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Review of IT Project Risk Analysis

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Abstract: **Risk is defined as the possibility of an event occurring that may positively or negatively impact a project, potentially leading to missed schedules, budget overruns, or unmet specifications outcomes that are considered unacceptable. Delays in recognizing these risks can result in serious and potentially irreversible consequences. This study adopts an exploratory approach, grounded in a literature review of risk identification, quantitative and qualitative analysis, assessment, mitigation strategies, and risk monitoring processes.**

Key word: Risk management, Risk Assessment, mitigation strategies, Risk Control Process.

I Introduction:

A project consists of a series of tasks carried out within defined deadlines and budgets. Risk management is characterized as a collection of strategies and tools aimed at addressing threats to project completion. Effective risk management necessitates a proactive approach that involves identifying potential threats, assessing their impacts, and implementing appropriate strategies to manage or eliminate these risks [1]. These strategies contain five main axes, which are the risk identification stage, in which we separated several methods such as interviews and brainstorming. In the risk analysis section, we discussed quantitative and qualitative analysis. In the risk assessment stage, we presented the impact matrix and its role in organizing risks in terms of probability and impact. In the risk response stage, we presented seven methods used to address risks. In the final stage, risk monitoring and control, we presented the basic steps of risk monitoring, which are entry, treatment and exit.

II Risk Identification:

Identifying risks helps the team grasp their potential impact during project execution, which in turn facilitates more effective navigation of challenges [2,3]. Several strategies can be utilized, including interviews that assess candidates' analytical skills, strategic thinking, and decision-making abilities [4]. Furthermore, examining risk lists from previous projects can yield valuable insights [5]. Cause-and-effect diagrams are also effective for identifying the root causes of risks [6]. The main goal is to analyze and classify these causes to highlight the most significant factors, thereby improving the team's capacity to recognize risks.

III Risk Analysis:

The risk analysis process begins with identifying and describing potential problems or scenarios that could threaten the project. There are two main categories of analysis methods:

A. Quantitative Analysis:

This method measures variability in project performance concerning time and cost. It employs mathematical and statistical techniques to assess the likelihood of a risk occurring and its potential impact. To enhance accuracy in predictions, it relies on substantial amounts of data. Common types of quantitative analysis include Monte Carlo analysis [7] and regression analysis [8].

B. Qualitative Analysis:

Unlike quantitative analysis, this approach does not involve numerical measurements or statistical evaluations. Instead, it assesses the probability of a risk occurring and its potential impact based on previous experiences and qualitative data. A well-known qualitative method is the SWOT analysis, which evaluates strengths, weaknesses, opportunities, and threats. [9]

IV Risk Assessment:

Risk assessment involves determining the level of risk by evaluating its significance and severity, enabling risks to be prioritized and appropriate precautions to be implemented. This process is

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followed by documenting the findings, with the final step being a review and evaluation [10]. We assess risks using an impact matrix [11], which analyzes risks based on their probability and severity, allowing us to calculate their overall impact and establish their priority. The impact matrix consists of five rows and five columns, with the columns representing a risk scale in ascending order of severity: critical, dangerous, medium, low, and negligible. The degrees reflect the likelihood of these risks occurring, arranged from rare to almost certain: rare, unlikely, possible, probable, and almost certain. The risk factor (λ) for each risk is calculated using the following formula:

$$\lambda = \rho * \gamma$$

Where (λ) is the risk factor, (ρ) is the event probability, and (γ) is the impact factor. The hazard impact matrix can be color-coded from green to red to visually represent the overall risk impact, as illustrated in the accompanying table.

TABLE. 1: Probability-impact matrix：

	Rare	Unlikely	possible	Likely	Certain
Critical	M	H	H	H	H
Serious	M	M	H	H	H
Moderate	L	M	M	H	H
Minor	L	L	M	M	H
Negligible	L	L	L	M	M

V Risk Response:

Risk prevention may depend on one of the following seven strategies [12]:

A. Acceptance:
Some risks are deemed acceptable when the resulting losses are tolerable or unavoidable. In such cases, contingency plans are prepared to manage these risks if they materialize.

B. Avoidance:
This strategy is employed when there is a high likelihood of mission failure. It involves taking proactive steps to eliminate the risk entirely.

C. Protection:
The aim of this strategy is to minimize the chance of risk recurrence by implementing measures that prevent anticipated failures.

D. Reduction:
If the project budget allows, this strategy focuses on reducing the impact or likelihood of risks through cost-effective measures.

E. Reserves:
When there's uncertainty about the consumption of project resources, it's prudent to allocate additional costs. This includes considerations for implementation time, budget, materials, and human resources.

F. Transfer:
In this approach, risks are shifted to partners best equipped to manage them, such as insurance companies. This is particularly useful when accepting the risk would lead to increased costs.

G. Research:
When there's insufficient knowledge about the risks involved, this strategy is crucial. It involves gathering information to better inform decisions about which of the other strategies to adopt.

Each of these strategies has its place, and the key is to assess the situation critically to choose the most effective response.

VI Risk Control Process:

The aim of this process is to maintain a healthy level of risk by accounting for any actions taken [13]. The monitoring process is structured into three stages:

A. Input:
Includes the Risk Management Plan, Risk Register, Project Documents, Work Performance Information, Performance Reports, Approved Change Requests, and Performance Reports.

B. Tools & Techniques:
Utilizes methods such as Technical Performance Measurement, Reserve Analysis, Status Meetings, Variance and Trend Analysis, Risk Reassessment, and Risk Audits.

C. Output:
Generates Work Performance Information, Change Requests, Recommended Corrective and Preventive Actions, Risk Register Updates, Organizational Process Asset Updates, and Project Management Plan Updates.

Conclusion:

Project risk management is the process of identifying, analyzing, and responding to risks throughout the entire project lifecycle. It aims to keep the project on track and ensure the achievement of its objectives. Rather than being solely reactive, risk management should be integrated into the planning phase to anticipate potential risks and develop strategies to manage them effectively if they arise. In this article, we introduced the key stages of risk management: identification, analysis, assessment, treatment, and monitoring. During the identification stage, we discussed techniques such as interviews and checklists. In the analysis stage, we explored the concepts of quantitative and qualitative analysis and outlined some commonly used methods. For the risk assessment stage, we presented the probability and impact matrix, which categorizes risks based on their likelihood and impact. In the risk response stage, we covered various strategies to mitigate, avoid, or transfer risks, explaining the conditions suitable for each approach. Lastly, we highlighted the importance of ongoing monitoring and control throughout the project's implementation, focusing on the three main processes: input, treatment, and output. Risk management isn't responsive just; it ought to be a piece of the arranging procedure to make sense of hazard that may occur in the task and how to control that hazard on the off chance that it in actuality happens.

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