INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN ACCOUNTING, FINANCE AND MANAGEMENT SCIENCES

OPEN ACCESS JOURNAL

Vol 14, Issue 1, (2024) E-ISSN: 2225-8329

The Function of Risk Management in Improving Construction Project Implementation Efficiency

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To Link this Article: http://dx.doi.org/10.6007/IJARAFMS/v14-i1/20435 DOI:10.6007/IJARAFMS/v14-i1/20435

Published Online: 08 January 2024

Abstract

This study delves into the integral role of risk management in optimizing the efficiency of construction project implementation by identifying and categorizing potential risks while emphasizing proactive risk management strategies. The research underscores the vulnerability of construction projects to diverse risks and highlights the prevailing issue of insufficient emphasis on risk management practices in the field. Notably, the findings indicate a substantial correlation between early risk identification and heightened project efficiency, showcasing that project employing proactive strategies experience fewer disruptions and greater adaptability to unforeseen challenges. Furthermore, construction projects implementing robust risk management practices demonstrate noteworthy reductions in delays and cost overruns, contributing to streamlined timelines and adherence to budget constraints. The study recommends prioritizing the adoption of proactive risk management practices, focusing on early identification and mitigation, and advocates for investment in training programs to enhance stakeholders' risk management knowledge and skills. Additionally, it suggests leveraging technological solutions, such as predictive analytics and simulation models, for more accurate and dynamic risk assessments, facilitating informed decision-making in construction project management.

Keywords: Risk Management, Construction Projects, Efficiency, Proactive Strategies, Project Management

Introduction

Construction projects are complex, involving many stakeholders, intricate processes, and a range of unpredictable variables. These variables, which can range from weather conditions to organizational changes, can lead to uncertainties that may affect project timelines, budgets, and overall success. The successful implementation of projects depends on many factors, as risk management plays a pivotal role in ensuring efficiency and project success. In order to improve decision-making processes and project outcomes, effective risk management in construction projects entails detecting, evaluating, and minimizing potential risks. Through proactive risk identification and mitigation, project stakeholders can improve efficiency, minimize delays, cut costs, and ultimately contribute to the successful completion of construction projects. The main goals of risk management in construction projects are not only to anticipate and address potential challenges but also to seize opportunities for improvement.

The construction industry faces challenges that can have a significant impact on project timelines, budgets, and overall efficiency. Construction projects are inherently complex endeavors with many interconnected components and a wide range of uncertainties. The lack of a systematic and comprehensive approach to risk management in these projects often results in unforeseen complications that impede smooth implementation.

The study's focus is on how a lack of attention to risk management practices in construction projects results in avoidable disruptions and inefficiencies. Construction projects are vulnerable to a variety of risks, such as weather-related problems, organizational changes, labor disputes, shortages of materials, and unforeseen site conditions. In the absence of a robust risk management framework, these uncertainties can become significant roadblocks that cause delays, cost overruns, and, in the worst cases, project failure.

The issue is made worse by the historical propensity of construction projects to handle risks reactively rather than proactively; many projects lack systematic risk identification and assessment, which results in a lack of readiness and insufficient mitigation solutions. Consequently, stakeholders encounter hurdles in making well-informed decisions, adjusting to unanticipated obstacles, and upholding the overall efficacy of construction project implementation.

Stakeholders can increase productivity, decrease interruptions, and improve project results by comprehending the unique difficulties faced by construction projects and putting proactive risk management techniques into practice.

This study looks at how important risk management is to construction projects and how integrating it can increase productivity all the way through the project's lifecycle. By means of thorough risk assessment and tactical planning. The objectives of the study are organized as follows:

- Examine the procedures and approaches currently employed by the construction sector to recognize, evaluate, and control risks.
- Assess how owners, contractors, and consultants, among other project stakeholders, understand and apply risk management principles.
- Taking into account both internal and external factors, systematically identify and categorize potential dangers that often affect building projects.
- Set risk priorities according to likelihood of occurrence and effect on project budget, schedule, and efficiency.

Theoretical Framework

The Project

- **Project Concept**

The researchers present multiple definitions of the project, all of which concur on a number of points but varied in the project's scope and phrasing, for instance:

- A project is a collection of interconnected tasks with defined beginning and ending points, designated resources, and a distinct product (Krajewski & Ritzman, 2005, 342).
- A distinct collection of synchronized tasks, having independent start and finish points that are executed to meet objectives in terms of performance, cost, and time.
- A special procedure with start and finish dates that consists of a series of planned, regulated actions and events with the aim of achieving predetermined objectives

while adhering to restrictions and limitations in terms of money, time, and resources. (ISO 9000, 2000, 11) and (ISO 10006, 1997, 1)

- A sequence of connected operations or assignments that need time to produce important results (Chase et al., 2003, 87).
- A sequence of related tasks directed toward a main output.
- Temporary endeavor to accomplish a certain objective (Heerkens, 2002, 10).

According to the researcher, the project is made up of a number of consistent, interconnected activities with clear beginning and ending points. Individuals carry out these activities in order to meet predetermined objectives, which include financial, schedule, quality, and resource constraints.

The above definitions make clear that they apply to all project management processes, regardless of the size of the projects or their outputs, such as manufacturing a good or providing a service. What matters is that these projects fall under the category of project processes that provide high-variety, low-volume products that are typically produced in a made-to-order setting.

Project processes have several key characteristics, such as being devoted to the production of extremely complex products with low production volumes—typically one unit—long waiting times for operations. A high degree of product diversity, widespread customer participation, non-routine tasks requiring high levels of skill and flexibility, a high degree of complexity in production planning and control, quality and sadness, and the requirement to use general-purpose technology, equipment, and tools, which raises the cost of producing the unit (Krajewski &Ritzman, 2002,97).

Features of the Project

Every project has some traits, albeit in varying degrees, and some stand out more than others because of: (Slack et.al.,2004,554)

- **Temporary Nature:** Since every project has two beginnings and ends, resources must be temporarily mobilized in order to carry it out. Once these resources have contributed all they can to accomplishing the project's goals, they are redistributed to other initiatives. Since many initiatives last for several years, temporary does not always imply short-term.
- **Uniqueness**: When a project is performed again using the same specifications and methodology, it may differ in terms of the resources utilized and the actual context in which it is carried out. Uniqueness makes a project produce a unique product, service, or result.
- **Complexity**: Several distinct tasks must be completed in order to meet project objectives, and there may be intricate relationships between these jobs, particularly when there are a lot of them. Project size, value, and personnel count are all correlated with complexity.
- **Objective**: The objective denotes the ultimate outcome or output and establishes the output in terms of cost, time, quality, and field during project operations.
- **Uncertainty**: All projects are planned before they are implemented since they include new activities and varying degrees of risk. The degree of uncertainty has an impact on the project's ability to meet its goals in terms of budget, schedule, quality, and field.
- **Progressive elaboration**: This refers to the necessity of developing strategies and refining the field as new information becomes available.

The above-mentioned attributes serve as a good means of differentiating project management procedures from other kinds of activities, as the latter are distinguished by continuity and redundancy.

Variety of Projects

Due to the diversity of new products, expansion into new markets, heightened local and international competition, quick technological advancements, shifting dynamics of the global business environment, and sharply rising customer demand for diversified products, a significant portion of organizational resources are now being allocated to project-oriented activities in a multitude of companies.

Projects are therefore carried out in all organizations and at all levels (Russell & Tayor, 2000, 809), and their duration can range from a few weeks to several years. They can also involve one person, hundreds of individuals, or multiple organizational units. An overview of the diverse range of tasks in which project management principles can be used is given in the following table.

Table (1)
Main and secondary classes of projects

#	Main varieties	Secondary varieties
1	Aviation & Defense Projects	Defense, Space, and Military Operations Systems
2	Change in business and organization	Acquisition, integration, improvement of the management process, organization by restructuring, participation in new works, legal progress
3	Communication Systems Projects	Communication Systems Network and Modification of Communication Systems
4	Event Projects	World and national events
5	Facilities Projects	Documentation facilities, design, measures and construction, including (civil - environmental - commercial - energy, industrial and commercial - housing - ships) and others
6	Information Systems Projects (Software)	New MIS projects include
7	Global Development Projects	Agriculture, health, education, population and infrastructure including energy such as (oil - kerosene - power generation and distribution) industrial, telematics, and transportation
8	Amusement Projects	Animated movies, TV shows, and musical events
9	Product/Service Development Projects	IT Hardware, Industrial Product, Industrial Process, Pharmacy Product/Process, Services (Financial Services and Others)
10	R&D Projects	Environmental, Industrial, Economic Development, Medical, Scientific

Source: *(Schroeder , Roger . G . " Operations Management Contemporary Concepts" , Mc Graw – Hill , Boston , 2000) & (Archibald , Russell . D. , "Project Management State of the Art : Project Portfolios", 2004 . www . maxwideman. com*

Projects falling under these primary and secondary categories are distinguished by the fact that they are now more expansive due to the PMBOK-PMI (Archibald, 2004). These projects also require different life cycle models, planning and control methods, as well as different skills, experiences, and knowledge of project managers and team members.
Large businesses have a wide variety of projects falling into their major and secondary project categories. As a result, each category's project management process needs to be flexible in order to select the appropriate level of detail for large-scale, intricate, and risky planning and control. Using factors like project size, project complexity, external or internal client, and client engagement in project risk levels, it is imperative to separate projects into major and secondary projects.

Project Lifecycle

The stages that connect a project's beginning to end are known as the project life cycle. An organization may choose to define a particular set of life cycles for use on all of its projects because there is no one best way to define a cycle. One or more forms of delivery or technical transfer link the stages of a project together. Each stage's delivery is reviewed to ensure that it is accurate and fulfilled before moving on to the next stage of work. Certain organizations have established regulations that mandate a uniform life cycle be implemented for all of their projects.
The project management team is permitted to select the project's most suitable lifecycles by other organizations. The life cycle of software development projects in the software industry differs from that of construction projects in the construction industry. A preferred life cycle is frequently used within an industry due to common processes (PMBOK, 2004, 19–21).
There is a universal consensus that projects have starts, implementations, and ends, notwithstanding the differences in the life cycles of projects between industries. Few project life cycles overlap, despite the fact that many of them have identical deliverables and stage titles. Some may have four or five phases, while others may have nine or more (Burke, 2002, 24).

Most Project Life Cycles have Certain Characteristics

- The phases are ordered.
- Costs and labor levels are modest at first, then rise during the intermediate stages, and finally fall rapidly as the project nears completion.
- Uncertainty is most at the beginning of the project, and the danger of failing to meet the objectives is greatest, after which the level of certainty steadily improves as the project progresses.
- The ability of stakeholders to affect the final product attributes and project cost peaks at the start and rapidly falls as the project progresses.

Concept of Risk Management

Risk management in construction projects is defined as systematic practices for the process of selecting cost-effective methods to reduce the impact of a specific threat on the project, which is a continuous process throughout the project life cycle. Whereas the types of risk management in construction projects can be classified according to the following two criteria (2020, Kucuk) (Al-Najjar & Al-Fur, 2019)
Traditional risk management: A type of risk management that focuses on physical or legal threats (for example, natural disasters, floods, fires, or lawsuits).

Financial risk management: is a type of risk management that focuses on hazards that can be addressed using funds such as loans, with the banking institutions sponsoring the project serving as the primary environment.
Ideal risk management: This is a type of risk management that prioritizes financial risks with considerable harm over modest low-damage financial risks.

The Concept of Risk Management in Construction Projects
Events or circumstances that have a negative impact on the goals of the construction project overall or on any one of the project's departments, operations, or activities are referred to as risks in construction projects. Al-Masry & Nima, 2019).
The process of detecting, characterizing, assessing, monitoring, investigating, and reacting to the risks that the construction project is confronting is known as risk management in the construction industry. (Iswajuni & Soetedjo, 2018).
Risk management in construction projects is defined as operations that contain a method of controlling risks, whether these risks are in the field of work, scheduling, cost, contract, and quality or in refractory and thermal resources.

Risk Management in Construction Projects
The world is full of fast changes, and the construction industry is no exception. Throughout its life cycle, construction projects encounter many ups and downs, as demonstrated by the industry's history. These changes have a direct impact on how well construction projects perform in terms of commitment to project implementation timelines, estimated costs, and the quality of planned specifications. These three objectives have an impact on the project's finances and could result in losses if they are not handled well.
Change is inevitable, but it can be controlled and dealt with by managing the risks associated with building projects in a way that lowers uncertainty and raises the percentage of assurance that the project will be carried out in accordance with the necessary performance, whether it be in terms of schedule, budget, or compliance with the quality of specifications (13, 2014, Smith, Merna * Jobling). According to the Project Management by Knowledge Manual (PMBOK, 2008, 67), project risk management is the eighth of the nine fundamental components of project management.
During the stage of defining and structuring risks, the risk analyst works to collect crucial information from the project's principal players and those in charge of it. The risk management process is then carried out utilizing specialized approaches, methodologies, and tools.
It is crucial that the risk management process be carried out in a team rather than alone in order to facilitate the wide exchange of knowledge and experiences from a variety of fields. The process's success is dependent on the degree to which project participants contribute to providing critical information about the risks for the risk analyst to analyze the risks and indicate the extent of their impact on the project. (Smith, Merna & Jobling, 2014) All project participants are responsible for the construction project risk management process. The contractor must research the project's surrounding environment, including the political, economic, and market situations, and anticipate any potential hazards and make plans to mitigate them.
In compliance with the owner's specifications, the consultant also efficiently develops the designs and project documentation; however, the owner is still responsible for guaranteeing the financial savings necessary to pay for the project (Abdulsalam, 2015).

There are four primary steps in the construction project risk management process (Winch, 2011):

1. Determine the risks
2. Risk Assessment
3. Risk Response
4. Management of Risk

First: Stage of Risk Identification

This is the first phase of risk management, with the goal of identifying and discovering the risks that could affect the project and jeopardize its goals. It is a record of all anticipated risks to the project and serves as the foundation for the rest of the risk management and uncertainty process (2011, Winch).

In order to access and identify these risks, this process requires specific mechanisms and tools, such as brainstorming sessions, expert opinions obtained through the Delphi method or by interviewing them and learning from their experiences, historical data on project risks similar to the project under study, and multiple assessments based on the team's judgment (Pinto, 2016). Because there are a variety of hazards, some of which can be identified and some of which cannot; some are acceptable and some are intolerable. The organization's prior experiences inform the risk identification process. Risk identification techniques need to be developed based on these variables because risks are environment-dependent (Najm, 2013).

Numerous studies and references have classified the risks associated with construction projects in a variety of ways, including splitting them into two categories: internal and external hazards. While external risks are related to the external environment and include things like economic conditions and globalization, legal controls, state policy, unforeseen circumstances, security and safety issues that are outside the purview of the work team, community culture, social matters, environmental and health controls, and so on. Internal and manageable risks are related to the consulting owner, contractor, subcontractors, and suppliers (Al-shibly et al., 2013).

In construction projects, the American Society of Civil Engineers (ASCE) has adopted a risk classification scheme that divides risks into six main categories: construction hazards, underground physical hazards, legal and contractual risks, performance risks, economic risks, and political risks. These risks are identified along with the parties that bear responsibility for them (Fisk & Reynolds, 2016):

- Site readiness: Since the owner chooses the location, it is his job to get the site ready, but the contractor is in charge of obtaining the licenses and legal approvals needed to acquire the location, practice work, and begin implementation.
- The contractor bears responsibility for physical hazards, which include the subterranean nature of groundwater levels, soil composition, and geological conditions.
- Weather: With the exception of hazardous weather, the contractor is accountable for handling both expected and unforeseen weather.
- In the rare event that the designer is aware of the characteristics of the city in which the building is located, natural disasters—risks that fall outside the purview of human responsibility and are unplanned events like earthquakes and floods—fall under his responsibility. In other cases, however, the owner bears the responsibility for any losses resulting from these events.

- The variations between the actual and estimated quantities of materials used: The contractor is responsible for covering the cost of quantities that increase by 25–15%, whereas the owner is responsible for covering the value of quantities that increase as a result of change orders.
- Ineffectiveness of the working cadres Each entity involved in the project, including the owner, consultant, contractor, and project manager, is considered to be part of the working cadres. However, in practice, this means that the contractor is accountable for the inefficiencies of all the cadres.
- While it makes sense that the designer would be accountable for mistakes in design, this is not always the case; rather, the owner and the contractor are the ones who suffer losses as a result of the designer's mistakes.
- As the primary contractor is the one who hires subcontractors and has the authority to monitor their performance to guarantee quality and efficiency, he bears the liability for errors made by them.
- Poor implementation technique choices, subpar worker performance, unfavorable site conditions, and other variables might expose workers to accidents. Since the contractor is in charge of the site and everything that happens there, he is also liable for any accidents that occur there.
- The inability of qualified administrative cadres to perform administrative work efficiently; instead, each project partner must bear the consequences of inefficiency in the event that an administrative cadre's inefficiency occurs. To carry out administrative operations effectively, the right person must be chosen at the right place based on his or her area of expertise.
- Financial deficit: This is the inability to raise the necessary funds to finish the project's implementation. Since any party may be affected by the financial deficit, all project participants are obliged to guarantee the project's financial stability and the degree to which it complies with all project requirements.

Second: Stage of Risk Assessment

Following the identification and categorization of the risks, these risks are assessed with respect to the likelihood that they will materialize, the proportion of their impact, when they will occur, and potential mitigation strategies. (Risk Management Plan Preparation Guidelines, 2005), and the risk assessment procedure is used to determine which hazards are the most important to address first, followed by the least important, and so on.

According to Abdul Moneim, Al-Kashef, and Kaseb (2008), the degree of risk is indicated by the degree of its influence on the project; the more this impact, the more significant these risks are thought to be for the project. Three crucial factors need to be taken into account when evaluating risk: The Orange Book, 2004).

1. Ensure that the procedure for determining the risk's degree of impact and probability of occurrence is well-defined and organized.
2. Clearly document the risk assessment's findings so that it will be simple to rank the risks based on their significance and degree of impact.
3. It should be evident how the project's inherent risks and residual risks differ from one another.

A common technique for qualitative risk assessment is the application of a probability/impact matrix. By calculating the probability of each risk happening and the potential consequence,

this matrix helps determine which are the most significant risks that could have an influence on the project (Winch, 2011).
The following figure (1) illustrates how the matrix represents all potential risks that the project may encounter. These risks were first identified in the first phase and are subsequently categorized based on the likelihood that they will occur, with the three levels low, medium, and high (2016252 Pinto) determining the extent of their impact.

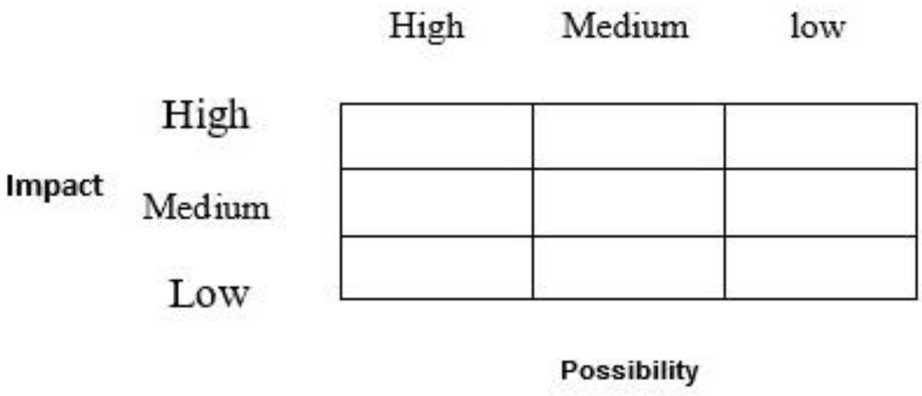

Figure 1: Probability and impact matrix of risks.

Based on the intensity of their impact on the project, risks are categorized into three tiers using the likelihood and impact matrix (Moussa et al., 2012). In Caltrans (2012).

- Serious risks are those whose occurrence could cause the project to fail; these preliminary risks are recognized and managed.
- Medium risks are those that could force the project into financial trouble and force it to borrow money; these risks are addressed in accordance with the time and resources available.
- Weak risks, which are risks that can be met and the resulting losses can be met through the cash available in the project, these risks do not need to be dealt with and addressed at this time.

Given the foregoing, it is evident that qualitative analysis of the risks identified in the first stage is crucial in order to determine the extent of the risk's probability of occurring, its level of impact, and the necessary decisions regarding these risks and their strength. The risk is categorized in figure (2) based on the likelihood that it will occur and the extent of its impact (Titi, 2010).

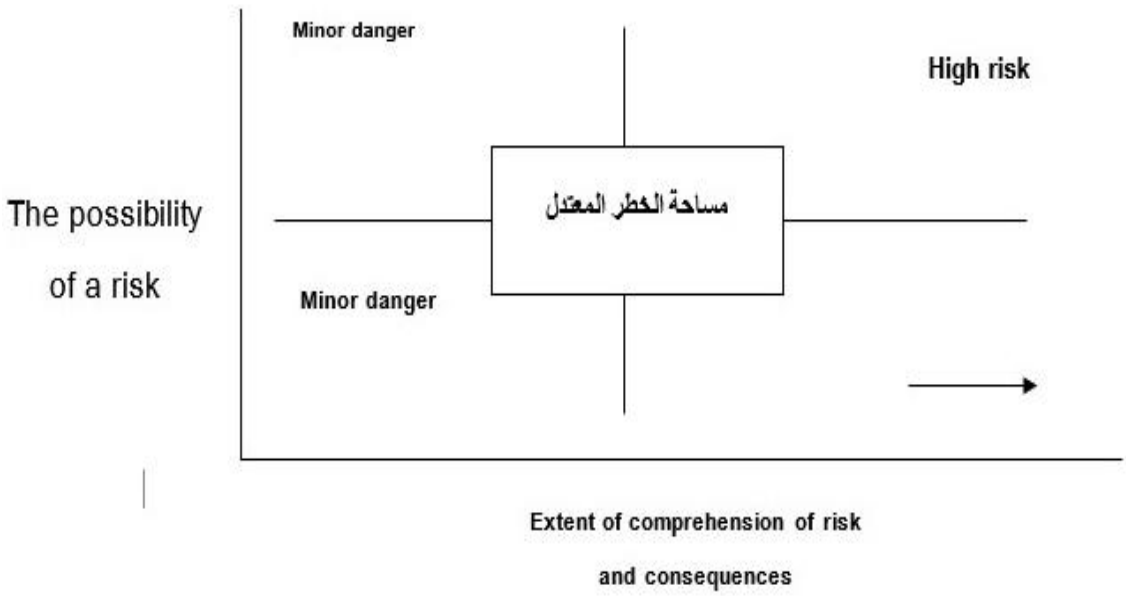

Figure 2: Hazard classification by probability and impact (Al-titi, 2010).

Quantitative risk analysis, also known as quantitative assessment, is based on estimating project success by following the predetermined schedule, budget, and quality. Quantitative analysis of risks can be conducted using sensitivity and probability analysis, which measures any increase in cost over the project's estimated cost and any increase in time through the use of additional duration. It also measures the degree to which the project fails to meet the required quality of work (2014, Smith, Merna & Jobling). The steps for applying quantitative risk analysis using inputs, tools, and outputs are shown in Figure 3.

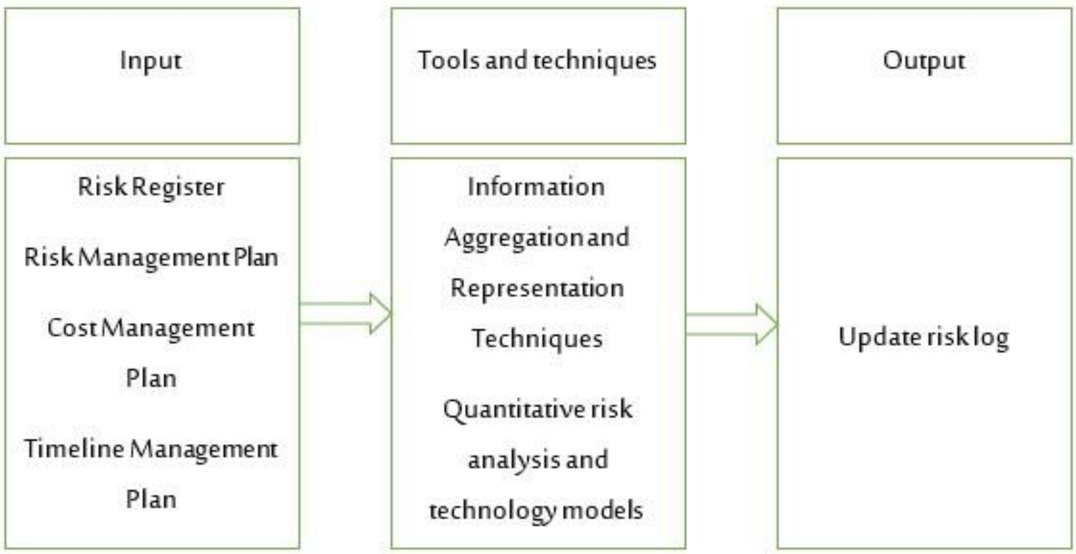

Figure 3: Steps to implement quantitative risk analysis through inputs, tools and outputs (PMBOK,2008).

This method is separated into two approaches: statistical and probabilistic. The statistical approach uses statistical methods to assess and analyze risks, while the probabilistic approach uses the probability analysis method, decision analysis tree, and sensitivity analysis. (Azri, 2011) The two stages of quantitative risk analysis are as follows: in the first, a matrix of

probability, impact, and consequences is prepared, and the strength and impact of each risk are determined. In the second stage, each risk is valued based on the strength of its impact overall and its impact is further evaluated on all project success factors by computing the following equation yields the risk coefficient
RF= PF+CF-(PF)(CF)

(RF) Risk Factor

Probability of Failure (PF): Probability of failure, which is the sum of the value of the probability of failure of success factors and dividing them by their number.
Consequences of Failure (CF): Consequences of failure (impact), which is the sum of the value of the consequences of failure (impact) success factors and divided by their number.
The risk is considered low if the risk coefficient (RF) is < 30, it is considered medium if the risk coefficient (RF) is between 30 to 70, and the risk is considered high and highly influential when the risk coefficient (Pinto, 2016).70 <
Qualitative analysis is considered the best and most appropriate in assessing risks in construction projects (Al-Azri, 2011).
Take note that the most significant risks to Kuwaiti construction projects have been listed in decreasing order of severity Financing Risks Design Dangers Relevant Dangers Risks in Management Risks related to labor, equipment, and the environment.

Third: Stage of Risk Response

During the risk response phase, strategies that minimize risks and maximize opportunities are selected. All project participants are accountable for responding to risks; each risk has a specific method of response that is overseen by the owner, who may assign the response's implementation to another individual (Caltrans, 2012).

Risk Response Strategies Include

- Acknowledge risks Because it is common for there to be certain natural risks that have a minor and incomplete influence on the project, this strategy accepts and prepares for the risk. However, there are other types of risks that are inherent in the project and cannot be avoided. (Pinto, 2016).
- Risk reduction: This approach seeks to lessen the likelihood that a risk will materialize. It accomplishes this by looking for alternatives that lower the risk ratio, such as strengthening ties with suppliers (Pinto, 2016). It also seeks to ensure that the risk is minimized by altering the project's objective or vision (Winch, 2011).
- Risk sharing: The best time to implement this strategy is during the contracting stage, when it is determined what each party's responsibilities are regarding the project's risks. This strategy relies on the sharing of project-related risks amongst parties, who bear the results and effects of their participation on each other, thereby mitigating the effects on one party (Pinto, 2016).
- Risk transfer: When it is extremely difficult to alter the risks, by either lowering or eliminating them, the risk is transferred to a different party. One such example of this is when construction projects employ completion guarantees to guarantee project completion, thereby shifting the risk of project delay to the contractor (Pinto, 2016). When employing this strategy, two considerations must be made: first, that the transferee is capable of facing this risk, handling it skillfully, and managing it to the fullest extent possible; second, that the costs associated with using the other party to bear this risk are

less than the potential losses to the project should this risk materialize (Smith, Merna & Jobling, 2014).

- It is possible to use specific methods and techniques that work to avoid these risks from the beginning when they are known and their sources are identified (Smith, Merna * Jobling, 2014). One method used to avoid risks is to work on changing the project management plan to eliminate the threat resulting from these risks. Risk avoidance is the process of avoiding risks from the outset and not allowing them to occur. It is also possible to shield the project's objectives from these risks when they arise, but most of the time, the project's objectives are modified to eliminate your exposure to them. Examples of these modifications include lengthening the project's implementation period, altering its strategy, or shrinking its scope. If risks arise early in the project, they can be avoided by being clear about the needs and taking precautions to minimize them. Alternatively, risks can be totally eliminated as a last resort. Providing information, enhancing communication channels, and ultimately making it feasible Hire an Expert (PMBOK, 2008). Certain construction projects can be risk-free. For example, tall structures can have lightning rods installed to prevent lightning-related fires, and dams can be built to prevent flooding (Musa, Nour, Al-Haddad, and Theeb 2012 (27). Some examples of risks in building projects and ways to address them are shown in the following table (2) (Caltrars, 2012).

Table (2)
Examples of construction project risks and responses

The threat	The threat formula	Response to the threat
The Design	Errors or incomplete information in the study file lead to redesign	Mitigation Strategy: Review the study file by those working on it carefully to ensure that it is completed, and additional studies are carried out
The environment	A lawsuit challenging the environmental report, causing the project to start a delay or the loss of the funding entity	Mitigation strategy: Record the interests of stakeholders and the general public during the environmental process and undertake additional scheduling to include the general public
The Construction	Discovery of unexpected objects buried underground during the execution process that need additional costs to be removed	Acceptance strategy: To accept this risk, it must be carried out under the heading of additional work

Caltrans (2012). Project Risk Management Handbook: A Scalable Approach. Risk Managemnt Task Group, California Department of Transportation. California, 28.

Fourth: Stage of Risk Control

Monitoring risks throughout the project life cycle is the final step in risk management. The more information we have, the more likely it is that we can minimize risks and their effects. We can also identify risks that have already materialized and remove them from the checklist by closely monitoring the project and its variables (Winch, 2011).

This phase entails monitoring the project's risks, assessing the efficacy and efficiency of the risk-reduction tactics, and implementing a corrective action plan in the event that the goal is not met in accordance with predetermined measurement standards (Khairuddin, 2014). The risks to which the project is exposed must be tracked down and frequently monitored in order to determine the degree to which this risk is controlled and reevaluated in order for the risk monitoring process to be effective. In actuality, it was not what was expected at the time (Abdel Moneim, Al-Kashef, and Kaseb, 2008).

In order to ensure that risks are accurately identified and dealt with, appropriate monitoring and response must be put in place. Regular reviews must also be conducted in accordance with the necessary performance standards and policies, taking into account changes in the project's surrounding environment that may result in new unexpected risks (2002, IRM, I.R., and I).

At this point in the project's life, monitoring activities and work must continue even after the response methods outlined in the project management plan are put into practice in order to detect changes in the presence of new risks. The project risk monitoring process requires specific techniques, such as trend analysis and variance, that need to be worked on. Additionally, new risks are identified and the previously identified risk response plans are put into action. Finally, the effectiveness of the risk management process during the project implementation period is evaluated. It gives details on how well the project performed throughout implementation. According to the PMBOK (2008), this phase aims to confirm the following:

- Do the project's theories still hold true?
- Should the dangers be reevaluated in case they have changed?
- Have risk management guidelines and practices been followed and put into practice?
- Should the cost and timing of emergency precautions be changed to reflect the current risk assessment?

From his point of view, the researcher concurs with the references that assert that one of the key processes to project success is risk management. This is especially true for construction projects, which are subject to a variety of risks. By managing these risks, these risks can be identified, classified into groups, and their impact on the project and probability of occurrence can be evaluated. Based on this information, effective response strategies can be developed to mitigate these risks and lessen their effects, and the effectiveness of these strategies can be monitored as well as any new risks that may arise during project implementation.

The Impact of Risk Management on the Performance of Construction Projects

Agarwal and Rathod (2006), among other scholars, highlighted that time, money, and requirements—the three factors Carbne (2004) described as having an objective impact on the challenges a project faces—are the determinants of project success. Based on the findings of this study, a more comprehensive approach to evaluating project success exists, with stakeholders themselves defining success factors. These factors may encompass not only financial and requirement aspects but also other aspects like stakeholder satisfaction and the project's long-term outcomes. Particular actions are delineated (Voetsch, 2004). particular actions Seldom are risk definition, risk analysis, action planning, and implementation followed.

According to Besner, Brian (2012), a project's success is influenced by how risky its activities are defined as well as by socially and effectively implemented actions.

The researcher states that one or more of the following three primary criteria typically determines a project's success: timely delivery, fulfilling specifications and staying under budget, and customer satisfaction—the latter of which is frequently greatly impacted by individual performance in the first two categories.

The modern global workplace is full of hazards and complications that could impede the progress and expansion of projects in general. Managers, in particular, must cope with a variety of risks, including the following: Technological Financial Insurance (Sagan, 2002) constancy and security. Thus, risk management is crucial to guaranteeing the efficiency and stability of profits (Wallac, Keil, Rai 2004).

Project management is particularly dependent on risk management because of the potential for project disruptions brought on by hurried timelines, inaccurate budgets, and constantly shifting needs (Kerzner H, 2009).

Market profit, project budget, product performance, market requirements, and project timeline are the five categories of variables that Huchzermeier (2001) described. Since project risk management is crucial, new risk management techniques have been employed. Ahmed, 2007.

The project plan outlines the instructions that are given to the project team, the processes that need to be followed, and the sources that will be consulted in order to attain the intended outcomes. It also provides the project team with a detailed timeline for the implementation of the stages. Risk efficiency is the lowest degree of risk to the lowest level of projected performance, according to Ward (2003). Risk management works to lower the risk by purposefully manipulating the campaign's current state.

Formal project risk management policies are available in most firms as auxiliary tools for analysis. Risk definition tools, discussions, checklists, efficacy of layouts, cause and effect of plans, impact and probability networks, event tree analysis (history), instability analysis, Delphi techniques, expert judgment, risk response tools (expected impacts, risk response plan, project risk planning), risk assessment tools (analysis), decision history, and file management are some of the analyses that are included in these lists. Criteria for Making Decisions Additionally, a software program is offered. Herroelen (2005) states that simulation tools are part of project risk management.

As to the PMI Standards Committee (2008), the majority of these tools concentrate on risk planning, identification, analysis, and development. Even though risk planning methods are widely used, various barriers to risk planning have recently been noted in the literature. These barriers can be summed up as follows:

1. Make use of a particular set of tools While there are several methods available for risk planning, most project managers utilize risk classification as their primary tool, if not their only one.

For instance, the widely held misconception that bonds and collateral loans lower overall risk in the financial system was the root cause of the global financial crises of 2008 and 2009, however this assumption turned out to be false.

2. Low level of usage Risk identification and effective strategy creation are two processes that most project manager's lack (Kwak, Stoddard 2004).
3. Worldwide intricacy in current instruments: The intricacy of the project increases the work needed for successful risk planning, making the use of current methods challenging.
4. The insufficient power of project managers Supervisors typically possesses critical data and risk planning procedures, which could be compromised by their incapacity to efficiently oversee risk management procedures (Zwikael, Ahn, 2011).
5. Ineffectiveness Research on risk management receives a low grade and is referred to as "project success factors." Studies that demonstrate how risk management

improves project success are often neglected. But risk management is critical to project management, particularly in the planning stage (Voetsch, 2004).

Because these studies took the improper tack of using "one framework that fits all projects, without distinguishing between projects and their objectives and circumstances," the researcher feels that the literature is inconsistent about the role that risk management plays in projects.

In certain papers, risk was explained as a set of interrelated procedures using various instruments and methods. Risk management is described as risk identification, risk management planning, qualitative and quantitative risk analysis, risk response plan, monitoring, and control by PMI (2008). By interviewing 701 project managers across seven industrial sectors, Zwikael, Mark (2011) conducted studies demonstrating the relationship between risk management and project success in three countries (New Zealand, Israel, and Japan). The study found a relationship between risk management, at various levels, and project success, and emphasized the significance of cooperation between the state and factories to face risks.

Theoretical and Practical Implications

Theoretical implications

In order to lay a strong foundation of knowledge and comprehension, it is essential to conduct a theoretical study on the subject of risk management in construction projects. Theoretical frameworks offer the conceptual underpinnings required for researchers and practitioners to examine and assess the fundamental ideas, concepts, and models that guide risk management in construction projects. This theoretical framework also makes it possible to identify the variables, relationships, and important factors that influence how well a project is implemented. By exploring the theoretical dimensions, scientists and professionals can gain insight into the complexities of risks in construction projects, leading to a more thorough and accurate understanding of how risks affect project efficiency. Understanding the theoretical aspects of risk management in construction projects also facilitates the development of conceptual models that can be used to guide research, inform decision-making processes, and contribute to the formulation of best practices.

Theoretical research also lays the groundwork for combining and synthesizing existing knowledge from a variety of disciplines, including engineering, finance, and project management. This interdisciplinary approach is crucial for developing a thorough understanding of risk management in construction projects and for enabling the application of various viewpoints and methodologies to increase research power.

Practical Implications

While theoretical studies provide a solid foundation, applied studies are equally important in translating theoretical ideas into practical solutions. In the context of risk management in construction projects, applied studies involve the realistic application of theoretical concepts to meet specific challenges and improve project efficiency.

Taking into account the dynamic and complex nature of construction projects, applied studies allow researchers and practitioners to test the efficacy and validity of theoretical models in real-world scenarios. Applied research also helps validate theoretical frameworks, identify real-world challenges, and effectively improve risk management strategies through case studies, simulations, and empirical investigations.

Additionally, by looking at actual projects, practitioners can gain insight into effective risk management techniques, learn from past mistakes, and create useful implementation guidelines. Applied studies also offer specific instances and proof of the impact of risk management on the efficiency of construction projects.
The development of knowledge in the area of risk management in projects essentially depends on the synergy between theoretical and applied studies; theoretical frameworks establish a conceptual understanding, while applied studies validate and refine these concepts in a practical setting, ultimately assisting in the development of comprehensive and successful risk management strategies to increase project efficiency.

Conclusion and Recommendations
In conclusion, risk management plays a crucial role in building projects to guarantee effective project execution. The success of construction projects is contingent upon a proactive and comprehensive approach to risk management, given the inherent uncertainties and complexity of the project. This study aimed to shed light on various aspects of risk management and its influence on project efficiency. The primary conclusions and recommendations of the research are as follows:
The results:

- Proactive risk identification techniques reduce project disruptions and improve project flexibility in the face of unforeseen obstacles. The study shows a strong relationship between early risk identification and increased project efficiency.
- Construction projects with strong risk management techniques demonstrate notable decreases in delays and overruns in costs, and efficient risk reduction techniques optimize project schedules while staying within budgetary limits.
- The study highlights how important stakeholder collaboration and communication are to good risk management, with projects that foster these relationships demonstrating increased resilience to unpredictability.
- The suggested Risk Management Conceptual Framework gives a structured method for recognizing, evaluating, and reducing risks, making it an invaluable resource for project practitioners. It has been validated through applied research and simulations.
- The study categorizes and analyzes important risk variables that are particular to the construction sector. By comprehending these characteristics, risk management solutions that are tailored to the particular difficulties encountered by building projects can be developed.

This study has suggested recommendations, as follows

- Adopting proactive risk management techniques should be a top priority for project stakeholders. By emphasizing early detection and mitigation, this strategy reduces the impact of uncertainties and improves overall project resilience.
- Organizations should fund training initiatives to improve project stakeholders' knowledge and proficiency in risk management; informed stakeholders are better able to assist in efficient risk detection and mitigation.
- Adopt technological solutions for risk assessment. Utilize tools like simulation models and predictive analytics. Technology may offer a more dynamic and accurate assessment of potential hazards, assisting in the formulation of well-informed decisions.

- Establish a culture of continuous improvement by reviewing and updating risk management plans on a regular basis. Since construction projects are changing, tactics must change to meet new risks and difficulties.
- Establish clear rules that will offer a foundation for uniform and efficient risk management across projects by working with industry associations and authorities to develop standardized risk management procedures in the construction sector.

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