

Risk Management and Project Success: A Case of Housing Projects in Pakistan

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Abstract

Purpose: This study aims to provide a thorough understanding of risk management and project success by examining the interactions and combined effects of many risk management factors, focusing on the potential mediating role of project risk management in conflict resolution in housing projects in Pakistan.

Methods: The project management team members employed by Karachi-based construction enterprises make up the sample population for the study. The survey approach was used as the data collection strategy for this investigation, while PLS-SEM was used for the data analysis.

Results/Findings: The results revealed that PRM has a positively significant effect on PS. MAN, ST, MA, and RE have a positively significant effect on PRM. DE has a positively insignificant effect on PRM. FI has a positively insignificant effect on PRM. The results also show that PRM significantly and positively mediates the effect of MAN, ST, MA, and RE on PS. PRM insignificantly and positively mediates the effect of DE and FI on PS.

Novelty/Originality: The work stands out for its focus on construction projects in developing countries like Pakistan. It aims to provide a deeper understanding by examining how project risk management mediates conflicts, a less explored area in the field. By addressing gaps in existing research and tackling practical challenges, like sampling bias and ethical considerations, it offers valuable insights for improving project success in these contexts.

Keywords: *Project Risks, Project Success, Construction Industry, Pakistan, PLS-SEM.*

JEL: L74, C00, M10.

1. Introduction

Project success is a top priority for enterprises in the dynamic and fiercely competitive world of construction projects. Like many construction projects, housing projects are beset by various complex issues related to management procedures, design considerations, stakeholder engagement, material choice, regulatory compliance, and budgetary limitations (Alchammari et al., 2021). These elements work together to affect how successful such undertakings are overall. As a crucial mediator, project risk management bridges the gap between the independent variables and project success. It serves as a tool to recognize, evaluate, and reduce risks related to housing projects, increasing the possibility that the projects will be successful (Rane et al., 2021).

The study can run into many practical issues. Due to workers' hectic schedules, unwillingness to engage, or requirement for access to confidential corporate information, employees of construction enterprises might be difficult to interview (Ahmad et al., 2022). Ensuring that the sample chosen accurately reflects the broad population of project management teams in Karachi can be challenging, which could result in sampling bias. In business, upholding moral standards and guaranteeing data confidentiality may be challenging. The study's success will also depend on readiness for unanticipated obstacles and changing the research strategy as necessary (Alzoubi, 2022).

There are significant gaps in the corpus of knowledge that research can fill. It is possible that earlier research on project risk management and project success did not address the construction sector's particular circumstances. While some studies have examined how certain aspects affect project performance, a dearth of thorough research considers several variables' interactions and combined effects (Nguyen & Macchion, 2023). The study suggests that project risk management can mediate disputes, although the building sector has not thoroughly investigated this idea. Most current research directly concentrates on the links between variables, frequently ignoring the mediating mechanisms. It is critical to comprehend the point of view of the individuals who make up the project management teams in construction enterprises of developing countries like Pakistan. Current studies may not sufficiently represent their thoughts and experiences (Baig et al., 2022).

Focusing on the particular circumstances and dynamics faced by construction enterprises operating in developing countries, this study seeks to fill in significant knowledge gaps regarding project risk management and project success in construction enterprises (Nguyen & Macchion, 2023). While some aspects of project performance have been the subject of prior research, this study aims to provide a more thorough understanding by examining the interactions and combined effects of many different variables, focusing on the potential mediating role of project risk management in conflict resolution (Kassem, 2022). Aiming to fill these knowledge gaps and advance the larger objective of sustainable development in the construction sector, this research aims to present a thorough understanding, inform best practices, and eventually lead to more successful building projects in poor nations (Hassan et al., 2023).

The following paper will have theoretical underpinnings and the development of the hypotheses along with the research framework. Followed by methodological aspects, including sample and population, measures and instrumentation, explanation, and justification of the data analysis technique. The paper's third section will provide results and findings, followed by their theoretical and critical discussions with the past studies. Lastly, the paper will provide conclusive remarks and recommendations.

2. Literature Review

2.1. Theory of constraints

Due to its success in eliminating bottlenecks, streamlining procedures, and enhancing system efficiency, the Theory of Constraints (TOC) is a robust theoretical framework that has gained popularity in several sectors, including project management and construction (Goldratt, 1990). The fundamental tenet of TOC is that each complex system or organization has at least one limiting element, or constraint, that prevents it from achieving its objectives. This restriction could be a resource shortage, a process bottleneck, or a generalized inefficiency. TOC strongly emphasizes recognizing and effectively managing these restrictions to improve the system's performance (Mabin & Balderstone, 1999). It introduces the idea of the "Five Focusing Steps," which include identifying the constraint, exploiting it by maximizing its utilization, putting it ahead of all other processes, elevating it if necessary through investments or improvements, and repeating the process as constraints change (Goldratt, 1990).

2.2. Relationship between project risk management and project success

The project's success can be assessed by evaluating its deliverables regarding benefits and stakeholder satisfaction or, in other words, by determining how well its final goals have been met. Similarly, the relationship between project risk management and project success is profound and direct (Alchammari et al., 2021). A robust risk management approach can assist in discovering, evaluating, and prioritizing potential risks that might influence the project. This enables project teams to create proactive ways to lessen or address these risks. This reduces the possibility of unfavorable results like cost overruns, timetable slips, or quality problems, which can jeopardize a project's success (Unegbu et al., 2022). Therefore, the hypothesis has formed: H1. Project risk management has a positive effect on project success.

2.3. Relationship between management-related project risks and project risk management

According to research, in project management, risk management identifies, evaluates, and prevents or mitigates project risks that can impact the desired outcomes. Project managers typically oversee a project's risk management process (Alchammari et al., 2021). Therefore, management-related project risks can positively affect project risk management. These risks, which are frequently connected to decision-making, leadership, and communication, might act as motivators for better project results. Organizations may have various advantages when identifying and properly managing these risks (Ahmad et al., 2022).

Moreover, identifying and reducing management-related risks helps the project team develop a culture of risk awareness. Team members are more likely to notice possible problems and report

them right away as a result. The process of managing risks as a whole is improved by this increased awareness (Kassem, 2022). Hence, the hypothesis has formed:

H2. Management risks have a positive effect on project risk management.

2.4. Relationship between design-related project risks and project risk management

Kassem (2022) stated that the success of a project as a whole depends on the link between design-related project risks and project risk management. Risks related to design include things like design complexity, requirement changes, and technical difficulties. Project results may be strongly impacted by how these risks have been managed. However, addressing design-related risks early in the project lifecycle enables project teams to deploy resources efficiently. A proactive approach can resolve possible design concerns before they become more serious (Gashaw & Jilcha, 2023). Delivering a successful project within scope, time, and budget restrictions while fulfilling quality and design objectives necessitates proactive risk assessment, mitigation, and continuing management (Kassem, 2022). Therefore, the hypothesis has formed:

H3. Design risks have a positive effect on project risk management.

2.5. Relationship between stakeholders-related project risks and project risk management

Project risks associated with stakeholders include everyone impacted by decisions or processes, including internal groups, organizations, or individuals with the potential to change roles (Bai et al., 2022). The success of the project and its capacity to live up to stakeholder expectations depend critically on the link between stakeholder-related project risks and project risk management. Risks associated with project stakeholders include things like shifting requirements, competing interests, and insufficient interaction. Additionally, Bai et al. (2022) indicated that project risk management is essential to address stakeholder-related risks. Establishing a proactive approach entails early risk identification and analysis. Throughout the project lifecycle, ongoing monitoring and adaptive risk management solutions guarantee a response to changing stakeholder dynamics, ensuring satisfaction (Huo et al., 2023). Thus, the hypothesis has formed:

H4. Stakeholder risks have a positive effect on project risk management.

2.6. Relationship between material-related project risks and project risk management

According to prior research, when managed strategically, material-related project risks can positively impact project risk management. These risks frequently entail problems with the tools, equipment, or materials needed for a job. Project managers can adopt efficient mitigation solutions when proactively identifying and analyzing such risks (Nguyen & Macchion, 2023). Moreover, project teams can reduce the effect of probable shortages or delays by developing contingency plans, securing alternative suppliers, or stockpiling essential resources by early identification of material-related risks. Project resilience is enhanced by this proactive approach (Abdaljader & Günal, 2023). Hence, the hypothesis has formed:

H5. Material risks have a positive effect on project risk management.

2.7. Relationship between regulatory-related project risks and project risk management

Project risk management and regulatory-related project risks have been intricately intertwined. These risks result from a project's requirement to abide by numerous laws, rules, and standards. A project's success can be significantly impacted by how it will be handled (Ahmad et al., 2022). Similarly, to ensure regulatory compliance, thorough planning and investigation are required for effective project risk management. Early detection of potential regulatory roadblocks permits the creation of solutions to either lessen or accommodate these difficulties. This can require speaking with legal professionals, obtaining licenses, or adjusting project budgets and timetables (Kassem, 2022).

Additionally, it is crucial to recognize that regulatory-related risks can intersect with other project risks, such as schedule delays or budget overruns. Non-compliance with regulations can lead to fines, legal disputes, or even project shutdowns, harming project success (Karytsas et al., 2022). Thus, the hypothesis has formed:

H6. Regulatory risks have a positive effect on project risk management.

2.8. Relationship between financial-related project risks and project risk management

Sun and Li (2022) claim that project risk management and financial-related project risks have a complex and essential link. Budgetary restrictions, financing volatility, and resource shortages constitute financial risks that can significantly impact how projects turn out. Continuous monitoring and control are essential for efficient risk management in the financial domain throughout the project (Alchammari et al., 2021). Due to regular financial assessments and tracking, project teams can quickly discover budget or funding plan deviations. This makes it possible to take prompt remedial action, keeping the project's finances on track (Nguyen & Macchion, 2023). An essential component of project risk management involves detecting and evaluating financial-related project risks. This entails examining potential budget overruns, cost uncertainty, and the availability of financial resources (Ahmad et al., 2022). Therefore, the hypothesis has formed:

H7. Financial risks have a positive effect on project risk management.

2.9. Mediating effect of project risk management between management-related project risks and project success

According to the study, the primary mediating factor between management-related project risks and project success is project risk management. Management-related risks, such as subpar decision-making, insufficient resource allocation, or inept leadership, can seriously impair the success of a project. To address these issues and improve project outcomes, effective risk management serves as an intermediary (Ahmad et al., 2022). Similarly, project teams can identify management-related risks before the project lifecycle by conducting thorough risk identification and assessment. Then, they can create plans to reduce these risks by boosting leadership and communication within the project team, optimizing resource allocation, and improving the decision-making process (Zitha & de Klerk, 2022).

Hence, the hypothesis has formed:

H8. Project risk management positively mediates between management risks and project success.

2.10. Mediating effect of project risk management between design-related project risks and project success

A critical intermediary between design-related project risks and project success involves risk management. Project outcomes may be compromised by design-related risks such as inadequate specifications, design faults, or modifications to design requirements. An effective risk management strategy acts as a link to tackle these issues and improve project success (Alchammari et al., 2021). Project teams can identify possible design-related risks at the start of the project lifecycle through thorough risk assessment and mitigation measures. They can develop strategies to hone and clarify design specifications, do in-depth design reviews, and create backup plans if design modifications happen. This proactive strategy reduces the possibility of design-related problems resulting in project delays or cost overruns (Yang et al., 2023). Thus, the hypothesis has formed:

H9. Project risk management positively mediates design risks and project success.

2.11. Mediating effect of project risk management between stakeholders-related project risks and project success

Project risk management ensures that project objectives are better aligned with stakeholder expectations by mediating stakeholder-related risks, which enhances project success (Alchammari et al., 2021). It helps project teams to satisfy all stakeholders while completing work on schedule, within budget, and at the desired quality. Project risk management is crucial in converting possible stakeholder problems into chances for project success (Alkilani & Loosemore, 2022). Moreover, conflicting expectations, shifting requirements, and opposition to project adjustments are stakeholder-related risks that might obstruct project success. In order to get over these difficulties, effective risk management serves as a bridge (Blak Bernat et al., 2023). Project teams can identify possible stakeholder-related risks throughout the project lifecycle by methodically identifying and analyzing risks. Therefore, the hypothesis has formed:

H10. Project risk management positively mediates between stakeholder risks and project success.

2.12. Mediating effect of project risk management between material-related project risks and project success

Wuni et al. (2023) indicated that material-related risks, such as supply chain interruptions, resource shortages, or technical difficulties, may severely impact project outcomes. An effective risk management program serves as a buffer, assisting enterprises in foreseeing, evaluating, and reducing these risks. Additionally, project teams can detect possible dangers proactively by putting solid risk management procedures into place, enabling them to take preventative action to lessen their impact (Kassem, 2022). Project delays, cost overruns, and quality problems—frequently arising from material-related risks—have been reduced by preemptive measures. Effective risk management also improves decision-making by offering stakeholders insightful information on risk trade-offs and mitigation tactics (Zaman et al., 2022). Thus, the hypothesis has formed:

H11. Project risk management positively mediates between material risks and project success.

2.13. Mediating effect of project risk management between regulatory-related project risks and project success

According to a study, project risk management is crucial in mediating the relationship between regulatory-related project risks and project success. Regulatory risks, such as altered legislation, problems with compliance, or unforeseen regulatory obstacles, can seriously jeopardize the success of a project. In order to negotiate and reduce these regulatory difficulties, effective project risk management identifies, evaluates, and implements strategies (Alchammari et al., 2021). Similarly, Si et al. (2022) stated that project managers can ensure compliance with the pertinent rules and regulations and lessen the possibility of expensive delays, penalties, or legal problems by proactively addressing regulatory risks. Preserving project momentum, avoiding legal hurdles, and assuring alignment with regulatory standards consequently improve the project's chances of success (Karytsas et al., 2022). Therefore, the hypothesis has formed:

H12. Project risk management positively mediates between regulatory risks and project success.

2.14. Mediating effect of project risk management between financial-related project risks and project success

Regarding financial-related project risks, project risk management is essential in deciding project success (Yang & Shen, 2022). Financial risks such as budget overruns, insufficient funds, or unanticipated cost increases might jeopardize project outcomes. By recognizing, evaluating, and implementing the proper solutions to handle them, effective project risk management serves as a bridge, reducing these financial risks (Alchammari et al., 2021). Project managers may improve resource allocation, control costs, and ensure the project stays within its budgetary restrictions by proactively managing financial risks. Additionally, by decreasing the adverse impacts of financial-related risks, this risk management method increases the project's chances of success (Osadare, 2022). Hence, the hypothesis has formed:

H13. Project risk management positively mediates between financial risks and project success.

2.15. Research framework

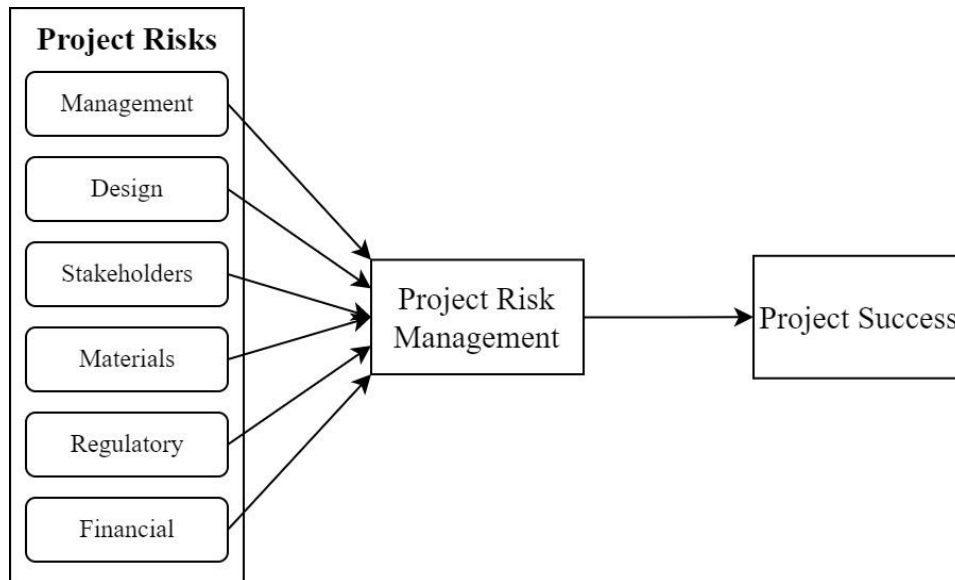


Figure 2.1: Research Model

3. Methodology

3.1. Sample and population

The project management team members employed by Karachi-based construction enterprises make up the sample population for the study using a purposive sampling technique and survey methodology. These people make up the core of the city's direct participants in the planning, carrying out, and supervising of construction projects (Ika & Pinto, 2022). Participants have knowledge and expertise pertaining to the complexities of Karachi's development projects. The study aims to compile viewpoints and opinions, enhancing the validity of the data and understanding the role of risk management in the construction projects of Karachi (Igberaese, 2022). Table 3.1 shows the profile of the 207 respondents.

Table 3.1: Demographic Profile (n = 207)

		N	%
Gender	Male	114	55.1
	Female	93	44.9
Age Group	21-25 years	27	13.0
	26-30 years	42	20.3
	31-35 years	25	12.1
	36-40 years	37	17.9
	41-45 years	40	19.3
	Above 45 years	36	17.4
Qualification	Undergraduate	67	32.4
	Graduate	65	31.4
	Postgraduate	75	36.2
Designation	Project Officer	26	12.6
	Project Manager	40	19.3

	Sr. Project Manager	37	17.9
	Project Coordinator	31	15.0
	Project Controller	31	15.0
	Project Officer	42	20.3
Experience	1-3 years	59	28.5
	4-7 years	48	23.2
	8-10 years	46	22.2
	More than 10 years	54	26.1
Are you currently involved in a housing project in Pakistan?	Yes	106	51.2
	No	101	48.8
Have you received any formal training or certification in project risk management?	Yes	105	50.7
	No	102	49.3

3.2. Measures

The study has adapted six measures of management risks from Ghasemi et al. (2017) based on a five-point Likert scale. The study has adapted five measures of design risks from Al-Mhdawi et al. (2022) based on a five-point Likert scale. The study has adapted four measures of stakeholder risks from Ibrahim et al. (2022) based on a five-point Likert scale. The study has adapted five measures of material risks from Tessema et al. (2022) based on a five-point Likert scale. The study has adapted four measures of regulatory risks from Yeboah et al. (2014) based on a five-point Likert scale. The study has adapted four measures of financial risks from Yeboah et al. (2014) based on a five-point Likert scale. The study has adopted six measures of project risk management from Al-Masawa et al. (2023) based on a five-point Likert scale. The study has adapted four measures of project success from Wu et al. (2017) based on a five-point Likert scale.

3.3. Data analysis

PLS-SEM was used as the data analysis method for this research investigation. PLS-SEM is a viable option in this situation for many reasons. First, PLS-SEM is a reliable method for handling smaller sample sizes and is frequently used in research investigations (Hair et al., 2011b). It is appropriate for this study to involve project management teams in the construction enterprises of Karachi since it can adequately handle data from smaller populations. Second, PLS-SEM is a flexible approach that allows for simultaneous analysis of the measurement and structural models (relationships between variables) (Hair et al., 2014). PLS-SEM is useful in thoroughly investigating these interdependencies because of the multidimensional character of the investigation, where project risk management, independent variables, and project success are interrelated (Hair et al., 2011b).

4. Results and Discussions

4.1. Measurement model

The outcomes of the measurement model using the PLS algorithm are shown in Table 4.1.

Table 4.1: Measurement Model

	Loadings	Prob.	VIF	Alpha	CR	AVE
DE1 <- DE	0.722	0.000	1.538	0.756	0.847	0.650

DE2 <- DE	0.894	0.000	1.435			
DE4 <- DE	0.794	0.000	1.829			
FI2 <- FI	0.788	0.005	1.737	0.789	0.882	0.791
FI4 <- FI	0.981	0.000	1.737			
MA1 <- MA	0.812	0.000	2.161			
MA2 <- MA	0.708	0.000	1.430			
MA3 <- MA	0.813	0.000	2.073	0.844	0.889	0.617
MA4 <- MA	0.787	0.000	1.699			
MA5 <- MA	0.801	0.000	2.158			
MAN3 <- MAN	0.914	0.000	1.541	0.744	0.885	0.795
MAN4 <- MAN	0.868	0.000	1.541			
PRM1 <- PRM	0.805	0.000	1.632			
PRM2 <- PRM	0.863	0.000	2.673	0.846	0.896	0.685
PRM3 <- PRM	0.877	0.000	2.702			
PRM4 <- PRM	0.759	0.000	1.597			
PS5 <- PS	0.874	0.000	1.527	0.740	0.884	0.793
PS6 <- PS	0.907	0.000	1.527			
RE1 <- RE	0.859	0.000	1.460	0.719	0.876	0.779
RE2 <- RE	0.906	0.000	1.460			
ST1 <- ST	0.757	0.000	1.539			
ST2 <- ST	0.802	0.000	1.702	0.792	0.865	0.616
ST3 <- ST	0.803	0.000	1.703			
ST4 <- ST	0.777	0.000	1.557			

Based on the guidelines Hair et al. (2011a) set forth, all outer loading values must exceed the threshold of 0.70 to be considered acceptable. The data presented in the table mentioned above corroborates this requirement, showcasing outer loadings that not only surpass the 0.70 mark but also maintain a probability level below 5% and a VIF under 5, as suggested by Hair et al. (2011b).

Moreover, the alpha coefficients linked to every latent construct are shown to be above the suggested 0.70 threshold. Additionally, according to Hair et al. (2014), for the model to be considered valid, the Average Variance Extracted (AVE) must be more significant than 0.50, and the Composite Reliability (CR) values must surpass 0.70. As mentioned above, the table validates that the constructs and indicators satisfy the requirements mentioned above, confirming the construct and convergent validity of the model.

4.2. Discriminant validity

Table 4.2 shows the HTMT ratio for discriminant validity assessment using the PLS algorithm.

Table 4.2: HTMT Ratio

	DE	FI	MA	MAN	PRM	PS	RE	ST
DE								
FI	0.138							
MA	0.326	0.082						

MAN	0.225	0.046	0.746				
PRM	0.213	0.059	0.764	0.774			
PS	0.441	0.049	0.837	0.705	0.801		
RE	0.444	0.066	0.776	0.894	0.791	0.777	
ST	0.499	0.092	0.879	0.767	0.888	0.857	0.865

As per the suggestions put forward by Henseler et al. (2016); Henseler et al. (2015), it is usually recommended that in order to guarantee sufficient discrimination across latent constructs, the Heterotrait-Monotrait (HTMT) ratio should not exceed the 0.90 threshold. The highest observed HTMT ratio, which relates to the link between the RE and ST constructs, is 0.865, according to the data analysis for the current study. This number indicates a reasonable differentiation between the latent constructs under research since it is less than the suggested 0.90 threshold.

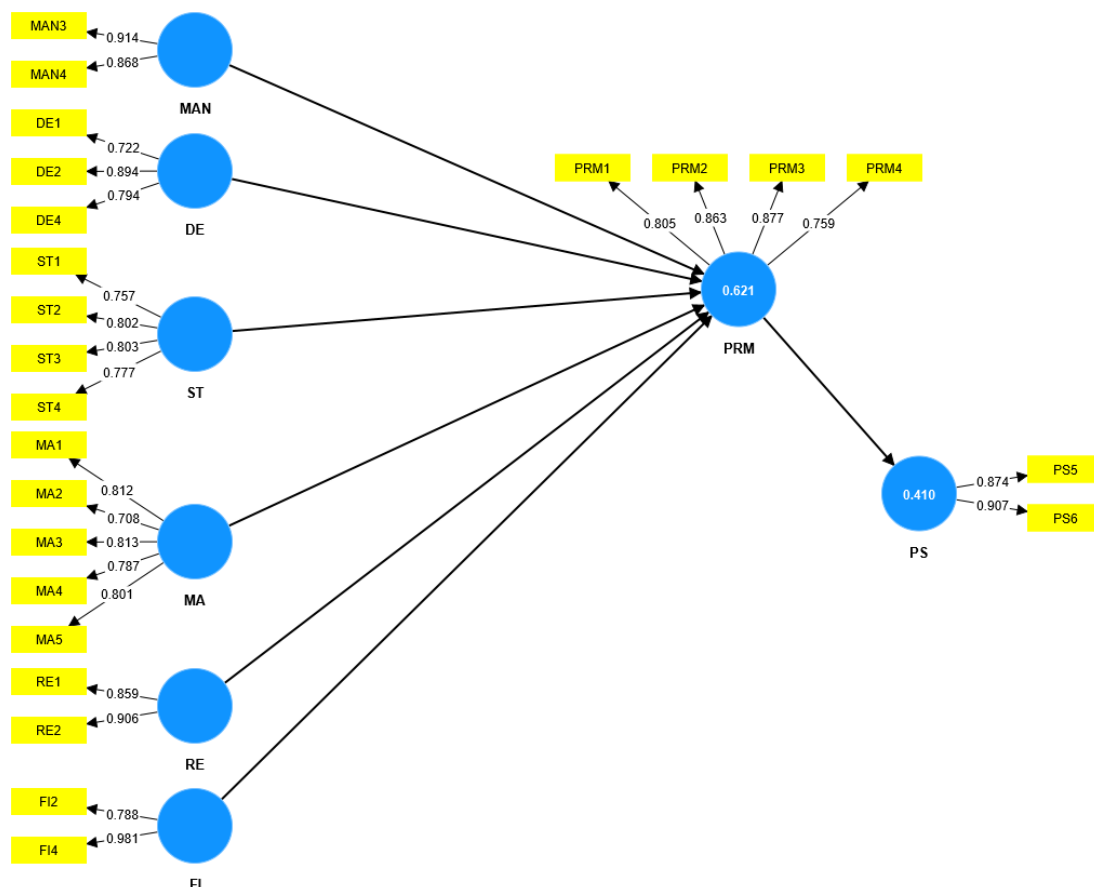


Figure 4.1: PLS Algorithm Illustration

4.3. Predictive power and relevance

Table 4.3 shows the predictive relevance of the endogenous constructs in the model.

Table 4.3: Predictive Relevance

	R Square	Q Square
Project Risk Management	0.621	0.590
Project Success	0.410	0.434

Chin (1998) recommended R^2 values for endogenous latent variables; more than or equal to 0.67 is considered substantial, more than 0.33 is considered moderate, and less than or equal to 0.19 is deemed weak. Here, project risk management and project success have a substantial predictive power of 0.621 and 0.410, respectively.

Hair et al. (2013) recommended that $Q^2 > 0.02$ indicates weak relevance, $Q^2 > 0.15$ indicates moderate relevance, and $Q^2 > 0.35$ indicates strong relevance. The above table demonstrates that Q^2 of project risk management and project success indicate strong relevance of 0.590 and 0.434, respectively.

4.4. Structural model

Table 4.4 shows the direct-effect analysis for hypothesis testing using PLS bootstrapping.

Table 4.4: Path Analysis

	Estimate	S. D.	t-Stats	Prob.	Decision
PRM -> PS	0.640	0.067	9.589	0.000	Accepted
MAN -> PRM	0.181	0.072	2.522	0.012	Accepted
DE -> PRM	0.091	0.079	1.152	0.250	Rejected
ST -> PRM	0.472	0.091	5.177	0.000	Accepted
MA -> PRM	0.141	0.064	2.213	0.027	Accepted
RE -> PRM	0.135	0.072	1.862	0.063	Accepted
FI -> PRM	0.041	0.046	0.894	0.371	Rejected

The above table shows that PRM ($\beta = 0.640$; $p < 0.05$) positively affects PS. MAN ($\beta = 0.181$; $p < 0.05$) has a positively significant effect on PRM. DE ($\beta = 0.091$; $p > 0.05$) has a positively insignificant effect on PRM. ST ($\beta = 0.472$; $p < 0.05$) has a positively significant effect on PRM. The above table also shows that MA ($\beta = 0.141$; $p < 0.05$) positively affects PRM. RE ($\beta = 0.135$; $p < 0.05$) has a positively significant effect on PRM. FI ($\beta = 0.041$; $p > 0.05$) has a positively insignificant effect on PRM.

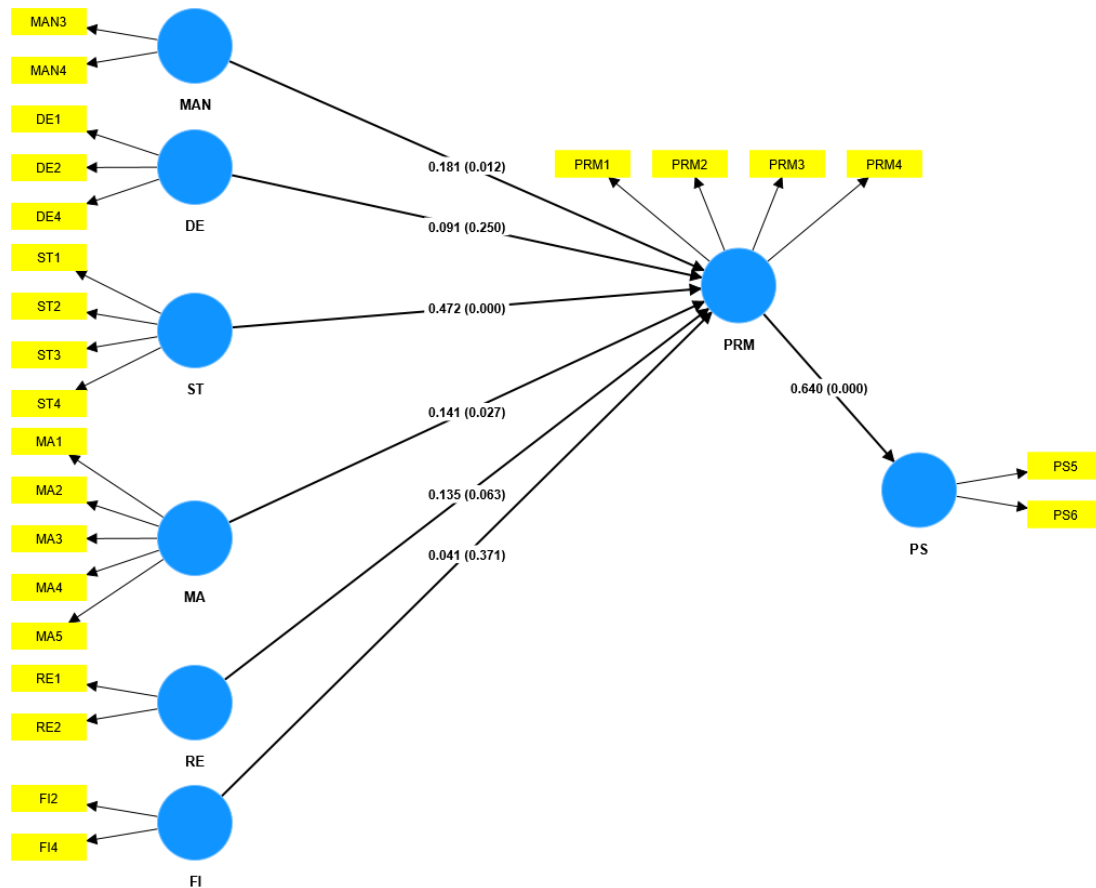


Figure 4.2: PLS Bootstrapping Illustration

Table 4.5 shows the specific indirect effect of hypothesis testing using PLS bootstrapping.

Table 4.5: Specific Indirect-Effect Analysis

	Estimate	S. D.	t-Stats	Prob.	Decision
MAN -> PRM -> PS	0.116	0.045	2.590	0.010	Accepted
DE -> PRM -> PS	0.058	0.049	1.188	0.235	Rejected
ST -> PRM -> PS	0.302	0.074	4.098	0.000	Accepted
MA -> PRM -> PS	0.090	0.044	2.034	0.042	Accepted
RE -> PRM -> PS	0.086	0.047	1.838	0.066	Accepted
FI -> PRM -> PS	0.027	0.030	0.880	0.379	Rejected

The above table has shown that PRM ($\beta = 0.116$, $p < 0.05$) significantly and positively mediates the effect of MAN on PS. PRM ($\beta = 0.058$, $p > 0.05$) insignificantly and positively mediates the effect of DE on PS. PRM ($\beta = 0.302$, $p < 0.05$) significantly and positively mediates the effect of ST on PS. PRM ($\beta = 0.090$, $p < 0.05$) significantly and positively mediates the effect of MA on PS. PRM ($\beta = 0.086$, $p < 0.05$) significantly and positively mediates the effect of RE on PS. PRM ($\beta = 0.113$, $p > 0.027$) insignificantly and positively mediates the effect of FI on PS.

5. Discussions

The research results show that PRM has a positively significant effect on PS. This result is consistent with Urbański et al. (2019). The rationale is that PRM makes it possible to identify and evaluate any risks early on, facilitating the development of proactive mitigation methods. This avoids expensive delays, overspending, and problems with quality (Alchammari et al., 2021).

The study outcomes revealed that MAN has a positively significant effect on PRM. This result is supported by Kassem (2022). For several reasons, management is crucial in positively influencing project risk management. A robust risk management framework is essential when risks result from managerial choices or actions. Therefore, stakeholders are prompted to invest in comprehensive risk identification, assessment, and mitigation plans. It also helps the project team develop a transparent and accountable culture, guaranteeing that any management-related issues are dealt with quickly (Ahmad et al., 2022).

Moreover, DE has a positively insignificant effect on PRM. The result is similar to the study of Patel and Patel (2021). Since they are essentially manageable, design-related risks might positively insignificantly impact project risk management. The project team usually has the necessary experience regarding design risks, unlike external elements like the weather or market circumstances. These risks can be reduced by careful planning, in-depth study, and application of recognized design standards (Alchammari et al., 2021).

The study outcomes revealed that ST has a positively significant effect on PRM. This result is supported by Wang et al. (2021). Project objectives and outcomes can be directly impacted by stakeholder-related risks, which positively and significantly influence stakeholder risk management. Project success depends critically on good stakeholder engagement. Customized risk reduction tactics are made possible by detecting their expectations, worries, and conflicts early. A supportive atmosphere for risk identification and reduction is also created by proactive stakeholder management, which cultivates collaboration and trust (Ahmad et al., 2022).

In addition, MA has a positively significant effect on PRM. The result is similar to the study of (Nee et al., 2022). Since they directly affect project execution and quality, materials-related risks positively and substantially impact project risk management. Material availability, quality, and prompt delivery are essential for building projects. Project schedules and budgets can be severely impacted by using poor or inadequate materials, which can cause delays, rework, and damaged structural integrity. As such, careful material evaluation, procurement, and monitoring are essential to risk management (Alchammari et al., 2021).

The research results show that RE has a positively significant effect on PRM. This result is consistent with West et al. (2019). Due to their ability to affect project deadlines, costs, and compliance, regulatory risks positively and substantially impact project risk management. Construction projects must adhere to local laws, norms, and regulations. Violations may result

in penalties, hold-ups, or even project termination. Thus, a deep comprehension of legal standards and ongoing oversight are crucial to risk management (Ahmad et al., 2022).

Moreover, FI has a positively insignificant effect on PRM. The result is similar to the study of Sun and Li (2022). Project risk management may be positively impacted by finance-related risks in situations when there are sufficient and easily accessible financial resources. In these situations, the project team can set aside funds for emergencies without impeding the project's advancement. Furthermore, the team may be able to absorb unforeseen charges with little disruptions if they are financially stable. The effects of financial uncertainty can also be reduced by prudent financial planning and risk assessment (Alchammari et al., 2021).

The study outcomes revealed that PRM significantly and positively mediates the effect of MAN on PS. This result is supported by Rehman and Ishak (2022). The link between management-related risks and project success is favorably influenced by project risk management, which plays a pivotal role as a mediator. It accomplishes this by offering a methodical framework for recognizing, evaluating, and reducing risks. Effective risk management makes identifying and applying suitable mitigation techniques possible when management-related issues materialize. Thus, the likelihood of adverse effects on the project's objectives is reduced (Ahmad et al., 2022).

Similarly, PRM insignificantly and positively mediates the effect of DE on PS. The result is similar to the study of Whang et al. (2023). Due to the controllable nature of design-related risks, project risk management may only marginally mitigate their impact on project success. The project team may effectively mitigate design risks via careful planning and strict adherence to established standards since they fall within their area of competence. Although risk management has the potential to improve this process, it might not have as much of an influence as more unpredictable external elements. Nonetheless, risk management may benefit when used well, offering an organized way to deal with design concerns (Alchammari et al., 2021).

The research results show that PRM significantly and positively mediates the effect of ST on PS. This result is consistent with Mohiuddin et al. (2023). Project risk management's capacity to promote efficient communication and stakeholder involvement greatly and favorably buffers the impact of stakeholder-related risks on project success. Early detection of possible issues and disputes with stakeholders is possible using a systematic risk management procedure. This enables proactive steps to meet customer requirements and expectations and specialized mitigation solutions (Ahmad et al., 2022).

The study outcomes revealed that PRM significantly and positively mediates the effect of MA on PS. This result is supported by Wuni et al. (2023). Due to its direct impact on project execution and quality, project risk management significantly and favorably mediates the effect of material-related risks on project success. By means of rigorous planning and ongoing oversight, risk management guarantees the prompt acquisition and quality assurance of

materials. This avoids rework, delays, and impaired structural integrity, which can negatively affect project costs and schedules (Alchammari et al., 2021).

Also, PRM significantly and positively mediates the effect of RE on PS. The result is similar to the study of Si et al. (2022). As project risk management plays a vital role in maintaining compliance and avoiding expensive legal difficulties, it considerably and favorably buffers the impact of regulatory-related risks on project success. It offers a methodical framework for recognizing and taking care of regulatory needs right from the start of a project. Risk management assists in mitigating any legal difficulties by proactively interacting with appropriate authorities and implementing compliance procedures in project planning (Ahmad et al., 2022).

Lastly, the research results show that PRM insignificantly and positively mediates the effect of FI on PS. This result is consistent with Yang and Shen (2022). When financial resources are plentiful, project risk management may hardly mitigate the impact of finance-related risks on project success. The presence of sufficient resources in these situations lessens the possible adverse effects of financial risks. The project team can set aside money for unforeseen expenses without stopping work. Furthermore, having stable finances makes it possible to absorb unforeseen expenses with the least interruption. The impact of financial uncertainty is further reduced by prudent financial planning and risk assessment (Alchammari et al., 2021).

6. Conclusion and Recommendations

6.1. Conclusion

This study's objective was to thoroughly investigate the relationship between risk management and project success within the framework of Pakistani housing projects. The study has shown project outcomes' complex dynamics by carefully investigating numerous risk management criteria. The core argument of the thesis was that project risk management, or PRM, is essential in mediating the impact of various risk variables on project success. It became apparent during the investigation that PRM is the crucial element in this interaction. The empirical results have shown that PRM has a noteworthy impact on project success. Notably, it was found that PRM was impacted by numerous risks, i.e., management, stakeholder, material, and regulatory risks, highlighting the significance of these elements taken in determining project outcomes.

On the other hand, the analysis also showed that PRM was less directly impacted by design and finance-related aspects. Although these factors are crucial for project execution, they did not affect risk management techniques as much. This emphasizes the necessity of customized approaches to smoothly incorporate these elements into risk management frameworks.

As a result, the study supports the idea that successful PRM is essential to completing housing projects in Pakistan. Through a methodical examination of the impact of different risk variables, the research has identified crucial areas that require intervention and enhancement. One concrete and doable step toward strengthening risk management techniques in the construction

sector is the suggestion to improve risk management expertise through regular training and development programs for project management teams.

6.2. Recommendations

The study's recommendations significantly affect practitioners, decision-makers, and researchers alike. Karachi's construction enterprises must prioritize strengthening their procedures for managing project risk. Creating effective risk identification, assessment, and mitigation techniques is part of this. Risk management proficiency may be increased through consistent training and development programs for project management teams. Recognize how interrelated rather than separate project hazards are. Implement a coordinated strategy considering management procedures, design excellence, stakeholder involvement, material sourcing, legal compliance, and financial management. This can stop prospective dangers from passing and impairing the project's success. Given its success in maximizing operations, the Theory of Constraints (TOC) should be applied to projects by construction enterprises.

Businesses may optimize operations and improve project success by locating and resolving bottlenecks and limits in their project management procedures. Proactively involving stakeholders can result in less conflict and more seamless project execution. Pay close attention to the administration and planning of your finances. This comprises precise budgeting, financial forecasting, and cost estimation. Sufficient financial resources should be committed to managing possible risks to keep projects financially viable. Employing skilled architects and engineers who can provide durable and sustainable designs is an investment in high-quality design. Keep abreast with regional and federal laws, ordinances, and compliance requirements. Construction enterprises should continue to take a proactive stance to ensure that projects comply with all legal standards, decreasing the possibility that regulatory difficulties would cause project delays. Companies should establish a reliable method for tracking and assessing project performance for the project's lifespan. Regular evaluations can assist in identifying new hazards and prompting appropriate corrective action.

Use thorough metrics to define and assess project success. Consider aspects like customer happiness, long-term viability, and adherence to quality standards in addition to conventional measures like on-time and on-budget completion. Promoting best practices in project risk management within the construction sector should be a consideration for policymakers. This can be incentivizing businesses that exhibit good risk management strategies or funding initiatives promoting learning and growth.

6.3. Limitations and future research

Despite this study's valuable knowledge, it is essential to recognize its limits. First, there may be response bias because the study uses self-reported data. Future research might overcome these restrictions by using mixed-methods methodologies for deeper insights. Little research has been done on how external variables like economic or geopolitical developments may affect project performance. Comparative research across several sectors and geographical areas might improve the applicability of findings.

Last, the study's cross-sectional design isolates a particular moment in time, potentially excluding the dynamics of long-term initiatives. Studies that follow a project over time can monitor its performance while considering changing risk-management techniques. Examining upcoming project management tools and how external factors affect project success might be fruitful directions for future research in this area.

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