

Risk Management Process Implementation in Warehousing to Enhance the Performance: A Case Study

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Abstract- Managing risks in an effective way will grant organizations a competitive edge in the market as the set objectives and strategies by these organizations will be met. This paper aims to address the risk management process application in warehouses and how that could affect the performance positively if applied correctly. The paper was developed from the review of the literature and a case study of a warehousing organization at Saudi Arabian Oil Company (Saudi Aramco) in The Kingdom of Saudi Arabia. The primary finding was that successful implementation of risk management process provides better performance and gives the management better informed decision making. Also, engaged people who are working in the organization will facilitate the process of application.

Keywords- Supply Chain, Warehousing, Risk Management, ISO 31000, Heat Map

1. Introduction

Warehouses are playing a big role in organizations' success and play a major role in the entire supply chain. They are necessary to have in order to keep the products/materials ready for any needs and keep the materials safe from loss or/and damage. Therefore, warehouses are important to the whole supply chain to make sure that products/materials are ready to be delivered to the customers in a timely manner and reduce the lead time [2]. For any warehouse, Risk Management (RM) has to be applied in an efficient way to make sure the services are provided as per the customers' expectations. The Supply Chain Risk Management (SCRM) has been growing fast in the

recent years that will help in reducing the level of uncertainty in the supply chain. [29] and [16].

Risk is “a potential for the realization of unwanted, negative consequences of an event” [5]. Therefore, risks often happened due to unplanned events or unanticipated conditions. In addition, [24] defined RM as the process of identifying, analyzing and responding to risk factors throughout the life of a project to meet its purposes. Another definition of RM by [9] is “the coordinated set of principle, processes, activities, roles and responsibilities, and infrastructure, combined into a system and used to control the actions of an organization in light of the risks it faces”.

RM helps organizations to have a better decision – making since the relevant and necessary information will be available. It is important process that helps organizations to identify and mitigate risks in a structured and effective way. Businesses could be impacted positively or negatively as argued by [15] and management should have a mitigation plans for the risks to maintain the business. International Standard Organization has ISO 31000 “Supply Chain Risk Management (SCRM) - Principles and Guidelines” which helps organizations to manage their identified risk qualitatively [1]. [6] stated that not many researches addressed the warehousing risk and its influence on supply chain performance like the numerous studies that have been focusing on other supply chain risks.

In this paper, a case study of RM implementation in a Warehousing Organization (WO) that operates in Saudi

Aramco in the Kingdom of Saudi Arabia will be presented to show how the process is effective in enhancing/improving the warehousing performance and to validate if the adapted RM model by the WO is sufficient.

2. Literature Review

Several Journals, books, and websites have been reviewed concerning the risk management in warehousing from 1990 to 2021. The keywords that have been used in the research engines are “risk management”, “warehouse management”, “supply chain risk management” “risk management processes” and “ISO 31000”.

2.1 Warehousing Risk Management

RM in warehousing is included in the SCRM since warehousing is part of the supply chain; where organizations are collaborating with each other to maintain their operations for the purpose of generating profit and maintaining business continuity [26]. [10] reviewed the literature from 2003 to 2013 of SCRM and found that 208 articles out of 224 international journal articles applied quantitative or qualitative research methods to address the SCRM processes. These processes are including; identify risks, assess risks, mitigate and monitoring risks. [10]. The authors also, conclude that common risks between different types of supply chains that have also impact on the warehousing processes are including; manufacturing risks, supply risks, macro risks, demand risks and infrastructural risks [10].

The main functions of warehousing which have different role at different stages of the supply chain are receiving, storing, picking, packing and issuing [17]. The receiving process include article checking of the materials and checking the condition of the materials and followed by system update of the received materials [25]. Then, the materials to be stored in the second phase

by identifying the storage location, physical goods movements and reflect these activities in the system [25]. In picking, the materials to be located and collected for packaging. Finally, the shipping process where the activities such as quality control, packing list preparation and order control and loading are performed [25].

Warehousing efficiency and gaining competitive advantages for the organizations can be obtained by implementing effective RM. RM in warehousing will prepare the management and the staff to deal with any uncertainty promptly in case of any disruption in the supply chain. Organizations have to establish a continuous attention to their risk management program when planning for operations to avoid any unwanted results. [13].

2.2 Risk Management Framework

The Risk Management Framework is guidelines and templates that organizations used as a guide to identify, assess, then eliminate and minimize risks [19]. In the following section, ISO 31000 which is one of the most popular risk management standards [4] will be discussed briefly. Figure 1 shows the model of risk management by ISO 31000.

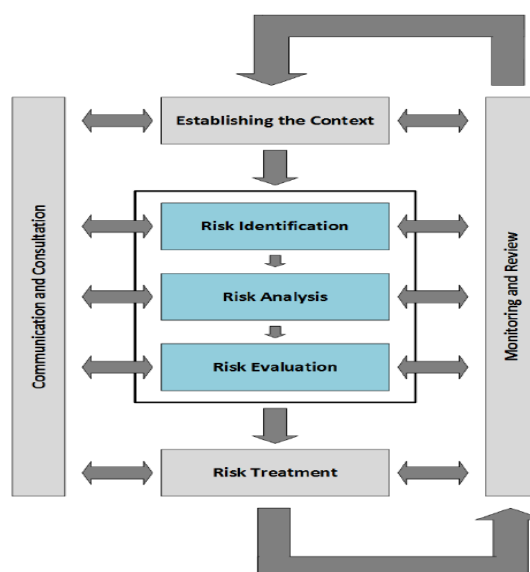


Figure 1. ISO 31000 Risk Framework

[20] developed a successful system based on the ISO 31000 targeted to prevent conservation of architectural heritage. [23] developed a framework based on ISO 31000 to mitigate the risk associated with the oil spills. Also [7] showed how organizations can utilize and benefit from the ISO 31000 standard for managing Information Technology (IT) risks. Despite that, [12] identified some of drawback that standard's users might fall into due to the misunderstanding of the standard and how to apply the principle. Many authors emphasis that organizations can manage their risks in an effective way by applying the well-structured systematic standard. Improving risk management at organizations is one of the main objectives of ISO 31000 that generally applicable to a wide variety of businesses and risks [14] and [21].

According to [27], RM has four (4) major steps that start with risk identification which need to be developed so the organization has a common understanding of the uncertainties that might face in the future for better preparation. Then, risk assessment which is the second step, where the identified risks from the previous step need to have a likelihood of occurrence and consequences. After that, risk management action, where each risk will have a plan for treatment and have re-active and pro-active plans. Finally, risk monitoring; the organization need to check the implanted plan if it is reducing/controlling the risks and to detect any resulted impact of the risks.

3. Methodology

To address the aforementioned objectives and aims of the paper, a single case study of RM implementation in one of Saudi Aramco Organizations that operates in warehousing which shall be referred to as Warehousing Organization (WO) later in this paper will be addressed. Many concepts have been developed by a single case study [28] and it can provide better and deep understanding of a phenomenon [22]. However, some

limitation could be addressed related to the generalization of the outcomes [8] and [30].

The risk management framework that is being adapted in the WO is based on the ISO 31000 framework as per figure 2. The main characteristic of this RM methodology that it is cyclic, repetitive, proactive, and embedded and that is why it has been selected as an official risk management framework by the WO. Although RM is applied long time ago in the WO, however, there were no evidence that RM was implemented in an effective way in some years. The analysis will be addressing three (3) years from 2019 to 2021 where the management put more emphasis on RM during that period and wanted to achieve the desired outcomes. The main objectives of adapting this model are to capture any risk that would affect the WO strategy, enhance the performance and meet the Key performance Indicators (KPI) such as the On Time Delivery (OTD). Also, the WO targeted to achieve an excellence level which is the highest level out of four (4) ranks on the Saudi Aramco Operational Excellence assessment for Risk Management. This study will not address the identified risks in the WO and what have been done to mitigate them, however, will be addressing how the WO was applying the RM process.



Figure 2. Risk Management Process

4. Findings & Discussion

The findings & discussion in this section will be addressed as per the proposed implemented RM processes in figure.2:

4.1 Step one: Establish Context

Started from the above-mentioned period, the WO developed Risk Management Plan (RMP) that defines the objectives of the organization's RM and shows how the business outcome aligns with the organization's objectives/strategy. In addition, the internal and external environment have been considered in the RMP. Also, the Head of the WO assigned officially Risk Management Coordinator (RMC) who is internationally certified in RM and a backup to lead the RM implementation. Finally, vision and mission for the WO redefined and aligned with the overall supply chain strategy.

As seen from the first step of the RM process, the management is in top of the process and leading the organization toward achieving the desired results since the context was well defined and addressed clearly. It is very important to have the top management's ownership to push the staff in achieving the assigned tasks pertaining the RM [18].

4.2 Step Two: Identify

The WO identified and generated a risk bank for all possible risks that potentially could affect the achievement of the WO objectives that identified in the first step (establishing the context). The identified risks have cause, risk event, and consequence. The WO used different ways to come up with the Risk Bank (RB) and used platforms such as group discussion, one on one interview and brain storming sessions. WO applied the following during this step:

- ❖ Subject Matter Experts have been appointed from all WO's Divisions to make sure that all

risks from different areas and thoughts are captures.

- ❖ All applicable types of risks have been considered, Risk Universe, that includes strategic, financial, operational, Reputation and compliance risks.
- ❖ The bowtie diagram technique used for identifying the causes, risk description and consequences as per the template in figure 3.
- ❖ All identified risks articulated and captured in the WO's RB.

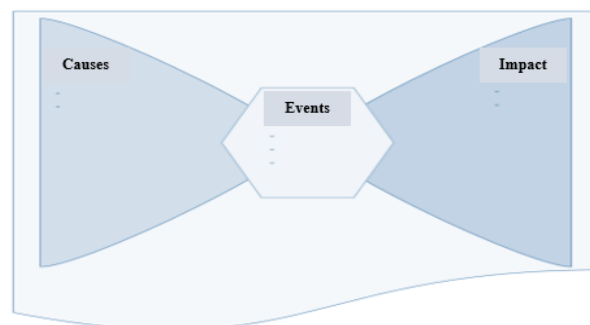


Figure 3. Bowtie diagram [11]

The WO has a clear picture of how to identify the risks that would affect the organization's objectives and strategies. This is very important step to be done in a right way in the early stages of the RM process implementation. Organizations might apply RM process correctly, however, they fail to achieve their objectives and one of the possible reasons is not identifying the right risks for the organization [18]. WO used one of the effective tools in describing the risks which is the bowtie diagram that will help in later stages in developing the controls.

4.3 Step Three: Analyze

In this step, WO assessed each risk's consequence and likelihood to determine the risk's overall severity and includes identification and assessment of controls. The team identified preventative controls that are intended to reduce the likelihood of a risk occurring. Also, reactive controls which are intended to reduce the consequence of risks once they occur. Moreover, the

team identified all Credible Worst-Case Scenario (CWCs) that is neither the most extreme nor unlikely event for the identified risks to have a better judgment in the next steps.

During the conducted workshops for risk identification, WO team assessed some of the risk as per the Risk Assessment Matrix (RAM) diagram to decide the severity of each risk. Heat Map (HM) developed where the severity is derived automatically from assessments of consequence and likelihood in figure 4. The team plot the top 5 identified risks in the HM as follows:

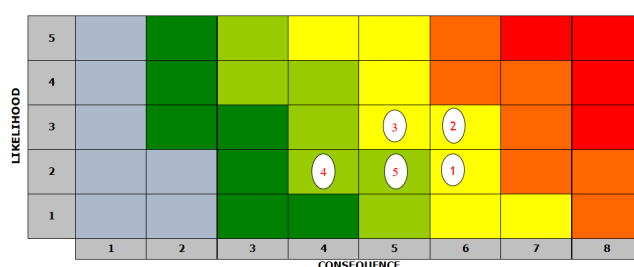


Figure 4. Heat Map before Treatment

By creating the HM, the WO was able to rank the identified risks and prioritized them based on the highest severity. HM helped the WO to have a better visual representation of the risks that is easy to be interpreted by all stakeholders.

4.4 Step Four: Evaluate

the RM strategy was developed to show how the WO is going to manage its risks and decide what to do in order to achieve the RM objectives. All identified risks evaluated, addressed and assigned champions in an electronic system where evaluations need to be presented to the head of the organization on a quarterly basis. The RM strategy for the WO included improving compliance with existing controls, developing new controls to reduce likelihood and strengthening the implementation of the reactive controls. Although the identified five (5) risks were not in the high zones, the WO decided have these risks to be treated which is one

of the four (4) treatment strategies (Ts); Treat, Terminate, Tolerate and Transfer.

4.5 Step Five: Treat

The WO prepared a Treatment Plan (TP) that specified the tasks that to be taken in support of the strategy, how they will be implemented, when, and by whom. Therefore, the WO selected the most appropriate treatments involves balancing the costs and efforts of implementation against the benefits derived. Also, the TP identified the priorities for treatment implementation and the components of the TP was SMART actions (Specific, Measurable, Accountable, Realistic, Time-framed).

After applying the TP, the severity of the risks for the WO have been reduced within 2 years to an acceptable level as shown in figure 5. Accordingly, the management in the WO decided to change the treatment strategy from Treat to Tolerate those risks and to be under radar with the others in the risk bank.

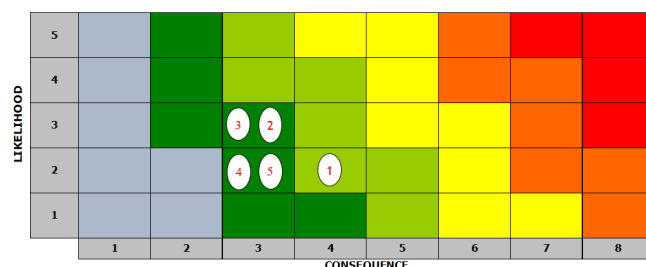


Figure 5. Heat Map after Treatment

4.6 Step Six: Monitor & Review

The WO in quarterly basis is visiting the RMP to make sure that the major identified risks are remain relevant to the objectives and the controls are continuing to be effective and efficient in tackling these risks. Also, Key Risk Indicators (KRIs) were reviewed on a quarterly basis. The WO developed, updated and maintained a Risk Register (RR) in quarterly basis that is reviewed and approved by the organization's Head. This RR shows the risks and status of the treatment action plan,

the assigned task owners and champions. Moreover, in order to elevate the level of awareness of RM among its employees, the WO as part of the RMP provided trainings and scheduled awareness sessions in quarterly basis. Also, the RM team conducted three (3) benchmarks in 2020 and 2021 with the top performer organizations within Saudi Aramco to ensure continuous improvement of WO operational excellence performance and implementation.

Using an electronic system that to be endorsed by the Head of the organization empower the process and made all employees within that organization on the same page. The WO applied the risk management process effectively and that resulted in a better risk reporting. Improved business performance and increased organizational effectiveness will be realized due to effective RM implementation [3] and [11] and the following are not limited to the resulted outcomes for the WO:

- ❖ The WO achieved 99% in the targetted years for the On-Time- Delivery KPI where the target is 98%.
- ❖ The WO achieved an excellence level in the internal Saudi Aramco Operational Excellence assessment that is conducted every three (3) years in the RM process.
- ❖ The inventory accuracy reached 99% in 2021.
- ❖ The warehouses capacity and utilizations were increased.

5. Conclusion

Since the presented RM steps are repetitive and iterative, I would suggest that WO to consider Change Management as part of the review to address any gap that would result in a risk. Also, make sure that people from all entities i.e., employees, contractors who are with the WO are fully aware of the identified risk and their mitigation plans. Moreover, The WO should

consider out of company, country, and best in class benchmarking to capture the up-to-date best practices in managing risks. Finally, although Communication and Consult is embedded in the adapted risk management by the WO, I would suggest to have it as a separate process as per the presented model in figure 6 to ensure the effectiveness of the RM process application.



Figure 6. Proposed Risk Management Process [3]

In summary, the paper is an addition to the knowledge base about the implementation of RM processes and it is valuable to show the realized benefits on the organizations' performance if applied correctly. The main contribution of this paper is that it has added to the body of knowledge on RM and its implementation, specifically through an exploration of its partial implementation.

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References

- [1] Al-babneh, H. and Abu Dalbough, M., 2020. Supply Chain Risk Management Methods in the Process of Formation of Advertising Campaign. *International Journal of Supply Chain Management*, 9(2).
- [2] Bidgoli, H., 2010. *Supply chain management, marketing and advertising, and global management*. Hoboken, NJ: Wiley.

- [3] Chapman, R., 2013. *Simple tools and techniques for enterprise risk management*. Hoboken, N.J.: Wiley.
- [4] Cobb, M., 2021. *ISO 31000 vs. COSO: Comparing Risk Management Standards*. [online] SearchCIO. Available at: <<https://www.techtarget.com/searchcio/feature/ISO-31000-vs-COSO-Comparing-risk-management-standards>> .
- [5] Conrow, E., 2003. *Effective risk management*. Reston, Va: American Institute of Aeronautics and Astronautics.
- [6] Elbarky, S. and Morssi, M., 2016. *Warehousing Risk Management in Different Industrial*. [online] Iils2016conference.com. Available at: <http://iils2016conference.com/wp-content/uploads/2015/03/ILS2016_SB04_3.pdf>.
- [7] Everett, C., 2011. A risky business: ISO 31000 and 27005 unwrapped. *Computer Fraud & Security*, 2011(2), pp.5-7.
- [8] Gay, W. and Bamford, D., 2007. A case study into the management of racial diversity within an NHS teaching hospital. *International Journal of Public Sector Management*, 20(4), pp.257-271.
- [9] Green, P., 2015. *Enterprise Risk Management*. 1st ed.
- [10] Ho, W., Zheng, T., Yildiz, H. and Talluri, S., 2015. Supply chain risk management: a literature review. *International Journal of Production Research*, 53(16), pp.5031-5069.
- [11] Hunziker, S., 2021. *Creating Value Through ERM Process*. In: *Enterprise Risk Management*. 2nd ed. Springer Gabler.
- [12] Lalonde, C. and Boiral, O., 2012. *Managing risks through ISO 31000: A critical analysis*. Springer Link.
- [13] Lam, H., Choy, K., Ho, G., Cheng, S. and Lee, C., 2015. A knowledge-based logistics operations planning system for mitigating risk in warehouse order fulfillment. *International Journal of Production Economics*, 170, pp.763-779.
- [14] Leitch, M., 2010. ISO 31000:2009-The New International Standard on Risk Management. *Risk Analysis*, 30(6), pp.887-892.
- [15] Lynch, R. and Cross, K., 1995. *Measure Up!: Yardsticks for Continuous Improvement*. 2nd ed. Wiley.
- [16] Manuj, I. and Mentzer, J., 2008. Global supply chain risk management strategies. *International Journal of Physical Distribution & Logistics Management*, 38(3), pp.192-223.
- [17] Meissner, J. and Li, H., 2010. Distribution and Warehousing in Supply Chains. *The Handbook of Technology Management*, 2.
- [18] Muha, R., Škerlič, S. and Erčulj, V., 2020. The Importance of Risk Management for the Introduction of Modern Warehouse Technologies. *Promet - Traffic & Transportation*, 32(3), pp.321-333.
- [19] Posey, B., 2021. *Risk Management Framework (RMF)*. [online] techtarget.com. Available at: <<https://www.techtarget.com/searchcio/definition/Risk-Management-Framework-RMF>> .
- [20] Prieto Ibáñez, A., Macías Bernal, J., Chávez de Diego, M. and Alejandro Sánchez, F., 2016. Expert system for predicting buildings service life under ISO 31000 standard. Application in architectural heritage. *Journal of Cultural Heritage*, 18, pp.209-218.
- [21] Purdy, G., 2010. ISO 31000:2009-Setting a New Standard for Risk Management. *Risk Analysis*, 30(6), pp.881-886.
- [22] SAUNDERS, M., LEWIS, P. and THORNHILL, A., 2019. *Research Methods for Business Students*. [online] Pearson.com. Available at: <<https://www.pearson.com/uk/educators/higher-education-educators/program/Saunders-Research-Methods-for-Business-Students-8th-Edition/PGM100003054179.html>> .

- [23] Sepp Neves, A., Pinardi, N., Martins, F., Janeiro, J., Samaras, A., Zodiatis, G. and De Dominicis, M., 2015. Towards a common oil spill risk assessment framework – Adapting ISO 31000 and addressing uncertainties. *Journal of Environmental Management*, 159, pp.158-168.
- [24] Stanleigh, M., 2011. *Risk Management...the What, Why, and How* | | *Business Improvement Architects*. [online] Bia.ca. Available at: <<https://bia.ca/risk-management-the-what-why-and-how/>> .
- [25] Stragas, N., Zeimpekis, V., Vlachos, I. and Bourlakis, M., 2011. *Basic Principles for Effective Warehousing and Distribution of Perishable Goods in the Urban Environment: Current Status, Advanced Technologies and Future Trends*. [online] Academia.edu. Available at: <https://www.academia.edu/22965089/Basic_Principles_for_Effective_Warehousing_and_Distribution_of_Perishable_Goods_in_the_Urban_Environment_Current_Status_Advanced_Technologies_and_Future_Trends> .
- [26] Tang, C., 2006. Perspectives in supply chain risk management. *International Journal of Production Economics*, 103(2), pp.451-488.
- [27] Tuncel, G. and Alpan, G., 2010. Risk assessment and management for supply chain networks: A case study. *Computers in Industry*, 61(3), pp.250-259.
- [28] Voss, C., Tsiriktsis, N. and Frohlich, M., 2002. Case research in operations management. *International Journal of Operations & Production Management*, 22(2), pp.195-219.
- [29] Wieland, A. and Wallenburg, C., 2012. Dealing with supply chain risks. *International Journal of Physical Distribution & Logistics Management*, 42(10), pp.887-905.
- [30] Yin, R., 2013. Validity and generalization in future case study evaluations. *Evaluation*, 19(3), pp.321-332.