

i-RIC 2024

INTERNATIONAL RESEARCH & INNOVATION CONFERENCE

PROCEEDING

“HARMONY IN DIVERSITY: FOSTERING UNITY
SUSTAINABLE RESEARCH AND INNOVATION SOCIETY”

24 & 25 JULY
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PREFACE

It is a great privilege for us to present the proceedings of the International Research and Innovation Conference (i-RIC 2024) to the authors and delegates. We hope that you will find it useful, exciting, and inspiring. The International Research and Innovation Conference (i-RIC 2024) was held online from 24 to 25 July 2024, organized by Politeknik Nilai in collaboration with Universitas Logistik dan Bisnis Internasional (ULBI) with the theme, “Harmony in Diversity: Fostering Unity Sustainable Research and Innovation Society.”

i-RIC 2024 aims to gather more researchers, students, government agencies, and private sectors in an event with a larger international impact. The organization of this program also serves as a platform for sharing research findings, ideas, and knowledge among members of polytechnics, community colleges, higher education institutions, public universities, as well as government and private agencies involved. Researchers, academics, and experts from various sectors will have a global stage at i-RIC 2024 to discuss the latest findings and research that support sustainable development goals. The conference aims to generate knowledge to make our world greener and better for us and our future generations.

There were 4 keynote speeches covering different areas of the conference. The first day started with Associate Professor Dr. Ir. Agus Purnomo (ULBI Indonesia) talk on "How to Boost Green Supply Chain Resilience?" and Professor Dr. Mohamed Kchaou (University of Bisha, Saudi Arabia; University of Sfax, Tunisia) on "Latex Based Membrane for Oily Wastewater Treatment Technology Process and Perspectives". The second day featured Professor Dr. Recai Kus (Selcuk University, Turkey) on "Load Optimization of AISI 1040 and AISI 5140 Joint" and Dr. Umawathy a/p Technamurthy (Universiti Kebangsaan Malaysia) with her talk on "Harnessing the Potential of Maker Education in Enhancing Student Learning Outcomes".

A total of 124 presenters participated in the parallel presentation sessions, which ran smoothly over the two-day event supported by 109 i-RIC 2024 organizing committees. This included 16 online presentation moderators, 42 reviewers, 19 judges, and all participants who took the time to attend the online sessions. A total of 124 research papers and 56 innovations were presented in this program across 7 fields, namely:

- A. Engineering and Technology
- B. Business Management
- C. Education, Teaching, and Learning
- D. Health and Life Sciences
- E. Social Sciences
- F. Information Communication Technology
- G. Logistics and Supply Chain

Information regarding i-RIC 2024 can be accessed through the Program Book at <https://heyzine.com/flip-book/521619ef82.html> and overall results can be found at <http://iric.polinilai.edu.my/.../confe.../results-innovation>.

We would like to express our heartfelt thanks and sincere appreciation to all the authors for their contributions to this publication. We also express our gratitude and appreciation to all of the reviewers for their constructive feedback on the papers. Warmest thanks to the members of the organizing committee for their hard work and dedication in ensuring the success of the event.

Congratulations to everyone involved in making this conference a success.

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LOGISTICS AND SUPPLY CHAIN MANAGEMENT

“HARMONY IN DIVERSITY: FOSTERING UNITY
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Analysis of Factors That Influence the Effectiveness of Hazardous and Toxic Materials Waste Warehouse Management at the Company PT Sinergi Mitra Lestari Indonesia

Muhammad Andrey Alfian, S. Log.¹, Dr. Erna Mulyati, S.T., M.T.²

^{1&2} Prodi S2 Manajemen Logistik, Fakultas Logistik Teknologi dan Bisnis ULBI,
Jl. Sariasih No.54 Kelurahan Sarijadi, Kecamatan Sukasari, Kota Bandung 40151, Indonesia

Abstract

This research aims to analyze the factors that influence the effectiveness of the hazardous and toxic materials waste warehousing and export process from PT Aneka Tambang carried out by PT Sinergi Mitra Lestari Indonesia. The research method used is a quantitative method which then explains and reveals the factors that influence the effectiveness of hazardous and toxic materials waste warehouse management. The data was processed using the factor analysis method. From the results of factor analysis, it was obtained that 7 factor components were formed that influence the effectiveness of hazardous and toxic materials waste warehouse management at PT Sinergi Mitra Lestari Indonesia. Of the seven factors, the one with the largest loading factor is storage capacity with a value of 0.875. This proves that storage capacity is the main factor influencing the effectiveness of B3 warehouse management at PT Sinergi Mitra Lestari Indonesia.

Keywords: Warehousing, Location of Warehouse, Warehouse Capabilites, Capacity, Hazardous and Toxic Materials Waste.

1. Introduction

Warehousing is an activity of storing goods, while a warehouse is a space for storing goods, which starts from the activities of receiving, recording, entering, storing, organizing, maintaining, issuing and distributing which ends in the responsibility report of the warehouse manager (Robiah Adawiyah, 2022). Effectiveness in warehouse management involves increasing productivity, reducing costs, optimizing resource use, and implementing best practices in organization, stock control, operational efficiency, risk management, and analysis and measurement (Arcelina Cindy Naomi, 2023). Warehouse management itself is an activity related to optimizing large warehouse capacity, warehouse location, speed of product selection, speed of loading and unloading, flow of goods in the warehouse, procedures for receiving and selecting products, maintenance procedures, work tools, warehouse security management, storage, product quality management, etc. (Haryono, 2020). Hazardous and toxic materials waste is a type of waste produced from industrial processes and other human activities that contains hazardous materials that can pose health and environmental risks (Pratama, 2023).

PT Sinergi Mitra Lestari Indonesia is a company that plays an important role in managing B3 waste in Indonesia, especially in warehousing and exporting hazardous and toxic materials waste. As a company engaged in hazardous and toxic materials waste management, PT Sinergi Mitra Lestari Indonesia provides adequate and safe warehousing services for hazardous and toxic materials waste produced by mining companies in Indonesia. One of the main clients of PT Sinergi Mitra Lestari Indonesia is PT Aneka Tambang, a leading mining company that produces various types of hazardous and toxic materials waste from its mineral extraction and processing activities. One of the wastes managed in the warehousing of PT Sinergi Mitra Lestari Indonesia for further export is ferronickel. Ferronickel waste is waste produced from the ferronickel production process, which contains dangerous and toxic materials such as heavy metals (nickel, chromium and

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cadmium) and chemical compounds that can pollute the environment and endanger human health if not managed properly (Sutikno, 2019).

As a hazardous and toxic materials waste management partner for PT Aneka Tambang, PT Sinergi Mitra Lestari Indonesia is responsible for managing this waste in a safe, efficient manner and in accordance with national and international regulations. Along with increasing industrial activity at the company PT Aneka Tambang, the volume of hazardous and toxic materials waste produced also continues to increase. Increasing ferronickel production without proper planning for waste handling can cause waste to accumulate in warehouse areas. This creates a challenge for PT Sinergi Mitra Lestari Indonesia to manage the flow of hazardous and toxic materials waste movement in the warehouse area before export without causing goods to pile up in the warehouse area. Dr. Ehrman (2021) found that ferronickel buildup in warehouses can lead to exposure to heavy metals, which poses a risk of causing respiratory problems and skin diseases for exposed workers.

Several previous researchers explained the factors that influence the effectiveness of hazardous and toxic materials waste warehouse management. Hartati (2019) stated that structured and consistently implemented SOPs in hazardous and toxic materials waste warehouses are very important to ensure that all waste handling processes are carried out in accordance with safety and environmental standards. Santoso (2020) explained that the effectiveness of hazardous and toxic materials waste warehouse management takes into account the selection of hazardous and toxic materials waste warehouse locations so that they are easy to access for transportation and monitoring. Novita (2021) emphasized the importance of training and education for all employees involved in B3 waste management. Every staff must be trained in safety procedures, storage techniques and emergency response to ensure they can handle hazardous and toxic materials waste safely and efficiently.

Fauzi (2022) emphasized that good inventory management can increase the operational efficiency of hazardous and toxic materials waste warehouses, with an effective inventory system, the process of receiving, storing and dispensing waste can be carried out more quickly and precisely. Putri et al (2024) added that good warehouse capabilities are very important for the safety and efficiency of hazardous and toxic materials waste management. This includes the ability to identify and manage risks, ensuring that all waste is stored and treated in accordance with regulations, as well as the ability to respond to incidents quickly and effectively. Based on previous research, this research was conducted to identify what factors influence the effectiveness of hazardous and toxic materials waste warehouse management, especially at PT Sinergi Mitra Lestari.

2. Body of Paper

This research uses qualitative and quantitative methods. The qualitative method used is descriptive, namely explaining and revealing the factors that influence the effectiveness of hazardous and toxic materials waste warehouse management. The quantitative method used is factor analysis, where this method is used to identify groups of variables that contribute significantly to the effectiveness of hazardous and toxic materials waste warehouse management. This method was chosen because it is suitable for describing the phenomena that occur and the relationships between the variables studied (Sugiyono, 2021). The factor analysis method was carried out with the help of SPSS software version 22. Research data was collected using a questionnaire containing a list of questions regarding factors that influence the effectiveness of hazardous and toxic materials waste warehouse management. Then, it was compiled based on the

results of questionnaires and interviews with 60 PT Sinergi Mitra Lestari warehouse employees. So, the sampling method used is a saturated sampling technique, where the entire population is taken as a sample. This technique was chosen because the population directly involved in managing hazardous and toxic materials is relatively small and allows it to be collected entirely (Arikunto, 2023).

Operationalization and Measurement of Variables

Table 1: Operationalization Variable

Variable	Dimensions	Indicator	Scale
Effective ness of Warehou se Manage ment	Location of Warehouse	Accessibility	Differential Semantic Scale
		Distance from port to warehouse	
		Distance between warehouse and residential area	
		Availability of supporting infrastructure	
		Warehouse location security and safety	
		Regulatory Compliance	
	Human Resources	Work motivation	Differential Semantic Scale
		Job satisfaction	
		Work experience	
		Qualifications and competencies	
		Occupational Health and Safety	
	Standard Operating Procedure	Receiving	Differential Semantic Scale
		Storage	
		Picking	
		Shipping	
	Warehouse capabilities	Capacity	Differential Semantic Scale
		Availability and quality of equipment	
		Technology and information systems	
		Emergency preparedness and response	
		Storage space management	
Inventory Management	Accuracy	Differential Semantic Scale	
	Availability		
	Stock rotation rate		
	Lead time		
	Storage costs		
	Shipping costs		

Source: Researcher 2024

Definition

- Warehouse Management Effectiveness: Warehouse Management Effectiveness is the ability to manage all aspects of warehouse operations including location of warehouse, human resources, standard operating procedure, warehouse capabilities, and inventory management.
- Location of Warehouse: Employee’s assessments of the effectiveness of warehouse locations start from accessibility, distance from the port to the warehouse, distance between the warehouse and residential areas, availability of supporting infrastructure, security and safety of the warehouse location, and regulatory compliance.
- Human Resources: Employee’s assessments of the effectiveness of the performance process start from work motivation, job satisfaction, work experience, qualifications and competencies, work health and safety.
- Standard Operating Procedure: Employee’s assessments of the effectiveness of SOP (Standard Operating Procedure) start from the activities of receiving, storage, picking, and shipping.
- Warehouse Capabilities: Employee’s assessments of the effectiveness of warehouse capabilities start from storage capacity, availability and quality of equipment, technology and information systems, emergency preparedness and response, and storage space management.

- f. Inventory Management: Employee’s assessments of the effectiveness of goods management in the warehouse starting from accuracy of availability, stock rotation rate, lead time, storage costs and shipping costs.

3. Results

Kaiser-Meyer-Olkin (KMO) and Bartlett’s Test

Table 2: Kaiser-Meyer-Olkin (KMO) and Bartlett’s Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.800
Bartlett's Test of Sphericity	Approx. Chi-Square	1084.873
	df	325
	Sig.	.000

Source: Processed by Researcher 2024

In the KMO and Bartlett's test table above, the KMO Measure of Sampling Adequacy value is 0.800 and the significance is 0.000. So, it can be ascertained that the data is suitable for factor analysis because it has a KMO value above 0.50 and a significance value far below 0.05 (Nani Sunarmi et. al, 2021).

Communalities Test

Table 3: Communalities Test

No.	Attribute	Extraction
1	Location of Warehouse	0.779
2	Human Resources	0.790
3	Standard Operating Procedure	0.764
4	Warehouse capabilities	0.807
5	Inventory Management	0.669

Source: Processed by Researcher 2024

In the communalities value based on the extraction column, the attribute value for Location of Warehouse is 0.779. This means that the variance value of this attribute is around 77%, which can be explained by the factors extracted in the factor analysis that will be formed. Similarly with other attributes, provided that the greater the communalities value of the attribute, the closer the relationship with the factors that will be formed.

Total Variance Explained

Table 4 Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10.266	39.486	39.486	10.266	39.486	39.486	6.157	23.679	23.679
2	2.838	10.916	50.403	2.838	10.916	50.403	3.561	13.694	37.374
3	1.757	6.757	57.160	1.757	6.757	57.160	2.965	11.404	48.777
4	1.455	5.598	62.758	1.455	5.598	62.758	2.498	9.608	58.385
5	1.220	4.692	67.450	1.220	4.692	67.450	1.532	5.893	64.278
6	1.130	4.348	71.799	1.130	4.348	71.799	1.518	5.838	70.116
7	1.062	4.085	75.884	1.062	4.085	75.884	1.500	5.768	75.884
8	.867	3.333	79.217						
9	.728	2.799	82.016						
10	.656	2.525	84.540						
11	.578	2.222	86.762						
12	.555	2.133	88.895						
13	.492	1.894	90.789						

Source: Processed by Researcher 2024

From the Total Variance Explained table shown above, the number of factors to be formed is determined by combining several criteria to get the number of factors that best suits the research. This stage identifies that the percentage of diversity can be explained by the factors formed. The criteria used are eigenvalues. Factors that have an eigenvalue of less than 1 are not good to include in the model. From the results of the table above, eigenvalues that have more than one value are found in indicators 1 to 7. Meanwhile, indicators 8 and so on are said to be not good because they have eigenvalues below 1. From these results, the number of factors used is 7. The total variance that can be explained by these 7 factors is 75.884%.

Rotated Component Matrix

Table 5 Rotated Component Matrix

Rotated Component Matrix ^a							
	Component						
	1	2	3	4	5	6	7
PA1	,062	,039	-,051	,244	-,182	,815	,203
PA2	,804	,111	,222	-,106	-,052	,114	,155
PA3	,480	,287	-,318	,109	,409	-,038	,485
PA4	,515	,269	,351	,189	,456	-,033	,000
PA5	,241	,303	,814	-,006	-,113	,127	,041
PA6	,439	,248	,699	,130	,126	-,084	,117
PA7	,336	,492	,413	-,002	,359	,309	,309
PA8	,329	,749	,391	,007	,002	,060	,107
PA9	,531	,609	,236	,086	,109	,183	-,026
PA10	,403	,470	,362	,409	-,041	-,178	,221
PA11	,633	,588	-,117	,063	-,184	-,055	-,172
PA12	,224	,724	,102	,045	,056	,236	-,307
PA13	,173	,720	,279	,205	,147	-,265	,052
PA14	,744	,185	,222	,286	,075	,015	-,094
PA15	,494	,249	,638	,167	,157	-,210	-,100
PA16	,875	,108	,099	,017	-,028	-,052	,218
PA17	,741	,262	,202	-,008	,172	,136	-,136
PA18	,105	,108	-,038	,817	,009	,017	-,019
PA19	,794	,150	,181	,197	,125	,015	,024
PA20	,539	,177	,375	,199	,264	,441	-,190
PA21	-,009	,247	-,198	,561	,038	,308	,258
PA22	,136	-,100	,266	,681	-,193	,297	-,025
PA23	,003	-,014	-,022	,299	-,750	,153	,137
PA24	,733	,336	,174	-,020	-,095	,084	,283
PA25	,105	-,168	,110	,188	-,166	,212	,715
PA26	-,024	,050	,300	,617	-,329	-,050	,318

Source: Processed by Researcher 2024

It can be seen in the table above that the results obtained show that the loading factor values between a variable and several factors are sufficiently differentiated and ready for interpretation. All variables have a high loading factor on one factor and have a fairly small loading factor for the other factors. The results of the factor analysis showed that 7 factor components formed influenced the effectiveness of hazardous and toxic materials waste warehouse management at PT Sinergi Mitra Lestari Indonesia. Then, it can be seen that the value with the highest indicator is 0.875, which means that warehouse capacity is the main factor that influences the effectiveness of hazardous and toxic materials waste warehouse management at PT Sinergi Mitra Lestari Indonesia. Furthermore, the factor that has the second highest indicator is Technology and Information Systems with a value of 0.817 so it can be said that this factor is the second dominant factor that

influences the effectiveness of hazardous and toxic materials waste warehouse management at PT Sinergi Mitra Lestari Indonesia. Then, followed by accessibility which is the third dominant factor that influences the effectiveness of hazardous and toxic materials waste warehouse management at PT Sinergi Mitra Lestari Indonesia with a value of 0.815.

4. Implications and Direction for Future Research

Implications

Based on the results of factor analysis conducted by researchers, it was found that the storage capacity at this company needs to be increased further considering that the hazardous and toxic materials waste warehouse requires a large area to avoid the risk of leaks, contamination and other dangers. Then, it is important to ensure that waste does not accumulate for too long and can be processed or exported on schedule. It is necessary to increase warehouse capacity because with the right capacity, storage space can be optimized for efficient storage, maximizing space use without compromising safety. Then, after the warehouse capacity has been expanded, the company needs a more sophisticated information and technology system to keep up with global competition. This is to make it easier to record and track every item of hazardous and toxic materials waste entering and leaving the warehouse with high accuracy, reducing the risk of errors in inventory management and ensuring compliance with strict regulations. Accessibility at this company's hazardous and toxic materials waste warehouse also needs to be improved because good accessibility also includes easy access to supporting services such as waste processing facilities, special transportation services for hazardous and toxic materials waste, and related administrative facilities.

Directions for Future Research

Optimizing the hazardous and toxic materials waste warehousing and export process at PT Sinergi Mitra Lestari Indonesia is an important strategic step to face existing operational and regulatory challenges. Future research is expected to find the right strategy, which can improve operational performance, reduce costs, and minimize environmental risks, thereby contributing to more efficient and sustainable hazardous and toxic materials waste management.

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