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Optimization of Operational Risk Management in a Stationery Company through the House of Risk Approach

Christabel Priscilla Sihombing[1], Christian Thomas[1], Dellyza[1], Kent Manuel Haryono[1], Marcia Jocelyn[1], Riveren Elvina[1], Safriyana[1*]
[1]School of Business and Economics, Universitas Prasetiya Mulya, BSD City, Serpong - Tangerang 15339, Indonesia
13112310116@student.prasetiyamulya.ac.id[1], 13112310117@student.prasetiyamulya.ac.id[1], 13112310072@student.prasetiyamulya.ac.id[1], 13112310195@student.prasetiyamulya.ac.id[1], 13112310432@student.prasetiyamulya.ac.id[1], 13112310458@student.prasetiyamulya.ac.id[1], safriyana@prasetiyamulya.ac.id[1*]

Abstract

This study aims to identify the operational risks faced by CV BMS as an office stationery retail company and to develop appropriate risk mitigation strategies. The problem addressed in this research is the high level of competition and supply chain complexity that can disrupt the company's operational continuity. To address these issues, the House of Risk (HOR) approach is utilized, consisting of two phases: the first phase is used to identify and map risk agents and risk events based on their severity and probability of occurrence, while the second phase is used to formulate effective and efficient risk mitigation strategies. The research was conducted through a case study using survey techniques, employing both qualitative and quantitative approaches, involving interviews, observations, and secondary data collection. The results indicate that several key risk agents contribute significantly to potential operational disruptions, such as supplier delays, demand fluctuations, and human error. The resulting mitigation strategies focus on integrated preventive actions and priorities based on effectiveness and cost-efficiency. The managerial implications of this study highlight the importance of a structured risk management system in supporting the company's operational sustainability amidst intense competition in the retail industry.

Keywords: risk agents, House of Risk, operations, risk events, stationery retail.

INTRODUCTION

Currently, the retail industry in Indonesia is projected to achieve a Compound Annual Growth Rate (CAGR) of 4.73% from 2024 to 2028. This surge in revenue is predicted to reach USD 49.56 billion (Pramudya, 2025). One category within the retail industry is the stationery store. This positive growth is supported by several catalysts, such as digitalization, which enhances digital sales, and a continuously growing population that increases the volume of demand year by year. However, the retail industry is categorized as highly competitive due to the large number of players and fierce price wars (Hsiao & Xiong, 2022; Bonfrer et al., 2022).

This high level of competition necessitates the retail industry to minimize the occurrence of risks throughout its operational activities and highlights the crucial role of its supply chain. This is evidenced by research from Gopal et al. (2022), which shows the influence of data availability on the success of the retail supply chain. This data availability may include raw material procurement processes, production volume and capacity, and distribution channels. The success of a supply chain is characterized by increased efficiency in business operations or improved financial conditions. The positive growth of a company demonstrates its success in minimizing existing risks, such as fluctuations in consumer demand, dependence on suppliers, and others.

On the other hand, the stationery retail industry faces specific challenges that require attention. Several frequently arising issues include seasonal demand fluctuations, uncertainty in the availability of certain products, price increases from distributors, and low product innovation, which drives even tighter price competition. Dependence on single suppliers for certain product types also increases potential operational risks, particularly during supply delays or surges in raw material prices. Furthermore, suboptimal inventory management often becomes an obstacle, considering that stationery demand tends to peak during specific periods, such as the start of the new academic year or exam seasons. Therefore, companies in this sector need to implement planned risk mitigation strategies to maintain supply chain smoothness and operational stability.

As a company operating in the office stationery (ATK) retail industry, CV BMS is a suitable subject for analysis. Given the high competition in the ATK sector and varied operational risks, an analysis will be conducted to identify risks that may arise at CV BMS and provide recommendations for risk mitigation actions to minimize potential risks. One approach that can be utilized to analyze and manage operational risks systematically is the House of Risk (HOR). This model has been widely applied across various industrial sectors to map the relationship between risk agents and risk events and to determine the priority of mitigation actions based on the probability of occurrence and the magnitude of the risk's impact. This approach is considered effective as it integrates both qualitative and quantitative analysis in risk assessment.

Based on previous studies, the House of Risk (HOR) model has proven relevant in managing risks within supply chains and company operations. Research by Ulfah (2021) in the furniture industry demonstrates that this model is capable of identifying risk events and formulating targeted mitigation strategies, thus confirming the flexibility and effectiveness of the House of Risk (HOR) in various industrial sectors. Nevertheless, studies regarding its application within the context of the office stationery industry remain limited. Therefore, this research plays an important role in helping the company develop a structured operational risk mitigation strategy.

This study aims to identify the primary risk agents affecting the operations of an office stationery company and to determine mitigation strategies based on risk priorities using the House of Risk (HOR) model. The author utilizes a case study research method at CV BMS, an ATK company, involving direct interviews and field observations. Additionally, this research utilizes secondary data, including scientific studies and other relevant data sources, to strengthen the analysis. The analytical process is conducted using House of Risk (HOR) Phase 1 for risk mapping and House of Risk (HOR) Phase 2 for determining mitigation strategies. With this approach, it is expected that the company will be better able to anticipate risks and improve operational performance sustainably.

LITERATURE REVIEW

In conducting operational activities, every company inevitably faces various risks that potentially disrupt business process continuity. These risks can emerge from both internal and external sources. On the operational side, the most common challenges include errors in production processes, distribution bottlenecks, and market demand fluctuations. In this context, it is crucial for companies to perform comprehensive risk identification and management.

Safriyana et al. (2019) emphasize that systematic risk evaluation within the supply chain can help reduce potential operational losses. Research by Chowdhury et al. (2019) also demonstrates that small and medium enterprises (SMEs) that actively implement risk mitigation strategies tend to achieve more stable and efficient operational performance. This is further supported by the findings of Jagoda & Wojcik (2019), which highlight the importance of risk management in supporting corporate sustainability, particularly in the energy sector.

One popular approach to managing operational risk is the House of Risk (HOR), a method that links risk agents and risk events to generate effective and prioritized mitigation strategies. Alfa et al. (2024) demonstrate the effectiveness of HOR in managing risk within the automotive industry, while Cahyani et al. (2016) prove its relevance in the shipbuilding context. Other research by Kusrini et al. (2021) also underlines that HOR can be utilized within sustainable supply chains. To classify risk agents, the ABC classification method can be employed, where classification A reflects 50% of the total risk level and is categorized as high risk. Classification B reflects 30% of the total risk level and is categorized as medium risk, and classification C reflects 20% of the total risk level and is categorized as low risk (Safriyana et al., 2019).

Several studies have developed the HOR method with additional approaches to produce more in-depth analysis. Natalia et al. (2020) applied HOR alongside interpretive structural modeling to systematically assess the interconnections between risks and their mitigation strategies. Technology and data-based approaches are also evolving; Gopal et al. (2024) show that the use of big data analytics has a positive impact on supply chain performance, especially in anticipating operational disruptions. Ma & Wong (2018) also proposed a fuzzy-based HOR method to handle uncertainty in decision-making within global supply chains.

The application of HOR has also proven flexible across various sectors. (Ulfah, 2021; Ulfah, 2022) demonstrate its efficacy in the furniture and food industries, while Magdalena & Vannie (2019) and Putri et al. (2021) applied it in the metal industry and book printing projects, respectively. A study by Wali et al. (2022) in the metal manufacturing sector shows that this method can assist companies in establishing risk mitigation priorities based on severity and the probability of occurrence.

In other sectors such as logistics and retail, operational risk remains a primary concern. Lam et al. (2015) developed a knowledge-based logistics planning system to mitigate warehouse order fulfillment risks. Meanwhile, Pramudya (2025) and Bonfrer et al. (2022) note that changes in store formats and consumer behavior contribute to increased operational vulnerabilities that must be managed adaptively.

METHODS

3.1 Research Framework

The House of Risk (HOR) model is a systematic approach commonly used in the field of business operations. HOR is a risk analysis method utilized to manage risks proactively rather than reactively. The primary objective of this method is to reduce the probability of risk occurrence (Ulfah, 2022).

This model serves several functions, including identifying, analyzing, and preventing risks by mapping the relationship between risk events and risk agents. A risk event is an occurrence that results in a loss, such as delivery delays or defective products, while a risk agent is the cause of such events, such as unreliable suppliers, human error, or extreme weather (Magdalena & Vannie, 2019).

House of Risk consists of two main stages: HOR 1 and HOR 2. HOR 1 focuses on risk identification and prioritization. In the first step, the organization identifies risk events (RE) and risk agents (RA) to determine the ranking of risk agents (RA) based on the Aggregate Risk Potential (ARP) value (Wali et al., 2022). The ARP value is calculated by multiplying the occurrence probability of the risk agent, the severity of the risk event, and the correlation strength. The higher the ARP value, the higher the priority of the risk agent to be addressed.

HOR 2 is conducted to design dominant mitigation strategies for priority risk agents (Wali et al., 2022). The organization prepares alternative mitigation actions for high-risk agents and evaluates their effectiveness and costs. In designing mitigation strategies, the organization must select strategies that provide the best mitigation results with the most efficient costs. This approach helps focus on handling the most critical risks while optimizing resource utilization.

3.2 Data Collection Procedures

This study utilizes data obtained through survey techniques, along with qualitative and quantitative approaches. The survey technique employs questionnaires to identify the main causes of risk events (O_j) in HOR Phase 1. The qualitative approach is conducted through direct field observations, interviews with company stakeholders, and discussions regarding operational risks at CV BMS, an office stationery (ATK) company. This approach aims to understand the actual operational conditions of the company and gain deeper information regarding potential risks. Meanwhile, the quantitative approach utilizes secondary data, including scientific studies and other relevant data.

3.3 House of Risk 1 Data Analysis

House of Risk 1 functions to determine the priority scale of risk agents that must be addressed through preventive measures (Magdalena & Vannie, 2019). The goal of HOR 1 is to map risks systematically and focus on the most significant root causes before proceeding to HOR 2, which focuses on mitigation strategies. The following are the steps in this process, including the identification of risk agents (RA) and risk events (RE), as well as calculating and prioritizing risks based on their impact (Safriyana et al., 2019) :

1. Identify risk events (RE), which are undesirable occurrences that can negatively impact processes, projects, or systems. By identifying RE, potential problems can be determined.
2. Determine the severity (S_i) of each risk event (RE). Severity is the level of impact of each risk event, usually assessed on a scale of 1 to 10. Determining severity helps assess the consequences of each risk event.
3. Identify risk agents (RA) that are the primary causes or sources of risk events (RE) through a scale of 1-10 (O_j). This step aims to identify the root causes of the identified risk events.
4. Establish correlations between RA and RE to understand the relationship between these two aspects and determine the extent to which each RA contributes to various RE. This matrix utilizes R_{ij} values (0, 1, 3, 9); where 0 means no correlation, 1 means low correlation, 3 means moderate correlation, and 9 means high correlation.
5. Calculate the Aggregate Risk Potential (ARP). The ARP can be calculated using the formula $ARP_j=O_j\sum_i(S_i \times R_{ij})$.

6. Rank risk agents (RA) based on the highest to lowest ARP values to prioritize them. The risk agents with the highest values become the primary focus for the HOR 2 stage.

3.4 House of Risk 2 Data Analysis

House of Risk 2 is required to design a mitigation strategy for the risk agents determined in HOR 1. By determining effective strategies, this stage can minimize the occurrence of risk agents and ensure easier implementation. The following are the steps in this process (Safriyana et al., 2019).

1. Determine the number of high-priority risk agents based on Pareto analysis of the Aggregate Risk Potential (ARPj), and establish them as the focus for mitigation (Aj).
2. Identify Preventive Actions (Pak) that can reduce the potential of more than one risk agent.
3. Determine the values of the relationship between risk agents and mitigation actions using the Ejk (0, 1, 3, 9); where 0 means no influence, 1 means weak, 3 means moderate, and 9 means very strong. Through the Ejk, scale, the effectiveness of risk agent reduction can be measured.
4. Calculate the Total Effectiveness (TEk) by summing the product of ARPj and Ejk for each mitigation action ($TEk = \Sigma(ARPj\ x\ Ejk)$).
5. Assess the degree of difficulty of the action (Dk) using a Likert scale (3, 4, 5) which describes how difficult the implementation is in terms of cost and other resources.
6. Calculate the priority value or Effectiveness to Difficulty Ratio (ETDk) using the formula $ETDk = TEk \div Dk$. A higher ETDk level indicates that the action is highly recommended for implementation.
7. Analyze the relationships between mitigation actions that may influence each other during implementation using notations Rajk (0, θ, *, •); where 0 means no relationship, θ means weak, * means moderate, and • means strong.

RESULTS AND DISCUSSION

4.1 Operational Risk Analysis

4.1.1 Risk Event Identification Stage

In the initial stage of operational risk analysis, various risk events that potentially disrupt the operational smoothness of CV BMS were identified. A risk event is defined as an undesirable occurrence that can negatively impact business processes, whether in terms of product quality, process reliability, or customer satisfaction. This identification process was conducted through direct field observations and interviews with relevant stakeholders. Based on this process, 9 potential risk events were identified, as listed in Table 1.

Table 1: Risk Events

Code	***Risk Event***
E1	Damage to paper products
E2	Inconsistency between product stock levels and sales
E3	Damage to products and storage facilities
E4	Stockouts or inventory shortages
E5	Arbitrary or excessive use of return policies
E6	Delays in order delivery
E7	Risk of losing access to software

E8	Depletion of imported product stock
E9	Financial losses charged to the company

4.1.2 Potential Impact Identification Stage

To determine the potential impact of each risk event, a severity assessment was conducted using a scale of 1-10. A value of 1 indicates low severity, while 10 indicates high severity with the potential to disrupt the company's operational performance. The severity values obtained are subjective and qualitative decisions (Ma & Wong, 2017). The results of the severity assessment are shown in Table 2.

Table 2: Risk Event Severity Assessment

Code	***Risk Event* (RE)**	***Severity (Si)***
E1	Damage to paper products	8
E2	Inconsistency between product stock and sales	7
E3	Damage to products and storage facilities	9
E4	Stockouts or inventory shortages	6
E5	Erbitrary use of return policies	5
E6	Delays in order delivery	4
E7	Risk of losing access to software	8
E8	Depletion of imported product stock	6
E9	Financial losses charged to the company	9

4.1.3 Risk Agent Identification Stage

A risk agent is a factor or root cause that triggers a risk event. Similar to risk events, the identification of risk agents was conducted through field observations and interviews. Our identification found 9 risk agents, as listed in Table 3. The table also includes Oj values, representing the probability of occurrence for each risk agent.

Table 3: Risk Agent Occurrence

Code	***Risk Agent***	**Oj**
A1	Improper storage environment for paper products	1.5
A2	Inaccurate product stock estimations	1
A3	Disasters caused by external factors	1
A4	Supplier delays in delivering goods	2
A5	Incorrect placement of identical products	2.5
A6	Transportation constraints (weather, traffic, etc.)	1.5
A7	Limited access to data storage software	1.5
A8	Sudden changes in import regulations	1.75
A9	Product loss during distribution due to negligence or unethical behavior	1.5

4.1.4 Correlation between Risk Agents and Risk Events

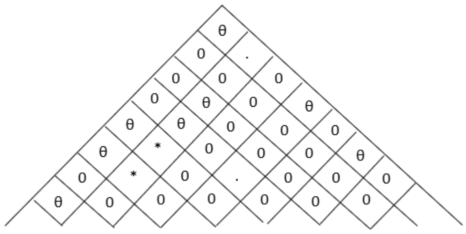
In this stage, an analysis of the influence of risk agents on risk events was conducted. The correlation is described by the level of influence (Eij) using numerical values (0, 1, 3, 9). 0 represents no influence, 1 represents a weak influence, 3 represents a moderate influence, and 9 represents a strong influence. The complete analysis is shown in Table 4**.**

Table 4 content follows the numerical correlations provided in your Indonesian text using the Risk Agent (Eij)

Code	***Risk Agent***	**E1**	**E2**	**E3**	**E4**	**E5**	**E6**	**E7**	**E8**	**E9**
A1	Improper storage for paper products	9	3	9	1	0	1	0	0	3
A2	Inaccurate product stock estimations	3	3	3	9	1	3	0	0	3
A3	Disasters due to external factors	3	3	9	1	0	3	0	1	3
A4	Supplier delays in delivering goods	0	1	0	9	0	3	0	3	3
A5	Incorrect placement of identical products	3	3	3	3	0	0	0	0	3
A6	Transportation constraints (weather, traffic, etc.)	0	0	0	3	0	9	0	0	3
A7	Limited access to data storage software	0	0	0	0	0	0	9	0	3
A8	Sudden changes in import regulations	0	0	0	0	0	0	0	9	3
A9	Product loss during distribution due to negligence or unethical behavior	0	9	0	3	0	1	0	0	3

4.1.5 Correlation between Risk Agents

This step aims to determine whether there are reciprocal relationships or interdependencies between one risk cause and another. Understanding these links strengthens the mapping of root causes and enhances the effectiveness of mitigation strategies. The results of this analysis are shown in Figure 1. In assessing the correlation levels, the symbol 0 indicates no relationship, θ represents a weak relationship, * represents a moderate relationship, and • represents a strong relationship.



	Risk Agent	A1	A2	A3	A4	A5	A6	A7	A8	A9
	Oj	1.5	1	1	2	2.5	1.5	1.5	1.75	1.5
Risk Event	Si									
E1	8	9	3	3	0	3	0	0	0	0
E2	7	3	3	3	1	3	0	0	0	9
E3	9	9	3	9	0	3	0	0	0	0
E4	6	1	9	1	9	3	3	0	0	3
E5	5	0	1	0	0	0	0	0	0	0
E6	4	1	3	3	3	0	9	0	0	1
E7	8	0	0	0	0	0	0	9	0	0
E8	6	0	0	0	0	0	0	0	9	0
E9	9	3	3	3	3	3	3	3	3	3
	ARP	316.5	170	177	236	292.5	121.5	148.5	141.7	168
	Rank	1	5	4	3	2	9	7	8	6

Figure 1: Risk Agent Correlation Matrix

4.2 ARP Calculation

Based on the points above, an Aggregate Risk Potential (ARP) analysis was conducted. For the complete calculation results, please refer to Appendix 1. Based on the ARP calculation results, a priority order for the risk agents was established, as shown in Table 5.

Table 5: ARP Calculation and Risk Classification

Rank	Code	Risk Agent	ARP Value	ARP Percentage	% Cumulative ARP	ABC Class
1	A1	Improper storage for paper products	316.5	17.81%	17.81%	A (High Level Risks)
2	A5	Inaccurate placement of identical products	292.5	16.64%	34.27%	A (High Level Risks)
3	A4	Supplier delays in delivering goods	236.0	13.28%	47.55%	A (High Level Risks)
4	A3	Disasters due to external factors	177.0	9.96%	57.51%	B (Medium Level Risks)
5	A2	Inaccurate product stock estimations	170.0	9.57%	67.08%	B (Medium Level Risks)
6	A9	Product loss during distribution due to staff negligence	157.5	8.86%	75.94%	B (Medium Level Risks)
7	A8	Sudden changes in import regulations	157.5	8.86%	84.81%	B (Medium Level Risks)
8	A6	Transportation constraints (weather, traffic, etc.)	139.5	7.85%	92.66%	C (Low Level Risks)
9	A7	Limited access to data storage software	130.5	7.34%	100.00%	C (Low Level Risks)

Risk classification utilizes the ABC method, where A reflects high-level risks, B represents medium-level risks, and C describes low-level risks. Therefore, risk mitigation actions will be developed according to the risk levels of the risk agents, most of which are at the high level. In determining the ABC class, the risk agents must first be ranked from the highest to the lowest ARP value. Subsequently, Class A is classified based on the first 50% of the cumulative data, Class B for the next 30%, and approximately the final 20% to determine Class C (Safriyana et al., 2019).

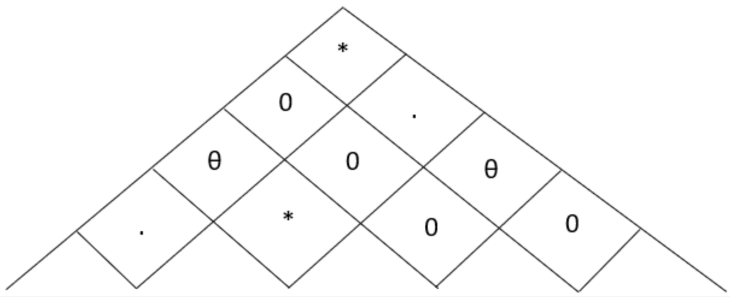
4.3 Risk Mitigation Actions

Based on the risk classification established, risk mitigation actions have been designed, as shown in Table 6.

Risk Mitigation Actions

Code	Mitigation Action
PA1	Routine inspections & training regarding product knowledge and item conditions
PA2	Improving forecasting accuracy & stock recording via Enterprise Resource Planning (ERP)
PA3	Supplier performance evaluation & supplier diversification
PA4	Securing insurance for natural disasters
PA5	Periodic stock audits & updates to Standard Operating Procedures (SOP)

Selanjutnya, dapat dilihat korelasi antar aksi mitigasi risiko pada Gambar 2. Dalam penilaian tingkat korelasi, lambang 0 menyatakan tidak ada hubungan, lambang θ menyatakan terdapat hubungan lemah, lambang * menyatakan terdapat hubungan sedang, dan lambang • menyatakan terdapat hubungan kuat (Safriyana et al., 2019).



Aj		PA1	PA2	PA3	PA4	PA5
A1	316.5	9	0	0	0	3
A5	292.5	9	0	0	0	3
A4	236	0	3	9	0	0
A3	177	0	0	0	9	0
A2	170	9	9	3	0	9
	TEk	7011	2238	2634	1593	3357
	Dk	4	5	3	5	4
	ETD	1752	447	878	839	318
	Rank	1	4	2	3	5

Gambar 2 Aksi Mitigasi Risiko

Furthermore, the correlations between risk mitigation actions can be seen in Figure 2. In assessing the correlation levels, the symbol 0 indicates no relationship, the symbol θ represents a weak relationship, the symbol * represents a moderate relationship, and the symbol • represents a strong relationship (Safriyana et al., 2019).

Table 7: ETDk Calculation for Risk Mitigation Actions

Mitigation Action	A1	A5	A4	A3	A2	TEk	Mitigation Action	A1	A5	A4
PA1 - Routine inspection & training regarding product knowledge and item conditions	9	9	0	0	9	7011	4	1752.75	1752.75	41.38%
PA3 - Supplier performance evaluation & supplier diversification	0	0	9	0	3	2634	3	878	2630.75	62.10%
PA5 - Periodic stock audits & updates to SOP	3	3	0	0	9	3357	4	839.25	3470	81.91%
PA2 - Improving forecasting accuracy & stock recording via ERP	0	0	3	0	9	2238	5	447.6	3917.6	92.48%
PA4 - Securing insurance for natural disasters	0	0	0	9	0	1593	5	318.6	4236.2	100.00%

Based on the ETDk, alculations, the risk mitigation action PA1 emerges as the top priority, followed by PA3, PA5, PA2, and PA4. This is evidenced by the ETDk values, which represent the effectiveness scale of each risk mitigation action based on the resulting output toward the risk agents relative to the level of difficulty in implementation, including aspects such as cost, technology, human resources, and others.

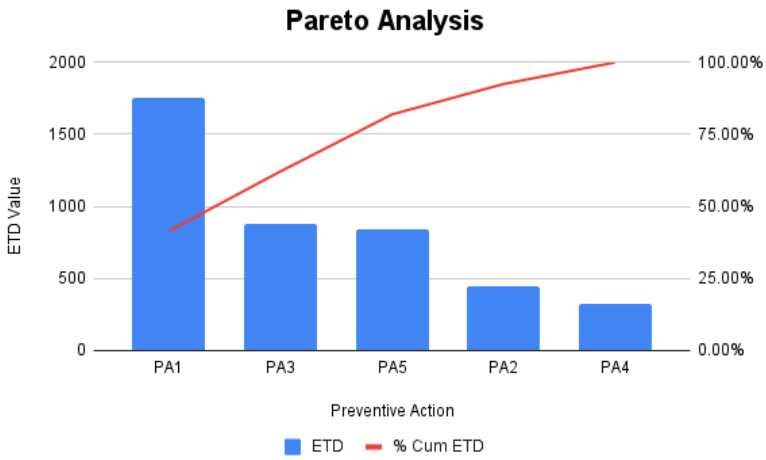


Figure 3: Pareto Analysis

Based on the Pareto analysis for risk mitigation actions, it is evident that 80% of the output can be achieved by focusing on three specific mitigation actions: PA1, PA3, and PA5. By concentrating on these three actions, the cumulative ETD will reach 81.91% of the total output. This is contributed by PA1 at 41.38%, consisting of routine inspections and training regarding product knowledge and item conditions; followed by PA3 at 20.73%, involving supplier performance evaluation and supplier diversification; and PA5 at 19.81%, encompassing periodic stock audits and updates to Standard Operating Procedures (SOP).

CONCLUSION

Operational risk analysis using the House of Risk (HOR) approach successfully identified 9 risk events and risk agents with potential risks at CV BMS. Through the HOR 1 model, it was determined that every risk event is interconnected with a risk agent, resulting in Aggregate Risk Potential (ARP) values that serve as the foundation for prioritizing risk mitigation. Out of the 9 identified risk agents, 5 were selected as top priorities for preventive action. Consequently, in the HOR 2 stage, 5 mitigation actions were determined based on the Effectiveness to Difficulty Ratio (ETDk) to ensure efficient and effective resource utilization. These five mitigation actions consist of routine inspections and training regarding product knowledge and item conditions, supplier performance evaluation and supplier diversification, periodic stock audits and SOP updates, improving forecasting accuracy and stock recording through Enterprise Resource Planning (ERP), and securing insurance for natural disasters. Through these actions, it is expected that the level of operational risk will decrease.

RECOMMENDATIONS

Future research should encompass a more comprehensive risk identification by considering a broader range of stakeholders, such as distributors and consumers. An analysis of additional risk types including technological risks, regulatory or policy risks, and changes in consumer behavior is also necessary to enhance the robustness of risk classification.

Furthermore, the development of mitigation strategies can be improved by utilizing technological tools such as barcode scanner systems, establishing clear work instructions, and conducting periodic updates and reviews of Standard Operating Procedures (SOP). Implementing systematic quality control and detailed quality standards could also contribute to more effective and sustainable mitigation.

Finally, in addressing the challenges of digitalization, it is recommended that the company begins developing an integrated information system capable of supporting operational processes and risk management in real-time.

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