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Success and Risks Related to Housing Projects in Pakistan: A Moderating Role of Project Management Risk Management

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This study investigates the critical success factors (CSFs) and their interplay with project risks in determining the success of housing projects in Karachi, Pakistan, while considering the moderating role of risk management. Analyzing data from 432 project management professionals within Karachi-based housing societies, the study establishes significant relationships between CSFs and various project success dimensions, including time, cost, quality, project profile objectives, impact, stakeholder satisfaction, and preparation for the future. Additionally, the research reveals that project risks exert substantial influence on these success dimensions. Risk management is a strong moderator, increasing risk variable's influence on project results. The findings provide insightful information for decision-makers, recommending the creation of sector-specific rules that place a strong emphasis on the highest standards in risk management and project execution. The construction industry benefits from this since it encourages long-term development and leads to better results for projects.

1. Introduction

Housing is a fundamental human need, and housing projects help to provide safe, secure, and affordable housing for individuals and families who would otherwise struggle to access it. A person's health, well-being, and quality of life can all be significantly impacted by having sufficient accommodation (Moghayedi et al., 2022). Housing projects can provide access to clean water, sanitation, and other basic amenities, improving overall living conditions for residents. In addition, housing projects can contribute to economic development by creating jobs in construction, property management, and related industries. They can also increase property values and stimulate local business activity (Salim & Dabous, 2022b). Housing projects can help to address social inequalities by providing affordable housing for low-income families and individuals who might otherwise struggle to access it (Chileshe et al., 2022). This can reduce the project's environmental impact and contribute to long-term sustainability (Noorzai et al., 2022).

The success of a housing project can be evaluated based on several criteria, including cost, stakeholder satisfaction, project impact, time, quality, and planning for the afterward. Delays can lead to increased costs, dissatisfaction among stakeholders, and negative impacts on the community (Abidoye et al., 2022). Going over budget can result in financial difficulties and may lead to reduced quality of the project or the inability to complete it. High-quality housing provides residents a safe, healthy, and comfortable living environment (Chileshe et al., 2022). Furthermore, stakeholders' satisfaction is essential for the project's success and can significantly impact future projects (Salim & Dabous, 2022a).

According to a sky-market report, most of the housing societies in Karachi are legal and offer residential plots, commercial plots, and top-notch bungalows (Andriyati & Fasa, 2022). Moreover, another source, Rentech Digital, reports that there are 503 housing societies in Pakistan as of July 14, 2023 (Papanek, 2023). However, it is unclear how many of these are located in Karachi. The Karachi Cooperative Housing Societies Union, comprises 24 cooperative housing societies with over 100,000 members. A paper published on PMC also states that the Karachi housing demand is estimated at 80,000 new units annually, and the formal sector supplies about 32,000 housing units (Shaikh, 2021).

Pakistan, a developing nation, is now seeing relatively rapid expansion in its building industry. Currently, behind agriculture, construction is Pakistan's second-largest financial industry (Hassan et al., 2023a). The construction industry has been expanding rapidly in recent years thanks to increased investment in infrastructure and the growing demand for housing and commercial properties (Afzal et al., 2022). Pakistan's government has also been promoting the construction industry through various policies and incentives, such as the construction package announced in 2020, which aimed to boost construction activity during the COVID-19 pandemic (Saad et al., 2022). In Pakistan, housing societies are modeled on several risks that hinder the success of housing societies (Mujeeb et al., 2023). In projects in the planning or carrying out stages, there are several causes of uncertainty, such as the success of labor teams, the accessibility of tools, financing, the engagement of other parties, safety, design, and architects, among others (Aisheh, 2022). Owners establish strict deadlines that are unreasonable and hard to adhere to (Tryhuba et al., 2022).

One of the critical challenges facing the construction industry in Pakistan is the need for adequate infrastructure, including roads, power, and water supply. Another challenge is the need for more skilled labor and technical expertise, often leading to delays and cost overruns in construction projects (Wahid et al., 2023). Moreover, safety risks can occur during construction, particularly if safety regulations are not followed. Safety risks can lead to injury or loss of life, resulting in legal action. Stakeholder opposition can occur if the project is seen as not meeting the needs or expectations of the community (Khan, 2022). Stakeholder opposition can also result in delays, increased costs, and even project cancellation (Hasan et al., 2022).

Prior research and studies have generally focused on examining the impacts of influencing elements from one dimension or aspect on the triangle criterion of the projects in terms of cost, time, and quality (Wang et al., 2022); however, the project success is a complex phenomenon (Waqar et al., 2023). Some researchers have studied the projects' risk and management, and their impact on project success (Pereira et al., 2022; Saad et al., 2022; Sampaio et al., 2022; Waqar et al., 2023), but none, as per the knowledge of the researchers of this study has studied the project risks which include management, technical, and technology and regulatory and economics risk's impact on project success (Cao et al., 2021; Karam et al., 2021). Therefore, the study aims to explore the CSFs and the effect of the CSFs and project risks' impact on housing project success, with the moderating role of risk management.

2. Literature Review

2.1. Theory of constraints

The theory of constraints (TOC) is a procedure for finding a critical limitation (i.e., limiting factor) that inhibits the achievement of a goal and then carefully eliminating that restriction until it is no longer the limitation (Lv, 2021; Rahman, 1998). The limitation is often called a bottleneck in production (Sarkar et al., 2021). The theory of constraints utilizes a systematic approach to growth, proposing that any intricate system, such as industrial processes, comprises multiple interrelated activities, each affecting the entire system (Miladinovic & Schefer-Wenzl, 2022). TOC tends to support the CSFs methodology to achieve project success because TOC focuses on developing the key strategies that lead to project success. TOC clarifies that goal (project success) can only be achieved by setting the key strategies that lead to the project goal. However, key strategies that lead to success are critical success factors. Thus, developing CSFs to achieve project goals is consistent with TOC (Şimşit et al., 2014).

2.2. Housing project success

"Housing project success" refers to an endeavor for housing development's overall success and beneficial results (Muthini & Nyang'au, 2022). This idea evaluates a project's efficacy and efficiency in achieving its stated goals and providing high-quality housing solutions. Many important criteria determine the success of such undertakings. These include the housing unit's accessibility to target demographics, affordability, building code compliance, and neighborhood integration (Galmarini et al., 2022). Additionally, the effect on the inhabitant's health and satisfaction with the new living arrangements is a significant factor in success.

Further, a successful housing project will also consider energy efficiency and environmental sustainability, fostering a cleaner and greener living environment (Grace et al., 2023). The capacity to manage unanticipated obstacles and the timely completion of the project within the budgeted amount are also critical indicators of success (Bianchi & Schmidt, 2023). Success also heavily depends on the cooperation and participation of the community, stakeholders, and local government. To provide safe, decent, and affordable housing options to improve the quality of life for the intended beneficiaries, "housing project success" encompasses a holistic evaluation of the development's physical structures and the social, economic, and environmental aspects (Dwivedi, 2021).

2.3. Critical success factors

Critical Success Factors (CSFs) are the essential elements or variables for completing and achieving objectives in a particular project or endeavor (Waqar et al., 2023). In the context of a Housing Project, CSFs are the key factors that significantly influence the project's success. These factors can vary depending on the project, but common CSFs in housing projects include proper planning, effective project management, adequate funding, skilled labor, timely execution, and stakeholder engagement (Albtoush et al., 2022). A well-defined risk management strategy is an indispensable CSF in housing project success. Risk management involves identifying potential risks, assessing their impact, and developing strategies to mitigate or address them (Rodríguez-Espíndola et al., 2022). However, in the construction industry, numerous risks can affect housing projects, such as budget overruns, delays, material shortages, regulatory changes, and unexpected weather conditions (Zahoor et al., 2023). Failing to manage these risks effectively can lead to project failure, cost overruns, and damage to the stakeholders' reputations. By incorporating risk management as a critical success factor, housing projects can enhance their chances of successful completion within the predetermined timeframes and budgets (Roddis, 2023). Proper risk assessment allows project teams to anticipate and proactively address potential issues, minimizing their impact and ensuring a smoother project execution. This, in turn, fosters stakeholder confidence, improves decision-making processes, and contributes to the overall success of the housing project (Blak Bernat et al., 2023). In conclusion, recognizing risk management as a critical success factor in housing projects is imperative for achieving successful outcomes and delivering quality living spaces to needy communities (Zhu et al., 2023).

2.4. Project risks

"Project risks" refer to potential uncertainties, events, or situations that could adversely affect the successful completion of a housing project (Rauzana & Dharma, 2022). Such risks can arise from various sources, such as economic factors, environmental issues, technological challenges, regulatory changes, or unforeseen circumstances. Effective risk management in the context of a housing project involves identifying, assessing, and mitigating these potential threats to minimize their impact on project success (Elkhatib et al., 2022). In the context of "Housing Project Success," risk management is crucial in ensuring the project's timely and cost-effective completion while meeting its objectives. Project stakeholders can develop appropriate mitigation strategies by proactively identifying and analyzing potential risks (Rawat et al., 2023). These strategies may include contingency planning, allocating resources

for unforeseen challenges, establishing clear communication channels, and monitoring progress to address emerging risks promptly. Neglecting project risks can lead to cost overruns, delays, compromised quality, or even project failure (Ashkanani & Franzoi, 2022). Therefore, effective risk management safeguards the project's outcomes and enhances decision-making. It allows stakeholders to make informed choices, allocate resources wisely, and maintain a structured approach throughout the project's lifecycle (Bhyan et al., 2023). In summary, project risks are integral to understanding and managing the uncertainties associated with a housing project's success, and proactive risk management is essential for its smooth execution (Malik et al., 2022).

2.5. Project risk management

Project risk management is a crucial aspect of ensuring the successful execution of any housing project. It involves identifying, assessing, and mitigating potential risks that could hinder the project's objectives or lead to failure (Lenderink et al., 2022). In accordance with "Housing Project Success," risk management plays a pivotal role in minimizing uncertainties related to cost overruns, schedule delays, design changes, labor shortages, regulatory compliance, and unforeseen challenges. By systematically analyzing potential risks, project managers can develop strategies to either avoid or mitigate these risks (Nanto, 2022). This process helps enhance decision-making, resource allocation, and overall project planning. Effective risk management empowers project teams to be prepared for contingencies and adapt swiftly to changing circumstances, reducing the likelihood of project failure. It instills confidence among stakeholders, such as investors, lenders, and clients, as they see that potential risks are being proactively managed (Rahi et al., 2022). Moreover, risk management fosters a culture of accountability, fostering a smoother project delivery process and increasing the likelihood of achieving project objectives within the defined budget and schedule (Weng, 2023). Overall, project risk management protects the success of housing projects by fostering a proactive and systematic approach to tackling uncertainties and potential setbacks (Ahmed & Vikram, 2022).

2.6. Development of the hypotheses

2.6.1. Critical success factors and housing project success

Project success is a complex and multifaceted concept, and critical success factors (CSFs) are pivotal in determining its outcome. The relationships between CSFs and various inclusive variables of project success are crucial for achieving the desired results (Alawag et al., 2023). First and foremost, time is a fundamental aspect of any project, and CSFs significantly affect it (Ghatak & Garg, 2022). By identifying and prioritizing the most critical factors, project managers can streamline processes, allocate resources efficiently, and adhere to schedules, ultimately leading to timely project completion. Similarly, CSFs also impact the cost of a project. When key success factors are diligently addressed, it minimizes the risk of cost overruns. Proper planning and execution of CSFs ensure that resources are utilized optimally, reducing unnecessary expenses and improving the overall cost-effectiveness of the project (Al-Zubaidi et al., 2023).

Quality is another critical dimension of project success, and CSFs play a crucial role in its attainment. Project managers can implement robust quality control measures by focusing on

the factors influencing quality outcomes and delivering high-quality outputs that meet or exceed stakeholders' expectations (Abeysinghe, 2022). Furthermore, project profile objectives are closely tied to CSFs. By aligning CSFs with the project's objectives, the chances of achieving them significantly improve. CSFs guide project teams toward key milestones and outcomes, ensuring that project goals are accomplished effectively and aligned with the intended direction (Zada et al., 2023).

The impact of a project on its stakeholders is another key measure of success, and CSFs have a profound effect on this aspect. By understanding the critical factors influencing stakeholder satisfaction, project managers can adopt appropriate strategies to engage stakeholders effectively, address their concerns, and meet their needs (Waris et al., 2022). Satisfied stakeholders are more likely to support the project and contribute positively to its success. Moreover, CSFs also influence the project's preparation for the future. Project managers can future-proof the project's outcomes by identifying and emphasizing the factors contributing to long-term sustainability and adaptability (Lo-Fo-Wong, 2023). This proactive approach helps the project to remain relevant and successful even in changing circumstances, thus ensuring its lasting impact.

In conclusion, critical success factors are integral to project success as they significantly impact various inclusive variables. By addressing CSFs, project managers can effectively manage time, control costs, deliver high-quality outcomes, achieve project profile objectives, enhance stakeholder satisfaction, and prepare the project for future challenges (Mohammed, 2022). Hence, the study proposed the following hypotheses:

H1: Critical success factors has a significant effect on (a) time, (b) cost, (c) quality, (d) project profile objectives, (e) project impact, (f) stakeholder's satisfaction and (g) preparation for future.

2.6.2. Project risks and housing project success

Project success is a multifaceted concept influenced by various factors, one of which is project risks. Risks play a pivotal role in determining the outcome of a project, affecting several key dimensions of success (Guo & Zhang, 2022). Firstly, project risks have a significant effect on time. Unforeseen risks can delay project milestones, causing timelines to be extended beyond the initial estimates (Ahmed et al., 2023). Delays may result from resource constraints, rework due to risk mitigation, or disruptions in the project flow. Secondly, project risks have a substantial impact on cost. When risks materialize, they often require additional resources and efforts, increasing expenditures (Paul, 2022). This can strain the project budget and even lead to cost overruns, affecting the financial success of the endeavor (Singh et al., 2022).

Moreover, project risks directly influence the quality of the project deliverables. Unmanaged risks may result in compromised quality, as teams might rush to meet deadlines or ignore quality standards to address risk-related issues (Mataev & Mahmoudi, 2022). This can lead to defects in the final output, potentially causing customer dissatisfaction and rework. Furthermore, project risks have a profound effect on project profile objectives. Risks jeopardize the achievement of project objectives and may even force the project team to revisit or alter the initial goals. This can disrupt project planning and result in misalignment with stakeholders' expectations (Dewey, 2023).

The impact of project risks extends beyond the project itself; it can influence stakeholder satisfaction. Risks create uncertainty and unpredictability, leading to dissatisfaction among stakeholders, including clients, investors, and team members. Also, risks that are not properly managed might damage stakeholder confidence in the project's success (Pham, 2023). How risks are managed in a project mostly provides valuable lessons and insights for future endeavors. Successful risk mitigation strategies can be documented and shared, contributing to better risk management practices in subsequent projects (Anderson et al., 2022). However, a comprehensive risk management approach is essential to navigating uncertainties and challenges, ensuring that projects are delivered on time, within budget, and to stakeholders' satisfaction while upholding the desired quality and objectives (Jamali, 2023). By recognizing and addressing risks proactively, project teams can enhance their chances of achieving a successful outcome and set the stage for continuous improvement in future endeavors (Mahabir & Pun, 2022). Thus, the study proposed the following hypotheses:

H2: ***Project risks have a significant effect on (a) time, (b) cost, (c) quality, (d) project profile objectives, (e) project impact, (f) stakeholder's satisfaction and (g) preparation for future.***

2.6.3. Moderating role of risk management

In the context of project success, risk management plays a pivotal role in moderating the effects of various project risks on different aspects of a project. Firstly, when it comes to time, effective risk management ensures that potential risks are identified and mitigated proactively, reducing the likelihood of delays caused by unexpected issues (Mahabir & Pun, 2022). By employing risk management strategies, project teams can allocate resources efficiently, implement contingency plans, and maintain a smooth workflow, ultimately enhancing time management and timely project delivery (Biruk, 2022). Secondly, cost is critical to project success, and risk management can significantly moderate its impact. By identifying potential risks early on, project managers can make informed decisions on budget allocation and resource management (Holzmann et al., 2022). Mitigating risks that could lead to cost overruns or unforeseen expenses allows projects to stay within their financial constraints, contributing to overall cost-effectiveness and successful project outcomes (Kassem, 2022; Waqas et al., 2023).

Moreover, risk management substantially influences the quality of project deliverables. Identifying and addressing risks that could compromise product or service quality ensures that the result meets the required standards and exceeds stakeholder expectations (Godfrey, 2022). Through effective risk management, project teams can implement quality control measures, reducing the chances of rework and enhancing the final product's overall performance and value (Nguyen et al., 2023). Project profile objectives are also fundamental to project success, and risk management is closely related to achieving these objectives (Ammar et al., 2022). Project managers can appropriately align their strategies and resources by anticipating and managing risks that could hinder progress toward these goals. This alignment enhances the project's overall effectiveness in meeting its predefined objectives and ensures that it stays on track to deliver the desired outcomes (Di Maddaloni & Sabini, 2022).

Furthermore, risk management directly impacts a project's overall impact on its intended beneficiaries and stakeholders. By proactively addressing risks that could lead to negative consequences, project teams can enhance the positive outcomes and benefits that the project brings to the target audience or community (Rehman & Ishak, 2022). This, in turn, strengthens the project's positive impact and ensures its long-term sustainability. Additionally, stakeholder satisfaction is crucial to project success, and risk management is key to achieving it (Kimotho, 2023). By identifying and addressing risks that could adversely affect stakeholders, such as communication breakdowns or unmet expectations, project managers can foster trust and collaboration with stakeholders, resulting in higher satisfaction levels and support for the project (Ghatak & Garg, 2022).

Lastly, the future readiness of the project is also influenced by proper risk management. By anticipating and managing potential risks, project teams can develop valuable lessons learned and best practices that can be applied to future projects (Lisdiono et al., 2022). This continuous improvement approach strengthens the organization's ability to handle future challenges, adapt to changing circumstances, and maintain a competitive advantage in the market (Zieba et al., 2022). Therefore, the study proposed the following hypotheses:

H3: ***Risk management significantly moderates the effect of project risks on (a) time, (b) cost, (c) quality, (d) project profile objectives, (e) project impact, (f) stakeholder's satisfaction and (g) preparation for future.***

2.7. Model Framework

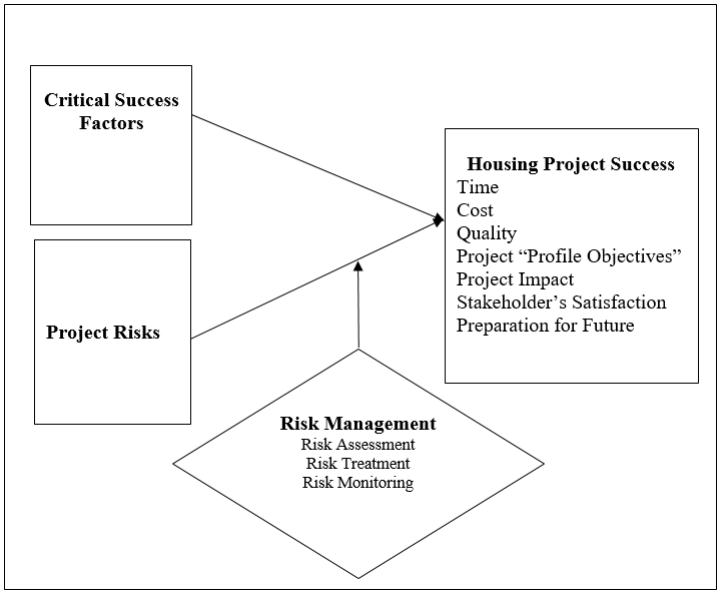


Figure No 1: Research Model

3. Methodology

3.1 Sample and population

Based on the Sindh Building Control Authority (SBCA) data, there are 80 approved and registered housing societies in Karachi (Zameen Express, 2021). Therefore, the study has collected 432 valid responses from the project management personnel of Karachi-based housing societies to gain insightful information and understanding of the research phenomenon. The present study employed a simple random sampling technique, a probability

sampling method, to generalize the findings (Amir & Ralph, 2018). Respondents' profiles are given in table 1.

Table 1 presents the profile of respondents from a survey based on age, gender, experience, position in projects, and PMP certification. Most respondents are between 26-40 years, with the highest percentage in the 36-40 age group (19.9%). Gender-wise, 70.4% identified as male, while 29.6% identified as female. Experience levels are evenly distributed, with 7 to 10 years of experience being the largest group (25.7%). The distribution of positions in projects is relatively balanced, with PMOs being the most common (14.6%). A significant portion of respondents (70.6%) hold a PMP certification, reflecting a strong commitment to project management, while 29.4% do not possess this certification.

Table No 1: Respondents' Profile

		N	%
Age	21-25 years	60	13.9
	26-30 years	73	16.9
	31-35 years	70	16.2
	36-40 years	86	19.9
	41-45 years	74	17.1
	Above 45 years	69	16.0
Gender	Male	304	70.4
	Female	128	29.6
Experience	Below 3 years	109	25.2
	3 to 6 years	106	24.5
	7 to 10 years	111	25.7
	More than 10 years	106	24.5
Position	Project Coordinator	52	12.0
	Project Scheduler	55	12.7
	PMO	63	14.6
	Assistant Project Manager	57	13.2
	Project Manager	48	11.1
	Senior Project Manager	49	11.3
	Program Manager	52	12.0
	Others	56	13.0
PMP Certified	Yes	305	70.6
	No	127	29.4

3.2 Data analysis

PLS-SEM enables estimating intricate causal relationships in path models involving latent variables (Hair et al., 2011). PLS-SEM is emerging as a statistical modeling technique. Its use has significantly increased over the years within various disciplines due to the realization that PLS-SEM's methodological characteristics make it a viable alternative to the more popular covariance-based SEM approach. When an analysis focuses on confirming a theoretical framework from a position of prediction, when a structural model is complex and involves some constructs, indicators, and model links, or when the study employs various methods Hair et al. (2011); (Hair et al., 2019) stated that because this method has several benefits over CB-SEM, it can be called the "silver bullet."

PLS-SEM can be an appropriate analytical technique for the current study that aims to explore the critical success factors (CSFs) and the impact of CSFs and project risks on housing project success, with the moderating role of risk management. PLS-SEM can handle manifest (observed) and latent (unobserved) variables, which is useful when studying complex constructs like project success, critical success factors, and risk management. PLS-SEM can be used with relatively small sample sizes, often in housing project research. PLS-SEM can analyze intricate relationships between variables, including non-linear relationships and interactions among variables. PLS-SEM can test hypotheses about the relationships between variables, which is essential in research studies exploring the impact of CSFs and project risks on housing project success. PLS-SEM can account for measurement error in observed variables, which is necessary for studies that use self-reported measures or other measures that may be subject to measurement error. The current study has used PLS-SEM as its data analysis method for the abovementioned reasons.

4 Results and Discussions

4.1 Measurement model

The outcomes of the measurement model employing the PLS algorithm shown in Table 2.

Table No 2: Measurement Model

	Loadings	Prob.	VIF	CR	AVE
CO1 <- COST	0.619	0.000	1.390	0.829	0.551
CO2 <- COST	0.788	0.000	1.608		
CO3 <- COST	0.817	0.000	1.581		
CO4 <- COST	0.728	0.000	1.405		
CSF1 <- CSF	0.754	0.000	1.696	0.884	0.656
CSF2 <- CSF	0.820	0.000	1.754		
CSF3 <- CSF	0.866	0.000	2.228		
CSF4 <- CSF	0.796	0.000	1.755		
PF2 <- PFF	0.837	0.000	1.177	0.819	0.694
PF3 <- PFF	0.829	0.000	1.177		
PI1 <- PI	0.685	0.000	1.513	0.880	0.649
PI2 <- PI	0.797	0.000	1.812		
PI3 <- PI	0.909	0.000	2.636		
PI4 <- PI	0.817	0.000	1.724		
PPO1 <- PPO	0.833	0.000	1.784	0.919	0.790

PPO2 <- PPO	0.914	0.000	2.885		
PPO3 <- PPO	0.917	0.000	3.058		
PR1 <- Risk	0.888	0.000	4.086	0.917	0.689
PR2 <- Risk	0.837	0.000	2.901		
PR3 <- Risk	0.840	0.000	3.031		
PR4 <- Risk	0.799	0.000	2.287		
PR5 <- Risk	0.783	0.000	2.553		
QU2 <- QUAL	0.830	0.000	1.292	0.848	0.736
QU3 <- QUAL	0.885	0.000	1.292		
RA1 <- RA	0.779	0.000	1.411	0.775	0.633
RA2 <- RA	0.812	0.000	1.506		
RM3 <- RMON	0.722	0.000	1.158	0.769	0.527
RM4 <- RMON	0.758	0.000	1.167		
RM5 <- RMON	0.695	0.000	1.130		
RT1 <- RT	0.789	0.000	1.430	0.798	0.664
RT3 <- RT	0.840	0.000	1.121		
SS3 <- SS	0.890	0.000	2.585	0.932	0.821
SS4 <- SS	0.923	0.000	3.313		
SS5 <- SS	0.906	0.000	2.447		
TI1 <- TIME	0.794	0.000	2.023	0.873	0.633
TI2 <- TIME	0.819	0.000	1.720		
TI3 <- TIME	0.781	0.000	1.850		
TI4 <- TIME	0.788	0.000	1.576		

Hair et al. (2011); Hair et al. (2019) advised that outer loadings need to be greater than 0.60 and that average variance extracted (AVE) and composite reliability (CR) be higher than 0.70 and 0.50, respectively. All indicators (items) have the proper outside loadings, as shown by the preceding table, and all structures have acquired a respectable degree of dependability and convergence.

4.2 Discriminant validity

Researchers use the idea of discriminant validity to determine how different two conceptions or variables in a measuring model are from one another. Construct validity, which relates to the correctness and precision of assessing intended theoretical constructs, considers to be a key component (Zaiţ & Bertea, 2011).

Table 4.3 displays the FLC assessment of discriminant validity results. Since the constructs' squared-root AVE (bold diagonal values) is greater than their corresponding horizontal and vertical correlation (non-bold) values (Hair et al., 2011), discriminant validity has been achieved using the FLC approach (Fornell & Larcker, 1981).

4.3 Predictive power

Table 3 displays the predictive capacity of the endogenous components in the structural model based on the PLS algorithm and PLS blinding techniques.

Table No 3: Predictive Power

	R-Square	Decision	Source
Cost	0.366	Moderate	(Chin, 1998)
Preparation for Future	0.517	Moderate	(Chin, 1998)
Project Impact	0.602	Substantial	(Chin, 1998)
Project Profile Objectives	0.296	Weak	(Chin, 1998)
Quality	0.419	Moderate	(Chin, 1998)
Stakeholder's Satisfaction	0.552	Moderate	(Chin, 1998)
Time	0.314	Moderate	(Chin, 1998)

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, cost, preparation for the future, quality, stakeholder satisfaction, and time have moderate predictive power, project impact has substantial, while project profile objectives have weak predictive power.

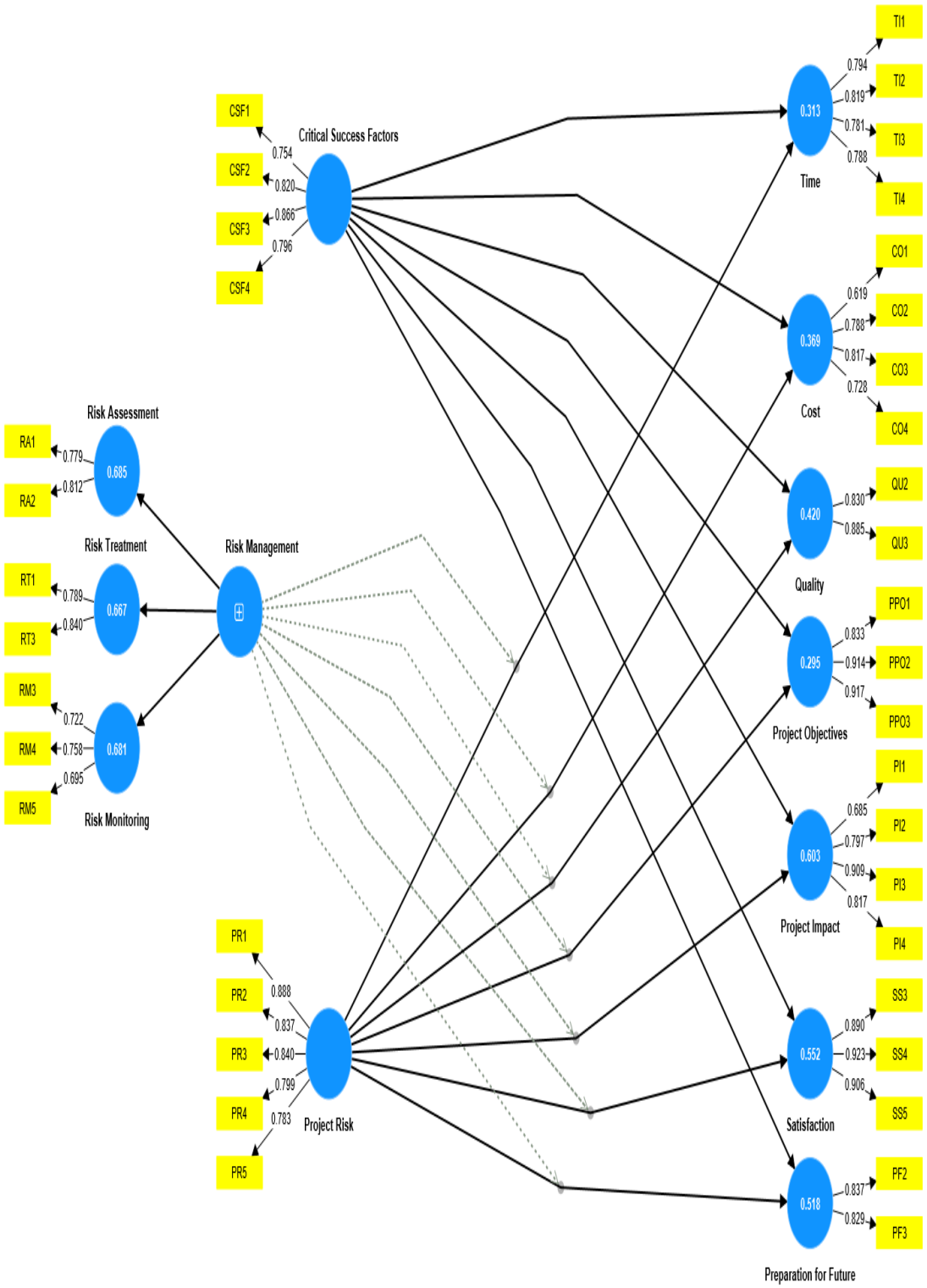


Figure No 2: PLS Algorithm using SmartPLS v4

Table No 4: Fornell-Larcker Criterion (FLC)

	COST	CSF	PFF	PI	PPO	QUAL	RA	RMON	RT	Risk	SS	TIME
COST	**0.742**											
CSF	-0.595	**0.810**										
PFF	-0.612	0.716	**0.833**									
PI	0.030	-0.027	0.023	**0.806**								
PPO	-0.505	0.538	0.527	0.047	**0.889**							
QUAL	-0.542	0.643	0.515	-0.012	0.478	**0.858**						
RA	-0.045	-0.083	-0.026	-0.024	-0.026	0.005	**0.796**					
RMON	-0.003	-0.026	-0.002	0.015	0.005	-0.018	0.509	**0.726**				
RT	-0.014	-0.035	0.020	0.015	0.031	-0.034	0.571	0.475	**0.815**			
Risk	-0.103	0.087	0.019	-0.775	0.058	0.081	0.043	0.008	0.002	**0.830**		
SS	0.055	-0.071	-0.020	0.728	-0.006	-0.022	-0.017	0.006	-0.010	-0.742	**0.906**	

TIME	0.391	-0.553	-0.355	0.048	-0.519	-0.485	0.017	0.029	0.043	-0.132	0.025	**0.796**

4.4 Path Analysis

Table 5 shows the result of path analysis for hypothesis testing using PLS bootstrapping.

Table No 5: Path Analysis

	Estimate	S. D.	t-Stats	Prob.	Decision
CSF -> COST	-0.595	0.031	19.483	0.000	Accepted
CSF -> PFF	0.722	0.031	23.183	0.000	Accepted
CSF -> PI	0.042	0.029	1.445	0.148	Rejected
CSF -> PPO	0.538	0.034	16.001	0.000	Accepted
CSF -> QUAL	0.642	0.033	19.740	0.000	Accepted
CSF -> SS	-0.006	0.032	0.181	0.857	Rejected
CSF -> TIME	-0.546	0.040	13.694	0.000	Accepted
Risk -> COST	-0.051	0.036	1.426	0.154	Rejected
Risk -> PFF	-0.044	0.032	1.393	0.164	Rejected
Risk -> PI	-0.779	0.020	38.976	0.000	Accepted
Risk -> PPO	0.010	0.041	0.233	0.816	Rejected
Risk -> QUAL	0.025	0.036	0.705	0.481	Rejected
Risk -> SS	-0.741	0.022	33.682	0.000	Accepted
Risk -> TIME	-0.085	0.039	2.158	0.031	Accepted

Table 5 showed that critical success factors (ß = 0.440, $p < 0.05$) has a negative significant effect on cost. Critical success factors (ß = 0.722, $p < 0.05$) positively and significantly affects preparation for future. Critical success factors (ß = 0.042, $p > 0.05$) has a positively insignificant effect on project impact. Critical success factors (ß = 0.538, $p < 0.05$) significantly and positively affects project profile objectives. Critical success factors (ß = 0.642, $p < 0.05$) significantly and positively affects quality. Critical success factors (ß = -0.006, $p > 0.05$) has an insignificant and negative effect on stakeholders' satisfaction. Critical success factors (ß = -0.546, $p < 0.05$) significantly and negatively affects time. Project risk (ß = -0.051, $p > 0.05$) has an insignificant and negative effect on cost. Project risk (ß = -0.044, $p > 0.05$) has an insignificant and negative effect on preparation for future. The above table has shown that project risk (ß = -0.779, $p < 0.05$) has a negative significant effect on project impact. Project risk (ß = 0.010, $p > 0.05$) has a positive and insignificant effect on project profile objectives. Project risk (ß = 0.025, $p > 0.05$) has a positively insignificant effect on quality. Project risk (ß = -0.741, $p < 0.05$) significantly and negatively affects stakeholders' satisfaction. Project risk (ß = -0.085, $p < 0.05$) significantly and negatively affects time.

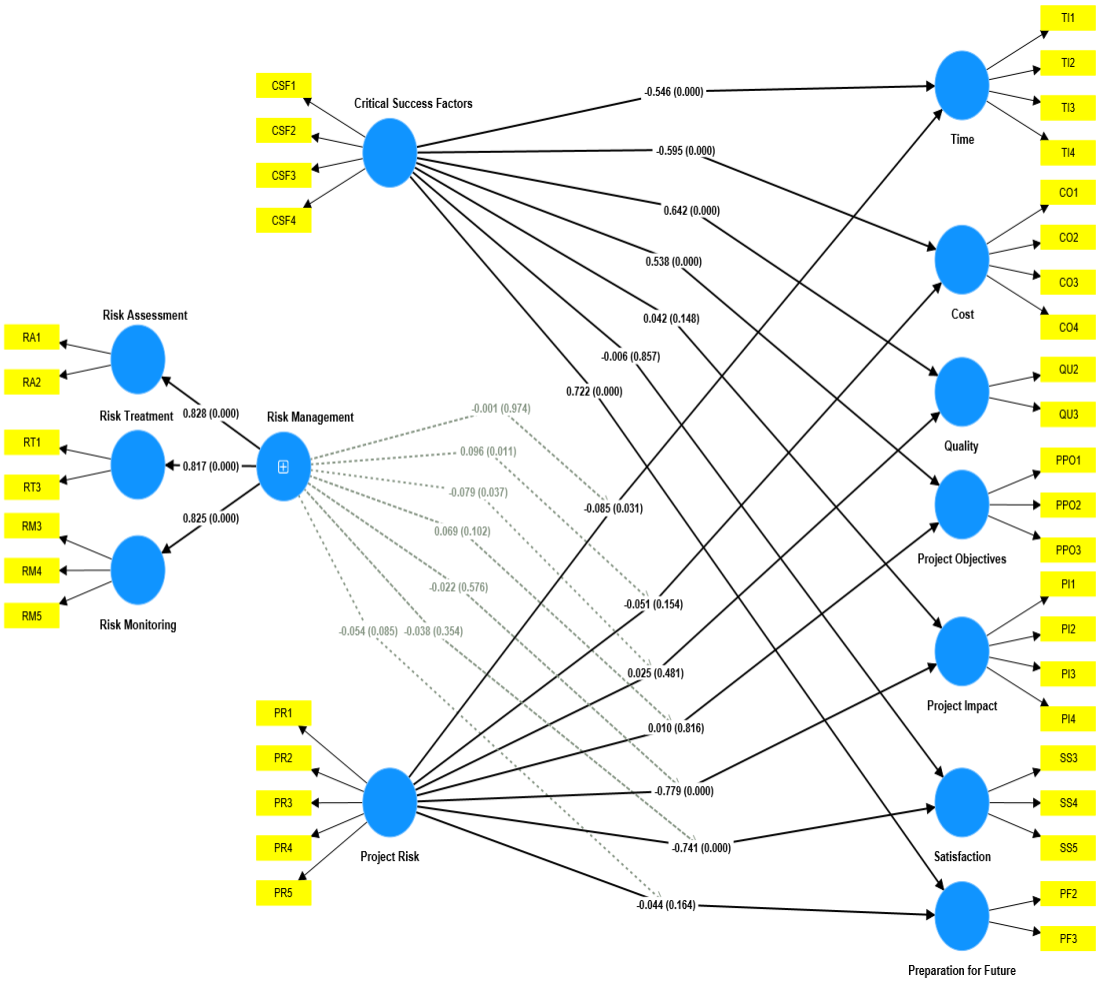


Figure No 3: PLS Bootstrapping using SmartPLS v4

4.5 Moderating effect analysis

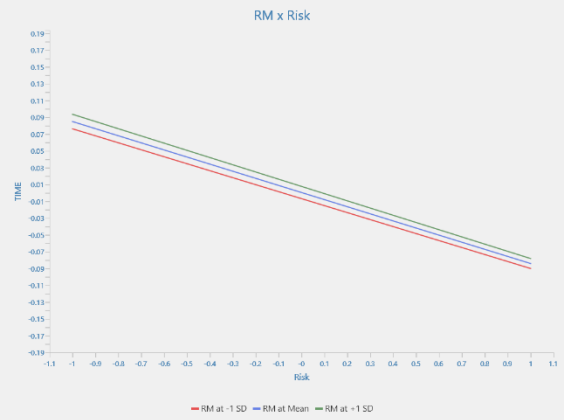
Table 6 shows the result of moderation analysis using PLS bootstrapping.

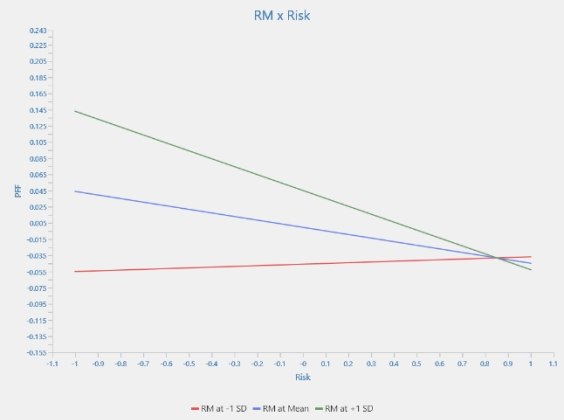
Table No 6: Moderation Analysis

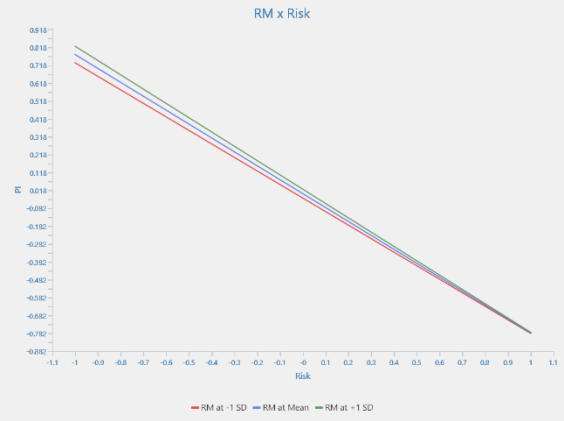
	Estimate	S. D.	t-Stats	Prob.	Decision
RM x Risk -> COST	0.096	0.038	2.528	0.011	Accepted
RM x Risk -> PFF	-0.054	0.031	1.724	0.085	Accepted
RM x Risk -> PI	-0.022	0.039	0.559	0.576	Rejected
RM x Risk -> PPO	0.069	0.042	1.636	0.102	Rejected
RM x Risk -> QUAL	-0.079	0.038	2.090	0.037	Accepted
RM x Risk -> SS	-0.038	0.041	0.927	0.354	Rejected
RM x Risk -> TIME	-0.001	0.041	0.033	0.974	Rejected

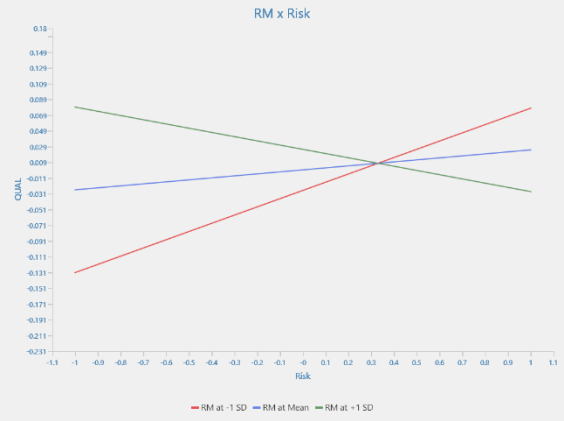
Risk management ($\beta = 0.096$; $p < 0.05$) positively and significantly moderates the effect of project risk on cost. Risk management ($\beta = -0.054$; $p < 0.05$) negatively and significantly moderates the effect of project risk on preparation for future. Risk management ($\beta = -0.022$; $p > 0.05$) negatively and insignificantly moderates the effect of project risk on project impact. Risk management ($\beta = 0.069$; $p > 0.05$) positively and insignificantly moderates the effect of project risk on project profile objectives. Risk management ($\beta = -0.079$; $p < 0.05$) negatively

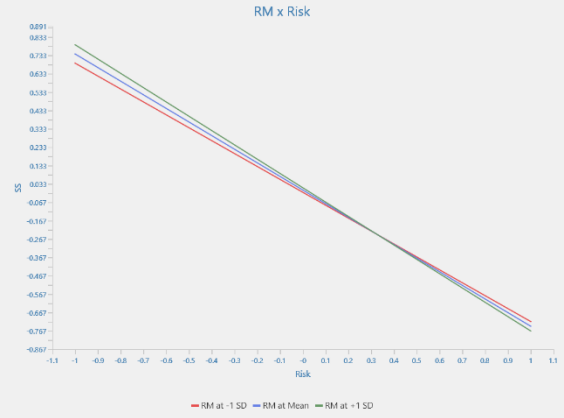
and significantly moderates the effect of project risk on quality. Risk management (β = -0.038; p > 0.05) negatively and insignificantly moderates the effect of project risk on stakeholders' satisfaction. Risk management (β = -0.001; p > 0.05) negatively and insignificantly moderates the effect of project risk on time.

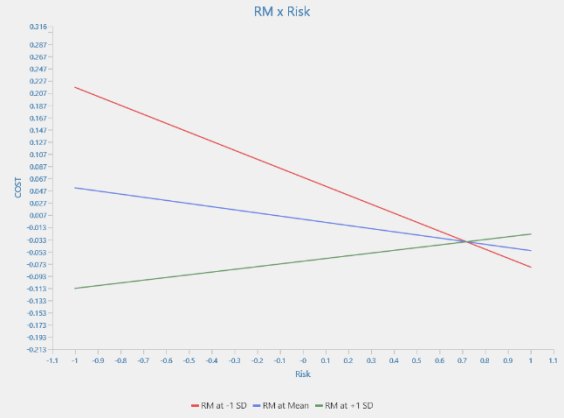












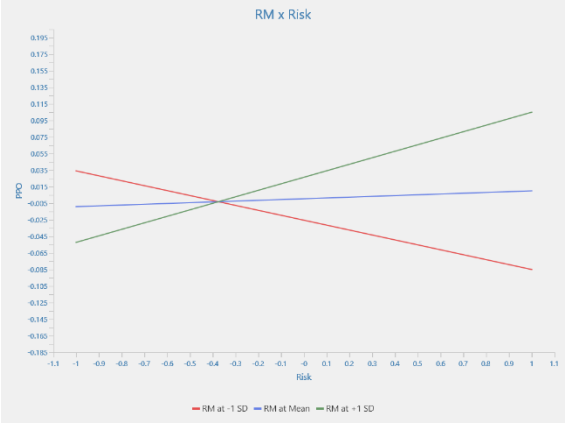


Figure No 4: Moderation Graphs

4.6 Predictive relevance

The predictive relevance (Q2) of endogenous components in the structural model based on the PLS blinding approach is shown in Table 4.6 below.

Table 4.6: Predictive Relevance

	Q-Square	Decision	Source
Cost	0.351	Strong	(Hair et al., 2013)
Preparation for Future	0.505	Strong	(Hair et al., 2013)
Project Impact	0.599	Strong	(Hair et al., 2013)
Project Profile Objectives	0.282	Moderate	(Hair et al., 2013)
Quality	0.407	Strong	(Hair et al., 2013)
Stakeholder's Satisfaction	0.540	Strong	(Hair et al., 2013)
Time	0.297	Moderate	(Hair et al., 2013)

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 cost, preparation for the future, project impact, quality, and stakeholder satisfaction have strong relevance above 0.35. Project profile objectives and time have moderate relevance of above 0.15.

4.7 Discussions

4.7.1 Critical success factors and housing project success

The study found a significant positive relationship between CSF, PFF, and PPO. This result is also supported by Ahmad et al. (2021), who concluded that success factors are key areas determining a project's success level or crucial elements that must be handled properly to attain the success factors. CSF influences PPO. Officials often create a needs statement for each project that defines the project's objectives and profile, which are publicly announced and available on the website (Amaral, 2009). One of the main objectives is to deliver maximum service at the lowest possible cost while maintaining standard quality. It is also critical for the government to achieve value for money (VfM) to avoid political hostility. Achieving particular objectives is one of the components of success (Ahmad et al., 2021).

Pacagnella Jr et al. (2019) also indicated that CSF impacts the future preparation or expansion of the market and the fulfillment of a future requirement. Each project was developed with specific objectives in mind. All budgeted statements are prepared based on particular demands. CSFs are critical components of a project that help company owners to meet their long-term objectives. The government's need statement also accounts for future demands and develops project plans (Gravell et al., 2017). Alawag et al. (2023) also identified that the quality of service is crucial for success factors. Service quality must be consistent with key performance indicators (KPIs). Quality is crucial for success because projects that use a systematic approach to quality management are more likely to meet their objectives and produce high-quality results. This may result in improved project outcomes, such as increased project performance and lower project costs (Albtoush et al., 2022).

Moreover, CSF has a negative significant effect on time and cost. This result is consistent with Alsolami (2022) and indicates that cost is crucial for the project's success since it influences the entire budget. The project cost includes the cost of operation and maintenance. Cost is also vital since the government must bear the project's cost. As a result, the cost is minimal. If the cost of maintenance increases. The government incurs no increase in project costs. This influences the project's success. Albtoush et al. (2022) also said that project cost overruns are the most serious consequences of poor project management. If appropriate project management skills are not employed, estimations will be inaccurate, and activities will cost more than expected. Mohammed (2022) explained that to meet the demands of the scheduled time, appropriate planning time, project completion, and commencement of operations at the anticipated time are crucial in a project. Albtoush et al. (2022) also stated that time is crucial for project success because delays in commencement may incur extra costs for providing a substitute. Furthermore, if the project is delayed for an extended period, the government may cancel the agreement, resulting in the project's failure.

In addition, CSF has an insignificant positive effect on PI which is also in line with Yalegama et al. (2016), who explained that committed team, careful planning, clear project goals, monitoring, and change control, budget, time/schedule, and scope all have an impact on the project. If one of these factors is changed, something other must change. Keeping these factors in mind to manage a project will allow it to change over time while still delivering the best possible results (Pade et al., 2008).

Similarly, the study identified an insignificant negative effect of CSF on SS. This outcome is also consistent with Maqbool et al. (2020), who explained that a project is successful if it is completed within the anticipated cost, delivers the desired services within the scheduled time, achieves all its objectives, and satisfies all stakeholders. Low service quality is related to dissatisfied beneficiaries, which creates hostility. Lamprou and Vagiona (2018) also said project operations may be halted due to non-payment of debt installments. The delay in debt installments inhibits market financial institutions from extending project credit. As a result, the quality of the phenomena impacts all stakeholders.

4.7.2 Project risks and housing project success

Likewise, the study identified an insignificant negative effect of project risk (PR) on cost and PFF. This outcome is also consistent with Faiz (2020), who explains that the project's

cost is recognized as the most prevalent project objective that may be related to project success measures. Risk does not impact cost since project results often fail to achieve satisfactory objectives due to the high frequency of cost and schedule overruns. Only a few projects with high-performance quality and owner satisfaction are completed on time and within cost. Similarly, future preparation evaluates how well the project helps develop its infrastructure for the future. Successful awareness is required to improve future project planning and execution (Đaković et al., 2020).

Moreover, the study showed that risk has an insignificant positive effect on PPO and QUAL. This result is also consistent with Marcelino-Sádaba et al. (2014) and supports that project objectives are an essential element of project management—without them, the organization lacks a concise means to convey the objectives before and during the project; projects have specified objectives that provide people engaged with a clear vision and clarification of their aim. Risk does not affect PPO because achieving the project's "profile objective" requires establishing project details and analyzing team requirements (Shishodia et al., 2018).

Muriana and Vizzini (2017) also identified that in-depth project planning, important milestones, and project assessment are other essential factors that affect a project's success or failure. These can propel the project to a successful completion if properly addressed. The project's quality should guarantee that it is carried out in accordance with the three constraints of time, budget, and scope. If the project is within the defined tolerance levels of these three factor, then the project is of high quality (Wu et al., 2018). Le et al. (2020) indicated risk significantly negatively affects PI, SS, and time. Risks affect a project's performance; risks must be effectively controlled, monitored, and addressed to guarantee successful completion. Poor project performance, cost overruns, scheduling delays, and failure might all result from unmonitored or uncontrolled risks (Obondi, 2022).

Moreover, project stakeholders include any individuals interested in or influencing the project, including customers, sponsors, team members, suppliers, and beneficiaries. Their satisfaction and value are essential for the project's success and sustainability since they can impact its scope, quality, cost, risk, and reputation (Elkhatib et al., 2022). Babar et al. (2017) also found a risk to the project from missing information, ignoring stakeholder issues, or misinterpreting their concerns. If stakeholders believe their concerns and opinions have not been considered or risks are not properly handled, they may lose faith in the project team (Omolloh et al., 2023). Identifying the stakeholders is one of the most important steps in ensuring success. They can affect the project's result and have a direct or indirect interest. This proactive approach to stakeholder management results in a successful project by minimizing conflicts, gaining support, and achieving the intended objectives for all parties involved (Mwanza, 2023).

4.7.3 Moderating effect of risk management on project risks and housing project success

Moreover, the study identified that RM significantly and positively moderates the effect of PR on cost. This result is also supported by Muriana and Vizzini (2017), who described that RM usually aims to identify and analyze possible project risks and minimize their effects on

the project's progress. Unanticipated risks may significantly slow a project since it requires time to understand, analyze, and create management strategies to monitor, respond to, and track them. The project schedule might experience delays if risk management activities take longer than anticipated and take priority over other tasks. One of the most frequent project risks is the cost risk. It may result from poor financial planning and inaccurate cost estimations. Dey (2002) also said that RM provides better cost and time estimates to prevent overspending that could undermine the project's financial condition, and it reduces costs and increases project value by identifying, analyzing, assessing, and responding to risks associated with options that provide the project better value.

Similarly, RM significantly and negatively moderates the effect of PR on PFF and QUAL, which is also in line with Faiz (2020) and indicates that companies may better plan, learn from mistakes, and develop improved processes for future projects by understanding risks. It also helps in more accurate time, money, and resource estimation, which benefits the team and their clients. Additionally, proper risk management involves taking proactive rather than reactive measures to control possible future catastrophes. Effective risk management strategies enable the identification of the project's strengths, weaknesses, opportunities, and threats (Pacagnella Jr et al., 2019). Kumareswaran (2018) also stated that risks have an impact on the project's objectives (scope and quality), which must be taken into account while creating a quality management system (QMS). Risks are potential threats that might result in failure and loss, harming a certain project. As a result, risk is considered when establishing quality objectives and monitored using KPIs.

Moreover, RM insignificantly and negatively moderates the effect of PR on PI, PPO, SS, and time. Project risk is an unpredictable occurrence or circumstance that, if it occurs, might positively or negatively impact a project's objective. Analyzing project risks is essential for assuring the success of any project (Yim et al., 2015). By identifying possible risks early on, project managers may create strategies to reduce or eliminate them, minimizing the negative impact on timelines, budgets, and outcomes. Gładysz and Kuchta (2022) also said establishing and understanding a project's objectives is crucial in assessing risk. Risks don't exist if there aren't any objectives, and vice versa if the objectives are vague. Clearly defined objectives are needed for the risk process. Without a context, it is impossible to determine risks. Businesses must first understand what is "at risk," what matters, and what they are trying to accomplish (Rodríguez-Rivero & Ortiz-Marcos, 2022).

Moreover, time shifts describe variations from the schedule, such as interruptions, accelerations, or delays. Effective project management is also necessary to complete any effort successfully (Kurniady et al., 2022). Managing time shifts throughout the project lifetime is another major difficulty faced by project managers. Time, particularly delays, poses a serious risk to the project's success. When tasks or milestones are delayed, it can have an adverse effect that delays related processes. As a result, project schedules might need to be adjusted, extending the project's duration and raising the possibility of cost overruns (Subramonian et al., 2022). Fernandes et al. (2022) also stated that delays could harm a project's overall performance by eroding stakeholder confidence and causing missed market opportunities. Stakeholder satisfaction is another performance indicator based on how well the project's

objectives and operations or implementation (such as a service) meet or exceed those objectives. One of the success factors for projects is stakeholder satisfaction; if the stakeholders are satisfied, the project must be successful (Micán et al., 2022). Watema and Tulirinya (2021) also indicated that SS emphasize good project work quality, which contributes to project success because they have strong communication and stakeholder engagement and can deliver projects in a good estimated time; in contrast, poor stakeholder management decreases stakeholders' satisfaction with project outcomes because poor stakeholder management includes poor stakeholder engagement (Tkachenko & Zlygostev, 2022).

5 Conclusion and Recommendations

5.1 Conclusion

In conclusion, this study sheds light on the critical success factors, project risks, and risk management practices in Pakistan's construction industry. The findings underscore the importance of effectively managing critical success factors to improve project outcomes and stakeholder satisfaction. Robust risk management strategies are essential in mitigating the impact of project risks on time, cost, quality, and overall project success. The study highlights the interconnectedness of these factors and the need for an integrated project management approach to achieve successful housing projects. While the research provides valuable insights, its focus on a specific region and reliance on self-report data calls for caution in generalizing the findings.

5.2 Practical implications

The study's conclusions include many applications that the construction sector in Pakistan might use to improve project performance. To enhance overall project outcomes, project managers should first concentrate on efficiently managing critical success factors, such as planning, resource allocation, and stakeholder involvement. Furthermore, putting strong risk management procedures in place may help lessen the detrimental effects of risks on projects. These procedures include rigorous risk assessments and proactive mitigation. Thirdly, to win over support and guarantee project success, it is essential to prioritize stakeholder satisfaction through ongoing involvement and resolving their concerns. Then, to maximize time and cost management, resource allocation choices should be based on the essential success elements discovered. Fifth, project teams should promote a culture of ongoing learning to remain adaptable to changing conditions.

Lastly, policymakers can use the research implications to develop industry-specific regulations that promote best practices in risk management and project execution, fostering sustainable growth in the construction sector. By applying these practical implications, stakeholders in the construction industry can enhance project performance and achieve better outcomes.

5.3 Limitations and future research directions

The research's emphasis on the Pakistani construction sector is a problem in that it may limit the applicability of the findings to other locations or sectors with various contexts and challenges. Furthermore, the study's dependence on project managers' and stakeholders' self-report data might create biased responses and subjective views. Additionally, it is difficult to demonstrate a causal relationship between critical success factors, project risks, and project

success because of the cross-sectional character of the research methodology. Longitudinal studies would be more appropriate for analyzing the temporal links across a project's lifespan. Furthermore, the study probably overlooked crucial components by not considering all project risks and essential factors for success that may apply to the construction sector.

To understand regional differences in critical success factors and project risks, future studies might broaden their focus by integrating a comparative investigation of the construction industries in other developing countries or by contrasting them with those in advanced economies. Researchers may employ objective data or mixed-methods approaches to triangulate results to avoid self-report biases. Experimental or quasi-experimental designs may provide a more reliable method of determining causal linkages. Furthermore, case studies or qualitative research can provide in-depth insights into how particular important success criteria and risk management techniques affect project performance in actual settings.

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