Risk Identification in Packaging Material Warehouse in PT. Cedefindo using the House of Risk Method

Nadya Adira Fabiani[1], Dr. Liane Okdinawati[2]

[1,2] School of Business Management, Institut Teknologi Bandung

ABSTRACT: The cosmetic industry in Indonesia continues to experience rapid growth, in line with high consumer demand and the widening cosmetic market. In 2021, based on data from the Central Statistics Agency (BPS), cosmetics will grow by 9.61%. One of Indonesia's well-respected cosmetic manufacturing companies is PT. Cedefindo, which is part of the Martha Tilaar Group. Martha Tilaar Group is one of the local pioneers in the Indonesian beauty industry. There are very large numbers and types of packaging in the warehouse of PT. Cedefindo. Due to the wide range of products, there are a number of risks associated. As a result of redesigns and product discontinuation, a lot of unused packaging material has accumulated in the storage facility. Deadstock and unused packaging materials can disrupt the flow in the warehouse, increasing costs and reducing available storage space. Delays in delivering packaging materials to the production line are a further risk that could be triggered by flow disturbances. Given this potential risk, the company must identify potential risks in every packaging material warehouse activity. Currently, PT. Cedefindo has not examined every action in the packaging material warehouse to identify risks. Risk identification is very important because it will enable the company to develop plans to minimize harmful events before they arise, without proper risk identification, no mitigation strategy can be devised. This research was conducted by identifying warehouse activities, mapping them into (SCOR) and identifying risks using House of Risk Phase 1. The first stage of the House of Risk process is the identification of risk events and risk agents. Next, the severity and occurrence levels are measured, and the aggregate risk priority (ARP) value is calculated to determine which risk agents should be prioritized based on the Pareto diagram. There are 18 risk agents and 15 risk events have been identified as a result of this research, 6 risk agents were given the highest priority based on the Pareto diagram, and 2 risk agents were identified as having a high-risk level and being in the red zone, requiring immediate direct action.

KEYWORDS: Cosmetic, House of Risk, Packaging Material, Risk Management, Warehouse.

INTRODUCTION

Rising productivity, declining costs, and satisfying consumer demand in developing economies have all contributed to the fast growth of supply chains management over the past few decades (Palaniappan, 2014). Warehouses are crucial components of a supply chain management system (Harjono, 2019). One of the important things in warehouse management is knowing the risks that occur (Pujawan, 2019). Identifying risks that could or may not have happened in the company's warehouse operations is required based on the possible severity that might develop and occur (Rebecca, 2019). There are very large number and types of packaging in the warehouse of PT. Cedefindo due to the variety of product lines. This variety of product lines poses several risks. The redesigning and discontinuation of product, resulted in a accumulation of unused packaging raw materials in the warehouse. The accumulation of unused packaging materials or deadstock has the impact of flow disturbances movement of goods, extermination cost and lacking of space. The flow disturbances of movement will poses another risk, which is delay in transferring packaging material to production line. The high number of packaging rejects can also disrupt the process of packaging goods which will have an impact on the delay in providing finish goods to customers. Given this potential risk, the company needs to identify risks in each packaging material warehouse activity. Currently, PT. Cedefindo has not examined every action in the packaging material warehouse to identify risks. This research aims to identify the risks that exist in PT. Cedefindo's warehouse and scaling each potential risks event and checking the correlation with the risk agent. The objective of risk identification is to identify, acknowledge, and define risks that may assist or obstruct an organization's ability to achieve its goals. Relevant, appropriate, and recent knowledge is essential for recognizing risks (ISO 31000, 2018). Preparation for risk mitigation is the end objective of risk identification and analysis (Kenneth, 2022). Appropriate risk mitigation begins with the identification of risks to a project (Indeed, 2022). House of Risk method has been used in several previous research to identify potential risk events, particularly in the manufacturing operation process. The previous researched industries were mostly in

the food processing and heavy equipment sectors. Researches on a house of risk are Doddy et al. (2020) Analyze the improvement of risk management on the procurement process in the Balikpapan Samarinda Toll Project using the house of risk method and Diana et al. (2018) in mitigating risks in the procurement process of milkfish processing raw materials. The difference in the current research is that apart from the object, cosmetic industry and the area being studied is also very different. This research will be conducted in the packaging material warehouse. Packaging does more than simply hold and protect products, it also functions as a marketing tool, introducing the product to consumers and encouraging repeat business (Elisabeth, 2018). The House of Risk (HOR) phase 1 methodology will be used to determine risk agent that may activate a risk event. Furthermore, this research involved Supply Chain Operations Reference (SCOR) for mapping packaging material activities which will be developed for risk identification.

RESEARCH METHODOLOGY

The collection of data in this research used qualitative and quantitative method. The qualitative data were gathered by observing the PT. Cedefindo warehouse where the packaging materials were stored, conducting in-depth interviews with internal employees, and engaging brainstorming sessions. In order to quantify the occurrence, severity, and linkage of risk events and risk agents, a questionnaire is given to the warehouse manager. Questionnaire are also used in assessing ARP value of risk agents in House Of Risk phase 1. This study only use House Of Risk phase 1 because the purpose is only to identify risk event and agent in the packaging material warehouse of PT. Cedefindo. Problems at the research site were found by direct observation, which completed the identification stage. Both a literature review and a field study are carried out to provide context for the research and ensure its completion. The detail of data collection and processing in this study used the following methods:

A. Mapping Warehouse Activity (SCOR)

In this research, SCOR ver.12 is used to map the activities in the packaging material warehouse. SCOR is able to mapping warehouse activities from upstream to downstream. This is what makes SCOR superior to other methods that tend to measure the company's internals only. The results of the mapping are used to identify risk events and sources of risk in the packaging material warehouse based on literature studies and discussions with the company. According to APICS (2020), SCOR model divides supply chain processes into 6 core processes, namely: Plan, Source, Make, Deliver, Return and Enable. In this research, the SCOR process that will be used for mapping the activities of packaging raw material are source, delivery and return. Plan, make and enable on SCOR process was not used in this research since it is not performed in the packaging material warehouse but rather in another department.

B. House of Risk 1

Prior study had conducted risk analyses qualitatively, which involved sorting potential risks into categories based on factors like how likely they were to occur and how severe their potential consequences would be. Risk events and risk agents are identified using a combination of interview and quistionnare. This paper will use the House of Risk (HOR) method to prioritize which risk agents are to be dealt with first based on an analysis of the literature on risk management in the packaging material warehouse. Pujawan, P. I., & Geraldin, L. H. (2009) defines house of risk as a technique for developing preventative, mitigation, and management strategies for risk variables that may contribute to more than one problem. HOR phase 1 is made through several stages as follows:

- Identifying Potential Risk Events (Ei) in Business Processes. This from previous step in SCOR (Source, Delivery, Return)
- Measuring the degree of impact of a risk event (Si) on defined warehouse activities. This severity value is based on a scale of 1 to 10, with a value of 10 indicating that the risk event is extremely severe. (Shahin, 2004).
- Identifying the risk agent (Aj), which is any factors that can cause the occurrence of the risk events that have been identified.
- Measuring the risk agent's probability of occurrence (Oj). This occurrence value is calculated on a scale of 1 to 10, with a score of 10 indicating that the source of risk is almost certain to occur. (Shahin, 2004).
- Measuring the correlation value between a risk event and its underlying cause (Rij). There is a correlation if it is discovered that a risk agent causes the appearance of a risk event. The correlation value is (0,1,3,9), with 0 indicating no association, 1 indicating a slight correlation, 3 indicating a moderate correlation, and 9 indicating a strong correlation.
- Calculating the aggregate risk potential (ARP) value. This ARP will be taken into account for prioritizing risk mitigation actions. The formula for calculating ARP is $ARPj = Oj \sum SiRij$

- Establish the order or ranking of risk agents based on the ARP value, starting with the highest value and working down to the lowest value, and choose a few risk agents to be prioritized using the Pareto diagram approach.
- Make a risk map for the selected risk agent using a probability impact matrix consisting of areas colored red, yellow, and green. The red area represents the risk impact from the risk source, which is high, the yellow color indicates a moderate impact, and the green color indicates a low impact (Nanda, Hartanti, & Runtuk, 2014).

RESULT AND DISCUSSIONS

After mapping the activities in the packaging material warehouse using the SCOR method (Source, Delivery, Return). The risk event and risk agent were identified by the expert. For each action in the packaging material warehouse, risks are identified. There are 15 risk events and 18 risk agents were identified in packaging material warehouse activities. Risk events and risk agent in each activity of packaging material warehouse can be seen in Table 1 below:

Table 1. Risk Event and Risk Agent in Packaging Material Warehouse of PT. Cedefindo

Process	Activity	Code	Risk Event	Code	Risk Agent
Source	Determine the time of receipt of packaging materials from suppliers	E1	Delivery schedule discrepancies	A1	Supplier failure
	Warehouse receives purchase order (PO) from purchasing department			A2	Miss communication and coordination with related parties
	Warehouse receives packaging material from suppliers	E2	Packaging materials didn't match the delivery order (DO)	A3	Unavailability of materials from suppliers
	Warehouse admin checks the suitability of Purchase order and delivery order			A1	Supplier failure
	QC checks packaging material according to standardization	E3	Low quality of packaging material	A4	Production defect from supplier
				A5	Packaging material damage on delivery
	Unloading the packaging material that has been received	E4	The unloading process takes too long	A6	Lack of human resources
	Transfer of packaging material to pallets			A7	Lack of facility (material handling)
	Transfer of packaging material to the warehouse according to the material group	E5	Material buildup in the warehouse	A8	Lack of space
				A9	deadstock (unused packaging material)
	Make a proof of material purchase receipt (BPPB)	E6	Report discrepancies	A10	Low level of disciplines and inaccuracy employee
Delivery	Receive packaging material release document (PBP) from production	E7	Lack of packaging material availibility	A11	Inconsistent system stock and actual stock
	Check the availibility of packaging material			A12	Packaging material damage on storage
				A13	Loss of materal during storage
	Determine the delivery schedule for packaging materials to the production line	E8	Wrong delivery schedule	A14	Production schedule change
	Prepare and pick up packaging materials as per BPPB	E9	Wrong material pick-up	A10	Low level of disciplines and inaccuracy employee
				A15	Incorrect packaging material request from production department
	Arrange the packaging material on the pallet	E10	Long delivery time to production line	A6	Lack of human resources
				A7	Lack of facility (material handling)
	Material delivery to production line			A16	Irregular placement of packaging materials
				A9	deadstock (unused packaging material)
	Receive packaging material by production department	E11	Incompatibility of packaging material received	A2	Miss communication & coordination
	Check the completeness and correctness of the material according to BPPB				
Return	Check the type of defect in material	E12	Error detecting the type of defect	A10	Low level of disciplines and inaccuracy employee
	Separation of reject materials	E13	Misplacement of reject materials	A8	Lack of space
				A16	Irregular placement of packaging materials
				A10	Low level of disciplines and inaccuracy employee
	Make the repairs report (LTPS) and proof of return (BRS) to supplier	E14	Wrong amount of returned defective material	A17	Incorrect report of packaging to return
	Packaging material reject return schedule	E15	Wrong return schedule	A18	Shipping schedule change
	Return of reject packaging materials				

The next stage is to assess the risk agent's likelihood of occurrence and the impact of the risk event. The weighting of the severity and occurrence values is done by PT. Cedefindo's warehouse manager, who is an expert in the field. The expert selected in the risk assessment is an expert who has a large influence on the flow of warehouse activities to know the impact that arises from the risks posed. The purpose of calculating the severity value is to quantify the extent to which a risk event will result in company losses, the higher the severity value, the more devastating the resulting losses will be. The purpose of determining occurrence values is to assess the likelihood that a risk will occur, the higher the number, the more likely it is to occur. Table 2 summarizes the findings of the severity and occurrence assessments of existing risk events and risk agents:

Table 2. Severity Value of Risk Event

Code	Risk Event	Severity	Code	Risk Agent	Occurance
E1	Delivery schedule discrepancies	6	A1	Supplier failure	4
E2	Packaging materials didn't match the delivery order (DO)	4	A2	Miss communication and coordination with related parties	3
E3	Low quality of packaging material	6	A3	Unavailability of materials from suppliers	2
E4	The unloading process takes too long	1	A4	Production defect from supplier	6
E5	Material buildup in the warehouse	8	A5	Packaging material damage on delivery	1
E6	Report discrepancies	4	A6	Lack of human resources	1
E7	Lack of packaging material availibility	7	A7	Lack of facility (material handling)	2
E8	Wrong delivery schedule	4	A8	Lack of space	6
E9	Wrong material pick-up	3	A9	Deadstock (unused packaging material)	8
E10	Long delivery time to production line	6	A10	Low level of disciplines and inacurracy employee	5
E11	Incompatibility of packaging material received	5	A11	Inconsistent system stock and actual stock	7
E12	Error detecting the type of defect	3	A12	Packaging material damage on storage	2
E13	Misplacement of reject materials	2	A13	Loss of materal during storage	3
E14	Wrong amount of returned defective material	3	A14	Production schedule change	4
E15	Wrong return schedule	3	A15	Incorrect packaging material request from production department	4
			A16	Irregular placement of packaging materials	5
			A17	Incorrect report of packaging to return	1
			A18	Shipping schedule change	2

When dealing with a risk agent, Potential Aggregate Risk (ARP) is designed to be utilized as a prioritizing tool. These risk agents will be rated from highest to lowest when the ARP values have been calculated. Once the value of the relationship between the risk agent and the risk event has been determined, the ARP may be calculated. Correlation values of 0, 1, 3, and 9 imply that there is no correlation, a weak correlation, a medium correlation, and a strong correlation. The ARP value is calculated by combining the likelihood of occurrence of a risk agent, the severity of risk events, and the degree of correlation between the risk event and the risk agent. Table 3 shows the House of Risk phase 1 calculations. The table displays the severity level of the identified risk event, an estimate of the risk agent's likelihood of occurrence, the Aggregate Risk Potential (ARP) value, and the relationship between the risk event and the risk agent. Below Table 3 shows the calculation for the House of Risk phase 1:

Table 3. House of Risk phase 1

Risk Event (Ej)	Risk Agent																		Severity
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	A15	A16	A17	A18	
E1	3	3																	6
E2	1		9																4
E3				9	1														6
E4						1	3												1
E5								3	9										8
E6										3									4
E7											9	9	3						7
E8														9					4
E9										3					3				4
E10						1	3		3							9			6
E11		3																	5
E12										3									3
E13								9		1					3				2
E14																	9		3
E15																		3	3
Occurance (Oj)	4	3	2	6	1	1	2	6	8	5	7	2	3	4	4	5	1	2	
ARP	88	99	72	324	6	12	42	252	720	175	441	126	63	144	48	300	27	18	
Rank	10	9	11	3	18	17	14	5	1	6	2	8	12	7	13	4	15	16	

Example of ARP calculation of this research:

ARP1 = 8 [8(9) + 6(3)]

ARP1 = 8 [72 +18]

ARP1 = 6 [90]

ARP1 = 720

In this case, the answer is 720

The ARP value is graded from highest to lowest to decide which risk agents should be prioritized. The priority risk agent is the risk agent with the highest ARP value, and vice versa. The Pareto principle, also referred to as the 80:20 principle, is used to determine the categories of priority and non-priority risk agents. The Pareto principle states that 20% of the significant risks are responsible for 80% of an organization's losses. The primary components that generate the most issues in packaging material warehouse activities are all to the left of the 80% line. Figure 1 shows the Pareto diagram for ARP:
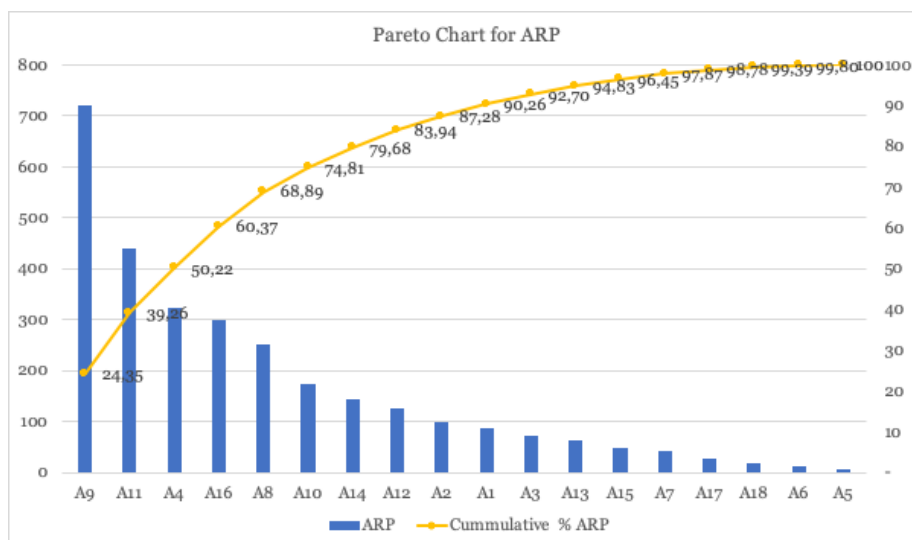

Figure 1. Pareto Diagram for ARP

There are 7 risk agents were prioritized based on the results of this research. An 80:20 Pareto analysis was used to determine which risk agent would be targeted for mitigation. If the risk agent was found to have an 80% impact on the risk event, then only 20% of the cumulative percentage value would be allocated to other potential causes. The most important risk factor is:

1. Deadstock (unused packaging material) (A9)

   The presence of deadstock or accumulation of unused packaging material has the highest ARP value of 720. This risk agent arises due to many factors, namely the existence of various product variants and discontinuation of the product that causes the amount of material to exceed the actual production. Apart from that, the presence of highly rejected material from suppliers can also lead to the accumulation of unused packaging material. Excess stock of raw materials ordered from miscommunication that occurred with customers or other departments is also a factor in the presence of deadstock or accumulation of unused packaging material.

2. Inconsistent system stock and actual stock (A11)

   Inconsistent system stock and actual stock have an ARP value of 441. The existence of defective products in inventory is a common source of this risk factor. There was also negligence on the side of warehouse employees, who failed to keep the inventory count accurate.

3. Production defect from supplier (A4)

   Production defects from suppliers have an ARP value of 324. This is due to negligence from the supplier, namely, damage from the supplier during the production of packaging material or damage that occurred during delivery.

4. Irregular placement of packaging material (A16)
   Irreguler placement of packaging material have an ARP value of 300. Given that the warehouse's capacity is insufficient to hold all of the available packaging material, the crew has been placing the materials wherever they can find a free spot and doesn't follow the existing SOP, leading to an erratic distribution pattern. Warehouse packaging material pickup times may be affected.

5. Lack of space (A8)
   Lack of space has an ARP value of 252. This risk agent is primarily caused by the packaging material warehouse inefficient layout. The organization is not appropriately utilizing and managing the room's size and location.

6. Low level of disciplines and inaccuracy employee (A10)
   Low level of discipline and inaccuracy employee has an ARP value of 175. This risk agent is posed by staff who are directly related to the activities of the packaging material warehouse. The indiscipline and inaccuracy of the employees are due to a lack of training programs and periodic staff performance evaluations.

7. Production schedule change (A14)
   The production schedule change has an ARP value of 144. This risk agent arises due to the factor of customer orders that must be completed together with other orders. Unexpected shifts in the production schedule can result from the late arrival of raw materials, the rejection of goods, or mismatched or mistimed measurements of raw material and packaging material.

The Probability Impact Matrix methodology is used to map out the likelihood and impact of each dominating risk agent. This mapping aims to identify risk condition before solving them. Table 5 shows the level of risk assessment:

Table 5. Probability Impact Matrix Model

Occurance		Severity				
		1	2	3	4	5
		Very Low	Low	Medium	High	Very High
5	Very High					
4	High			A9, A11		
3	Medium	A8		A4		
2	Low	A16	A10			
1	Very Low		A8	A14		

Based on the risk map in table 5 above, A9 and A11 are in the red zone with a high risk level, which means immediate direct action must be taken, then A4 is in the yellow zone with a medium risk level, which means immediate corrective action must be taken. For A16, A10, A8 and A14 are in the green color zone with a low risk level, which means that corrective actions must be carried out regularly and appropriately.

CONCLUSION

The result identification of risk events in the of packaging materials warehouse at PT. Cedefindo are 15 risk events and 18 risk agents. Through the responses to an interview and questionnaire given to the expert, PT. Cedefindo's warehouse manager, both severity and the chance of occurrence value are the input for the House of Risk phase 1 and also determined the value correlation between the two variables. All this variable will be calculated to get the Aggregate of Priority (ARP) and then the output will be processed in Pareto Diagram with 80:20 principle. There are 7 risks were prioritized base on the result of this research, namely: Deadstock (unused packaging material) (A9), Inconsistent system stock and actual stock (A11), Production defect from supplier (A4), Irregular placement of packaging material (A16), Lack of space (A8), Low level of disciplines and inaccuracy employee (A10), Production schedule change (A14). Two of the seven risk agents, numbers A9 and A11, are considered to be high-risk, requiring immediate, direct action. A4 will be exposed to the medium-risk level, which requires immediate corrective action, while A16, A10, A8, and A14 will be subject to the low-risk level, which requires the corrective action be carried out frequently and effectively. The following recommendations can be made in light of the findings of the research, the company must take corrective

and preventative measures against all potential risk agents, with the highest priorities going to those with the greatest potential for negative impact. For each potential risk agents, the company needs to figure out the best way to deal with it. Moving forward, conduct additional future research into House of Risk Phase 2 to establish which risk-mitigation strategies are most applicable to each risk agent, and rank these strategies in order of priority for implementation within the company, taking into consideration both degree of difficulty and financial outlay.

REFERENCES

1. Ahyudanari, Ervina and Doddy Arief Wibowo. (2020). The 1st International Conference on Business and Engineering Management (Application of House of Risk (Hor) Models for Risk Mitigation of Procurement in The Balikpapan Samarinda Toll Road Project 2020). International Conference on Business and Engineering Management (IConBEM 2020), 7 (3.21)
2. APICS, Supply Chain Operations Reference Model: SCOR Version 12.0, Chicago: APICS, 2017.
3. British Standard Instituiton. ISO 31000, 2018. Risk Management - Guidelines.
4. Chopra dan Sodhi, 2004. Managing Supply Chain Risk and Vulnerability: Tools and Methods for Supply chain management.
5. Editorial Team, Indeed. (2022, May 26). 5 Key Risk Mitigation Strategies from https://www.indeed.com/career-advice/career-development/risk-mitigation-strategies
6. Elisabeth, D. A. (2018, Oktober 9). Peran Kemasan dan Label Produk Pangan terhadap Minat Beli Konsumen. Retrieved Mei 8, 2021, from Balai Penelitian Tanaman Aneka Kacang dan Umbi:
   https://balitkabi.litbang.pertanian.go.id/infotek/peran-kemasan-dan-label- produk-pangan-terhadap-minat-beli-konsumen/
7. Harjono, Heru. (2019). WAREHOUSE MANAGEMENT SYSTEM AND ITS IMPACT ON DATA ACCURACY. Digital Literacy President University, 1-2.
8. Nanda, L., Hartanti, L. P., & Runtuk, J. K. (2014). Analisis Risiko Kualitas Produk dalam Proses Produksi Miniatur Bis dengan Metode Failure Mode and Effect Analysis Pada Usaha Kecil Menengah Niki Kayoe. Jurnal Gema Aktualita, (pp.75).
9. Palaniappan, Dr. Pl. K and Faizal. (2014). Risk Assessment and Management in Supply Chain. Global Journal of Researches in Engineering: G Industrial Engineering, Vol. 14, Issue 2 ISSN 0975 - 5861.
10. Pujawan, I. N., & Geraldin, L. H. (2009). House of Risk: a Model for Proactive Supply Chain Risk Management. Bussiness Process Management Journal, 15(6), 952-968.
11. Reinschmidt, Kenneth. National Academies of Sciences, Engineering, and Medicine. 2005. The Owner's Role in Project Risk Management. Washington, DC: The National Academies Press. https://doi.org/10.17226/11183.
12. Sari, Diana Puspita, Zahra Lutfia and Icha Putri (2018). PERENCANAAN MITIGASI RISIKO AKTIVITAS PENGADAAN BAHAN BAKU PADA CV. DINASTI SEMARANG. Undip: Jurnal Teknik Industri, Vol. 13, No 13.
13. Shahin, A. (2004). Integration of FMEA and the Kano Model. International Journal of Quality& Reliability Management, (pp.733).
14. Webb, Rebecca. (2019, February 27). Warehouse Risk Management: Is Your Facility Secure? From https://www.clearrisk.com/risk-management-blog/is-your-warehouse-secure