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Quantitative Risk Management: Concepts and Techniques

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Abstract:
With the rapid development of technology, companies need to constantly improve their abilities to cope with risks or face bankruptcy and liquidation. Risks are everywhere when a business is in operation. Therefore, how to identify risks as well as systematically analyze and propose solutions is the focus of this paper. 4×4 risk matrix is generally used in analyzing a project or proposal risky or not. This paper also utilize 4×4 risk matrix to identify risks and propose realistic solution on that. The result demonstrates that this matrix can provide company more direct and clear evidence to adopt this proposal or not. If risks are unavoidable, it should be adequately planned for and mechanisms for identifying them should be well developed.

Key words: risk management, risk management process, 4×4 risk matrix

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1. Introduction

Risks are everywhere in life. Considering company, some risks can't be accepted but some cannot since some risks may lead to a direct severe crisis or failure at once. Therefore, risk management comes into being. Risk management defined as a process, which involves identifying, assessing solving and monitoring phases together with continuous efforts to reduce or avoid the risks happened (Board, 2024). A proactive approach to recognizing and resolving these uncertainties is essential to effective risk management because it helps organizations accomplish their objectives while reducing the possibility of losses. (Ahmad & Mohammed, 2024) Organizations can improve resource allocation, decision-making processes, and resilience against unforeseen challenges by implementing risk management practices. This comprehensive approach ensures long-term sustainability and success by protecting assets and reputation in addition to offering a structured framework for handling crises.

1. Risk management process

Identifying a risk or not requires a systematic process, like risk management process of figure 1, which shows that this process should run in a recycling circle with the order of risk identification and assessment, risk treatment, risk monitoring and risk reporting (Board, 2024). Organizations can safeguard their assets, enhance decision-making, and more efficiently deploy resources by methodically recognizing, evaluating, and ranking risks. By using this process, risks can be proactively planned for and mitigated, preventing unfavorable events from impeding the accomplishment of organizational objectives. Furthermore, a strong risk management framework promotes resilience, upholds regulatory compliance, and cultivates a continuous improvement culture, all of which are critical to the organization's long-term success and sustainability (Albarraq et al., 2023).

Figure 1: risk management process

2. 4×4 risk matrix

How to identify the severity of a risk for a company? In global context, 4×4 risk matrix is popular in different levels of companies like figure 2. This matrix consists of 4 rows and 4 columns with number 1 to 4 with impact and likelihood respectively. When the impact number identified higher together with higher possibility to happen, it would be called the riskiest event at 16 level. It means that company needs to respond this risk earlier and efficiently. Otherwise, with low impact and unlikely happened risk, company may put in a normal treatment or even ignore it. (Lengyel et al., 2023) Meanwhile, the red area means the highest level of risk, which requires the immediate intervention on that risk, like disasters on key facilities. Orange area means high level of risk, which requires the company treat it at once when it happened, but it is not the urgent like red ones, like loss of marketing share. Yellow parts mean medium level of risk, it may not require the immediate action, but in daily work, it must be considered the possibility to happen, like employee absenteeism. As for the green part, it can be treated later or even ignore it, like minor system glitch (Kursunoglu, 2023).

4- Extreme	4	8	12	16
3-High	3	6	9	12
2-Moderate	2	4	6	8
1-Low	1	2	3	4
Impact / Likelihood	1- Unlikely	2- Possible	3- Likely	4- Almost Certain

Figure 2: 4×4 risk matrix

2. Methodology

To learn how to identify risk also a lesson needed to be paid more attention to. Risks exist in all industries, and it has become critical to identify them, assess them and act accordingly. According to (Rashidi et al., 2024), who cited the bank as an example to use 4×4 risk matrix to identify and assess risks existed in bank and take necessary actions to solve it efficiently. In this research, an information and technology companies were used a case to be analyzed by risk matrix. The server machine in this company failed to run for a week and then demonstrate it into the risk matrix and see what the exact likelihood and impact to a company.

3. Findings and discussion

The result of server machine broken in this information and technology company risks through 4×4 risk matrix shows like figure 3 below:

4-extreme	4	8	12	16
3- high	3	6	9	12
2-moderate	2	4	6	8
1-low	1	2	3	4
	1-unlikely	2-possible	3-likely	4-almost, certain

It can be described as below:
Likelihood: likely
Impact: extreme
Result: From figure 2, it can be drawn that 12 is in red area, which indicates highest level of risk. Therefore, the company needs to treat it at once.

Solutions: At first, the company needs to hire the professionals outside to repair the server or replace it; secondly, there should someone to monitor or protect the running of server since it is vital for an information and technology company. Finally, an emergency plan should be formed to deal with different levels of risks.

According to the example above, 4×4 risk matrix makes sure that risks with a high probability and impact are dealt with right away, while risks at a lower level are tracked or handled appropriately. The matrix helps with decision-making by making risk levels easily visible, encouraging stakeholder communication, and allowing the creation of focused mitigation plans. (Alarfaj & Rahman, 2024) also attached the importance of risk management that affecting fate of in medical industry and save not only the lives of patients but keep the hospital operated more smoothly and sustainably.

4. Conclusion

In conclusion, it is vital for a company to be equipped with awareness to risks and the skills to deal with. No matter what types or levels of risks they are, it must be taken into the whole strategic plan in daily working. Otherwise, the loss on that may cause the failure of a company. A well-established and performed risk management mechanism is a necessity for a company's sustainable success.

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