

Article

Project Complexity and Performance in the Construction Sector: The Mediating Role of Knowledge Sharing and the Moderating Role of Trust

Taha Aslam^{1*}, Zareen Naz² and Imran Khan³

¹Department of Management Studies, Bahria Business School, Bahria University, Islamabad, Pakistan. Email: ttahaaslam@gmail.com

²Department of Management Studies, Bahria Business School, Bahria University, Islamabad, Pakistan. Email: zareensh33@gmail.com

³International Business School, Teesside University, Southfield Rd, Middlesbrough TS1 3BX, United Kingdom. ORCID: 0009-0006-0457-1849. Email: imran.qhan@gmail.com

*Corresponding author: ttahaaslam@gmail.com



Abstract

Construction projects play a pivotal role in the economic and social development of developing countries by strengthening national infrastructure. However, the inherent complexity of such projects frequently undermines their successful execution and overall performance. Drawing on knowledge-based and relational perspectives, this study examines the impact of project complexity on project performance, incorporating knowledge sharing as a mediating mechanism and trust as a moderating variable. This study adopts a quantitative research design. Data were collected from 252 employees working in construction companies in Pakistan using a convenience sampling technique. Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed to test the proposed moderated mediation model. The findings indicate that project complexity significantly influences project performance. Knowledge sharing partially mediates the relationship between project complexity and project performance, suggesting that effective knowledge exchange mechanisms can alleviate some negative consequences of complexity. Furthermore, trust significantly moderates the relationship between project complexity and knowledge sharing, strengthening knowledge-sharing behaviors under conditions of high complexity. However, trust does not significantly moderate the relationship between knowledge sharing and project performance. This study contributes to project management literature by presenting an integrated framework that explains how complexity affects performance through knowledge-sharing processes and relational dynamics. The findings provide practical implications for project managers, emphasizing the need to cultivate trust and institutionalize knowledge-sharing practices to enhance project outcomes in complex construction environments.

Keywords: knowledge sharing; trust; project complexity; project performance

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1. Introduction

Complexity is becoming inherent in all types of projects (Tabassum et al., 2025). Particularly, practitioners are experiencing difficulties due to complexity, which in turn affects the project's success (Karimulla & Gupta, 2024). Following, construction projects are encountering management issues, reporting, and the dissemination of information. The International Centre for Complex Project Management presents that 25% of the worldwide Gross Domestic Product (GDP) is contributed by projects (ICCPM, 2025). However, Pakistan's construction sector is contributing approximately 380 billion (PKR) to the GDP, making it a significant component for the economy (Housing and Construction, 2022).

Complexity is known to be inherent in projects, which can direct the projects toward uncertain events (Azmat & Siddiqui, 2023; Zhang et al., 2022). If not managed from the start of the project, these uncertain events can have a significant impact on project outcomes (Liu & Zhang, 2025). The literature on project complexity presents

unequivocal findings indicating negative perspectives that can hinder project performance (Azmat & Siddiqui, 2023), and can have positive impacts too. According to Hu et al. (2023), the likelihood of achieving project performance will be lower if project complexity cannot be fully understood and addressed. Understanding complexity facilitates in coming up with coping mechanisms that is essential for performance as well as for the success of the project (Lafhaj et al., 2024).

The relationship between project complexity and project outcomes is influenced by various factors such as absorptive capacity (Mata et al., 2023), knowledge hiding (Zhang et al., 2022), Collaboration involving information sharing, joint decision-making, and incentive alignment (Vaez-Alaei et al., 2024), and effective knowledge transfer (Zhou & Fong, 2025). Numerous studies have investigated project complexity in different contexts (Bjorvatn & Wald, 2018; Kaufmann & Kock, 2022; Nguyen & Duy Ha, 2025; Trinh & Feng, 2020). However, Razzaq et al. (2025) demonstrate that the significance of project complexity on project outcome is contingent upon the specific circumstances of the project. In line with the literature, project complexity and knowledge sharing have received little to no attention, particularly regarding its role in the context of the project complexity-project performance relationship. Hence, the current study aimed to examine knowledge sharing as an alternative mechanism that may impact the project complexity-project performance relationship, because knowledge sharing has been proven to be a critical factor for achieving superior results in complex project environments (Shi & Xie, 2024).

Furthermore, there is considerable literature available on complexity in terms of trust but in different contexts (Princes & Said, 2022; Qiangqiang & Maelah, 2025; Vaez-Alaei et al., 2024). But there is limited research on the role of trust in the context of project complexity (Vaez-Alaei et al., 2024). Trust and knowledge sharing are known to play significant roles in the successful completion of projects (Shang et al., 2023). Furthermore, trust is referred as a motivating factor for individuals, enabling them to maintain positive perspectives and overcome challenges imposed by project complexity and transience as well (AlKheder et al., 2025).

Moreover, the project complexity and project performance relationship has been examined under different theoretical perspectives (Phoebe, 2024; Vaez-Alaei et al., 2024). Further, recommended to investigate the constructs from different perspectives. There exists a significant research gap regarding holistic views on project outcomes, considering project complexity and the factors that support or hinder performance (Vaez-Alaei et al., 2024). Furthermore, the current study aimed to address gaps that are required to be investigated in developing country i-e, Pakistan, as most of the existing research in the context of project complexity has been conducted in developed countries (Nubuor et al., 2025; Su et al., 2025). Moreover, the current study is aimed to investigate the impact of project complexity on project performance, with the moderating effect of T. The knowledge management perspective provides strong grounds through the lens of a resource-based view (RBV) to investigate different sets of mediators in the relationship between the complexity and performance outcomes of the projects. This is because of the nature of projects that knowledge management activities, such as knowledge sharing, play an important role in projects under the principles of leadership and system thinking (Project Management Institute, 2022). Drawing on RBV, project performance depends on the effective use of intangible resources such as knowledge sharing, which functions as a strategic capability that mediates the impact of project complexity on performance, while trust enhances this capability by facilitating the interchange and integration of valuable knowledge resources.

The current study aimed to investigate how knowledge sharing and the complexity of a project affect one another, and in addition, project performance. The key findings of the study enable managers to improve the performance in complex projects by strengthening knowledge sharing practices and building trust among all stakeholders to address the emerging and unforeseen uncertainties associated with project complexity, ultimately leading to improved project performance.

2. Literature Review

Every organization has its own unique set of resources (reputation, knowledge, information, relationship with key stakeholders or customers or suppliers, etc.) on which they carry out tasks (Kozlenkova et al., 2014) to attain better performance (Wernerfelt, 1984). RBV argues that the resources are exploited to develop strategies for increasing efficiency (like cost reduction), effectiveness (like quality enhancement), and capabilities (like information, knowledge, and practices) in managing the supply chain (Barney, 2012; Hitt et al., 2016), collectively contributing to project performance. The Knowledge-based assets are always distinctive to the organization, challenging to replicate, and deeply embedded in the company's culture (Barney, 1997; Foss, 1996; O'Dell & Grayson, 1998; Teece, 1998).

2.1. Role of Project Complexity and Project Performance

During the last decade, the complexity in the construction projects have increased exponentially. Due to rapid urbanization, mega-construction projects are being executed across the globe, with an average cost of US\$700 million (He et al., 2015). Increasing budgets and managing performance are more frequently experienced on large-scale projects (Thomas & Mengel, 2008) leading to increased complexity (Williams, 1999). Projects are becoming

more complicated; that conventional PM techniques are turning obsolete (Luo et al., 2017). Complexity is often characterized by ambiguity (Bjorvatn & Wald, 2018). For which, the knowledge contributors are facing difficulties in experiencing a decline to execute tasks (Zhang et al., 2022).

Complexity requires an in-depth understanding of ambiguity and uncertainty to come up with appropriate procedures (Snowden et al., 2007), issues related to coordination, or specific knowledge (Glouberman & Zimmerman, 2002). Few studies emphasized the negative impact of project complexity on project outcomes (Butler et al., 2019; Zhang et al., 2022). Traditionally, project performance was assessed in terms of the needed resources to complete the project (Razmdoost & Mills, 2016). Construction projects are referred successful if they are finished under budget, on schedule, and to the satisfaction of all stakeholders (Gebrehiwet & Luo, 2017). Based on the above discussion, this study hypothesizes:

H1: Project complexity has a significant relationship with project performance.

2.2. Mediating Role of Knowledge Sharing

To sustain project performance, knowledge sharing is a deliberate approach that leverages existing knowledge to foster the ability of project team members (Park & Lee, 2014). When employees operate in an environment that promotes extensive knowledge sharing, they are better positioned to unleash innovative potential, and reciprocal learning, which serves as a valuable method for enhancing skills and capabilities (Wang & Noe, 2010). Sharing resources through knowledge with project team members facilitates coming up with better solutions (Imam & Zaheer, 2021). The processes that organizations follow for knowledge dissemination facilitate in attaining competitiveness (Kearns & Lederer, 2003). Existing literature indicates that knowledge sharing positively correlates with performance (Imam & Zaheer, 2021; Park & Lee, 2014; Um & Kim, 2018). According to Young Choi et al. (2010), sharing knowledge in a complex environment may improve team performance by facilitating better decision-making and coordination (Neves et al., 2014). The exchange of knowledge is significant in promoting stronger team cohesiveness and bringing a shared understanding of project objectives (Han & Hovav, 2013; Pollack & Matous, 2019). A few of the seminal studies present that knowledge sharing leads to achieving project objectives by sharing information among and with the team members (Ali & Park, 2016; Leal-Rodríguez et al., 2014; Zahra & George, 2002). The complexity of a project is believed to adversely affect its performance due to increased uncertainty and coordination demands; however, knowledge sharing can play a significant role in alleviating this impact by enhancing the quality of problem-solving and decision-making. Furthermore, the integration and transformation of explicit and tacit knowledge is essential for endeavors that require complex decisions (Tiwana, 2008) and sharing knowledge lowers manufacturing costs, quicker completion of new product development initiatives, and enhanced overall performance (Mesmer-Magnus & DeChurch, 2009; Tsai, 2001; Wang & Noe, 2010). Based on the above arguments, this study hypothesizes that:

H2: Knowledge sharing mediates the relationship between project complexity and project performance.

2.3. Moderating Role of Trust

Trust strengthens the bond between team members, enhances collaboration among stakeholders, and is seen as a significant aspect of project success (Baer & Frese, 2003; Rezvani et al., 2018). Based on RBV perspective, having trust in one another as a viable governance asset that reduces coordination and opportunistic expense, which in turn makes knowledge resources more accessible and efficient to employ. An environment that prioritizes collaboration and knowledge sharing includes trust as a connecting factor (Černe et al., 2014; Rezvani et al., 2018). Employees exhibit higher satisfaction, organizational commitment, and cooperation when they collaborate with the individuals whom they trust (Bhatti et al., 2021; Gill, 2008). In addition to the processes, a trustworthy work environment encourages team members to collaborate to resolve issues and act in ways that enhance project performance (Ning, 2017; Rezvani et al., 2018). In recent literature, little attention has been given in prior literature on trust, in the context of complexity-performance relationships (Zhang et al., 2022). The study proposes that:

H3: Trust moderates the relationship between the project complexity and knowledge sharing.

H4: Trust moderates the relationship between knowledge sharing and project performance.

3. Methodology

The study employed a quantitative, time-lagged survey design to examine the mediating effect of knowledge sharing and the moderating effect of trust on the relationship between project complexity and project performance within construction firms in Pakistan. The target population comprised registered construction companies operating in Islamabad and Rawalpindi, with an estimated population of approximately 700 firms registered with the Pakistan

Engineering Council. A purposive sampling strategy was adopted to ensure that respondents possessed adequate domain knowledge and contextual exposure. Specifically, project employees occupying managerial and non-managerial roles with a minimum of one year of project-related experience were considered eligible to participate. Based on the sample size determination guidelines proposed by Krejcie and Morgan (1970), a minimum sample of 248 respondents was deemed appropriate. Accordingly, data were collected from 252 project employees during June and July 2025, satisfying the recommended threshold.

To mitigate common method variance, a three-wave time-lagged data collection procedure was implemented, with a three-week interval between each wave. In the first wave (T1), 680 questionnaires were distributed, and respondents provided demographic information along with assessments of project complexity (independent variable) and trust (moderator). Unique identification codes were assigned at T1 to facilitate response matching across subsequent waves while preserving anonymity. In the second wave (T2), only those respondents who had completed T1 were invited to report on knowledge sharing (mediator). In the third wave (T3), the same respondents evaluated project performance (dependent variable). After matching responses across all three waves and excluding incomplete cases, 252 usable questionnaires were retained for hypothesis testing and subsequent statistical analyses.

Data were collected with structured questionnaires administered through online platforms, including WhatsApp and LinkedIn. The survey instrument consisted of two sections. The first section captured demographic characteristics of the respondents, whereas the second section measured the study constructs using previously validated scales. All variables were operationalized using a five-point Likert-type scale ranging from strongly disagree to strongly agree. Project complexity was measured using a three-item scale adapted from Butler et al. (2019). Trust was assessed using a five-item scale adopted from Zhang et al. (2022). Knowledge sharing was measured with a five-item scale adapted from Bhatti et al. (2021), and project performance was evaluated using a six-item scale adopted from Zhang et al. (2022).

Several methodological considerations were incorporated to enhance the rigor and validity of the study. The use of purposive sampling ensured that respondents possessed sufficient experiential knowledge to provide informed evaluations of the constructs. Non-response bias was examined by comparing early and late respondents following the procedure recommended by Armstrong and Overton (1977), and no statistically significant differences were observed, indicating that non-response bias was unlikely to pose a serious threat. Although the sample predominantly comprised male respondents, this distribution reflects the structural composition of the construction sector in Pakistan and therefore does not undermine the external validity of the findings. In addition to the time-lagged design, Harman's single-factor test was conducted to further assess common method bias. The first factor accounted for less than 50% of the total variance, suggesting that common method variance was not a substantial concern.

4. Results

Table 1 findings reveal that more than 85% of the respondents were male, indicating the predominance of males in the construction sector of Islamabad, and Rawalpindi region. The analysis showed that more than 71% of the data was collected from Islamabad and the remaining from Rawalpindi. Almost 23.4% of the respondents lie in the age group below 25, 61.1% between 26 and 35, and 11.1% are between 36- to 45-year-old and 4.4% fell in the age group above 45 years. Furthermore, more than 55% had bachelor's degrees, while the remaining had master's and PHD degrees. Moreover, more than 28% of responses were obtained from project team members, with the project team lead ranking second.

The study utilized the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach to analyze the collected data. This approach is known for its efficiency in handling small sample sizes and non-normal data (Hair et al., 2011). PLS-SEM is particularly useful to test the existing theories (Chin, 2010; Hair et al., 2011; Ringle et al., 2020). It is two-step process: at first measurement model is assessed, and evaluation of the structural model (Hair et al., 2011; Ringle et al., 2020). To ensure the validity and reliability of the analysis, this study followed guidelines for data analysis (Ringle et al., 2020).

To evaluate the measurement qualities of latent constructs, the measurement model demonstrates how these constructs have been assessed via their observable variables. For structural model, it is imperative to ensure that the characteristics of the measurement model are met (Fornell & Larcker, 1981). Four different types of reflective constructs were used in the present study. These included: project complexity, knowledge sharing, trust, and project performance.

Figure 1 depicts the model with circles representing the construct variables and rectangles representing measurement items. In preparation for hypothesis testing, the researchers assessed the measurement model using Smart PLS. This involved evaluating several aspects, including the reliability and validity of the indicators, internal consistency and reliability, and convergent validity. The measure of outer loadings is analyzed to determine the reliability of the items. The outer loadings greater than 0.7 are suggested (Seyfi et al., 2021), indicating that more than 50% of the variation in a construct is explained by the items and that the degree of item reliability is adequate (Hair Jr et al., 2021). The PLS algorithm revealed that all outer/factor loadings were more than the minimal threshold value.

Table 1. Demographics of study participants.

Category	Number of Respondents	Cumulative Percent
Gender		
Male	215	85.3
Female	37	100.0
Age		
Below 25 years	59	23.4
26-35 years	154	84.5
35-45 years	28	95.6
Above 45 years	11	100.0
Designation		
Project Director	19	7.5
Project Manager	23	16.6
Project Team Lead	41	32.9
Project Team Member	72	61.5
Project Supervisor	26	71.8
Other	71	100.0
City		
Islamabad	179	71.0
Rawalpindi	73	100.0
Highest Qualification Level		
BS/BSc	140	55.6
MBA/MA	22	64.3
MS/Mphil	79	95.6
PHD	11	100
Experience		
Less than 1 year	41	16.3
1-5 years	132	68.9
6-10 years	43	86.0
Above 10 years	36	100.0

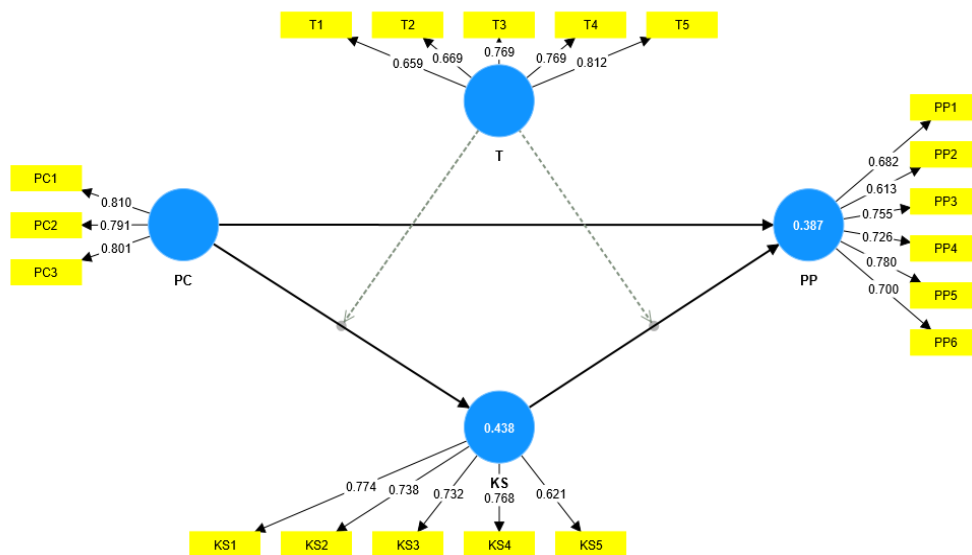


Figure 1. Measurement model.

Cronbach's Alpha (α) and Composite Reliability (CR) are used to verify internal consistency and reliability whereas Average Variance Extracted (AVE) is used to measure convergent validity. Ringle et al. (2020) and Hair Jr et al. (2021) suggested the range of acceptable values for CA and CR, 0.6-0.7 is considered minimum acceptable reliability, 0.7-0.95 is a good range, whereas 0.95 and beyond is unacceptable. Evaluating the reliability and convergent validity of the model's constructs, the researchers scrutinized AVE and CR values, following the recommendations of (Pesämaa et al., 2021). Fornell and Larcker (1981) postulated that the AVE should exceed 0.5. Table 2 exhibits Cronbach's alpha and CR values surpassing 0.70 and AVE values exceeding 0.50, indicating a satisfactory degree of convergent validity.

Table 2. Measurement model.

Construct and Items	Loading	α	CR	AVE
Project Complexity (PC)				
"Project complexity was high"	0.810	0.725	0.843	0.641
"The number of project requirements was high"	0.791			
"Technical expertise required to complete the project was high"	0.801			
Knowledge Sharing (KS)				
		0.778	0.849	0.531

Construct and Items	Loading	α	CR	AVE
“More knowledgeable team members freely provide other members with hard-to-find knowledge or specialized skills”	0.774			
“Members in our team share their special knowledge and expertise with one another”	0.738			
“Team Members have systems and venues for people to share knowledge and learn from each other in the company”	0.732			
“Team Members share information and knowledge with our superiors”	0.768			
“People are encouraged to access and use information and knowledge saved in our company systems”	0.621			
“If someone in our team has some special knowledge about how to perform the team task, he or she is not likely to tell the other member about it”	dropped			
“There is virtually no exchange of information, knowledge, or sharing of skills among members”	dropped			
Project Performance (PP)		0.808	0.859	0.506
“This project has come in on schedule”	0.682			
“This project has come in on budget”	0.613			
“The product quality and the deliverables quality accord with the standard”	0.755			
“I was satisfied with the process by which this project was completed”	0.726			
“Our stakeholders are satisfied with the project outcomes”	0.780			
“The project results, or deliverables, are in line with client objectives”	0.700			
Trust (T)		0.792	0.856	0.545
“Most of my team members can be relied on to do as they say they will do”	0.659			
“I can rely on my team not to make my job more difficult by careless work”	0.669			
“I can trust my team I work with to lend me a hand if I needed it”	0.769			
“If I got into difficulties at work I know my team would try and help me out”	0.769			
“I have full confidence in the skills of my team”	0.812			

Discriminant validity assesses how distinct constructs differ from one another. The purpose of evaluating discriminant validity is to ensure that a reflective construct exhibits the highest correlations with its own indicators, specifically in comparison to all other constructs in the PLS path model (Hair Jr et al., 2021). Discriminant validity was assessed by analyzing the Heterotrait-Monotrait (HTMT) ratio through Smart PLS 4.0 (Table 3). According to Henseler et al. (2015), Discriminant validity is regarded adequate between 0.85 and 0.9, however between these two values, it is lacking. Consequently, any value of 0.85 or below is regarded as having strong discriminant validity. The HTMT values are shown in Table 3 below.

Table 3. HTMT criterion.

	Knowledge Sharing	Project Complexity	Project Performance	Trust
Knowledge Sharing	-	-	-	-
Project Complexity	0.597	-	-	-
Project Performance	0.687	0.536	-	-
Trust	0.756	0.715	0.621	-

The study employed Smart PLS for conducting structural path modeling and testing proposed hypotheses. This involved evaluating the relationships between constructs through path coefficients and determining their statistical significance, in accordance with the guidelines provided by (Hair et al., 2011). The researchers followed the evaluation and reporting guidelines outlined by Ringle et al. (2020), to assess the structural model. These guidelines likely encompassed aspects such as model fit, significance testing of path coefficients, and the overall explanatory power of the model.

Based on the gathered data from the respondents, the collinearity assessment was performed as it is crucial to evaluate if there is collinearity among the predictors. Collinearity among predictor variables is a problem that may result in inaccurate estimations (Hair et al., 2017). Variance inflation factor (VIF) values, generated by Smart PLS 4.0, were used to determine if multicollinearity is present. As per Hair et al. (2017), a VIF value should be equal or less than 5 for accessing multicollinearity. The model's maximum VIF value, 2.063, is shown in Table 4 and is below the threshold. Therefore, the current model's predictor collinearity problem is not present.

Table 4. Collinearity assessment.

	Knowledge Sharing	Project Complexity	Project Performance	Trust
Knowledge Sharing	-	-	1.783	-
Project Complexity	1.557	-	1.599	-
Project Performance	-	-	-	-
Trust	1.796	-	2.063	-

For structural models as shown in Figure 2 to be statistically significant, Beta (β), t and P values were used to check the significance of the model. A hypothesis is deemed significant if it possesses a t-value exceeding 1.96 and a p-value below 0.05. Additionally, Beta values substantially exceeding 0.1 indicate a positive relationship and may be used to validate the presence of a path coefficient. Table 5 shows the results for path coefficient.

As depicted in Table 5, the indirect effect of project complexity was found to be positively significant ($\beta=0.139$; $t=1.983$; $p=0.032$), supporting (H1). It was hypothesized that project complexity, knowledge sharing, and trust have a significant relationship with project performance, H1, H2, H3. Hypotheses (H2) is accepted as knowledge sharing significantly mediates the relationship between project complexity and project performance ($\beta=0.041$; $t=1.631$; $p=0.048$). The role of trust as a moderator (H3) among project complexity and is proven to have significant relationships ($\beta= -0.133$; $t=2.854$; $p=0.02$). Only one hypothesis (H4), the role of trust among knowledge sharing and project performance is not supported (insignificant) ($\beta= -0.022$; $t=0.462$; $p=0.322$). Thus, results show a significant relationship among project complexity, and project performance but one moderation among knowledge sharing and project performance failed after testing.

Table 5. Path coefficient and hypothesis testing.

Hypothesis		β	t-value	p	Decision
H ₁	Project complexity -> Project performance	0.139	1.983	0.032	Significant
H ₂ **	Project complexity -> Knowledge sharing -> Project performance	0.041	1.631	0.048	Significant
H ₃	Trust*Project complexity -> Knowledge sharing	-0.133	2.854	0.002	Significant
H ₄	Trust*Knowledge sharing -> Project performance	-0.022	0.462	0.322	Insignificant

Note: Only ** shows that confidence level is at 90%, while others are at 95% confidence level).

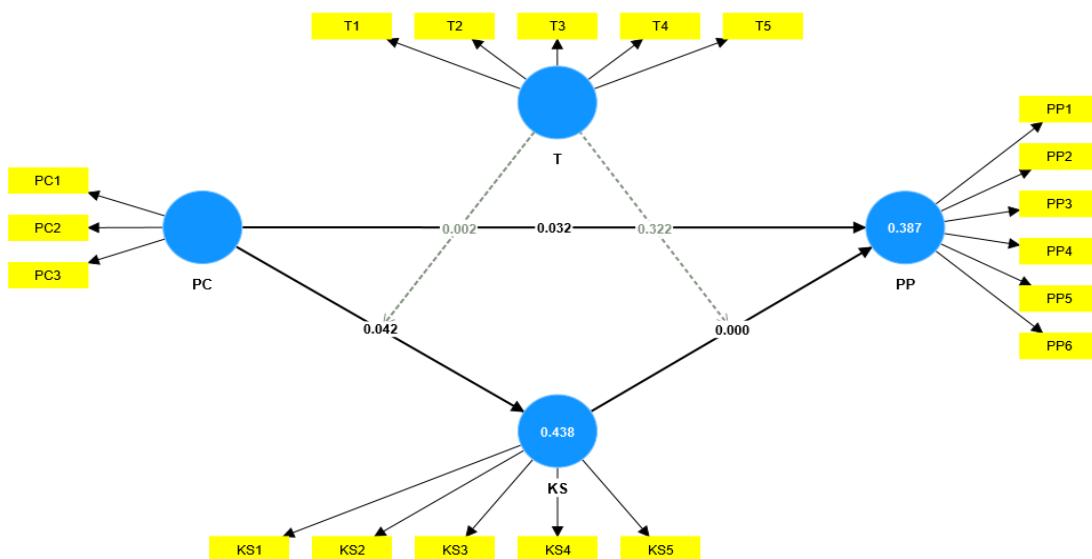


Figure 2. Structural model.

Likewise, Variance Accounted For (Seyfi et al., 2021) approach is used to determine the type of mediation for H2 (full, partial or zero mediation). If VAF is below 20%, it signifies zero mediation. If VAF is greater than 20% but less than 80%, it indicates partial mediation, and if VAF exceeds 80%, it suggests full mediation (Hair et al., 2017). Above Table 6 shows VAF value for the current study is 0.23, showing 23% variation hence it is partial mediation. This study underscores the significant correlation of knowledge sharing in project complexity and project performance relationship.

Table 6. Mediation analysis.

Indirect effect	Direct effect	VAF	Decision
0.041	0.180	0.041/0.180=0.23	Partial Mediation (20% < VAF < 80%)

This research aimed to investigate whether trust acts as a moderator in the association between project complexity and knowledge sharing. The hypothesis posited that team members having a high trust factor would weaken the complex nature of the project by means of knowledge sharing. The hypothesis was tested using Smart PLS as shown in Figure 3, and the findings are presented in Table 5. The results ($\beta=-0.133$, $t=2.854$, $p=0.002$), indicate that trust moderates the significant relationship between project complexity and knowledge sharing, since the β value is negative with significant p value, it shows the reverse relationship of the moderator. Hence, H3 of the study is supported. Also, this research study was to examine whether trust moderates between knowledge sharing and project performance. The hypothesis posited that team members having a high trust factor would enhance the impact of on project performance. The hypothesis was tested using Smart PLS as shown in Figure 4, and the findings are presented in Table 5. The results indicate that the p-value is beyond the threshold limit and insignificant ($\beta=-0.022$,

$t=0.462, p=0.322$), indicating that trust does not moderate the relationship between knowledge sharing and project complexity. Therefore, H4 of the study is insignificant.

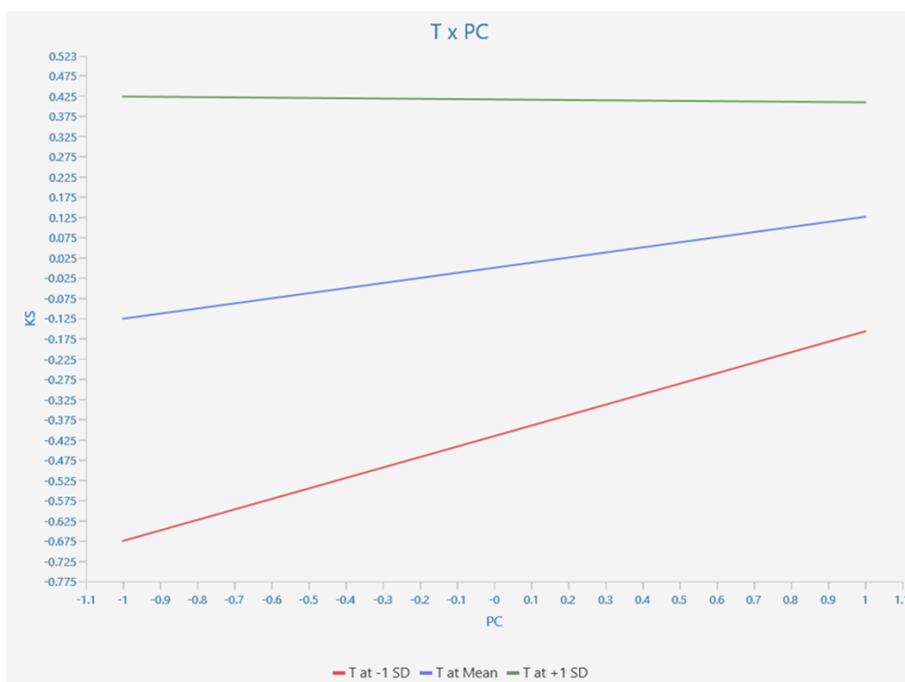


Figure 3. Moderation of trust with project complexity.

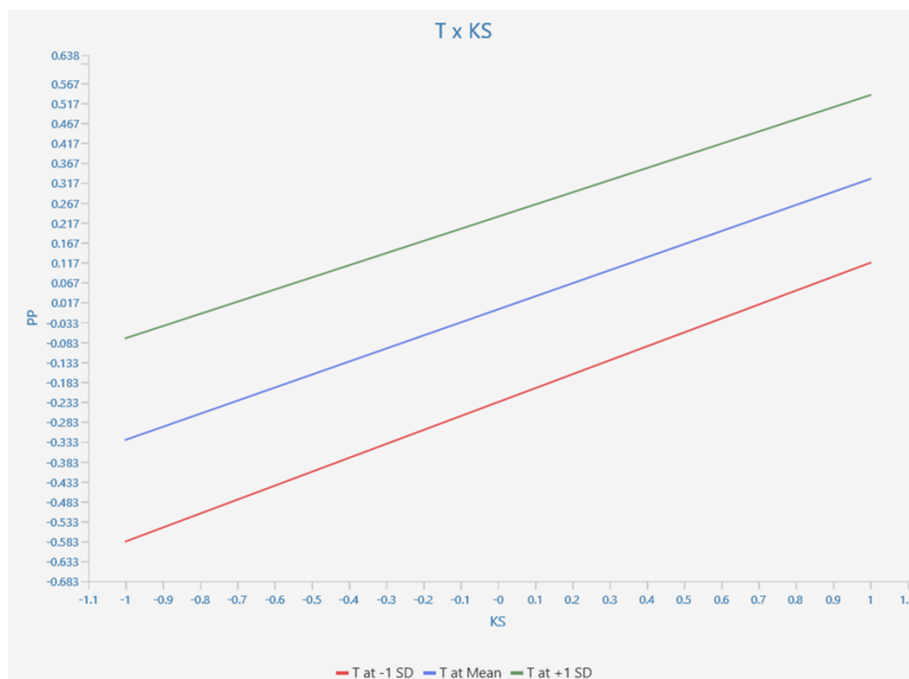


Figure 4. Moderation of trust with knowledge sharing.

5. Discussion

The primary objective of this study is to examine the relationship between project complexity and project performance while considering the mediating effect of knowledge sharing and moderating effect of trust. The results showed that project complexity has a significant impact on the project performance. However, it is worth noting that in previous studies, such as Zhang et al. (2022), have postulated a negative relationship between project complexity and project performance. The literature on project complexity presents divergent findings, with some studies indicating positive impact (Florice et al., 2016; Hanisch & Wald, 2014) and other demonstrating a negative influence (Bjorvatn & Wald, 2018; Sicotte & Bourgault, 2008; Zhang et al., 2022) on projects. It can be inferred from the literature that the negative effect may arise from the introduction of new features that are incompatible with the existing

system components. Conversely, the positive effect may be attributed to unexpected events that emerge through knowledge sharing and interactions among system's constituents (San Cristóbal et al., 2018).

The results postulated that 38% of the variation among the complexity performance relationship. It is due to the circumstances from which the projects are being displaced in a certain environment and it might evolve, leading the performance toward its positive behavior under a complex environment. Project complexity and performance in project management exhibit bidirectional and weak correlations (Florichel et al., 2016; Hanisch & Wald, 2014; Sicotte & Bourgault, 2008). Furthermore, the findings highlight that knowledge sharing accounts for 43% of the variation in project complexity. As hypothesized, knowledge sharing significantly mediates the project complexity and project performance relationship (H2). In certain situations, team members find it difficult to ascertain their tasks which need to be sorted out through the provision of resources and knowledge exchange (Imam & Zaheer, 2021; Princes & Said, 2022). This finding aligns with the perspective of resource-based theory. Adverse expectations regarding the project's outcome may arise from these circumstances, thereby diminishing the overall project effect (Zhang et al., 2022). In knowledge-intensive construction projects, social capital is essential for productive cooperation among all parties (Di Vincenzo & Mascia, 2012). However, in complex projects collaboration relies on the partners' individual knowledge and experience (Park & Lee, 2014). Although complexity terms have negative influence on performance parameters (Bjorvatn & Wald, 2018), it can be observed that as the complexity (including uncertainties) of a project increases, so does the likelihood of knowledge sharing among the team members, resulting in higher project effectiveness. Thus, knowledge sharing serves as a significant mediator in the relationship between project complexity and project performance.

Trust has been verified as an influencing factor among knowledge sharing and project complexity (H3). Knowledge sharing in a project team depends on the participants building trust with one another. The success of the construction project can be enhancing when team members share their tacit and implicit knowledge, leading to favorable outcomes (Haq et al., 2023). Moreover, due to high levels of trust, team members are more open to sharing their knowledge. This stimulates the efficient transfer of information to promote greater project performance and project success (Zhang et al., 2013). The greater the level of trust among team members, the more willing they are to assume the risks associated with knowledge transfer caused by the complexity of task-related information (Zhang et al., 2022). More likely, project participants may share knowledge among team members when the projects are complex, which may open up possibilities for effective performance outcomes (Fridgeirsson et al., 2021; Zhang et al., 2013). The findings align with previous research of Vaez-Alaei et al. (2024) that suggests that trust capability enhances knowledge processes in complex projects. Trust plays a critical role in fostering knowledge exchange amidst complexity by significantly enhancing the correlation between project complexity and knowledge sharing. However, the findings postulate that trust among knowledge sharing and project performance has been found to be insignificant (H4). According to Curado and Vieira (2019) and Haq et al. (2023), trust demonstrates a significant influence on knowledge sharing, thereby enhancing project performance within a diverse project environment. Project members are more willing to share knowledge when there is trust and this could more likely increase the project performance and project success (Zhang et al., 2013). Although, results state the negative significance of trust in the association of knowledge sharing and project performance. Based on cultural diversity and human nature, the influence of the trust factor changes.

Moreover, in context of Pakistan, employees operate in collectivist culture. However, some percentage of employees tend to focus on self-creativity and self-attainment and prefer to work in silos to achieve recognition based on their efforts. It's important to avoid generalization and recognize that attitudes and behaviors can vary among individuals. Collaboration and knowledge sharing are crucial for successful project outcomes in any context. Thus, it is crucial to address these challenges and promote trust and knowledge sharing or knowledge awareness among team members to enhance efficiency of a project (Imam & Zaheer, 2021; Um & Kim, 2018; Zhang et al., 2022).

5.1. Theoretical Implications

The primary aim of this study is to scrutinize the correlation between project complexity and project performance within the construction sector of developing countries. Furthermore, the research seeks to elucidate the mediating role of knowledge sharing and the moderating influence of trust, examining their impact on the complexity-performance relationship in complex projects. The study's inherent nature, contextual focus, methodological framework, approach, and resultant findings collectively provide noteworthy contributions to the prevailing literature on project management, project complexity, and knowledge sharing. Significantly, these contributions transcend the geographical confines of Pakistan, thereby encompassing a broader spectrum of developing countries.

The study findings make distinct contributions to the prevailing body of literature on project complexity, knowledge sharing, trust, and project performance. Prior literature demonstrated how project complexity can have a negative effect on project performance (Bjorvatn & Wald, 2018; Zhang et al., 2022). Although the result of this study shows significance among the complexity-performance relationship. Specifically, the research reveals that whether a project is highly complex or relatively simpler, it significantly influences project performance, suggesting that

complex and non-complex initiatives exhibit similar performance characteristics. Second, the research contributes to theoretical comprehension by utilizing the Resource-Based View (RBV) to investigate the domain of project complexity, which has been previously neglected, and by clarifying the mechanism by which project complexity influences performance through knowledge-based capabilities. Moreover, the study strengthens RBV by illustrating that relational resources primarily facilitate the transformation of complexity into knowledge sharing, rather than directly improving performance outcomes, by differentiating the facilitative role of trust at various stages of the resource deployment process, thereby augmenting sustained project performance.

Existing literature lacks the combination of knowledge sharing among the project complexity and project performance relationship. Although this study provides significance among complexity-performance relationships. This study also guides executing complex nature projects implemented in collaboration with project members to increase performance parameters. In addition to the above, as per researcher's knowledge, the literature lacks the role of trust among project complexity, project performance, and knowledge sharing.

5.2. Practical Implications

The study encompasses the significance of complexity-performance relationships in the project-based sector, with a particular emphasis on construction projects. The findings of this study validate the role of knowledge sharing as a mediator. In essence, as project complexity increases, it has a two-fold influence on project performance, wherein knowledge sharing plays a significant role. On one end, higher complexity may adversely affect project performance while on the other end, it can potentially enhance performance outcomes. Notably, this study indicates that projects with higher complexity factor typically have enhanced performance outcomes. Therefore, project complexity encompasses the diverse set of circumstances that must be handled effectively to get the desired outcomes. In practice, there is no one best way to tackle project complexity. Complexity in projects arises when generic approaches fail to address the variety of issues that might arise during their execution. So, solutions must be tailored to address these issues. This research augments the existing literature on the significance of knowledge in emerging economies by shedding light on the challenges associated with complexity. When a project experiences problems, trust is a vital intangible resource that can foster cohesion among project teams and stakeholders. When project managers begin and develop open and honest communication, they may build trust. This is essential in achieving successful results, especially in complex projects. Because every project is unique, the project-based economy has seen a dramatic shift in complex situations because of social networking that can bring knowledge resources. By framing sharing of knowledge as a strategic resource, knowledge-based competency and trust as a relational governance asset within the RBV perspective, this theoretical enhancement contributes to the current project management literature. The model clarifies how project-based organizations can mitigate the adverse impacts of complexity on project performance by utilizing internal intangible resources, rather than perceiving it as an unmanageable constraint. This represents that project managers needs transition exclusively from structural or technical responses to complexity; to strengthening proactive development of trust-based settings. To enhance the performance outcome of projects, construction firms should foster an environment that actively promotes trusting relationships and facilitates knowledge sharing. By doing so, issues or uncertainties that arise due to complications in projects would tend to decrease.

5.3. Limitations and Future Recommendations

It is imperative to acknowledge the inherent limitations of this study. Primarily, the research focuses solely on construction projects specifically in Pakistan's construction sector, specifically gathering data from construction companies located in Islamabad, and Rawalpindi region. While addressing the issue of project performance under the complexity factor in the construction sector holds significance in emerging markets, confining the study's scope to these twin cities may not present a comprehensive understanding of the situation in the other emerging markets. It is important to recognize that the result can vary across different industries. Consequently, future studies are recommended to conduct this study in different project-based sectors such as Engineering, Telecom, and IT sectors. Furthermore, to improve the generalizability of the results, it is advisable for subsequent research to collect data from multiple countries.

Time and cost are the two important factors that impacted the current study. Due to time constraints, a limited sample size was collected. Future studies should try to collect data from larger samples. This study used the multistage data collection technique. Future studies can opt for longitudinal data collection for better understanding of the phenomenon. The study focused on project complexity and project performance as a whole construct. However, further research should incorporate additional dimensions of project complexity and project performance, as well as other factors that are involved in project success.

6. Conclusion

Project complexity is a well-established construct that is not only widely understood in the field of project management but is practiced too. Over the period, it has become an essential component that contributes to the existence of challenges in the path to accomplishing project outcomes. The primary aim of this study was to examine the correlation between project complexity and project performance and how knowledge sharing and trust are interconnected. Consistent with prevailing trends, a significant correlation between project complexity and project performance has been observed in construction companies. This implies that intricacies associated with complex projects, combined with the unique context of emerging markets, make it difficult to determine success. As a result, Project management offices and project teams within construction companies should proactively identify and recognize predominant complexity factors during project initiation and throughout its lifecycle. This proactiveness will ultimately enhance the performance of the project. Project managers are advised to prioritize their efforts on improving their effectiveness in fostering knowledge sharing while using management instruments to promote knowledge transfer and information sharing. However, trust significantly moderates and plays a vital role in complexity-performance relationships. The findings indicate that project complexity and knowledge sharing associations are weakened by trust. Specifically, in situations characterized by high levels of trust, the likelihood of enhancing knowledge sharing through project complexity is reduced.

Author Contributions:

Conceptualization: Taha Aslam, Zareen Naz.

Data curation: Taha Aslam, Imran Khan.

Formal analysis: Taha Aslam, Imran Khan.

Funding acquisition: Zareen Naz, Imran Khan.

Investigation: Taha Aslam, Zareen Naz.

Methodology: Zareen Naz, Imran Khan.

Project administration: Taha Aslam, Imran Khan.

Resources: Taha Aslam, Zareen Naz.

Software: Taha Aslam, Imran Khan.

Validation: Taha Aslam, Zareen Naz.

Visualization: Taha Aslam, Imran Khan.

Writing –original draft: Taha Aslam, Zareen Naz.

Writing –review & editing: Zareen Naz, Imran Khan.

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