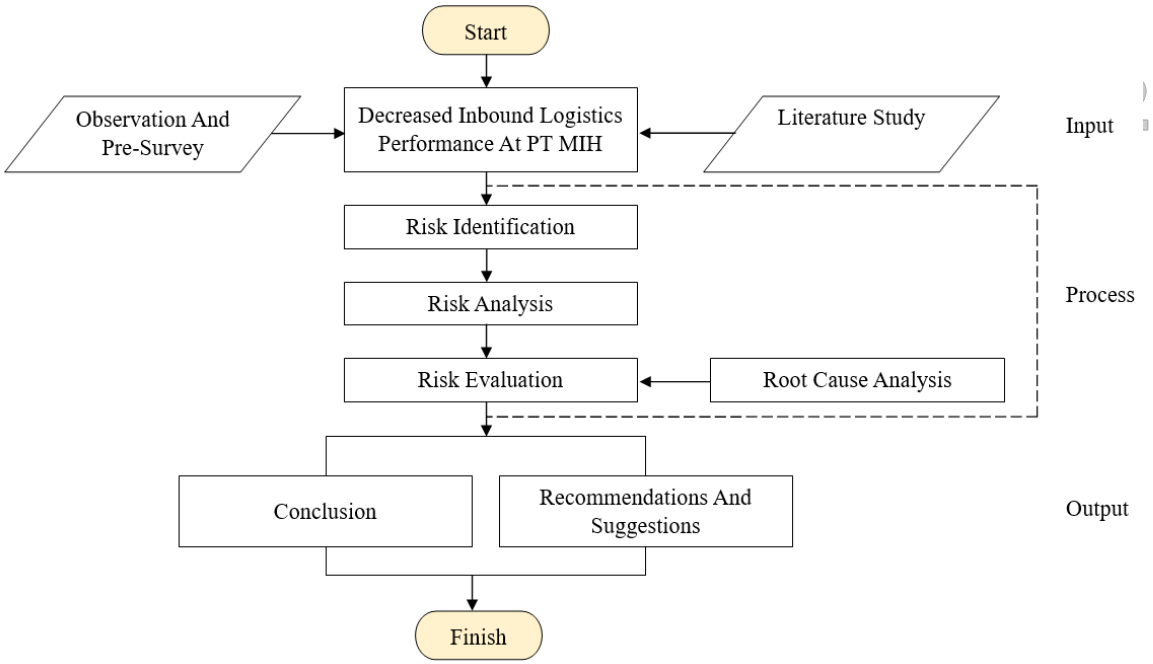

Fig. 4. *Framework*

There are two important stages of the framework in this research are Risk Assessment and Root Cause Analysis. Risk assessment begins with identifying activities that have the potential to cause risk by means of in-depth

interviews looking for what risks occur, the causes of the risk, where the risk occurs and how the risk arises [13]. Risk analysis determines the level of risk by considering components that affect the chance of risk occurrence (likelihood) and the negative impact of risks (consequence) that have been identified [9]. The likelihood and consequence scale will be used to determine the risk rating where the extreme level needs risk response planning. Risk evaluation, which determines which risks need further treatment, or are included in the risk response planning process [7] ISO 31000 defines risk response planning as the development and implementation of measures to modify risks. The stages in risk response planning are reject (or 'avoid'), reduce, transfer ('share'), and accept [16]. To get risk response planning, root cause analysis is required using the fishbone diagram method.

IV. RESULTS AND DISCUSSION

A. Risk Identification

Risk identification in this study was conducted through field observations and in-depth interviews. The results of risk identification are summarized in Table 1.

Activities	Target	Code	*Risk event*	Code	*Risk cause*
Shipping	Arrival of goods on schedule	R1	Potential for goods not to arrive on time	A1	Unavailability of ships to Indonesia
				A2	Ship arrival time at port *delay*
				A3	Delay in making PO (*Purchase Order*)
				A4	Container transport damaged/broken tyre.
				A5	Truck not available
	Low Operating Costs	R2	Potentially delayed inclusion process time	A6	The lab inspection process at Customs takes too long
				A7	Incorrect inclusion document
				A8	*Down system* INSW/CEISA
				A9	Late in preparing *Delivery* Order documents
				A10	Charged Notul on Customs Value Information
				A11	Late Form E sent to Customs
				A12	Lack of coordination with PPJK.
				A13	Block Importers
				A14	Document/NPD request by Customs not fulfilled
				A15	No field officer knowledge training
Reception	Efficiency of unloading time	R3	Potential *Waste Time* in the unloading process	A16	Incorrect arrangement of goods in the container
				A17	The way of *handling* goods is not appropriate
		R4	Potential for damaged container unloading equipment	A18	Shortage of warehouse personnel
				A19	Unmaintained forklift and crane equipment
				A20	there is no SOP for the use of tools from the company
				A21	Tool Misoperation
		R5	Potential lack of communication and team coordination	A22	Containers stay in the warehouse because they have not been unloaded
				A23	Goods *in- out* schedule clashes
				A24	Employees work overtime to unload goods
		R6	Potential for goods received not according to specifications	A25	There is no clear SOP running in the company
				A26	actual weight is not the same as the *invoice* and *packing list*
				A27	Wet steel coil
				A28	Torn steel coil
				A29	Dented steel coil

Storage	Stock the optimum amount of goods at all times	R7	Potential *overstock*	A30	*marketing* did not meet sales targets
				A31	Raw materials received do not match customer orders
		R8	Potential Occupational Accidents	A32	Purchase of goods whose specifications are not in line with market interest
				A33	Errors when operating forklifts and cranes
				A34	Employees experience fatigue
				A35	Forklif and Crane damage occurred
				A36	Not using personal protective equipment (PPE) when handling goods
				A37	Management-designed OHS procedures are inadequate
				A38	Insufficient light in the warehouse room
				A39	Air circulation in the warehouse is hot and stuffy
				A40	There is no *safety line* in the warehouse area
				A41	Pinched/Scraped or crushed by items
				A42	Hitfall from forklift
		R9	Potential for damaged goods	A43	Overlapping storage due to limited space
				A44	Goods dropped from forklift
Returns	Customer Trust Level Increases	R10	Potential return of goods	A45	Wrong delivery of steel coil
				A46	*defects* in steel coil
				A47	The colour of the item is not the same as before
				A48	There is rust on the goods

The results of the risk identification process in the inbound logistics activities of PT MIH obtained 10 risk events (risk events) that can hinder the achievement of organizational goals and 48 risk causes (risk sources) which can be in the form of systems, technology, people, materials, internal processes, and/or external processes. The identified risks come from 4 activities, namely shipping activities, receiving activities, storage activities, and return activities. In the shipping activity there are 2 risk events with 15 risk causes. The receiving activity has 4 risk events with 14 risk causes. Storage activities have 3 risk events with 15 risk causes. Return activity has 1 risk event with 4 risk causes. Unidentified risks can lead to errors in the supply chain risk management process, which then leads to inappropriate risk control strategies and greater losses. (Rizqiah & Karningsih, 2017).

B. Risk Analysis

Risk analysis is an attempt to understand the risks more deeply. The risk analysis was conducted with a closed questionnaire by giving a value based on the risk factor scale of the likelihood of occurrence in table 2 and the negative impact (consequences) in table 3 by key informants who are directly involved with inbound logistics work. The result of this risk analysis is the risk rating in Table 4 which is then validated to the risk owner. The benefit of risk analysis is that the risk can be evaluated, and the treatment plan can be determined.

The 1-5 scale in table 2 likelihood and table 3 consequence has been validated that the scale is in accordance with the current trends of the company.

Table 2. *Likelihood Scale*

Likelihood (L)		
Scale	**Frequency Level**	**Frequency of Risk Occurrence**
1	Very Rarely	Chance of occurrence ≤ 1 time in 1 year
2	Rare	Likely to occur 2-5 times in 1 year
3	May Occur	Chance of occurrence 6-9 times in 1 year
4	High Probability of Occurrence	Possibility of occurrence 10-12 times in 1 year
5	Almost Certain to Happen	Chance of occurrence ≥ 12 times in 1 year

Table 3. Consequences Scale

Consequences (C)			
Scale	**Magnitude**	**Financial Loss (IDR)**	**Achievement of Performance Targets**
1	Very Low	0 - 20.000.000	70% - 90%
2	Small	20.000.000 - 100.000.000	50% - 70%
3	Intermediate	100.000.000 - 500.000.000	30% - 50%
4	Great	500.000.000 - 1.000.000.000	10% - 30%
5	Very High	more than 1.000.000.000	0.1% - 10%

Table 4. *Risk Analysis*

Kode	(L)	(C)	Risk Rating	Level	Kode	(L)	(C)	Risk Rating	Level
A1	3	4	12	H	A25	3	4	12	H
A2	4	4	16	H	A26	3	4	12	H
A3	4	4	16	H	A27	4	4	16	H
A4	2	5	10	H	A28	4	4	16	H
A5	4	4	16	H	A29	3	3	9	H
A6	1	2	2	L	A30	3	3	9	H
A7	1	3	3	L	A31	3	4	12	H
A8	3	4	12	H	A32	1	2	2	L
A9	2	2	4	M	A33	1	5	5	M
A10	4	5	20	E	A34	2	3	6	M
A11	4	5	20	E	A35	1	5	5	M
A12	2	4	8	M	A36	1	4	4	M
A13	1	4	4	M	A37	1	3	3	L
A14	1	4	4	M	A38	1	2	2	L
A15	2	2	4	M	A39	5	4	20	E
A16	1	4	4	M	A40	1	2	2	L
A17	2	4	8	M	A41	3	4	12	H
A18	4	5	20	E	A42	1	5	5	M
A19	2	5	10	H	A43	4	4	16	H
A20	2	2	4	M	A44	3	4	12	H
A21	1	3	3	L	A45	3	3	9	H
A22	2	4	8	M	A46	3	5	15	E
A23	4	3	12	H	A47	3	3	9	H
A24	4	4	16	H	A48	2	3	6	M

Risk rating (RR) is the determination of the risk level through the likelihood scale (L) and the consequences scale (C): RR = L × C. Five risk level categories are applied, including: E - Extreme risk (20-25) in red, H - High risk (9-16) in orange, M - Medium risk (4-8) in yellow, and L - Low risk (1-3) in green. The results of the risk analysis are mapped into the Risk Matrix which can be seen in Figure 5. The risk matrix can help in prioritizing risks.

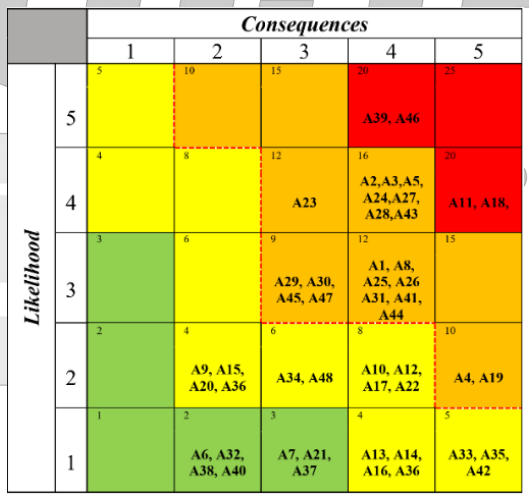

Fig. 5. *Risk Matrix*

Figure 5 shows 7 sources of risk with a low risk rating, 16 sources of risk rated medium risk, 21 sources of risk rated High risk, and 4 sources of risk rated Extreme risk. Furthermore, a thorough analysis was conducted of the risk assessment results, which resulted in an extreme risk rating. This is because the extreme level should be a priority in risk control.

C. Risk Evaluation

Risk evaluation aims to determine the priority of risks that should receive additional risk treatment. Information on the level of risk prioritization is obtained after the risks of inbound logistics activities are identified and assessed. Risk evaluation was conducted with FGDs and obtained the results of the risk evaluation assessment that the company is expected to achieve according to the following table:

Table 5. Risk Evaluation

Code	L	C	RR	Category	Proposed Programs
A11	1	2	2	Low	Provide training or mentoring to employees on the import inclusion SOP.
A18	2	2	4	Medium	Conduct performance assessments and provide training to each current employee.
A39	3	2	6	Medium	Adding an air control system in the form of a cyclone turbine ventilator and exhaust fan that can reduce room temperature and remove smoke from the forklift.
A46	2	4	8	Medium	Evaluate suppliers to improve delivery quality and CRC steel coil quality in accordance with company standards.

Based on the results of the table above, risk A11 is expected to be reduced to low risk with a scale of 1 likelihood and a scale of 2 consequence. Risk A18 is expected to be reduced to medium risk with a scale of 2 likelihood and a scale of 2 consequence. Risk A39 is expected to be reduced to medium risk with a scale of 3 likelihood and a scale of 2 consequence. Risk A46 is expected to be reduced to medium risk with a scale of 2 likelihood and a scale of 4 consequence. Furthermore, to achieve the expected assessment results, the following risk handling program is proposed:

1. Provide training or mentoring to employees on import inclusion SOPs. By providing training, employees will understand the regulations and SOPs that apply in the import inclusion process and know how to solve problems.
2. Conduct a performance assessment of every employee at present. With performance assessment, companies can assess how well employees perform their duties and can make it easier to identify employee strengths and weaknesses. So that the company can do better human resource planning.
3. Adding an air control system in the form of a cyclone turbine ventilator and exhaust fan that can reduce the room temperature and remove the smoke of the forklift equipment. A decrease in room temperature will create more comfortable conditions for warehouse employees and ultimately increase the concentration of warehouse employees.
4. Evaluate suppliers to improve the quality of delivery and the quality of CRC steel coil in accordance with company standards. Supplier evaluation can help companies find the best suppliers according to company needs.

D. Root Cause Analysis

The risk assessment process in this study found extreme risk ratings that can affect inbound logistics performance and need to be prioritized for risk handling, so researchers brainstormed root cause analysis through FGDs to find the root cause of the problem. The results of the FGD are presented in the fishbone diagram as follows:

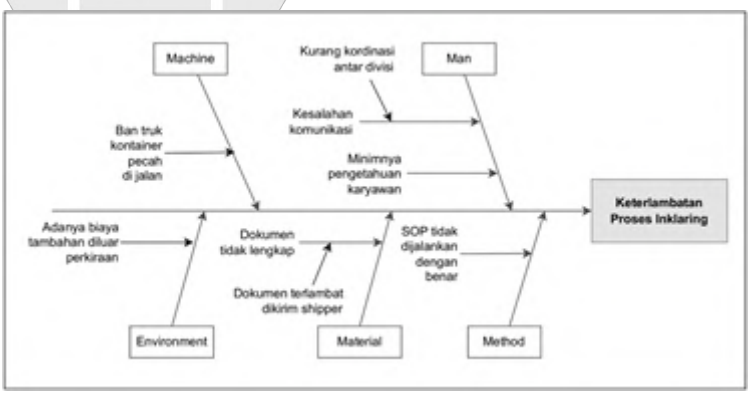

Figure 6. *Fishbone diagram Root Cause Analysis*

The results of the fishbone diagram root cause analysis resulted in 3 proposed programs as follows:

1. Provide a supervisor as the person in charge. With the supervisor, there will be a coordination space between the supervisor and his subordinates so that

there is continuous supervision of inbound logistics work and work can be completed according to work targets. Supervisor recruitment can be done through an internal system where the company appoints existing employees. The criteria for such employees are recognized as having the ability to meet the management objectives set by the company, having a leadership spirit, having a thorough knowledge of the company and the company's products, having respect, discipline, and being able to handle problems well, and having the right to promotion if it can be calculated accurately. The biggest overcost loss phenomenon experienced by the company occurred due to fines given by customs due to the import inclusion process that was not in accordance with the SOP. By increasing the position and salary of a supervisor employee such as Rp 1,000,000.00. This can reduce costs of Rp 1,479,224,000.00 to normal operating costs that must be borne according to the organization's work objectives. Because competent supervisors can mediate and manage conflicts between team members or departments, improve coordination between teams, monitor the quality of work of their subordinates, and provide constructive feedback, employees will work better and more efficiently because they know they are being supervised.

2. Cooperation with transport vendors who have transportation equipment according to company needs. So that when shipping containers from the port to the warehouse, it is not late to arrive due to problems with damage to transportation equipment on the way to delivery. An effective transport vendor company can help reduce the operational costs of the import inclusion process.
3. Create a KPI (Key Performance Indicators) system to measure the inclusion process that runs in accordance with the standard. KPIs can help companies assess employee performance at work and make data-driven decisions to optimize employee performance and drive business success.

V. CONCLUSION

Through the risk assessment process in shipping activities, receiving activities, storage activities, and return activities in the inbound logistics process of PT MIH, 10 risk events and 48 risk causes were identified, consisting of 2 risk events and 15 risk causes in shipping activities, 4 risk events and 14 risk causes in receiving activities, 3 risk events and 15 risk causes in storage activities and 1 risk event with 4 risk causes in return activities. Then risk analysis was carried out, obtained 7 sources of risk in the low risk category, 16 sources of risk ranked medium risk, 21 sources of risk ranked high risk, and 4 sources of risk ranked Extreme risk. Risk evaluation for risk control is expected that risk A11 can be reduced to low risk, risk A18 A39, A46 can be reduced to medium risk. Furthermore, to achieve the expected assessment results, a risk management program proposal was made through FGDs resulting in 4 program proposals. Root cause analysis of the phenomenon due to the decline in inbound logistics performance resulting in delays in the inclusion process, resulting in 3 proposed programs for risk control that can be implemented at PT MIH.

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