

Analysis and Mitigation of Supply Chain Risks in the Procurement of Production Materials Using the House of Risk (HOR) Method at PT. XYZ

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Abstract: The study examines hazards associated with the supply chain for the acquisition of ABS (Acrylonitrile Butadiene Styrene) materials at PT. We implement the House of Risk (HOR) methodology for XYZ. The primary aim of this research is to identify risk factors that may hinder the seamless procurement of materials and to formulate appropriate mitigation methods. The initial phase of the HOR approach entails the identification of principal hazards, thereafter prioritized according to the Aggregate Risk Potential (ARP) value. In the subsequent phase, mitigation solutions are formulated and assessed utilizing the Effectiveness to Difficulty Ratio (ETD) value. The findings reveal that the primary risks to be mitigated are delivery delays, discrepancies in material quality, and variations in raw material costs. Proposed mitigation techniques encompass enhancing communication with suppliers, diversifying the supplier base, and instituting fixed-price contracts. The application of the HOR technique has demonstrated efficacy in assisting PT. XYZ emphasizes risk reduction and distributes resources effectively, ultimately improving the resilience and operational stability of the supply chain.

Keywords: Supply Chain Risk, Procurement of ABS (Acrylonitrile Butadiene Styrene) Materials, House of Risk, Risk Mitigation, Aggregate Risk Potential.

1. Introduction

In the industrial sector, the success of the supply chain is profoundly impacted by the efficacy and efficiency of the material procurement process. Supply chain risks can significantly affect firms' operational performance, leading to production delays, heightened operating expenses, and diminished product quality (Pratiwi, 2020). Consequently, organizations must implement effective strategies to detect and reduce supply chain risks, especially concerning the procurement of ABS (Acrylonitrile Butadiene Styrene) materials, essential for production continuity.

Numerous prior studies have examined the utilization of the House of Risk (HOR) method as a systematic strategy for identifying and alleviating supply chain risks in the industrial sector. A research by Pratiwi (2020) in the pulp sector found multiple risk indicators in the supply chain for material procurement and using HOR to establish mitigation strategies. The results demonstrated that HOR is proficient in detecting

hazards with significant impact and probability, enabling firms to concentrate on preventive measures for priority risks (Pratiwi, 2020).

The implementation of the HOR approach in the industrial sector has led to substantial risk mitigation techniques, especially during the material procurement phase (Santoso, 2019). Through the use of HOR, industrial businesses can discern and prioritize risks, including supply uncertainties and material quality concerns. The HOR approach facilitates the formulation of mitigation solutions centered on supplier engagement and inventory management (Santoso, 2019).

Furthermore, Wulandari's (2018) research underscores the adaptability of the HOR approach across several industrial sectors, using systematic risk detection and analysis procedures. Wulandari's study illustrated that HOR not only identifies sources of risk but also quantitatively assesses risk potential through the Aggregate Risk Potential (ARP) value, which is subsequently utilized to prioritize mitigation strategies (Wulandari, 2018). The HOR approach is positioned as a pertinent and efficient instrument in supply chain risk management across several industries.

This research intends to implement the HOR technique into the supply chain of PT. XYZ concerning material buying. This research will utilize the HOR technique to identify and mitigate the primary risks that may disrupt the efficient functioning of the company's supply chain. Consequently, this study aims to aid in the development of targeted risk mitigation methods, so strengthening the resilience of the company's supply chain and ensuring overall operational stability.

2. Method

A. Subsection

The HOR technique consists of two primary phases: HOR 1 and HOR 2. HOR 1 seeks to identify and prioritize sources of risk, whereas HOR 2 is employed to formulate effective mitigation measures based on the prioritized risks (Pratiwi, 2020; Santoso, 2019; Wulandari, 2018).

1) Risk Identification Stage (House of Risk 1)

The initial phase of this research involves identifying the primary risks associated with the material procurement process

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at PT. Risk identification is performed using comprehensive interviews and questionnaires aimed at stakeholders engaged in the supply chain, encompassing procurement, production, and supplier management divisions. This phase adheres to the methodology employed by Pratiwi (2020) in her sector, wherein both qualitative and quantitative data are gathered to guarantee comprehensive identification of all potential risk sources.

Each detected risk source is subsequently assigned a rating based on two parameters: severity (S), reflecting the impact degree of the risk on the supply chain, and occurrence (O), indicating the frequency or possibility of the risk materializing. The Aggregate Risk Potential (ARP) is calculated by multiplying the values of S and O (Santoso, 2019). Risk sources with the greatest ARP values will be prioritized for mitigation, given their ability to significantly disrupt the company's supply chain (Wulandari, 2018).

2) *Risk Mitigation Strategy Development Stage (House of Risk 2)*

The second stage of the House of Risk 2 methodology entails formulating risk mitigation measures derived from the previously prioritized hazards. HOR 2 concentrates on formulating efficient mitigation strategies to diminish or eradicate the primary risks identified in the HOR 1 phase. Each suggested mitigation action is evaluated using effectiveness and implementation difficulty ratings, which are subsequently utilized to compute the Effectiveness to Difficulty Ratio (ETD) for each mitigation plan (Pratiwi, 2020; Santoso, 2019).

Mitigation methods exhibiting the greatest ETD values are prioritized for execution, since they are deemed the most effective in risk reduction given the available resources. This report proposes mitigation techniques that involve enhancing communication with suppliers, adopting more efficient inventory management procedures, and streamlining the material ordering process to reduce the impact of risks on PT's operational continuity. The supply chain of XYZ (Wulandari, 2018).

3) *Data Validation and Analysis*

The data acquired from the ARP and ETD measurements are scrutinized to verify the precision of risk identification and the efficacy of mitigation techniques. Reliability tests are performed to examine the consistency of risk identification outcomes, whilst correlation analysis assesses the relationship between risk characteristics and the efficacy of the adopted mitigation strategies. This procedure adheres to validation methodologies utilized in prior investigations within analogous

circumstances, thereby guaranteeing the academic integrity of the research findings (Santoso, 2019; Wulandari, 2018). This methodology section mentions works by Pratiwi (2020), Santoso (2019), and Wulandari (2018), which are pertinent for elucidating the stages of using the HOR approach in risk assessment and mitigation across diverse industries.

3. Result and Discussion

A. *Risk Identification and Assessment (House of Risk 1)*

The initial phase in the implementation of the House of Risk (HOR) methodology at PT. XYZ aims to identify the primary risks in the supply chain with the procurement of industrial inputs. According to the findings from questionnaires and interviews with pertinent stakeholders at PT. XYZ discovered 15 risk sources that could potentially impede the seamless procurement of production materials. Identified hazards encompass delays in supplier deliveries, volatility in raw material pricing, discrepancies in material quality, and reliance on a sole supplier.

Each determined risk is subsequently assigned a severity (S) and occurrence (O) value. The Aggregate Risk Potential (ARP) is computed to establish risk priorities. According to the ARP calculations, five risk sources exhibited the highest ARP values: delivery delays (ARP = 320), quality discrepancies in materials (ARP = 280), volatility in raw material prices (ARP = 250), reliance on a sole supplier (ARP = 230), and alterations in import regulations for raw materials (ARP = 200). The prioritization according to ARP corresponds with the methodologies employed by Pratiwi (2020) and Santoso (2019), wherein risks with the most significant impact are recognized as primary priorities for mitigation.

B. *Risk Mitigation Strategies (House of Risk 2)*

In the HOR 2 phase, mitigation plans are formulated to diminish the effects of the prioritized risks identified in the preceding phase. Each proposed mitigation technique is thereafter evaluated for its efficacy and implementation challenges to ascertain the Effectiveness to Difficulty Ratio (ETD). Mitigation methods exhibiting the greatest ETD values are prioritized for execution, since they are deemed the most effective in risk reduction with constrained resources (Santoso, 2019; Wulandari, 2018).

The subsequent table presents the chosen mitigation techniques derived from the greatest ETD results

The proposed mitigation techniques, as indicated in the table

Table 1
Mitigation strategies

Risk Sources	Mitigation Strategies	Effectiveness	Difficulty	ETD
Delivery Delays	Enhance communication and cooperation with suppliers while monitoring delivery schedules in real-time.	8	3	2.67
Quality Mismatches of Materials	Quality Discrepancies of Materials Establish more definitive quality standards and enforce rigorous inspections upon delivery. Establish clearer quality standards and implement stricter inspections upon receipt.	7	3	2.33
Fluctuations in Raw Material Prices	Variations in Raw Material Prices Investigate fixed-price agreements with primary suppliers to stabilize expenses.	6	2	3.00
Dependence on a Single Supplier	Reliance on a Sole Supplier Cultivate ties with alternative suppliers to diversify sourcing options.	6	3	2.00
Changes in Import Regulations for Raw Materials	Modifications in Import Regulations for Raw Materials Remain informed about regulatory alterations and establish more adaptable license agreements. Stay updated on regulatory changes and prepare more flexible licensing arrangements.	5	2	2.50

above, encompass enhancing communication with suppliers, establishing fixed-price contract terms to mitigate cost swings, and diversifying suppliers to diminish reliance on a singular provider. These solutions correspond with the findings of Pratiwi (2020), which indicate that mitigation methods incorporating communication and contracts can substantially diminish the risks of delays and price.

The analytical results demonstrate that the HOR approach may establish distinct priorities for mitigating supply chain risks based on their impact and likelihood. The ARP value facilitates PT. XYZ aims to identify which hazards necessitate more comprehensive scrutiny, especially during the material purchase phase. Furthermore, the ETD assessment enables the organization to allocate resources more effectively, ensuring that each mitigation activity yields maximum benefits with a reduced implementation burden.

A study by Pratiwi (2020) indicated that in the pulp sector, delivery delays from suppliers represent the predominant risk, with mitigation techniques emphasizing enhanced communication and rigorous quality check of supplies. In the manufacturing sector, Santoso (2019) identified that risks associated with raw material discrepancies and reliance on suppliers were considerable issues, which were later mitigated through supplier diversity and contractual agreements. This study's findings corroborate prior research, indicating that mitigation techniques like supplier diversification, rigorous inspections, and fixed-price contract arrangements effectively diminish the impact of risks on the supply chain.

The execution of the HOR technique at PT. XYZ has significantly improved supply chain risk management by increasing the dependability and efficiency of the material procurement process. This methodology offers insights for physical therapy. XYZ's management aims to enhance collaboration with suppliers and evaluate the adoption of improved contract procedures and inventory management practices. This study corroborates earlier findings by Wulandari (2018), illustrating that HOR may be efficiently utilized across diverse industries to systematically prioritize and control supply chain risks.

4. Conclusion

This study identifies and examines vulnerabilities in the supply chain pertaining to the procurement of ABS (Acrylonitrile Butadiene Styrene) materials at PT. XYZ employing the House of Risk (HOR) methodology. The findings reveal multiple critical risk factors that may hinder the seamless procurement of materials, such as supply delays, discrepancies in material quality, and variations in raw material costs. The calculation of the Aggregate Risk Potential (ARP) facilitated the prioritization of various risks, enabling the formulation of effective mitigation solutions.

Utilizing HOR 2 allows for the prioritization of diverse risk mitigation techniques according to their Effectiveness to Difficulty Ratio (ETD). The suggested mitigation techniques encompass enhancing communication with suppliers, diversifying the supplier base to diminish reliance, and instituting fixed-price contracts to regulate price volatility. The

results highlight that the HOR technique is successful in prioritizing supply chain risk reduction and facilitates more efficient resource allocation. The application of this strategy can improve the reliability of PT. XYZ's supply network and mitigate any operational disruptions that adversely affect production continuity.

Several recommendations for PT. XYZ are derived from the research. On the findings, several recommendations for PT. XYZ are as follows:

A. *Strengthening Supplier Relationships*

PT. XYZ should improve communication and cultivate robust ties with essential suppliers to guarantee punctual delivery and adherence to quality standards. It is advisable to implement a real-time delivery schedule monitoring system to reduce delays.

B. *Supplier Diversification*

To mitigate reliance on a singular source, PT. XYZ ought to investigate partnerships with alternative suppliers. Diversifying suppliers will enable the organization to more effectively mitigate risks related to quality discrepancies and delivery delays.

C. *Development of Fixed-Price Contract Policies*

Formulation of Fixed-Price Contract Policies Considering Variations in Raw Material Costs, PT. XYZ is urged to establish fixed-price contract rules with suppliers. This policy will mitigate the effects of price volatility on material expenses while improving budget predictability.

D. *Regulatory Monitoring*

Regulatory Surveillance Considering the potential for alterations in import laws, PT. XYZ ought to perform consistent oversight of policy modifications concerning raw material imports. This will equip the organization to fulfill requisite standards and modify buying procedures in response to regulatory alterations.

The execution of these proposals is anticipated to enhance PT. XYZ's supply chain risk management facilitates a more streamlined, efficient, and sustainable material procurement process. Further study is anticipated to evaluate the efficacy of the proposed mitigation techniques and to apply the HOR approach to additional industrial scenarios.

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