DEVELOPING A SYSTEMIC APPROACH TO CONFLICT MANAGEMENT IN PROJECT RISK MANAGEMENT: AN ANALYSIS OF CONTRIBUTING FACTORS AND THEIR MANAGEMENT

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Abstract: To achieve successful outcomes, project managers must effectively resolve conflict situations during project management. In this study, we focus on developing a systemic approach to conflict management in project risk management and analyzing various factors contributing to conflict situations. Using a structured questionnaire, we collected data from 200 risk analysts working in the software industry under the project management domain. The data were analyzed using probabilistic methods and statistical analysis to develop a systemic approach to conflict management. The questionnaire was designed to capture information on various factors that contribute to conflicts during project risk management, including the extent of exposure and multiple exposures. The study's findings reveal that a systemic approach to conflict management in project risk management is effective in minimizing the negative impacts of conflicts. Our analysis identified several contributing factors to conflicts, including poor communication, insufficient risk assessment, and unclear project goals. We propose a systemic approach to conflict management that involves identifying the contributing factors, assessing their severity, and developing appropriate conflict management strategies. The study's contributions include developing a systemic approach to conflict management in project risk management, identifying contributing factors to conflicts, and proposing effective conflict management strategies. Research results have significant implications for project managers seeking to achieve successful project outcomes while minimizing the negative effects of conflict.

Keywords: Risk management, project management, software development, conflict management

I. INTRODUCTION

One of the difficult but essential duties in project risk management is addressing conflicts. Limiting and mitigating the detrimental effects of conflict that arises during project management is the goal of conflict management. One of the most crucial phases of software development is risk management. It entails the recognition, preparation, analysis, monitoring, management, and communication of risks. [1] The visibility of threats to the project's success is a key component of risk assessment. Future dangers could potentially result in significant development issues that would have an impact on every area of expertise in software project management. Analysis of potential conflicts and risk assessment follow. Whenever a project is being planned and developed, this is typically seen as a crucial concern. Conflicts that arise throughout the risk assessment process must be resolved, according to the project management. In IT in general, and in software development, in particular, the risks can be significant and the consequences can be severe. By conducting rigorous and proper risk assessment analysis, organizations can identify potential risks and develop strategies to mitigate or manage them. This can help to minimize the impact of risks on project timelines, budgets, and outcomes, and improve the overall effectiveness and performance of the organization. However, it's important to note that creating software with the least amount of risk is not always possible. Some risks may be inherent in the software development process, while others may be external factors
that are beyond the organization's control. In these cases, the focus should be on identifying and mitigating the most significant risks, rather than trying to eliminate all risks entirely. Overall, effective risk assessment analysis can help organizations to make more informed decisions and manage their projects more efficiently, ultimately leading to improved performance and outcomes. There is a need for a more effective approach to risk assessment in project management, particularly with regard to the systemic analysis of contributing and leading factors. The current approach may not be sufficiently comprehensive or rigorous and may result in a lower success rate in managing and mitigating risks. By focusing on the systemic analysis of various contributing and leading factors, the paper aims to provide a more holistic approach to risk assessment that considers the complexity and interdependence of different factors. This approach may help to identify risks that might otherwise be overlooked and to develop more effective strategies for managing those risks. Ultimately, the goal of this paper is to improve the success rate of risk assessment and management in project management and to ensure that projects are completed on time, within budget, and with the expected outcomes. 200 completed questionnaires from risk analysts in the software sector working in the field of project management are analyzed. These 200 completed questionnaires are then analyzed statistically and their answers evaluated using probabilistic analysis.

This article focuses on how systemic analysis of various project management contributing and leading elements can be done successfully and with a greater success rate (e.g., extension of the exposure, numerous exposures). Also, each knowledge area's risk impact is examined, and their relevance to conflicts is considered.

A survey has been conducted in which risk assessment awareness and the relationship between risk and conflicts in each knowledge area have been studied. The results of this survey prove that risk assessment and conflicts are strongly related and they play a significant role in successful project development.

The survey's findings are based on replies from several organizations. These responses are confidentially examined and combined without mentioning any sources or organizations.

On the basis of eleven software project management knowledge domains, the questionnaire is organized into various sections. There are a few questions in each section of the questionnaire designed to examine how risks are perceived in relation to that knowledge area. For each question, we have given different instructions, and based on those instructions, we have divided the participants into groups and examined their responses. This research made it easier to understand how crucial risk assessment is to project success and how it relates to issues that arise during project development.

The survey is carried out at businesses with an emphasis on IT. We have concentrated on those software companies whose commitment to their objectives and apparent adherence to best practices in project development caught our attention. These are the businesses that fall between software houses with medium to high ratings.

II. SURVEY OF RELEVANT WORK

The three main procedures that go into a software risk assessment (SRA) are risk identification, analysis, and prioritization. Creating risk mitigation techniques is a key component of risk analysis in project development. [2]

Around 50 civil officials and the Department of Defense (DoD) have used SRA since it began its evolutionary development at SEI in 1992 [3]. The question of why risk assessment or risk management is crucial arises. This question's obvious solution is discovered. Every endeavor or undertaking carries some level of risk. [4] Any aspect, including scope management, integration management, cost management, human resource management, communication management, etc., may be at risk. Understanding risks and their corresponding aims is therefore crucial to the project's progress. It enables stakeholders to create a backup plan that will help them to better plan while accepting, relocating, and minimizing risks. The systematic and ongoing process of risk management was outlined by the SEI risk management paradigm. There are six different paradigms for risk management:
Identify: Exploring and locating risks before time.
Analyze: Build decision-making information from each risk, and Study its impact, time frame, and probability. It also includes the classification and prioritization of risks.
Plan: Transforming risk information into decisions and actions, then implementing those actions.
Track: Risk indicators are monitored and reduction actions are fully observed.
Control: Changes in the mitigation plan are handled.
Communicate: This is the process that throughout all the functions kept going. It includes information and feedback internal and external to the project about risk activities, current risks, and emerging risks.[5]

Figure 1: Paradigms of risk management

A few models are also published to help with risk assessment. Risk drivers are the next step in identifying and reducing software risks, after US Air Forces. Cost risk, support risk, performance risk, schedule risk, etc., are significant risk components. [6] This model doesn't have process-related risk, making it more appropriate for acquisition than software development. Technical risk, cost risk, and scheduling risk are the three primary risk components of the Engineering Risk Model (SERIM). This paradigm has the flaw of not accounting for the intricate problems with any software. The suggested article does not analyze the hazards associated with requirements; these risks are taken into consideration. [6]

III. CONFLICTS HANDLING AND RISK ASSESSMENT

Conflicts are inevitable and guaranteed when managing a project. Because of the diversity of perspectives, experiences, and orientations that can be linked to project skills or other circumstances, conflicts are frequently highly likely to arise in development projects. [7]

Most of the time, it's easy to forecast the type of the fight. Differences in values, needs, finances, attitudes, expectations, and personalities, among other factors, may be the cause.

The likelihood of loss or uncertainty is now essentially the risk. In project management, risk plays a significant role. It's regarded as one of the major obstacles to effective project development. Risk is typically what makes a project successful or unsuccessful [8]. Chances of failure exist whenever there is uncertainty. Risk assessment is done as part of project planning to lower the possibility of failure and raise the likelihood of success. Identification, analysis, and prioritizing of risks are all part of the risk assessment process.
Yet today, a drawback of this strategy is that conflicts arise while evaluating the risks. This is due to the fact that various people desire various risk assessment implementations. The project manager has a responsibility to manage the circumstance [9].

Figure 2: Elements of Risk Assessment

Finding risks related to the management of software development is the first and most crucial phase in the risk assessment process. The objective is to locate dangers without evaluating them just yet. Finding risks related to the management of software development is the first and most crucial phase in the risk assessment process. The objective is to locate dangers without evaluating them just yet. [10] To begin a risk assessment, first determine the potential risks in a project that are connected to project management and organization or project operations. The management should convene a brainstorming session with all relevant project stakeholders in order to appropriately assess the risk. All 10 of the software project management knowledge areas contain risk identification. There are a number of risks in every region that can lead to disputes. The costing area, for instance, lacks proper contracts, subsequent payments, and cost estimation for uncertain certainties.

Once project hazards have been identified, the project manager goes over the list to eliminate any that overlap or contradict.

Go on to risk assessment after identifying the danger. Risks are assessed against two dimensions: probability and impact. Probability is the feature of a risk's likelihood of happening. Risk should only occur in one of three situations: High: risk occurs frequently. Risk is medium: it typically happens. Low: risks are less common. The risk assessment component known as "impact" examines how a risk may affect a project or organization. One of three categories correspond to the effect of risk. [13] High impact: Due to the devastating consequence, the project manager was forced to stop all efforts. Medium: The project manager will continue to handle this risk, but performance may be impacted. Low: This danger will have little effect and is easily manageable. Following risk assessment, the figure displays risk prioritisation based on likelihood and impact, as well as a risk classification chart. [12] Regular hazards are ones that are highly probable but have little consequence. This kind of error can be fixed during ordinary project or organizational operations. Examples of minor human errors are delivery processes or procedures [15]. Risks with a low probability and a modest impact are considered low-importance risks [16]. Lesser-level management is in charge of these risks. Risks that are difficult are those that are unlikely to materialize but would have a significant impact on the project [17]. Critical risks are those that have a high probability of occurring and a high impact on a project or organization [18].

IV. METHODOLOGY
Conducting a survey-based methodology is a common and effective way to gather information on risks in software project management. By surveying a diverse group of risk analysts from the software industry, you can obtain a range of perspectives on different risks and their potential impact. Using statistical analysis to interpret the results of the survey can help to identify trends and patterns in the data, as well as to quantify the relative importance of different risks. This can help project managers to prioritize their risk management efforts and to focus on those risks that are most likely to have a significant impact on the project. Overall, a survey-based methodology can be a useful tool for identifying and prioritizing risks in software project management. However, it's important to ensure that the survey is well-designed and that the sample size is large enough to provide meaningful results. Additionally, the interpretation of the results should be done carefully and with appropriate statistical analysis to ensure that the findings are accurate and reliable. Ten knowledge areas of software project management have been taken into consideration when creating the questionnaire. Risk assessment and conflict relationships, as well as how they affect project success, are examined under each knowledge domain. On the basis of this study, inquiries have been made. All the ten software project management knowledge domains are detailed out in Fig 3. For each knowledge domain, the connection between conflicts and dangers has been examined. Their impact and likelihood of occurrence have both been carefully evaluated. [20]

Figure 3: Project management knowledge cycle.

V. RESULTS AND DISCUSSION

The results, to get better understanding of risk in project management, are obtained and those are in alignment with the knowledge areas in order to get a better understanding of risk assessment.

We have collected data from different groups of people. The responses are studied and analyzed to see what the impact of each risk is and how heavily it can affect the success rate of a project. “Awareness of the importance of risk assessment in software project development.”[19]
A) Project Integration Management

The study has found that failing to integrate with the system has the highest impact on project success, it suggests that this is a critical risk factor that needs to be carefully managed and mitigated. Integration is a critical aspect of software development, and failure to integrate effectively can lead to delays, errors, and other issues that can have a significant impact on project success. By identifying this risk factor as a high priority, the study can help project managers to focus their attention and resources on developing effective strategies for managing and mitigating this risk. This may include implementing robust testing and quality assurance processes, ensuring clear communication and collaboration among team members, and using appropriate tools and technologies to support integration. Overall, the study's findings can provide valuable insights into the most critical risk factors in project management and can help organizations to develop more effective strategies for managing those risks and improving project success.
B) Project Scope Management:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope is not defined accurately.</td>
<td>16% 10% 56% 18%</td>
</tr>
<tr>
<td>Changes that are uncontrolled and increase the project scope.</td>
<td>44% 34% 12% 10%</td>
</tr>
<tr>
<td>Important requirements are missing from project scope.</td>
<td>4% 18% 76% 2%</td>
</tr>
<tr>
<td>The requirements that are ambiguous and incomplete are caused to project risk.</td>
<td>18% 38% 56% 8%</td>
</tr>
</tbody>
</table>

If important requirements are missing from the project scope, it can have a significant impact on the success of the project. Requirements are the foundation of any software development project, and they define what the project aims to achieve and how it will be implemented. If important requirements are missing, it can lead to confusion, delays, and even failure to meet the project's goals. Missing requirements can result in a number of problems, such as:

- Misaligned expectations: If important requirements are not included in the project scope, it can lead to misaligned expectations between stakeholders and the development team. This can result in a lack of clarity and misunderstandings about what the project is supposed to achieve.
- Increased risk: Missing requirements can increase the risk of errors and omissions in the final product. This can lead to delays and additional costs as the team works to fix issues that could have been avoided if the requirements were properly defined and included in the scope.
- Reduced quality: Missing requirements can also lead to a final product that does not meet the required quality standards. This can impact the project's success and the organization's reputation.

Overall, it is important to ensure that all important requirements are included in the project scope to minimize the risk of project failure and ensure the success of the project.

C) Project Cost Management:

<table>
<thead>
<tr>
<th>Issue</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrong estimation and forecast cost of project.</td>
<td>7% 48% 35% 12%</td>
</tr>
<tr>
<td>Rate of change in currency of different countries on daily basis.</td>
<td>59% 16% 6% 18%</td>
</tr>
</tbody>
</table>

It is difficult to make a definitive statement about the impact of currency fluctuations on the success of a project without more context. Currency fluctuations can have a range of impacts on a project depending on various factors such as the type of project, the industry it operates in, and the location of the project. For example, a project that
involves importing or exporting goods may be significantly affected by currency fluctuations as changes in exchange rates can impact the cost of materials and shipping. Similarly, a project that involves working with foreign partners may be impacted by changes in currency exchange rates. On the other hand, a project that is entirely domestic and not reliant on international trade may not be as affected by currency fluctuations. Additionally, the degree of impact can vary depending on the magnitude of the currency fluctuation and the duration of the project. Overall, it is important to consider the potential impact of currency fluctuations on a project and develop strategies to mitigate any negative effects. This may involve implementing contingency plans or financial hedging strategies to minimize the impact of currency fluctuations on project success.

D) Project Time Management

Correctly identifying the critical path is an important aspect of project management as it helps to ensure that the project is completed within the planned timeframe. If the wrong shortest path is identified, it can result in delays and impact the overall success of the project. Therefore, it is important to properly analyze the project and determine the correct critical path. As the study shows, 60% of people agree that determining the wrong shortest path in the critical path analysis technique will moderately affect the project. While this may not have a catastrophic impact on the project, it can still result in delays and additional costs. Therefore, it is important to carefully analyze the project and use accurate data to determine the critical path. It may also be helpful to perform sensitivity analysis to identify potential changes to the critical path and develop contingency plans in case any delays occur. Overall, while determining the wrong shortest path may not be a high-priority risk, it should still be taken seriously and addressed appropriately to minimize the impact on the success of the project.

E) Project Quality Management
It is true that conflicts between project qualities, time, and scope can have a significant impact on the project development process. These conflicts can arise when there are competing priorities or limited resources, which can make it difficult to achieve all project objectives within the planned timeframe. As the results show, many respondents agree that conflicts between project qualities, time, and scope can have a high impact on the success of the project. This highlights the importance of properly managing these conflicts and making trade-offs where necessary to ensure that project objectives are met within the available resources.

In addition, effective communication and collaboration among project stakeholders can help to identify potential conflicts early on and develop strategies to address them. This can help to minimize the impact of conflicts on the project development process and ensure that the project is completed successfully. Overall, it is important to recognize the potential for conflicts between project qualities, time, and scope and take steps to manage them effectively to ensure the success of the project.

F) Project Human Resource Management
The research shows that a lack of resources can have a significant impact on the development process of a project. This can include a shortage of funding, materials, equipment, or personnel needed to complete project tasks. When resources are not available at the time needed, it can cause delays in the project timeline and potentially impact the quality of the final product. In some cases, it may also lead to increased costs if additional resources need to be brought in or if the project needs to be reworked due to resource constraints. Effective resource management is therefore crucial for the success of any project. This includes identifying resource needs early on in the planning process, allocating resources appropriately, and continuously monitoring and adjusting resource usage throughout the project lifecycle. In situations where resources are not available as needed, project managers may need to make trade-offs or prioritize certain tasks over others to ensure that critical project objectives are met. This can involve re-sequencing project tasks, revising timelines, or adjusting project scope to accommodate resource limitations. Overall, managing resources effectively is a critical aspect of project management and can have a significant impact on the success of a project.

G) Project Communication Management

The risk of a lack of understanding of the requirement usually creates major problems. This is the result we have extracted from analyzing the responses of the people. It is important to have a clear understanding of project requirements in order to avoid potential risks and ensure successful project development.
H) Project Risk Management

Avoid an important risk that have no cost estimation but high impact. 

Mitigate the high level risk with low impact.

It is important to consider risks with high impact, even if there is no clear cost estimation, as ignoring them can have significant negative effects on project development. This highlights the importance of properly assessing and prioritizing risks in project management. 70% of people have said that in risk management if we ignore a risk with no cost estimation but high impact then it has the highest effect on the development of the project.

I) Project Procurement Management

Issues occur in project when conflicts developed among vendors.

Contractor’s term and conditions that are unacceptable for top management and project manager.

No accurate response from contractors.

It is important to manage conflicts effectively in order to avoid negative impacts on project development. While conflicts among vendors may have a medium effect, it is still important to address them and find solutions to minimize their impact on the project. When there occur conflicts among vendors then it will have a medium effect and 61% of people agree with this as shown in the above table.
J) Project Stakeholders Management:

If the inputs from stakeholders are of low quality, it can negatively impact the project development process and ultimately the success of the project. It is important to have clear and accurate inputs from stakeholders in order to ensure the project meets their expectations and requirements. Therefore, it is essential to prioritize and address this risk in order to mitigate its impact on the project's success. This study shows that most people agree on the thing that inputs from stakeholders are of low quality has the highest impact on project success.

Risk Assessment Matrix

A risk assessment matrix is a tool used in risk management to prioritize risks based on their likelihood and potential impact. It is often used in conjunction with a risk register, which lists identified risks and their corresponding risk response plans. The risk assessment matrix is a useful tool for project managers to prioritize risks and determine the appropriate risk response plans. It allows for a systematic approach to risk management and helps to ensure that resources are allocated appropriately to address the most critical risks.

<table>
<thead>
<tr>
<th>Knowledge Area</th>
<th>Risk Description</th>
<th>Probability</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integration</td>
<td>Delay in providing hardware/software or development environment.</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td>Integration</td>
<td>Fail to integrate with the existing system.</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Scope</td>
<td>Scope is not defined accurately.</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>Scope</td>
<td>Changes that are uncontrolled and increase the project scope.</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>Scope</td>
<td>Important requirements are missing from the project scope.</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Scope</td>
<td>The requirements that are ambiguous and incomplete are caused project risk.</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Cost</td>
<td>Wrong estimation and forecast cost of the project.</td>
<td>Low</td>
<td>Medium</td>
</tr>
<tr>
<td>Cost</td>
<td>Rate of change in the currency of different countries on daily basis.</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>
VI. PRIORITIZATION OF RISKS:

A) High Probability, High Impact

Risks with high priority and high impact must be addressed first because they have the potential to significantly impact the project's success or failure. These risks are typically those that have a high probability of occurring and could cause significant damage if they do. By prioritizing these risks and addressing them proactively, project managers can minimize the chances of failure and increase the project's chances of success. It is important to have a risk management plan in place to identify and mitigate risks throughout the project lifecycle. Risk management should be an ongoing process throughout the project, with risks continually reassessed and prioritized as necessary. By addressing high-priority and high-impact risks early in the project, project managers can reduce the likelihood of significant problems occurring later in the project, which can save time, money, and resources.[21]

B) High Probability, Medium Impact
Risks with high probability and medium impact should be the second priority after the risks with high priority and high impact. These risks are important because they have a high likelihood of occurring and can have a significant impact on the project, although not as severe as those with high priority and high impact. It's essential to address these risks in a timely manner to prevent them from escalating into more significant problems that could affect the project's success. These risks can be managed by implementing mitigation strategies to reduce their likelihood or developing contingency plans to minimize their impact if they occur. Project managers should have a risk management plan in place that outlines how to identify, assess, and respond to risks throughout the project lifecycle. By doing so, they can ensure that risks with high probability and medium impact are identified and addressed appropriately.

C) Medium Probability, High Impact

The risks with high probability and medium impact should not be ignored and should be addressed as the second priority in a risk management plan. Doing so can help project managers minimize the likelihood of these risks occurring and reduce their impact. Risks with medium probability and high impact should be the third priority in a risk management plan, after the risks with high priority and high impact, and those with high probability and medium impact. These risks are important because although their probability of occurring is not as high as the risks with high priority, their potential impact on the project is significant. Therefore, project managers should not ignore them and must address them proactively. To manage these risks, project managers should assess the likelihood of the risk occurring and its potential impact on the project. Mitigation strategies should be developed to reduce the likelihood of the risk occurring, and contingency plans should be created to minimize its impact if it does occur. It's important to note that a risk management plan should be a living document that is regularly updated and adjusted as the project progresses. Risks with medium probability and high impact that were previously considered lower priority may need to be addressed more urgently if the situation changes.

D) Medium Probability, Medium Impact

Risks with medium probability and medium impact should be the fourth priority in a risk management plan, after the risks with high priority and high impact, those with high probability and medium impact, and those with medium probability and high impact. While risks with medium probability and medium impact may not pose an immediate threat to the project's success, they are still important and should not be ignored. These risks could still have a negative impact on the project if they are not managed properly. To manage these risks, project managers should assess their potential impact on the project and develop mitigation strategies to reduce their likelihood of occurring. Additionally, contingency plans should be created to minimize their impact if they do occur. It's important to note that while risks with medium probability and medium impact are not as high a priority as the risks mentioned above, they still need to be considered and addressed as part of a comprehensive risk management plan. By doing so, project managers can minimize the likelihood of these risks occurring and reduce their impact if they do. In summary, risks with medium probability and medium impact should be addressed as the fourth priority in a risk management plan. By doing so, project managers can ensure that all risks, regardless of their likelihood or impact, are considered and managed appropriately.

VII. CONCLUSION

Careful risk assessment is a critical aspect of software project management. The assessment should be done in accordance with all ten knowledge areas to ensure that all risks are identified and addressed appropriately. The survey conducted in this scenario is an example of such risk assessment. It helped in making distinctions between various risks related to conflicts and prioritizing them based on their probability and impact. The methodology used in the survey was implemented honestly and is under complete consideration. The survey questionnaire was sent to a diverse group of people, and sampling was done keenly to ensure accurate results. The results obtained will help in improving the software under each knowledge area of software project management. Overall, a
comprehensive risk management plan that considers all possible risks and addresses them appropriately can help in ensuring the success of software projects.

Future Work: Once risks have been identified and prioritized, it's important to develop mitigation strategies to reduce the likelihood of those risks occurring and to minimize their impact if they do occur. After implementing these mitigation strategies, it's important to evaluate their effectiveness. This evaluation should consider whether the strategies effectively reduced the likelihood of the risks occurring and whether they effectively minimized their impact if they did occur. Based on the results of the evaluation, new solutions can be proposed or previously defined solutions can be modified to improve their effectiveness. This iterative process of identifying risks, developing mitigation strategies, and evaluating their effectiveness can help in continuously improving software project management and reducing the likelihood of project failure. Overall, future work in this area should focus on developing and refining risk management strategies to ensure that software projects are completed successfully and deliver the expected value to stakeholders.

I. REFERENCES


