Optimizing Inventory Management: A Strategic Approach Using House of Risk and Analytical Hierarchy Process for Obsolescence Reduction

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Abstract

Obsolescence usually occurs in companies because the material has an expiration period or commonly called phase out which is caused by frequent changes in production models in a fast period of time so that material changes are also needed, causing excessive amounts of inventory. PT XYZ is a company engaged in the production of household appliances. Therefore, due to the many variations required, there is inventory between production processes due to the flow of material processes and the flow of information through an improper system, which ultimately causes obsolescence for the company. The formulation of the problem in this study is how to overcome obsolescence using the HOR and AHP methods to reduce the amount of inventory at PT XYZ. The purpose of this study is to identify and analyze the risks that may occur in supply chain activities on obsolescence materials at PT XYZ using the HOR method and AHP weighting. The method used in this research is a qualitative approach. The informants in this study consisted of 3 informants, namely buyer asst manager, quality, and procurement. The research results obtained from the HOR method are 6 risk events, and 14 risk agents and based on AHP weighting there are 4 alternative solutions to deal with these problems, namely modification, scrapping, wholesaling, and elimination.

Keywords: Risk, Inventory, Obsolescence, HOR, AHP

1. Introduction

The supply of goods consists of raw materials for production, semi-finished products and finished goods. For manufacturing companies, well-controlled inventory management is essential to ensure smooth sales and production performance and prevent customers from switching to competitors (Karim & Nawawi, 2018). Obsolescence occurs in companies because the material has an expiration period or commonly called phase out. In addition, it can also be caused by frequent changes in production models in a fast period of time so that material changes are also needed, causing excessive amounts of inventory so that it is necessary to maintain to minimize the inventory.

PT XYZ is a Dutch company that produces household appliances, such as mother and child care, and there are also men's care shavers, and finally household needs, namely irons, which have both domestic and foreign demand. These products use the main raw material of resin which is then processed through the production process and becomes a certain product requirement in the form of plastic of various sizes. Therefore, due to the many variations required, inventory arises between production processes due to the flow of material processes and the flow of information through an improper system, which ultimately causes obsolescence for the company. To overcome the high amount of inventory value, PT XYZ has established several efforts to overcome it, namely by implementing inventory control, using alternative materials, SMOI (Self-Managed Supplier-Owned Inventory). These efforts will allow the company to control quality in the production process, as well as reduce additional costs for stock storage of goods or materials, and avoid the accumulation of unused or unused goods or materials in the production process. The formulation of the problem in this study is how to overcome obsolescence by using the HOR and AHP methods to reduce the amount of inventory at PT XYZ.

In this study there are two benefits, namely practical and theoretical benefits, practically the results of this study are expected to be useful and become input for the company and provide suggestions for improvements to the company to minimize or reduce the risks that will occur due to the accumulation of obsolescence in the material in order to increase the company's operational efficiency. While the theoretical benefits in the research conducted are expected to expand insight and understanding, science and as a study material for researchers in the development of knowledge that has been obtained during lectures, especially in the field of manufacturing industry so that it can be used as input to conduct further research. Then this research can be used as a source of reference and information for readers and for future researchers who want to conduct research related to this topic.

To limit the scope of the study to stay within the main objective, which is to only focus on the effectiveness of implementing obsolescence management in the supply chain. Obsolescence in the supply chain is an important strategy to improve operational effectiveness, focusing on effective and efficient inventory management, and can reduce costs, improve quality.

2. Literature Review

Obsolescence Management

Obsolescence is a term used to describe the process or state in which a piece of equipment is no longer useful, or its functionality no longer matches the latest developments, and is no longer available for production or repair (Hagan, 2015).

Inventory

Inventories are stocks of goods and resources used by companies to conduct operations and production. Inventory is usually the largest asset in the statement of position finance, and companies usually try to keep inventory levels low because they are difficult to cash in or cash out (Jacobs and Chase, 2016). Material obsolescence can lead to an increase in inventory, which in turn will increase storage costs. This theory confirms the importance of identifying and mitigating obsolescence risk to minimize inventory.

Risk Management

Risk management is a field that studies how to identify and measure each problem in a systematic way (Fahmi, 2010). Risk management is a method to manage risk by anticipating losses, by designing procedures to overcome losses in material form (Vaughan, 2008). This theory presents a conceptual framework for understanding the importance of risk management, including material obsolescence risk in the supply chain.

House of Risk Method

According to Geraldine and Pujawan (2009), there are two phases to the House of Risk: HOR phase 1 determines which risk agents need to be prioritized for prevention, and HOR phase 2 determines effective prevention measures for these priorities by considering the financial situation and availability of resources. Risk management is based on a preventive focus on reducing the likelihood of risk agents in the HOR model. So, identifying events and risk factors is the first step. One factor can usually result in multiple risk events. Tailored to the FMEA method, the risk assessment used is the risk priority number (RPN), which consists of three factors: likelihood of occurrence, severity of impact, and detection. With the HOR method, only the likelihood for the risk agent and the severity of the risk event. Due to the possibility of one risk agent causing more than one risk event, the sum of the risk potentials of all risk agents is required.

Analytical Hierarchy Process Method

Analytical Hierarchy Process (AHP) is an analysis and synthesis technique that can support the decision-making process. AHP is a powerful and accurate decision-making tool because it has a predetermined scale or weight and uses a three-level hierarchy: objectives, criteria, and alternatives. (Abdullah & Pangestika, 2018). Analytical Hierarchy Process (AHP) is a decision-making technique designed to prioritize several alternatives when several criteria need to be considered. The scale value used is a scale of 1 to 9 in accordance with its understanding. A further description of the steps used in the Analytical Hierarchy Process (AHP) method is as follows: 1. A hierarchical arrangement is a problem designed to support decision-making by considering all the decision components involved in the system. Breaking down a complex problem into smaller parts will make it easier to understand. 2. Prioritization Relative Measurement: Comparing all criteria for each subsystem of the hierarchy in pairs is the best way to assign priority elements in decision making. Eigenvalue and Eigenvector are arranged in a matrix to determine which criteria are significant. After the formation of the comparison matrix for each group of criteria, the next step is to calculate the priority level of each criterion. The results of this calculation produce a decimal number below one, which indicates that the total priority level for all criteria in the group is equal to one. For the matrix calculation, that is:

Description: $A.w = \lambda.w$

(Sumber: T.L. Saaty, 1993)

W: Eigenvector

Λ: Eigenvalue

A: Matrix

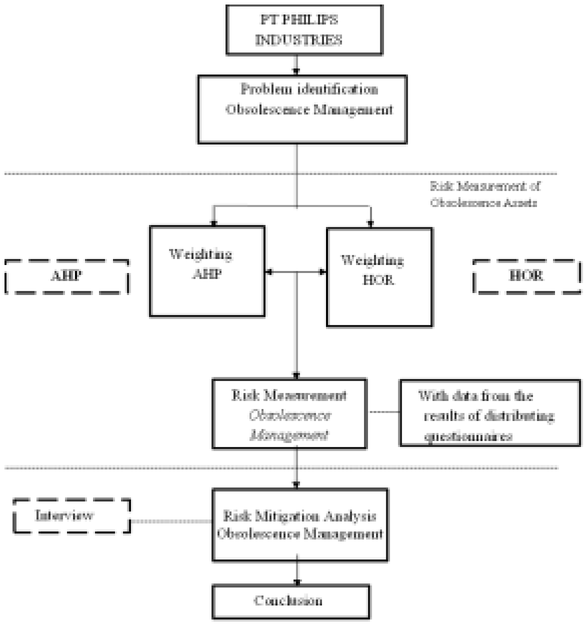
3. Consistency

The square eigenvector is the characteristic vector of the rectilinear matrix, while the eigenvalue is the characteristic matrix. It is used as a tool to determine the priority level of each comparison matrix in the model because this method is more accurate and takes into account all interactions between criteria in the Analytical Hierarchy Process (AHP) comparison matrix. Regardless, this technique can be difficult to use manually, especially if the matrix meets three or more criteria and requires the help of a computer program to solve.

4. Prioritization Synthesis

In order to get a complete set of priorities for a decision problem, weighting and calculations need to be done in order to make a single number that proves the priority of each component.

3. Research Method



Source: Research Results, 2024

This research is a study using a qualitative approach because it makes observations by identifying and analyzing. qualitative research is research to find out the events felt by research subjects, for example motivation, behavior, perceptions, and other behaviors as a whole and descriptively in special situations using various natural techniques (Sugiyono, 2015).

The type of data used in this study, namely the first primary data, primary data is data or information obtained by researchers directly by conducting interviews and distributing questionnaires to trusted sources and experts in their fields. The second data is secondary data, which is data used to support research obtained from previous literature.

The sample in this study amounted to three experts who were directly related to the company's supply chain activities, namely Buyer, Lead Quality, Procurement. The sampling technique used in this study was purposive sampling (Sugiyono, 2016). Purposive sampling is a data source sampling technique with a consideration. The following are the criteria for sampling: An expert in the company and knows in detail the obsolescence activities at PT XYZ and has a job desc related to obsolescence activities.

Data analysis techniques in this study, analysis is carried out to deal with the risks that arise due to high inventory caused by product obsolescence using the House of Risk (HOR) and Analytical Hierarchy Process (AHP) methods.

4. Results and Discussion

Two discussions are obtained in this study, namely, in the first stage a discussion of the results of risk identification using the House of Risk (HOR) method and for the second stage regarding the results of weighting superior alternatives using the Analytical Hierarchy Process (AHP) method.

Risk Identification

Identify and calculate risk events and risk agents. This calculation is carried out to ensure the severity scale of the risk event identification results and to ensure the occurance scale of the risk agent. This calculation is done by distributing questionnaires. Then the results of the calculation.

Table 1. Identification of risk events and risk agents

Activities	Risk Event	Code	Risk Agent	Code
Check Internal	Check the stock quantity of obsolescence materials or components	E1	Total stock of obsolescence material has increased	A1
			Material obsolescence is still in store even though the data has been deleted in the system	A2
	Financial cost check	E2	Material obsolescence has decreased performance	A3
Inspection External	Material condition inspection obsolescence	E3	Store room conditions are getting hotter and more claustrophobic	A4
			Dust-covered material obsolescence	A5
			Material obsolescence lost	A6
			Material obsolescence is damage	A7
			Store capacity is getting smaller	A8
	Inspection of store inventory condition	E4	Store room conditions are getting hotter and more claustrophobic	A9
			Air pollution due to too much dust on obsolescence materials	A10
	Employee condition inspection	E5	Inhalation of dust from materials obsolescence	A11
			Material pile fall obsolescence	A12
Care	Material obsolescence treatment	E6	Increase the burden and responsibility of employees	A13
			Employee has a work accident	A14

Source: Research Results, 2024

Based on the identification table above, there are 3 activities, with 6 risk events, and 14 risk agents. Then further generated to identify the level of impact (Severity) and identification of risk causes (Risk Agent) with a scale of 1 to 10.

Table 2 Risk event identification results

Risk Event	Code	*Severity*
Check the stock quantity of materials or components obsolescence	E1	7
Financial cost check	E2	8
Material condition inspection *obsolescence*	E3	6
Inspection of store inventory condition	E4	7
Employee condition inspection	E5	7
Material obsolescence treatment	E6	6

Source: Research Results, 2024

Table 3 Risk event identification

Risk Agent	Code	Occurance
Total stock of obsolescence material has increased	A1	5
Material obsolescence is still in store even though the data has been deleted in the system	A2	5
Material support facility costs obsolescence accrues	A3	5
Material obsolescence has decreased performance	A4	7
Dust-covered material obsolescence	A5	8
Material obsolescence is lost	A6	7
Material obsolescence is damage	A7	7
Store capacity is getting smaller and smaller	A8	8
Store room conditions are getting hotter and more claustrophobic	A9	8
Air pollution due to too much dust on obsolescence materials	A10	6
Inhalation of dust from materials obsolescence	A11	6
Material pile fall obsolescence	A12	6
Increase the burden and responsibility of employees	A13	6
Employee has a work accident	A14	5

Source: Research Results, 2024

House of Risk Phase 1

The identification results show that 6 risk events and 14 risk agents. Get different assessments on severity and occurance. Then, it is necessary to calculate the Aggregate Risk Potential (ARP) to determine the order in priority, in order to obtain the calculation results in the House of Risk Phase 1. The calculation of the ARP value is carried out as a consideration to determine the priority of risk agents that need to be addressed first. ARP value calculation can be done using equation. Below is an example of how to calculate the ARP value.

$ARPj = Oi \sum Si Rij$

ARP1 = 5 [(9x7) + (3 x 8) + (3 x 6) + (1 x 7) + (1x7) + (3x6)]

ARP1 = 5[63+24+18+7+7.+18 = 685

Table 4 Calculation House of Risk Phase 1

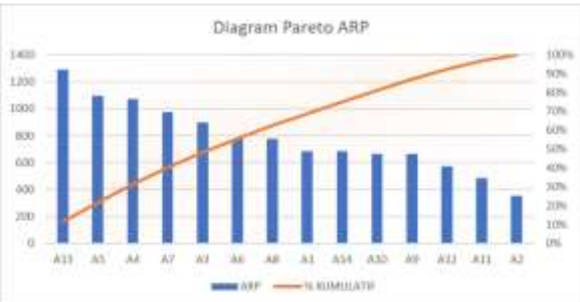
	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12	A13	A14	Severity (Si)
E1	9	3	3	3	3	3	1	3	1	3	1	3	9	3	7
E2	3	3	9	3	1	3	3	3	3	1	1	1	1	1	8
E3	3	1	9	3	3	3	3	1	1	1	1	1	1	1	6
E4	1	1	1	9	9	3	9	3	3	9	3	3	3	3	7
E5	1	1	1	3	3	3	3	1	1	1	3	3	9	9	7
E6	3	1	3	1	1	1	1	3	3	1	3	3	9	3	6
Occurance (Oj)	5	5	5	7	8	7	7	8	8	6	6	6	6	5	
Aggregate Risk Potential (ARP)	685	355	895	1071	1096	777	973	776	664	666	486	570	1290	685	10989
Priority Rank of Agent (Pj)	8,5	14	5	3	2	6	4	7	11	10	13	12	1	8,5	

Source: Research Results, 2024

Based on table 4 HOR phase 1 above, the result of the Risk Agent with the lowest aggregate risk potential value is the highest Risk potential is Risk Agent A13, namely Increasing the burden and responsibility of employees. Meanwhile, the risk agent with the lowest aggregate risk potential value is risk agent A2, namely Material obsolescence still exists in the store even though the data has been deleted in the system. After obtaining the dominant risk agent, the next step is to evaluate the risk.

This risk assessment aims to determine the main risk factors that must be addressed based on the aggregate risk potential values that have been processed previously. Pareto diagrams are used to conduct risk assessments. Pareto diagrams sort data categories from left to right based on the highest to lowest ranking. Pareto diagrams help find problems that make them a priority for handling.

Figure 1 Pareto diagram



Source: Research Results, 2024

House of Risk Phase 2

HOR phase 2 is the second stage of the HOR method. In this phase, preventive action strategies are developed against the risk causes that have been previously selected in HOR phase 1. The steps of HOR phase 2 start with determining the risk agent, then creating a response strategy to the selected risk agent, determining the correlation value between the response strategy and the risk agent, and

determining the total Effectiveness (TEk) value, by determining the degree of difficulty of implementing a corrective action and finally calculating the overall effectiveness ratio value, or Effectiviness to Difficulty of Ratio (ETDk) ratio, of the prioritized action determined by the existing strategy.

Table 5 Risk Mitigation Strategy Plan

Code	Mitigation Risk	Scala
PA1	Conduct regular inventory	3
PA2	Identify materials that will have OBS potential	3
PA3	Evaluate the inventory management policy	3
PA4	Conduct standard setting to determine the expiration period of materials	4
PA5	Ensure the packaging on the material is always in a safe state from the entry of dust	3
PA6	Place material orders in accordance with the	3
PA7	Organize the layout of stored items	3
PA8	Use appropriate PPE to avoid inhaling dust	3
PA9	Conduct retraining activities for employees	3
PA10	Conduct training and evaluation to employees	3
PA11	Conduct training to always apply the correct safety procedures.	3

Source: Research Results, 2024

Table 6 House of Risk Phase 2

	PA1	PA2	PA3	PA4	PA5	PA6	PA7	PA8	PA9	PA10	PA11	ARP
A13	1	1	1	1	1	9	1			3	3	1290
A5	1	3		1	9	3	3	9	1		1	1096
A4				1	9	3	9	1				1071
Total Effectiveness of action	2386	4578	1290	3457	20793	18111	14217	10935	1096	3870	4966	
Degree of Difficulty Performing Action	*3*	*3*	*3*	4	3	3	3	3	3	3	3	
Effectiveness to Difficulty Ratio	*795,33*	*1526*	*430*	864,25	6931	6037	4739	3645	365,333	1290	1655,33	
Rank Priority	*9*	*6*	*10*	*8*	*1*	*2*	*3*	*4*	*11*	*7*	*5*	

Source: Research Results, 2024

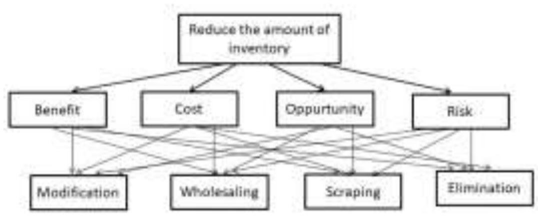
Based on table 6 above and considering the effectiveness of mitigation strategies when implemented, four mitigation strategies are identified as preferred mitigation strategies. Therefore, the main improvement strategies that can be implemented are Ensuring that the packaging on the material is always in a safe state from dust ingress (PA5), Ordering materials according to the qty required (PA6), Organizing the layout of stored goods (PA7), Using appropriate PPE so as not to inhale dust (PA8).

AHP weighting

The calculation of the AHP method begins with the creation of a pairwise comparison matrix that describes the relative contribution of the influence of each element on each criterion objective. Data on pairwise comparisons of provider selection were obtained through questionnaires distributed to three respondents, namely asst manager buyer, quality, procurement. The function of this AHP method is to help determine the best alternative to the obsolescence problem. This method is supported by using software from Microsoft excel in processing data.

After collecting the ratings of the three respondents, then averaging the results using (geometric mean). This happens because AHP only requires one answer for the comparison matrix. The following are the results of the pairwise comparison matrix:

Figure 2 Hierarchical structure



Source: Angga Priyambada, 2020

Calculating the AHP Method Between Criteria, after collecting the ratings of the three respondents, then averaging the results using (geometric mean). This happens because AHP only requires one answer for the comparison matrix. The following are the results of the pairwise comparison matrix:

Table 7 Results of Pairwise Comparison Matrix Value between Criteria

	Benefit	***Cost***	***Oppurtunity***	***Risk***
Benefit	1.00	1.913	4.48	6.07
Cost	0.523	1.00	4.22	6.07
Oppurtunity	0.223	0.237	1.00	1.91
Risk	0.165	0.165	0.523	1.00
Total	1.910	3.314	10.221	15.059

Source: Research Results, 2024

Table 8 Calculation results of priority weight between criteria

	Benefit	***Cost***	***Oppurtunity***	***Risk***	**Jumlah**	**Prioritas**
Benefit	0.52	0.58	0.44	0.40	1.94	0.486
Cost	0.27	0.30	0.41	0.40	1.39	0.348
Oppurtunity	0.12	0.07	0.10	0.13	0.41	0.103
Risk	0.09	0.05	0.05	0.07	0.25	0.063
Total	1.00	1.00	1.00	1.00	4.00	1.000

Source: Research Results, 2024

Table 9 CI Calculation Results Between Criteria

Prioritas	Eigen Vektor	Lambda	Lambda maks	CI	CR
0.486	1.999	4.116	4.1	0.020	0.023
0.348	1.422	4.089			
0.103	0.415	4.020			
0.063	0.255	4.018			
1.000	4.090	16.243			

Source: Research Results, 2024

Alternatives on Benefit Criteria

Table 10 Comparison Results between Alternatives on Benefit Criteria

	MODIFICATION	*WHOLESALING*	*SCRAPPING*	*ELIMINATION*
MODIFICATION	1.00	7.652	2.091	5.944
WHOLESALING	0.131	1.00	2.520	1.587
SCRAPPING	0.478	0.397	1.00	1.587
ELIMINATION	0.168	0.630	0.630	1.00
Total	1.777	9.679	6.241	10.12

Source: Research Results, 2024

Alternatives on Cost Criteria

Table 11 Results of Inter-Alternative Comparison on Cost Criteria

	MODIFICATION	*WHOLESALING*	*SCRAPPING*	*ELIMINATION*
MODIFICATION	1.00	2.76	3.17	4.16
WHOLESALING	0.36	1.00	3.56	3.68
SCRAPPING	0.31	0.28	1.00	2.62
ELIMINATION	0.24	0.27	0.38	1.00
Total	1.92	4.31	8.11	11.46

Source: Research Results, 2024

Alternatives on Oppurtunity Criteria

Table 12 Results of Inter-Alternative Comparison on Oppurtunity Criteria

	MODIFICATION	*WHOLESALING*	*SCRAPPING*	*ELIMINATION*
MODIFICATION	1.00	1.69	1.53	3.56
WHOLESALING	0.59	1.00	0.78	4.72
SCRAPPING	0.65	1.29	1.00	2.88
ELIMINATION	0.28	0.21	0.35	1.00
Total	2.53	4.19	3.65	12.16

Source: Research Results, 2024

Alternatives on Risk Criteria

Table 13 Results of Inter-Alternative Comparison on Risk Criteria

	MODIFICATION	*WHOLESALING*	*SCRAPPING*	*ELIMINATION*
MODIFICATION	1.00	1.687	0.585	0.669
WHOLESALING	1.233	1.00	1.651	0.693
SCRAPPING	1.710	0.606	1.00	0.585
ELIMINATION	1.494	1.442	1.710	1.00
Total	5.437	4.735	4.946	2.948

Source: Research Results, 2024

Overall Consistency Index (CR)

This consistent measurement is used to detect inconsistencies in the answers given by respondents. If the number of CR < 0.1 then the value of the pairwise comparison given is consistent, but on the contrary if the number of CR > 0.1 then it is inconsistent.

Table 14 Overall CR

Perbandingan Berpasangan	CR	Keterangan
Antar Kriteria	0.023	Konsisten
Alternatif Berdasarkan Atribut *Benefit*	0.17	Konsisten
Alternatif Berdasarkan Atribut *Cost*	0.08	Konsisten
Alternatif Berdasarkan Atribut *Oppurtunity*	0.30	Konsisten
Alternatif Berdasarkan Atribut *Risk*	0.622	Konsisten

Source: Research Results, 2024

The results of prioritization and consistency testing for the level of criteria, and alternatives as a whole are declared consistent, because the value obtained from the Cosistency Ratio (CR) is below the standard provisions of the AHP method, which is <0.1. The geomean formulation is used to calculate the results of combining respondents' opinions. The results of individual respondents' assessments are measured by geometric mean, and used to determine the results for a particular group. The geometric mean formula:

GM =$n \sqrt{R1\ X\ R2\ X\ R3}$

GM: Geometric mean

R: Respondent

N: Number of Respondents

Weighted Prioritization of Options against Criteria
After each criterion and alternative is identified, a synthesis is carried out to determine the total weight of the alternative from the existing criteria. By multiplying the average priority weight to get the total global priority value. Global priority is a result that shows the weight value for each alternative choice. The weighting results show that the best alternative weights are:

Table 15 Global Priority

	Benefit	*Cost*	*Oppurtunity*	*Risk*	**Bobot Kriteria**
Bobot Alternatif	0.485	0.347	0.103	0.063	1
Modification	0.569	0.479	0.378	0.221	0.495
Wholesaling	0.184	0.295	0.268	0.252	0.235
Scrapping	0.157	0.145	0.269	0.211	0.167
Elimination	0.090	0.081	0.085	0.316	0.100
Jumlah	1	1	1	1	1
				Jumlah	

Source: Research Results, 2024

Table 16 Overall Alternative Weight

Alternatif	Bobot	Rank
Modification	0.495	I
Wholesaling	0.235	II
Scrapping	0.167	III
Elimination	0.100	IV

Source: Research Results, 2024

In table 16, the alternative solution for obsolescence with the highest result is an alternative solution to modification with a global priority weight result of 0.8248, so the modification alternative solution is the alternative with the highest value based on the priority results with matrix constraints.

Previous research by Angga Priyambada in 2020 entitled "Risk Management and Decision Analysis of Obsolete Mechanichal Material Solutions Using the HOR and ANP Methods" focused on managing obsolete materials at PT XYZ using the House of Risk (HOR) and Analytic Network Process (ANP) methods, while the current research focuses on obsolescence in the supply chain using the HOR and AHP methods. The AHP method is used to help identify and prioritize each criterion in a hierarchical arrangement in a more structured and simple way than ANP.

5. Conclusion

a) How to overcome obsolescence using the HOR method. Based on the results of the questionnaire from expert respondents, namely buyers, the results of phase 1 HOR, namely the risks that have been identified in obsolescence, have been obtained as many as 6 risk events and 14 risk agents that may occur. Then after calculating ARP, the 14 risk agents obtained 3 dominant risk agents. The three dominant risk agents are increasing the burden and responsibility of employees (A13), material obsolescence covered with dust (A5), and material obsolescence experiencing decreased performance (A4).

Furthermore, the calculation of HOR phase 2 is based on the three dominant risk agents in HOR phase 1. Identifying mitigation actions to overcome risk agents, there are 11 risk mitigation actions. Of the 11 mitigation actions by considering the effectiveness of the mitigation action in its implementation, four dominant risk mitigation strategies were obtained, namely ensuring that the packaging on the material is always in a safe condition from dust ingress (PA5), ordering materials according to the quantity needed (PA6), organizing the layout of stored goods (PA7), using appropriate PPE so as not to inhale dust (PA8).

b) How to overcome obsolescence with the AHP method is after identifying the problem using a hierarchical structure consisting of objectives, 4 criteria and 4 alternatives. After calculating the priority weight and consistency, there are four criteria that become a reference in the alternative selection process, namely benefit, cost, opportunity, risk. Then it is produced for the weight with the first priority, namely the benefit criterion has a priority weight value of 0.485 because this criterion is very important in determining the quality of the raw materials used. High quality raw materials can ensure the success of the production process, reduce errors, and expedite production process activities. While the cost criteria with a priority weight value of 0.347, opportunity with a priority weight value of 0.103, and risk with a priority weight value of 0.063 have a lower weight because factors such as cost, opportunity, risk have a more limited impact in determining the quality of ideal raw materials.

From the results of the overall calculation using global priorities, the overall result is that modification can be used as an alternative to the obsolescence problem, and has the highest weight result of the other four alternatives, namely with a weight value of 0.495 so that it becomes the top priority. Because modification allows to extend the life of existing products by updating or replacing certain parts that are no longer available or obsolete, so it can be a proposal to overcome obsolescence to reduce the amount of inventory.

For the company is to be able to implement and consider the proposed main risk mitigation strategies given, and be able to pay attention or make careful improvements to the risks that might occur in order to avoid losses and minimize the occurrence of risks. And for calculations on AHP weighting so that it can be taken into consideration for companies in making alternative proposals to reduce the amount of inventory. For further researchers, it is hoped that for using the Failure Mode and Effects Analysis (FMEA) method.

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