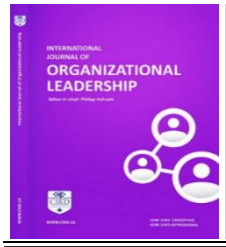
International Journal of Organizational Leadership 13(First Special Issue - 2024) 119-139



INTERNATIONAL JOURNAL OF ORGANIZATIONAL LEADERSHIP

WWW.CIKD.CA

journal homepage: https://www.ijol.cikd.ca

Investigating the Impact of Project Planning on Construction Project Success through the Mediating Role of Risk Management and Safety Climate

Shakir Iqbal[1*], Muhammad Javid Nawaz[2], Arshad Ali[3], Esam Osman[4], Ameer Hamza[5]

[1,3]Department of Management Sciences, Abasyn University, Peshawar, Pakistan
[2]Department of Project & Operation Management, Islamia University of Bahawalpur, Pakistan
[4]Department of Economy, ALzawia University, ALzawia, Libya
[5]Department of Management Sciences, Shaheed Zulfikar Ali Bhutto Institute of Science and Technology, Islamabad, Pakistan

Keywords:
Project planning, Project success, Risk management, Safety climate, Construction industry

Received
24 May 2024
Received in revised form
19 June 2024
Accepted
26 June 2024

***Correspondence:**
shakiriqbal499@gmail.com

ABSTRACT

This research aims to determine the impact of project planning on project success using a resource-based view and social exchange theory concepts. This study investigated the role of risk management and safety climate as mediators in the link between project planning and project success. Data was gathered from 263 team members in Pakistan's construction industry. This study employed partial least squares structural equation modelling based on Smart-PLS to validate the direct and mediated effects. The data suggests that project planning has a positive and considerable influence on project success. Furthermore, the findings confirm that risk management and safety climate mediate the association between project planning and project success. Empirical research on the connection between project planning and project success in developing countries is lacking. This study makes an important contribution to the field of construction industry project management by proving that project planning influences project success, with risk management and the safety climate mediating the link. This is one of the first studies to investigate the interactions among project planning, project success, risk management, and safety climate.

The construction sector is critical to global infrastructure development and contributes significantly to economic growth and societal advancement (Fareed et al., 2024; Mansell & Philbin, 2020). The critical factors for the success of a construction project must be considered (Salem et al., 2022). Recent research has highlighted the paramount importance of project planning, risk management, and safety climate in achieving successful outcomes within the construction sector (Ashraf et al., 2023; Irfan et al., 2022). As these aspects are interlinked and ever-evolving, it is crucial to investigate their complex relationships in order to enhance project success and promote overall industry excellence.

The construction sector plays a pivotal role in the growth of infrastructure around the world and determines the contribution to the economy and the progress of society (Giang & Pheng, 2011)). Project Planning (ProP) plays a critical role in construction projects because it outlines how the project objectives will be accomplished as well as the timelines and resources that should be used (Banihashemi et al., 2017). Project planning is mapping out the project with special consideration given to factors that may hinder or slow down the project and determinants that may help improve the project, making the process efficient (Demirkesen & Ozorhon, 2017). Project planning is the most important success factor for a project. Project planning entails designing the entire layout of the project in advance, similar to creating a project map. ProP plays an important role in the successful delivery of construction projects (Akinradewo et al., 2022). Effective project planning requires a systematic approach to define project objectives, scoping, resource allocation, and realistic timeline establishment (Kafile, 2021; Sudha et al., 2020). This is particularly important in the housing construction industry, where a clear understanding of the project scope and identified risks is essential (Arief & Latief, 2021). Information analysis can help prioritize pre-project planning activities to enhance project planning (Esnaashary Esfahani et al., 2020). When proper ProP and Risk Management (RisM) are combined, they significantly influence a Project Planing Success (ProS) (Alchammari et al., 2021).

Besides project planning, risk management is also significant in the project since it involves identifying, evaluating, and controlling risks that may affect the project or cause costs to go overboard (Elkrghli & Almansour, 2024). Pakistan's construction sector has consistently contributed between 2.33 percent and 2.85 percent of GDP, with an average of 2.53 percent. Despite its economic significance, the construction sector has experienced a variety of obstacles in reaching project goals. The construction industry is inherently exposed to a spectrum of risks stemming from factors such as weather variability, labor market fluctuations, and supply chain disruption (Babalola et al., 2023). This leads to risk management maturity that creates agility in the execution of projects and continuity in the event of external shocks, as noted by (Htoo et al., 2023). RisM encompasses a structured approach to finding, assessing, and mitigating possible threats that could impede project progress or lead to budget overruns (Habib et al., 2023). Risk management is a critical component of construction project success, with a focus on risk response as a key element in achieving project objectives (Ghaeb & Mahjoob, 2023). This process should be dynamic, continuous, and real-time, particularly in difficult and major civil engineering projects, to address the constantly changing risk exposure atmosphere (Tshering, 2023). A practical example of a risk management plan for a construction project in a challenging environmental condition is provided, emphasizing the importance of applying appropriate tools (Mantas & Caro, 2023).

The safety climate prevailing within construction organizations has garnered heightened attention as a fundamental driver of project success over the past three decades (Zhou et al., 2023). Organizational safety climate or organizational perceptions towards safety have been too often identified as one of the primary sources of specific project outcomes (Kajumulo et al., 2023). A positive safety climate fosters a culture of heightened safety consciousness, which in turn leads to fewer accidents, reduced injuries, and improved overall project performance (Draghici et al., 2023). A positive safety climate minimizes the occurrence of accidents and adverse effects on workers, thus enhancing project productivity (Lee et al., 2020). Safety climate encapsulates the attitudes, perceptions, and behaviors of individuals within an organization concerning safety practices and protocols (Dursun, 2023). Studies showed that construction safety climate influences construction project outcomes (Schutte, 2010). This study recognizes the current need to investigate how safety climate acts as a mediator in the relationship between ProP and ProS in the construction sector (Gao et al., 2016). Safety climate has been shown to be a predictor of safety performance in the construction sector.

When discussing Project Success, project planning is essential. The ProP serves as the foundation for the endeavor and shapes the course of the project's duration. The current literature on the effect of project planning on construction ProS has identified several key factors (Memon et al., 2023; Ohag et al., 2023) that emphasize the importance of coordination factors, including scheduling and planning, in design and build projects. The project's outcome will undoubtedly be impacted if things go wrong with the plan. Project planning and risk management are crucial success factors for any project, and current studies have demonstrated that they positively affect ProS (Alchammari et al., 2021). Daboun et al. (2022) further underscore the significance of relationship management, particularly in terms of contractual measures, team interactions, and top management actions (Khahro et al., 2023; Onubi et al., 2023) highlight the influence of social and economic factors, such as safety, land value, and productivity, on project performance in Pakistan (Harðardóttir & Möller., 2023) add to this by emphasizing the role of positive communication, trust, and organization in ensuring project success.

Although project planning, risk management, and safety climate have been widely investigated, the combined effect of the three variables on construction project success has not been well investigated. Many previous studies focused separately on these variables without taking into account the interconnected relationships among these factors that influence project results (Urbański et al., 2019). While studies on project planning, risk management, and safety climate are well-researched, little effort has been directed toward investigating the interaction of the above factors in construction project success. Prior research has paid most of its attention to each of the aforementioned variables exclusively, without considering the complex interdependence between the variables (Hotchkiss & Seekamp, 2024). This is the research gap this study seeks to address by examining the mediating roles of risk management, safety climate between project planning, and project success, especially within the construction industry (Al-Balawneh & Tarabieh, 2024). Moreover, there is a limited amount of literature on safety climate as a mediator between planning and project success, which offers a fresh perspective for this study (Onyango, 2023). Thus, by integrating these elements, this study will contribute to an improved understanding of how these significant factors affect project outcomes and will

present new theoretical advances as well as practical recommendations for improving project success in construction organizations (Milijić et al., 2020).

The findings of this study will enhance the state of knowledge as it will cover these outlined research gaps while contributing to defining the best practices in the field (Yilmaz & Artan, 2024). Many studies in various industries have been conducted on project planning and risk management's mediating function. However, the safety climate is a unique study with a mediating effect. The purpose of this research is to further examine these interrelationships and centers on the ways in which effective project planning with the help of risk management and safety climate might help achieve the best project result and aid in advancing the construction industry. Knowledge of these dynamics is crucial when it comes to formulating plans that can improve the outcomes of projects and increase the adherence of businesses to standards within the appropriate industry (Yilmaz & Artan, 2024). Our research will concentrate on project planning, with safety climate acting as a mediator, and how risk management and safety climate can affect project success. In order to improve project success, the findings of this investigation will be valuable. In figuring out how risk management, safety climate, and project planning are related. Nonetheless, a thorough grasp of the interplay between these variables and the precise effect of ProP on the success of construction projects is still missing. More studies are needed to fill this knowledge gap and provide a more thorough understanding of the relationship between project planning and project success in construction. Thus, the following are the research questions for this study:

1) Does project planning impact ProS?
2) Does risk management mediate the relationship between ProP and ProS?
3) Does the safety climate mediate the relationship between ProP and ProS?

This Study aims to comprehensively examine the impact of project planning on project success within the construction sector while concurrently exploring the mediating roles of risk management and safety climate. Project planning is the most essential component of a project’s success. The success of the project was only a dream without project planning. Although no planning will ensure project failure, it cannot guarantee project success. ProP is a major part of project management and all facets of diverse environments. Project planning involves measuring and estimating ahead of time, and risk management is crucial for accomplishing the project. Risk management follows well-executed project planning, which entails anticipating uncertain circumstances. Effective outcomes are produced in all cultures when project planning and risk management are combined. By delving into these multifaceted relationships, we aim to deepen our understanding of how effective project planning can optimize project outcomes and contribute to the overall excellence of the construction industry. Furthermore, we seek to elucidate the mechanisms through which risk management and safety climate mediate this relationship, thereby providing invaluable insights for improving project success in the construction sector.

Literature Review

Project Success

A project's success is a sequence of actions that include the stages of planning, implementation, and supervision so that the goals that have been set can be reached and implemented (Setiawan et al., 2023). Project success is a complicated concept that includes accomplishing predefined

objectives and understanding desired outcomes within the context of a project (Ktaish & Hajdu, 2022). Identifying important success elements and project success criteria at the initial project assessment is a significant step toward successful project completion (Gomes & Romão, 2023).

Project Planning

Project planning is a structured approach that involves identifying project objectives, scoping work, allocating resources, scheduling tasks, and developing strategies to achieve ProS **(**Okudan & Çevikbaş, 2022). Project planning is an indispensable aspect of project management across various industries (Emedosi et al., 2023). It serves as the blueprint for a project's successful execution, providing a roadmap that guides project teams and stakeholders throughout its lifecycle. As emphasized by (Mulesa et al., 2023), a well-structured project plan is essential for achieving project objectives and delivering results efficiently.

Risk Management

Risk management is a systematic and deliberate method for identifying, analyzing, managing, and monitoring risks and uncertainties that might affect an organization's goals, initiatives, or day-to-day operations (Damayanti et al., 2023; Kajwang, 2022). Risk management should be at the center of an organization's operations by integrating risk management techniques throughout the whole organization's processes, systems, and culture (Ugli et al., 2023).

Risks are to be expected in every construction project, so it is vital to operate as an integrated project team from the early phases to identify risks and efficiently deal with them when they emerge (Galinsky et al., 2021). Risk management is an essential part of every company's overall management plan. Risk management aims to reduce the negative impact of risks on an organization's capacity to fulfill its objectives (Zhai et al., 2022).

Safety Climate

Safety climate may be characterized as employees' shared impressions of how safety policies, standards, and procedures are applied and prioritized in relation to other objectives such as productivity (Judge et al., 2019). Safety is of paramount importance in various industries, workplaces, and organizations for several critical reasons (Asad et al., 2021). An effective safety climate plays a pivotal role in confirming the well-being of employees and the smooth operation of organizations **(**Lin & Lou, 2022; Rini & Gracia, 2023). It reflects the shared values, attitudes, and behaviors that underpin a culture of safety, promoting not only the physical well-being of workers but also the overall health of the organization.

Theoretical Framework

The proposed theoretical framework is of considerable importance from the perspective of construction project management. It recognizes the interplay between ProP, risk management, safety climate, and project success, emphasizing that these are not isolated components but interrelated factors that influence each other.

Project Planning and Project Success

Project planning is the master blueprint that pushes the project towards its objectives (Bopalia, 2023), whereas the project schedule outlines the precise activities that individuals or groups

must complete to reach the project's goal. Construction projects require effective scheduling and planning (Harshavardhan et al., 2023). Planning plays an important part in the effective execution of construction projects (Akinradewo et al., 2022). A well-structured project plan clarifies the project's purpose, objectives, and expected outcomes (Mykytyuk et al., 2024)

Project success is a sequence of activities that comprise the stages of planning, execution, and supervision in order to fulfill the goals that have been specified and implemented (Setiawan et al., 2023). Achieving project success is fundamental for organizations, as it fosters stakeholder trust and loyalty (Bugarčić & Slavković, 2022). A successful project positively reflects an organization's capabilities, fostering a sense of achievement among project teams (Gomes & Romão, 2023). The link between ProP and ProS is intricate (Irfan et al., 2021; Zanezi et al., 2023), with effective planning significantly contributing to project success by ensuring that project objectives are well-defined and aligned with stakeholder expectations.

Given the new developments in the project management literature, project planning is a critical factor that affects project success. Research also focuses on the importance of top-down planning in the realization of project objectives (Karasira & Irechukwu, 2021). This hypothesis is consistent with the research that highlights how planning influences performance indicators for the project, like cost and time (Patanakul & Milosevic, 2009). Furthermore, current studies reveal planning as one of the most important factors associated with project clarity and goals. By incorporating these findings, this study is able to build a strong theoretical understanding that project planning is an essential foundation for influencing positive project outcomes. Such linkage highlights the significance of active planning processes that may help avoid potential threats and allocate resources effectively to improve general project outcomes in construction environments (Takagi et al., 2024). Based on the above logic, we assume the following hypothesis:

Hypothesis 1: Project planning is positively linked with ProS.

Mediating Role of Risk Management

Risk management mediates the link between ProP and ProS (Wadhwa & Aron, 2022). The Resource-Based View (RBV) hypothesis proposed by Barney (1991) and Wernerfelt (1984) posits that optimizing resource allocation enhances project performance by aligning project planning with efficient risk management strategies. In practice, this means that a well-structured project plan should account for potential risks and challenges, effectively allocate resources to mitigate these risks, and ultimately contribute to the achievement of project success.

Effective risk management ensures that project teams proactively identify potential risks and develop strategies to address them (Panahi et al., 2023). This reduces the likelihood of costly disruptions, budget overruns, and delays, which are key factors that can undermine project success.

Risk management is an intermediary step between the planning of a project and achieving its goals, as the literature on project management has advanced. Studies show that proper adoption of risk management practices can be incorporated to improve the results of projects (Chapman & Ward, 2011). This hypothesis extends to research that supports the purpose of controlling uncertainties as crucial for realizing project objectives. Additionally, research focuses on which proper risk management techniques decrease possible interferences and

enhance other key efficiency indicators, including quality and satisfaction rates (Okika et al., 2024). This mediation pathway studied in the current research helps enhance the success factors in the given project, communicated and planned, by strategic integration of risk management. This theoretical background acknowledges the importance of risk management in promoting coordination between the implementation of construction projects and organizational goals (Amoah & Pretorius, 2019). Based on the given logic, we make the following assumption:

Hypothesis 2: Risk Management will mediate the relationship between ProP and ProS.

Mediating Role of Safety Climate

The Safety climate served as the second mediating variable in the theoretical framework. According to Social Exchange Theory (Emerson, 1976), a positive safety climate fosters safety-conscious behavior through an exchange of safety to enhance worker well-being. This aligns the safety climate with the mediating role of ProP and ProS (Sankar et al., 2023). In construction, ensuring safety is paramount, not only for legal and ethical reasons but also for its direct impact on project success (Xia et al., 2023). A positive safety climate enhances worker morale and engagement, which, in turn, contributes to increased productivity and reduced accidents and injuries (Lee, 2022). Project teams operating within a positive safety climate are more likely to adhere to safety protocols, resulting in fewer disruptions and accidents that could otherwise impede project success.

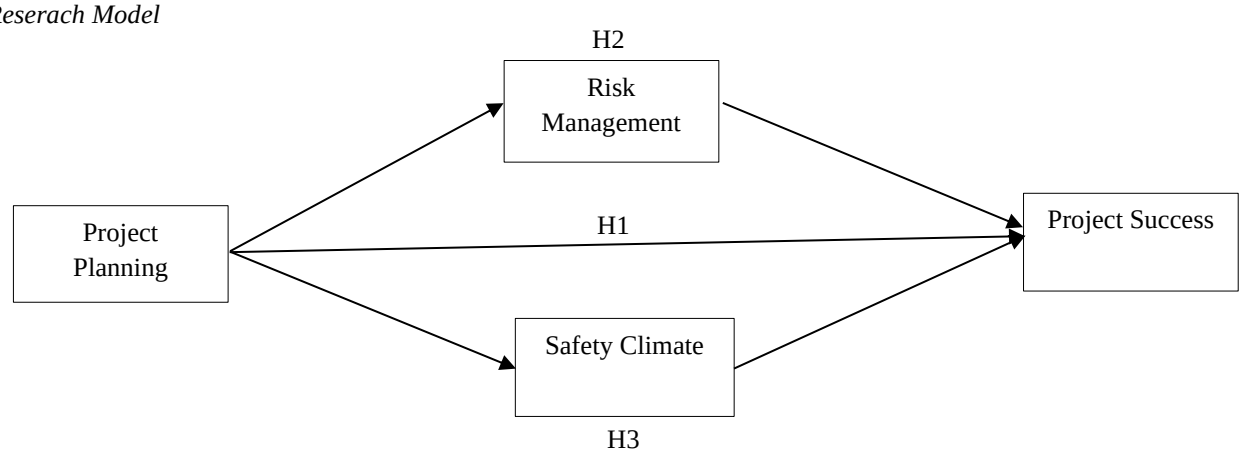
Safety climate is the intervening variable that links the level of project planning to the level of project success, with the support of the existing literature in the fields of organizational safety and project success. Research shows that the safety climate is the most critical area to consider in the creation of safety awareness and enhanced risk handling (Abeje & Luo, 2023). Developing research that centers on the importance of safety climate to employee behavior and organizational results (Zohar, 2010) insists that further studies highlight that the safety climate improves project performance, prevents the occurrence of accidents, and minimizes the impact of accidents (Xie et al., 2020). By establishing this mediation pathway, it is possible to contribute to this research toward identifying how safety climate interventions influence the enhancement of a project's planning strategies for improved project success, especially in the construction industry. The following hypothesis is predicated on the logic shown above:

Hypothesis 3: The safety climate mediates the association between ProP and ProS.

Figure 1 presents the research model.

Figure 1

Reserach Model



Method

Sample and Procedure

The study adopted purposeful sampling techniques to increase the probability of convenience sampling by covering all aspects of the construction industry, such as project managers, engineers, and safety officers. This approach was deemed appropriate to ensure the capture of multiple perspectives that are instrumental in investigating the relationship between project planning and project success, as influenced by risk management and the safety climate, as specified in Schwatka and Rosecrance (2016). Because the study was structured to explore various issues with depth and insight, purposive sampling assisted in identifying participants, indicating that they were highly qualified and possessed substantial and appropriate experience for the study's objectives (Barton, 2020). Data were collected by distributing survey questionnaires to the selected participants. The surveys will be administered in a structured manner, and every participant will be asked to provide informed consent. Data Collection will be conducted during a defined period with a clear timeline for survey distribution and response collection. The current research was quantitative, cross-sectional, and conducted using survey questionnaires. Scholars have mostly used two major quantitative research approaches: survey- and experiment-based (Creswell, 2016). One well-known technique for gathering data is survey questionnaire-based research (Groenewald, 2004). This study examines ProP's impact on ProS with regard to risk management and safety climate using a co-relational approach. Pakistani construction businesses were approached to collect essential data for further study and to generalize the results. Project managers and team members served as the study units for analysis. The data was efficiently collected through the use of a convenience sampling approach. The study's sample population consists of project-based companies in the construction sector. Data were gathered from team members in the construction sector via an online Google form and, if required, in-personal visits. Participants were urged to have confidence in the data they supplied for the study. A five-point Likert scale was utilized, ranging from strongly agree to strongly disagree. Concerning the sample size, out of 282 completed questionnaires, 263 were considered valid for further analysis after eliminating the responses that did not include the necessary information. This allowed reaching an acceptable response rate of 75.14%. This sample size is suitable for quantitative research to ascertain enough statistical power and reliability in testing the presence of relationships between the variables (Groenewald, 2004). In this survey, we asked participants to fill out some basic demographic information. Table 1 displays the demographic data of the participants.

Table 1

Demographics Profiling of Respondents

Demographic Variable	Type	Frequency	Percentage
Gender	Male	192	76.52
	Female	71	10.43
	Total	263	100.0
	Matric	1	0.38
	Intermediate	2	0.76
Qualification	Bachelor	160	60.84
	MS/MPhil	67	25.47
	PhD	33	12.55
	Total	263	100.0
	5 and less	171	65.02
Experience	6-13	43	16.35
	14-21	27	10.26
	21-29	17	6.46
	30 and above	5	1.90
	Total	263	100.0

Instruments

The primary instrument used for data collection was the survey questionnaire. The questionnaire was designed to capture information on project planning, risk management, safety climate, and project success.

Project Planning: The ProP scale was based on the scientific work of (Irfan et al., 2021). All nine items were used. The sample question in ProP is, "project planning has been creating an environment for responsible employee behavior and teamwork."

Project Success: The project success scale was derived from a study by Aga et al. (2016). Four items were used in this study. This is an example of a question about ProS: "whether the project has been completed on time and within budget with expected outcomes."

Risk Management: The RisM scale was adapted from Raz et al. (2002). All five items were used in this study. An example question of risk management is "detail planning for uncertainty to reduce the probability and/or consequence of an adverse risk event to an acceptable threshold"

Safety Climate: Based on the findings of the study, the scale for safety climate was adopted from Huang et al. (2013). All eight items were used. This is an example of a question about Safety Climate "project team can get a safety climate when it works hard".

Data Analysis

IBM SPSS was used for data entry and initial screening. This phase involves identifying and addressing missing data, outliers, or data quality issues. The Smart PLS-4 software was utilized to carry out the model evaluation. PLS-SEM, which stands for partial least squares structural equation modeling, was utilized to analyze the data collected from the study's respondents. Because of its capacity to investigate intricate interactions and latent variables, PLS-SEM was selected as the method. In most cases, the PLS-SEM procedure is divided into two distinct components: the evaluation of the measurement and the structural bases of the model, respectively (Ringle et al., 2018). Prior to moving forward with further analysis, the measurement model evaluates construct outer loading, Cronbach's alpha, and convergent and discriminant validity. On the other hand, the structural model estimates path coefficients and investigates the significance level. In addition, the PLS-SEM methodology has gained widespread acceptance in the field of management research for utilization in data analysis and the generalization of consequences (Aga et al., 2016; Shaukat et al., 2021).

Results

Descriptive Statistics of Constructs

Descriptive statistics were utilized to determine the most important aspects of project planning, project success, risk management, and climate safety, including the mean and standard deviation values for each item considered. The fact that respondents gave the project planning components an average score of 4.05 implies that they are in agreement with them. The fact that the respondents gave risk management a mean score of 3.86 implies that they are in favor of it. It may be deduced from the mean score of 3.86 that respondents are in agreement with the

safety climate. There is a consensus among respondents about the survey questions regarding ProS, as indicated by the mean value of 3.86.

Measurement Model

We examine the measurement model in five separate ways: convergence and discriminant validity, composite reliability, Cronbach's alpha, and loadings shown in Figure 2. The usual threshold range for loadings is more than 50 (Gefen & Straub, 2005). The allowable limit for the outside loading of all objects is met. The composite reliability normal range of a build is .70. The data suggested that the composite reliability of all factors was substantially greater. The typical range of a variable is .70, as indicated by Cronbach's alpha (Nunnally, 1978). The results confirm the use of Cronbach's alpha to verify data reliability. The data is illustrated in Table 2.

Table 2

Measurement Model

Variable	Loading	Alpha	CR	AVE
Project Planning		.87	.90	.50
ProP-1	.63			
ProP -2	.78			
ProP -3	.80			
ProP -4	.70			
ProP -5	.70			
ProP -6	.74			
ProP -7	.62			
ProP -8	.72			
ProP -9	.62			
Project Success		.79	.86	.61
ProS-1	.71			
ProS-2	.81			
ProS-3	.81			
ProS-4	.78			
Risk Management		.82	.87	.58
sM-1	.74			
RisM-2	.68			
RisM-3	.80			
RisM-4	.80			
RisM-5	.77			
Safety Climate		.89	.91	.58
SafC-1				
SafC-2	.76			
SafC-3	.73			
SafC-4	.74			
SafC-5	.75			
SafC-6	.72			
SafC-7	.72			
SafC-8	.82			

*Note. *CR stands for composite reliability. AVE stands for "average variance extracted."*

For the goal of determining convergent validity, we make use of the Average Variance Extracted (AVE) approach, during which the permissible limit is .50 (Fornell & Larker, 1981). Therefore, convergent validity can be observed for every variable. When conducting our analysis on discriminant validity, we utilized the HTMT ratio. According to the definition supplied by Henseler et al. (2014), an acceptable HTMT ratio is defined as less than .90, with a confidence interval of 1. The values of the HTMT and the confidence interval for each variable are found to be less than 90 and 1, respectively, as shown in Table 3. This indicates that convergent validity is present. Furthermore, Fornell and Larker (1981) advocate that the square

root of the average variance extracted (AVE) of a construct be larger than the correlations among the other constructs since it is more accurate. The findings presented in Table 3 demonstrate that the Fornell and Larker criterion is satisfied by this study.

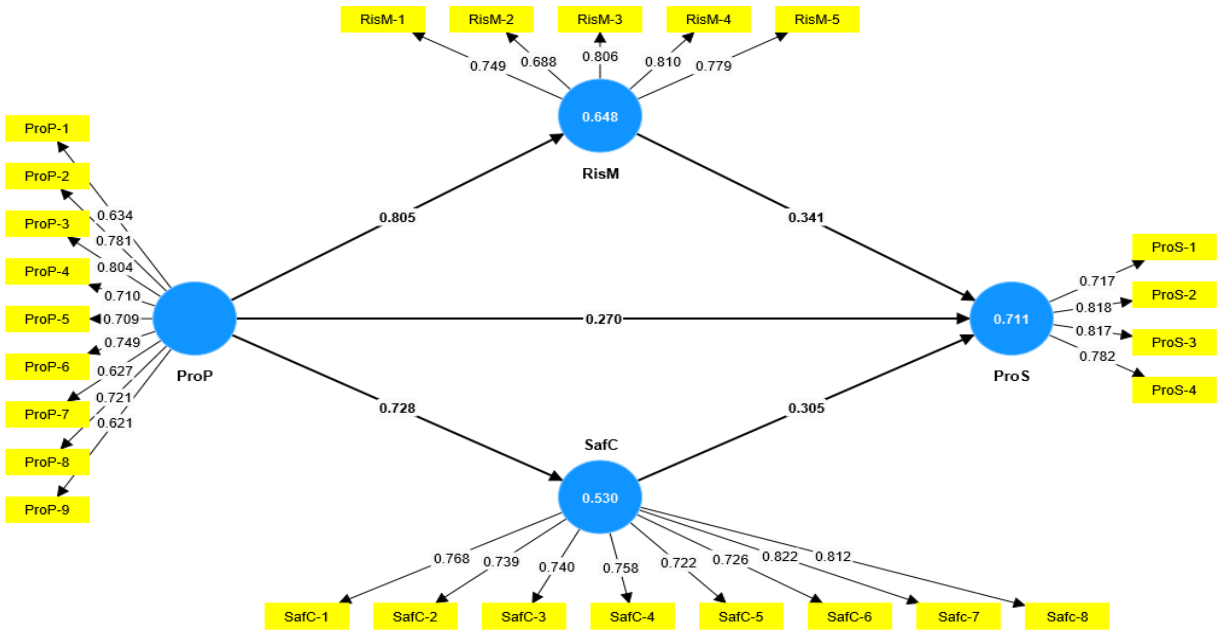
Table 3

Discriminate Validity

Variable	Project Planning	Project Success	Risk Management	Safety Climate
Fornell-Larcker criteria				
Project Planning				
Project Success	.89			
Risk Management	.73	.77		
Safety Climate	.80	.89	.70	
Discriminant validity – (HTMT)				
Project Planning	.70			
Project Success	.76	.78		
Risk Management	.80	.79	.76	
Safety Climate	.72	.76	.77	.76

Figure 2

Measurement Model



Structural Model

In this study, the Structure Equation Model (SEM) was assessed according to the criteria laid out by Hair et al. (2019). The predictive relevance metric and the coefficient of determination (R^2) were evaluated first (Q^2). As presented in Table 4, the results showed that there was a 71% change in project success (R^2 = .71), a 64.8% variance in risk management (R^2 = .64) as a result of project planning, and a 53.0% variance in risk management (R^2 = .53) as a result of project planning, indicating that the model has sufficient predictive accuracy (Hair et al., 2019). Furthermore, we conducted the blindfolded test of Q^2. Q^2 values greater than zero indicate robust predictive power; project success, risk management, and safety climate all had values of .52, .42, and .31, respectively.

Table 4

Coefficient of Determination

Variables	R^2	Q^2
RisM	.64	.42
SafC	.53	.31
ProS	.71	.52

Note. RisM = risk management; SafC = safety climate; ProS = project success

Hypotheses Testing

We utilised PLS-SEM to build the structure model shown in Figure 3. We assess theories by examining their direct and mediated influence (Table 5 and 6). H1 examined if project planning improves project success. Table 5 shows that ProP positively impacts ProS (β = .26, *t* = 2.34, *p* < .01), supporting the study's hypothesis (H1). In order to assess mediation analysis, we employed the mediator variable risk management to compare the predictor variable ProP and the criterion variable ProS. (H2). To ascertain the mediation outcome, we implemented Smart PLS-4 bootstrapping. The indirect influence of ProP on ProS is demonstrated in Table 6 as a result of risk management (H2: *t* = 2.80, *p* < -.005). There was a significant overall impact of project planning on ProS (*t* = 16.36, *p* <.000). Even after accounting for the mediator, ProP had a substantial effect on ProS (*t* = 9.16, *p* <.000). This indicated complimentary partial mediation, which substantiated the investigation's hypothesis H2. A mediation study was also conducted between the predictor variable ProP and the criterion variable ProS, with the mediator variable risk management. The study proved that the safety climate of project planning has a substantial indirect impact on ProS (H3: *t* = 5.83, *p* < .000). Project planning had a substantial effect on ProS (*t* = 15.70, *p* < .000). Even after accounting for the mediator, ProP had a substantial effect on ProS (*t* = 9.16, *p* <.000). This illustrated complimentary partial mediation, which substantiated the investigation's claim H3.

Table 5

Hypothesis Result

	β	STDV	*t*	*p*
H1: Project Planning -> Project Success	.26	.11	2.34	0.019

Table 6

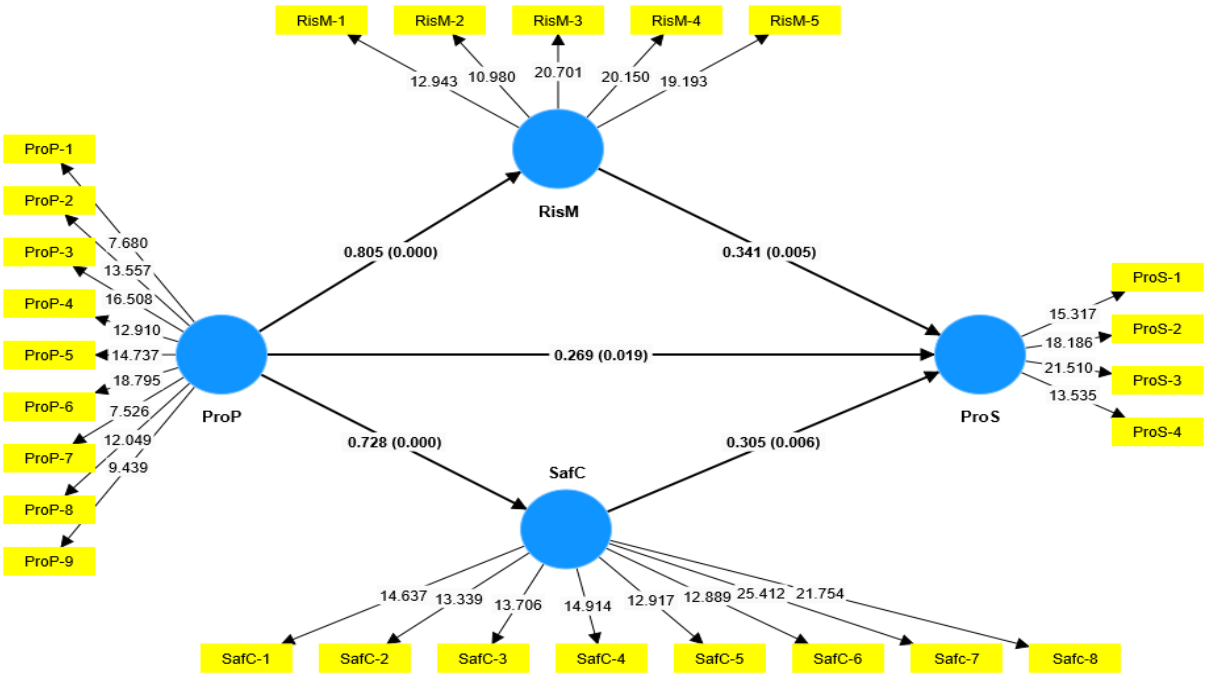
Mediation Analysis

	Total Effect		Direct Effect			Indirect Effect	
	t	*p*	*t*	*p*		t	p
ProP -> ProS	16.36	.000	5.47	.000	ProP -> RM-> PS	2.80	.005
					ProP -> SfC-> PS	2.780	.006

Note. ProP = Project Planning; ProS = project success; RM = Risk Management; SafC=Safety Climate.

Figure 3

Structure Model



Discussion

The purpose of this study is to investigate the ways in which project planning, risk management, safety climate, and ProS are related to one another. Verifying the Knowledge-Based View (KBV) and utilizing social exchange theory is made possible by the significance of the hypotheses that have been provided (SET). This research lends credence to the positive and significant impact that ProP has on the success of construction projects. According to the findings, the hypothesized link was correct. Previous studies have demonstrated that ProP has a significant influence on PS, and these findings appear to be consistent with that research (e.g., Alchammari et al., 2021; Urbański et al., 2021). This study confirms the beneficial and considerable impact of risk management and safety climate on ProS. The results confirmed the predicted association. The results also correspond with the existing research, which supports and witnesses the considerable influence of risk management and safety climate (e.g., Aga et al., 2016; Khattak et al., 2022; Roth et al., 2020). Risk management and safety climate have been shown to play an important role in construction firms, according to a number of studies. Umar (2020) identified key factors influencing the safety climate. Thabit and Younus (2018) further emphasized the need for clear rules and regulations, adequate training, and strict policies to mitigate risks on construction sites. They propose that risk management is an important way in which design thinking impacts project success. While previous research has shown that safety climate is important in the construction industry (Xie et al., 2020), Salem (2022) delves further into the relationship between psychological capital and safety behavior, discovering that optimism, hope, and work engagement have a positive effect on safety compliance and participation. Lee (2020) adds to this by suggesting that a positive PSC can enhance employees' personal initiative, improving safety behavior. These studies collectively suggest that a positive safety climate, driven by factors such as PCS, PSC, and psychological capital, can lead to improved safety behavior in construction workers. According to their findings, ProS is

positively correlated with risk management. Moreover, Khattak et al. (2022) found risk management and safety climate to contribute to ProS. This is also supported by Rafique et al. (2021), who discovered a significant positive association between safety behavior and safety atmosphere in building sites. This supports the validity of SET. As a result, this study discovered that risk management and a safe work environment increase team members' confidence, allowing project management operations to be carried out more efficiently. The risk management and safety atmosphere instills great confidence in team members, which directly contributes to ProS. This research demonstrates that risk management plays a favorable mediating function in the link between the PS. The results confirmed the predicted association. The current findings are in accordance with the results of the existing investigation, which supports and demonstrates the substantial mediating role of risk management and safety climate (Draghici et al., 2022; Liu et al., 2023). This study assessed the impact of project planning on project success in construction firms through the mediating mechanisms of project planning and project success and identified significant mediation. Research (Erwanto et al., 2020; Kırmızı, 2021) found that project planning has a major impact on corporate resource planning, ultimately leading to project success. As a result, this study discovered that project risk management and safety climate improve ProS by making the most of their skills, knowledge, and potential and empowering themselves through project planning.

Conclusion

This study emphasizes imperious innovative constructs. Project planning, risk management, and safety climate outcomes that create the ProS. This research was one of the first attempts to develop a theorized framework that ties ProP to project success by utilizing risk management and safety climate facilitation mechanisms. For the purpose of enhancing ProS, this study focused on the most important components of project planning, such as risk management and safety climate, as mediating variables. The conclusions showed that project planning affects construction project success, whereas risk management and safety climate mediate this relationship. It has also been proven that construction businesses must properly manage organizational risk and provide a safe environment for their teams to make decisions that promote successful project management and efficiency. Policymakers and leaders should develop a strategic strategy to ensure seamless application of project planning methods, provide a safe atmosphere, and manage risks to execute a project more effectively.

Theoretically Implications

This manuscript's contributions have significant theoretical implications, which cannot be overstated. Our understanding of the dynamics of project planning within the context of project management has been significantly enhanced as a result of the confirmation of the postulated linkages between project planning, risk management, safety climate, and ProS. This information is particularly relevant to the building construction industry in Pakistan. In the first place, this research fills a significant void in the existing body of literature by presenting evidence that demonstrates a direct connection between successful project planning, risk management, and safety climate. Not only does this relationship add layers of complexity to the planning process, but it also enhances our comprehension of the ways in which these intricate components interact within the context of a project-driven environment. Furthermore,

the empirical proof of the favorable impact of project planning on project success is a breakthrough insight. It demonstrates the critical role that planning plays in meeting project objectives. Furthermore, illuminating the key factors that drive project performance provides practical benefits to the construction sector. These insights enable organizations to design strategic efforts based on those traits, enhancing project success rates and competitiveness. Beyond these important contributions, this study employs a novel theoretical approach based on the resource-based view (RBV). This approach not only places project planning in a larger theoretical perspective but also deepens our knowledge of how it works within Pakistan's specific construction industry setting by exploring the relationship between project planning, risk management, and safety climate. This study gives a detailed look at how project planning strategies affect the complicated concept of project success. The theoretical contributions are extensive and diverse. It broadens our understanding of the intricate interplay between project planning, risk management, safety climate, and project success, creating a solid platform for future study and practical applications in the dynamic field of construction project management.

This study emphasizes the theoretical and applied implications investigated in Pakistan's building industries. The findings support the importance of project planning in informing risk management, safety climate, and project success. Project planning reduces project complexity through risk management and a safe working environment.

Implications for Practice

Implementing project planning methods by construction managers not only improves team-level outcomes through risk management and safety climate but also increases project success. This demonstrates that organizations should prioritize project planning activities that increase risk management by focusing on professional development, creating a safe atmosphere, and boosting team health, safety, and behavior inside the organization. By doing so, the construction sector may be in a better position to manage project planning processes, risk management, and the safety climate required for success.

This study has several practical applications that might greatly assist construction enterprises and organizations, particularly in emerging economies such as Pakistan. First, it underlines the necessity of project planning for small and Medium-Sized Enterprises (SMEs) in the construction industry. Second, governmental institutions in rising countries like Pakistan play a vital role in fostering the expansion of the construction sector.

They could consider developing comprehensive planning training programs emphasizing good risk management and a safe environment. Finally, integrating project management methodologies with project planning principles is a practical strategy to elevate project results and build a competitive advantage. Organizations should study the incorporation of project planning approaches into their project management frameworks. This fusion can enable a dynamic and forward-thinking approach to project execution, boosting the possibility of project success and ensuring that efforts are linked with the organization's overall strategic objectives. In conclusion, the practical outcomes of this study argue for the implementation of project planning not just at the planning level but across the organizational hierarchy. Businesses in the construction sector may traverse the challenges of the dynamic business and position themselves for long-term growth and success in rising nations such as Pakistan by adopting these principles and cultivating an inventive and entrepreneurial culture.

Limitations and Future Research

Finally, the limitations of this study are also presented in this research, and some that may have an impact on the study findings are highlighted with the following recommendations for future research activities: Firstly, the data were collected just for the construction sector of Pakistan, and therefore, the findings and conclusions cannot be generalized for other sectors and/or other countries. Moreover, the study should apply the research context to other geographical locations and industries to enhance the generalization of the findings. Secondly, the cross-sectional approach adopted by the study restricted the conclusions made on the growth and transformation of relations along the time horizon. Cross-sectional studies could have emphasized the causal relationships under study, while longitudinal studies could have provided more explanation for these causal relationships. Third, the sampling of the study was comparatively small, which might have decreased the statistical significance of the results. Specifically, it increases the participant pool, as the main way of strengthening the work is by raising the number of samples. Fourth, this research used risk management and safety climate as mediator variables; future studies should include other mediator variables, including organizational culture, risk assessment, safety culture, risk control, and risk environment, as mediating variables between project planning and organizational performance. Future research should, therefore, endeavor to explore these variables in a way such that a clearer picture is obtained concerning the impact of these variables on project planning and organizational performance. Finally, sustainability is becoming increasingly important in company setups because of the increased emphasis on sustainability. Accordingly, a potential direction for future study is the mediating function of safety climate, risk management, team innovation, and green innovation between sustainable leadership and organizational performance.

Declarations

Acknowledgements

Not applicable.

Disclosure Statement

No potential conflict of interest was reported by the authors.

Ethics Approval

Not applicable.

Funding Acknowledgements

Not applicable.

Citation to this article

Iqbal, S., Nawaz, M. J., Ali, A., Osman, E., & Hamza, A. (2024). Investigating the impact of project planning on construction project success through the mediating role of risk management and safety climate. *International Journal of Organizational Leadership, 13*(First Special Issue), 119-139. https://doi.org/10.33844/ijol.2024.60426

Rights and Permissions

References

Abeje, M., & Luo, F. (2023). The influence of safety culture and climate on safety performance: Mediating role of employee engagement in manufacturing enterprises in Ethiopia. *Sustainability*, *15*(14), 11274. https://doi.org/10.3390/su151411274

Aga, D., Noorderhaven, N., & Vallejo, B. (2016). Transformational leadership and project success: The mediating role of team-building. *International Journal of Project Management*, *34*(5), 806–818. https://doi.org/10.1016/j.ijproman.2016.02.012

Akinradewo, O., Aigbavboa, C., Ikuabe, M., Adekunle, P., Thwala, W. D., & Olatunji, S. (2022). Project planning: a determinant of project delivery to time and cost. *AHFE International*. https://doi.org/10.54941/ahfe1001623

Al-Balawneh, K. A., & Tarabieh, S. (2024). The impact of risk management and knowledge management on construction project success: The mediating role of project management performance. *Mu'taï Li-l-buḥūṯ Wa-al-dirāsāt. Silsilaï Al-'ulūm Al-insāniyyaï Wa-al-iğtimā'iyyaï*, *39*(1). https://doi.org/10.35682/mjhss.v39i1.923

Alchammari, K. R. A., Ali, B., & Alshammare, J. (2021). The relationship between project planning, risk management and knowledge integration on project success. *Academy of Strategic Management Journal*, *20*(4), 1–11. https://www.abacademies.org/journals/academy-of-strategic-management-journal-ho me.html

Amoah, C., & Pretorius, L. (2019). Evaluation of the impact of risk management on project performance in small construction firms in South Africa. *Journal of Engineering, Design and Technology*, *18*(3), 611–634. https://doi.org/10.1108/jedt-06-2018-0098

Arief, M., & Latief, Y. (2021). Project planning system improvement in residential development project: A risk analysis. *IOP Conference Series. Materials Science and Engineering*, *1098*(2), 022032. https://doi.org/10.1088/1757-899x/1098/2/022032

Asad, M., Kashif, M., Sheikh, U. A., Asif, M., George, S., & Khan, G. U. H. (2021). Synergetic effect of safety culture and safety climate on safety performance in SMEs: does transformation leadership have a moderating role? *International Journal of Occupational Safety and Ergonomics*, *28*(3), 1858–1864. https://doi.org/10.1080/10803548.2021.1942657

Ashraf, H., Ejaz, M. K., Memon, S. A., Shen, Y., Maqsoom, A., & Sunindijo, R. Y. (2023). Examining a two-step working model of safety knowledge in translating safety climate into safety behavior. *Engineering Construction and Architectural Management*. https://doi.org/10.1108/ecam-09-2022-0906

Babalola, A., Manu, P., Cheung, C., Yunusa-Kaltungo, A., & Bártolo, P. (2023). A systematic review of the application of immersive technologies for safety and health management in the construction sector. *Journal of Safety Research*, *85*, 66–85. https://doi.org/10.1016/j.jsr.2023.01.007

Banihashemi, S., Hosseini, M. R., Golizadeh, H., & Sankaran, S. (2017). Critical success factors (CSFs) for integration of sustainability into construction project management practices in developing countries. *International Journal of Project Management*, *35*(6), 1103–1119. https://doi.org/10.1016/j.ijproman.2017.01.014

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99–120. https://doi.org/10.1177/014920639101700108

Barton, G. H. (2020). Designing and conducting mixed methods research (3rd Edition; International Student Edition) by John W. Creswell & Vicki L. Plano Clark. *the Cognitive Psychology Bulletin*, *1*(5), 88–89. https://doi.org/10.53841/bpscog.2020.1.5.88

Bopalia, V. S. (2023). *Iterative integrated planning and scheduling model in project management.* N SPE Middle East Oil and Gas Show and Conference (P. D031S114R006). SPE. https://doi.org/10.2118/213382-ms

Bugarčić, M., & Slavković, M. (2022). Assessing project value: End-user perspective. *In Proceedings of the 10th IPMA Research Conference "Value Co-Creation in the Project Society", Belgrade, Serbia*. https://doi.org/10.56889/okiw8035

Chapman, C., & Ward, S. (2011). *How to manage project opportunity and risk: Why uncertainty management can be a much better approach than risk management*. https://openlibrary.org/books/OL25011571M/How_to_manage_project_opportunity_and_risk

Creswell, J. W. (2016). Reflections on the MMIRA: The future of mixed methods task force report. *Journal of Mixed Methods Research*, *10*(3), 215–219. https://doi.org/10.1177/1558689816650298

Daboun, O., Yusof, A. M., & Khoso, A. R. (2022). Relationship management in construction projects: Systematic literature review. *Engineering Management Journal*, *35*(2), 120–143. https://doi.org/10.1080/10429247.2022.2041962

Damayanti, R. A., Syarifuddin, & Zalshabila, S. (2023). Risk management: The awareness of public managers on risk as a social construction. *International Journal of Professional Business Review*, *8*(7), e02504. https://doi.org/10.26668/businessreview/2023.v8i7.2504

Demirkesen, S., & Ozorhon, B. (2017). Impact of integration management on construction project management performance. *International Journal of Project Management*, *35*(8), 1639–1654. https://doi.org/10.1016/j.ijproman.2017.09.008

Draghici, A., Fatol, D., Ivascu, L., & Mocofan, M. (2023). Multimedia skills development to support engineering studies. In *Lecture notes in production engineering* (pp. 831–840). https://doi.org/10.1007/978-3-031-18641-7_77

Dursun, A. E. (2023). Fatal accident analysis and hazard identification in Turkish Coal-Extracting industry using Analytic Hierarchy process. *Mining, Metallurgy & Exploration*, *41*(1), 149–172. https://doi.org/10.1007/s42461-023-00905-z

Elkrghli, S., & Almansour, B. Y. (2024). An empirical investigation of risk management factors in private construction projects in Benghazi City. *Montenegrin Journal of Economics*, *20*(2). https://doi.org/10.14254/1800-5845/2024.20-2.16

Emedosi, A., Okereke, R. A., & Ukanwa, E. (2023). The effect of capital project planning on construction project delivery in Nigeria. *British Journal of Environmental Sciences*, *11*(4), 22–35. https://doi.org/10.37745/bjes.2013/vol11n42235

Emerson, R. M. (1976). Social exchange theory. *Annual Review of Sociology*, *2*(1), 335–362. https://doi.org/10.1146/annurev.so.02.080176.002003

Esnaashary Esfahani, M., Rausch, C., Haas, C., & Adey, B. T. (2020). Prioritizing pre project planning activities using value of information analysis. *Journal of Management in Engineering*, *36*(5), 04020064. https://doi.org/10.1061/(asce)me.1943-5479.0000822

Fareed, G., Nawaz, M. J., Iqbal, S., Ummara, U., & Hamza, A. (2024). Examining the impact of operational strategy and employee motivation on project performance in the construction projects. *Migration Letters*, *21*(S8), 86–101. https://doi.org/10.59670/ml.v21is8.9232

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104

Galinsky, O., Emelianova, O., & Tytok, V. (2021). Risk management in the design of the organization and technology for the construction of buried structures in conditions of compacted development. *International Journal*, *10*(1). https://doi.org/10.30534/ijatcse/2021/081012021

Gao, R., Chan, A. P. C., Utama, W. P., & Zahoor, H. (2016). Multilevel safety climate and Safety performance in the construction industry: development and validation of a Top-Down Mechanism. *International Journal of Environmental Research and Public Health/International Journal of Environmental Research and Public Health*, *13*(11), 1100. https://doi.org/10.3390/ijerph13111100

Gefen, D., & Straub, D. (2005). A Practical Guide to factorial validity using PLS-Graph: Tutorial and annotated example. *Communications of the Association for Information Systems*, *16*. https://doi.org/10.17705/1cais.01605

Ghaeb, H. O., & Mahjoob, A. M. R. (2023). Risk Response in Construction Project: A Review Study. *Journal of Engineering*, *29*(08), 121–137. https://doi.org/10.31026/j.eng.2023.08.09

Giang, D. T., & Pheng, L. S. (2011). Role of construction in economic development: Review of key concepts in the past 40 years. *Habitat International*, *35*(1), 118–125. https://doi.org/10.1016/j.habitatint.2010.06.003

Gomes, J., & Romão, M. (2023). Aligning project and benefits management with balanced scorecard approach to achieve project success. *Journal of Business Ecosystems*, *4*(1), 1–11. https://doi.org/10.4018/jbe.320481

Groenewald, T. (2004). A Phenomenological Research design illustrated. *International Journal of Qualitative Methods*, *3*(1), 42–55. https://doi.org/10.1177/160940690400300104

Habib, M. M., Eldawla, M. a. K., & Zaki, M. A. (2023). A risk management model for large projects in the construction phase in Egypt. *Journal of Project Management*, *8*(1), 25–36. https://doi.org/10.5267/j.jpm.2022.9.001

Harðardóttir, U. M., & Möller, E. (2023). Success factors in construction project management what factors potentially affect the success of construction projects for contractors? *Mitteilungen Klosterneuburg*, *73*. https://doi.org/10.59879/yz9ua

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24. https://doi.org/10.1108/ebr-11-2018-0203

Harshavardhan, T., Reddy, V. S., Vardhani, P., Shrihari, S., Alawadi, A. H. R., & Sharma, S. D. (2023). Resource allocation, scheduling and planning of a multi storeyed residential building. *E3SWebofConferences*, *391*, 01217. https://doi.org/10.1051/e3sconf/202339101217

Henseler, J., Ringle, C. M., & Sarstedt, M. (2014). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, *43*(1), 115–135. https://doi.org/10.1007/s11747-014-0403-8

Hotchkiss, C., & Seekamp, E. (2024). A systematic literature review on climate change adaptation planning for archaeological site management and the prevalence of stakeholder engagement. *American Antiquity*, *89*(2), 302–318. https://doi.org/10.1017/aaq.2023.97

Htoo, T. T., Dodanwala, T. C., & Santoso, D. S. (2023). Project management maturity and performance of building construction projects in Myanmar. *Practice Periodical on Structural Design and Construction*, *28*(1). https://doi.org/10.1061/ppscfx.sceng-1192

Huang, Y., Zohar, D., Robertson, M. M., Garabet, A., Lee, J., & Murphy, L. A. (2013). Development and validation of safety climate scales for lone workers using truck drivers as exemplar. *Transportation Research. Part F, Traffic Psychology and Behaviour*, *17*, 5–19. https://doi.org/10.1016/j.trf.2012.08.011

Irfan, M., Alaloul, W. S., Ghufran, M., Yasin, G., Thaheem, M. J., Qureshi, A. H., & Bilal, M. (2022). Analyzing the impact of organizational culture on social sustainability: a perspective of the construction industry. *Environment, Development and Sustainability*, *26*(1), 1103–1133. https://doi.org/10.1007/s10668-022-02751-3

Irfan, M., Khan, S. Z., Hassan, N., Hassan, M., Habib, M., Khan, S., & Khan, H. H. (2021). Role of project planning and project manager competencies on public sector project success. *Sustainability*, *13*(3), 1421. https://doi.org/10.3390/su13031421

Judge, J. L. P., Mosher, G. A., & Simpson, S. (2019). Use of exploratory factor analysis to identify factors influencing safety climate in two work environments. *The Journal of Technology, Management, and Applied Engineering*, *35*(2), 2. https://lib.dr.iastate.edu/abe_eng_pubs/1127/

Kafile, M. (2021). Project planning and scheduling in the face of the Fourth Industrial Revolution (4IR). *Journal of Business Administration Research*, *4*(3). https://doi.org/10.30564/jbar.v4i3.3398

Kajumulo, K., Matindana, J., & Mohamed, F. (2023). Exploring current and future research trends on safety climate in construction projects. *Tanzania Journal of Engineering and Technology/Tanzania Journal of Engeering and Technology*, *42*(1), 113–134. https://doi.org/10.52339/tjet.v42i1.893

Kajwang, B. (2022). Influence of knowledge management practices on the performance of insurance firms. *African Journal of Information and Knowledge Management*, *1*(1), 1–11. https://doi.org/10.47604/ajikm.1605

Karasira, M., & Irechukwu, E. N. (2021). Project planning and project implementation success in Rwanda: A case of Sebeya Watershed Management Project, Rubavu District. *International Journal of Scientific and Research Publications*, *11*(12), 148–156. https://doi.org/10.29322/ijsrp.11.12.2021.p12022

Khahro, S. H., Memon, A. H., Memon, N., Memon, Z. A., & Naresh, R. (2023). Influence of social and economic factors on construction project performance in Pakistan. *Sustainability*, *15*(3), 2469. https://doi.org/10.3390/su15032469

Khattak, S. R., Zada, M., Nouman, M., Rahman, S. U., Fayaz, M., Ullah, R., Salazar-Sepúlveda, G., Vega-Muñoz, A., & Contreras-Barraza, N. (2022). Investigating Inclusive Leadership and Pro-Social rule breaking in Hospitality Industry: Important role of Psychological safety and leadership identification. *International Journal of Environmental Research and Public Health/International Journal of Environmental Research and Public Health*, *19*(14), 8291. https://doi.org/10.3390/ijerph19148291

Ktaish, B., & Hajdu, M. (2022). *Success factors in projects*. IOP Conference Series: Materials Science and Engineering (Vol. 1218, No. 1, p. 012034). IOP Publishing. https://doi.org/10.1088/1757-899X/1218/1/012034

Lee, J. (2022). Good and bad apples in a Barrel: Opposing ends of within-workgroup safety climate. *Safety Science*, *145*, 105502. https://doi.org/10.1016/j.ssci.2021.105502

Lee, J. S., Son, S., Kim, S., & Son, K. (2020). Correlation analysis of safety climate and construction productivity in South Korea. *International Journal of Occupational Safety and Ergonomics*, *27*(2), 589–596. https://doi.org/10.1080/10803548.2020.1741279

Lin, Y., & Lou, M. (2022). Hospital safety climate: Concept and measurement tools. *PubMed*, *69*(5), 27–33. https://doi.org/10.6224/jn.202210_69(5).05

Mansell, P., & Philbin, S. P. (2020). Measuring sustainable development goal targets on infrastructure projects. *The Journal of Modern Project Management*, *8*(1). https://doi.org/10.19255/jmpm02303

Mantas, V. G., & Caro, C. (2023). User-Relevant land cover products for informed Decision-Making in the complex terrain of the Peruvian Andes. *Remote Sensing*, *15*(13), 3303. https://doi.org/10.3390/rs15133303

Memon, A. H., Memon, A. Q., Khahro, S. H., & Javed, Y. (2023). Investigation of project delays: Towards a sustainable construction industry. *Sustainability*, *15*(2), 1457. https://doi.org/10.3390/su15021457

Milijić, N., Stojanović, A., Mihajlović, I., Jovanović, I., & Popović, M. (2020). Safety Climate in project-based organizations: Multi-criteria analysis. *Management*. https://doi.org/10.7595/management.fon.2020.0026

Mulesa, O., Horvat, P., Радівілова, T., Sabadosh, V., Baranovskyi, O., & Duran, S. (2023). Design of mechanisms for ensuring the execution of tasks in project planning. *Eastern-European Journal of Enterprise Technologies*, *2*(4 (122)), 16–22. https://doi.org/10.15587/1729-4061.2023.277585

Mykytyuk, P., Brych, V., Manzhula, V., Borysiak, O., Sachenko, A., Banasik, A., Kempa, W. M., Mykytyuk, Y., Czupryna-Nowak, A., & Lebid, I. (2024). Efficient management of material resources in Low-Carbon construction. *Energies*, *17*(3), 575. https://doi.org/10.3390/en17030575

Nunnally, J. C. (1978). An overview of psychological measurement. In *Springer eBooks* (pp. 97–146). https://doi.org/10.1007/978-1-4684-2490-4_4

Ohag, M., Nawawi, A. H., Muhammad, F., & Hashim, N. (2023). Critical coordination factors affecting design and build projects: A comprehensive review of the literature. *International Journal of Environment, Architecture, and Societies*, *3*(01), 59–71. https://doi.org/10.26418/ijeas.2023.3.01.59-71

Okika, M. C., Vermeulen, A., & Pretorius, J. C. (2024). A systematic approach to identify and manage interface risks between project stakeholders in construction projects. *CivilEng*, *5*(1), 89–118. https://doi.org/10.3390/civileng5010005

Okudan, O., & Çevikbaş, M. (2022). Alternative dispute resolution selection framework to settle disputes in public–private partnership projects. *Journal of the Construction Division and Management*, *148*(9). https://doi.org/10.1061/(asce)co.1943-7862.0002351

Onubi, H. O., Carpio, M., Azian, F. U. M., & Binwai, P. (2023). Bridging the gap between health and safety performance and owner's satisfaction in construction projects adopting pro-environmental construction practices: role of economic performance. *Environmental Science and Pollution Research*, *30*(21), 59844–59860. https://doi.org/10.1007/s11356-023-26754-3

Onyango, J. (2023). Project planning and success of road construction projects in Siaya County, Kenya. *International Journal of Management Studies and Social Science Research*, *05*(05), 200–212. https://doi.org/10.56293/ijmsssr.2022.4717

Panahi, A., Habibirad, A., & Safari, S. (2023). Developing a mathematical programming model to determine the optimal portfolio of capital projects in oil and gas companies to achieve the strategic goals. *pbr.put.ac.ir*. https://doi.org/10.22050/pbr.2023.340014.1262

Patanakul, P., & Milosevic, D. (2009). The effectiveness in managing a group of multiple projects: Factors of influence and measurement criteria. *International Journal of Project Management*, *27*(3), 216–233. https://doi.org/10.1016/j.ijproman.2008.03.001

Rafique, M., Ahmed, S., & Ismail, M. (2021). Impact of safety climate on safety behaviour in construction projects: Mediating mechanism and interacting effect. *Journal of Construction in Developing Countries*, *26*(2), 163–181. https://doi.org/10.21315/jcdc2021.26.2.8

Raz, T., Shenhar, A. J., & Dvir, D. (2002). Risk management, project success, and technological uncertainty. *R & D Management*, *32*(2), 101–109. https://doi.org/10.1111/1467-9310.00243

Ringle, C. M., Sarstedt, M., Mitchell, R., & Gudergan, S. P. (2018). Partial least squares structural equation modeling in HRM research. *International Journal of Human Resource Management*, *31*(12), 1617–1643. https://doi.org/10.1080/09585192.2017.1416655

Rini, W. N. E., & Gracia, S. (2023). Description of the safety climate using the NOSACQ-50 method for employees in the production section at Pt. X in 2021. *East Asian Journal of Multidisciplinary Research*, *2*(1), 309–318. https://doi.org/10.55927/eajmr.v2i1.2622

Roth, K., Baier, N., Felgner. S., Busse, R., & Henschke, C. (2020). [Association between safety culture and risk of burnout: A survey of non-medical rescue workers]. Gesundheitswesen (Bundesverband der Arzte des Offentlichen Gesundheitsdienstes (Germany)), *84*(3), 199–207. https://doi.org/10.1055/a-1276-0817. PMID: 33302321

Salem, M., Asim, M., & Banerjee, R. (2022). Identification of success factors in construction projects-a systematic literature review. *International Journal for Research in Applied Science and Engineering Technology*, *10*(5), 1437–1439. https://doi.org/10.22214/ijraset.2022.42526

Sankar, S. S., Anandh, K. S., Rajendran, S., Ibrahim, C. K. I. C., & Szóstak, M. (2023). Examining the relative importance and association between safety leadership styles and factors affecting organizational safety climate. *Buildings*, *13*(8), 2062. https://doi.org/10.3390/buildings13082062

Schutte, R. (2010). *Safety performance in the construction sector: the influence of transformational leadership and the mediating role of safety climate* [Master's thesis, Utrecht University]. https://dspace.library.uu.nl/handle/1874/42909

Schwatka, N. V., & Rosecrance, J. C. (2016). Safety climate and safety behaviors in the construction industry: The importance of co-workers commitment to safety. *Work*, *54*(2), 401–413. https://doi.org/10.3233/wor-162341

Setiawan, A. (2023). Knowledge management strategy to improve quality and cost at PT total Bangun Persada TBK. *Jurnal Scientia*, *12*(02), 1874–1891. https://doi.org/10.58471/scientia.v12i02.1477

Shaukat, M. B., Latif, K. F., Sajjad, A., & Eweje, G. (2021). Revisiting the relationship between sustainable project management and project success: The moderating role of stakeholder engagement and team building. *Sustainable Development*, *30*(1), 58–75. https://doi.org/10.1002/sd.2228

Sudha, P. B., Venkatraj, D., Sreenivas, M., & Vidhya, K. (2020). Project Planning and Scheduling. *Available at SSRN 3720552*. https://ssrn.com/abstract=3720552 or http://dx.doi.org/10.2139/ssrn.3720552

Takagi, N., Varajão, J., Ventura, T., Ubialli, D., & Silva, T. (2024). Managing success criteria and success factors in a BPM project: an approach using PRINCE2 and Success Management on the public sector. *Cogent Business & Management*, *11*(1). https://doi.org/10.1080/23311975.2024.2336273

Thabit, T. H., & Younus, S. Q. (2018). Risk assessment and management in construction industries. *International Journal of Research and Engineering*, *5*(2), 315–320. https://doi.org/10.21276/ijre.2018.5.2.3

Tshering, D. (2023). Risk management as a dynamic and continuous process in the life cycle of a typical major civil engineering project. *Bhutan Journal of Research and Development*, *2*. https://doi.org/10.17102/bjrd.rub.se2.043

Ugli, S. U. G., Bakhritdinovich, K. M., & Alijonovich, M. A. (2023, April 29). *Navigating risks in investing in uzbekistan's international trade transport corridors. Galaxy International Interdisciplinary Research Journal*. https://www.giirj.com/index.php/giirj/article/view/5052

Umar, T. (2020). *Developing toolkits and guidelines to improve safety performance in the construction industry in Oman*. https://doi.org/10.18744/lsbu.89yz9

Urbański, A., Konopińska, N., Lubawy, J., Walkowiak-Nowicka, K., Marciniak, P., & Rolff, J. (2021). A possible role of tachykinin-related peptide on an immune system activity of mealworm beetle, Tenebrio molitor L. *Developmental and Comparative Immunology/Developmental & Comparative Immunology*, *120*, 104065. https://doi.org/10.1016/j.dci.2021.104065

Urbański, M., Haque, A. U., & Oino, I. (2019). The moderating role of risk management in project planning and project success: Evidence from construction businesses of Pakistan and the UK. *Engineering Management in Production and Services*, *11*(1), 23–35. https://doi.org/10.2478/emj-2019-0002

Wadhwa, H., & Aron, R. (2022). Optimized task scheduling and preemption for distributed resource management in fog-assisted IoT environment. *The Journal of Supercomputing*, *79*(2), 2212–2250. https://doi.org/10.1007/s11227-022-04747-2

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, *5*(2), 171–180. https://doi.org/10.1002/smj.4250050207

Xia, Y., Liu, X., Wang, X., Deng, H., Han, C., Liu, Z., & Tsai, S. (2023). The power of role models in a team: The impact of lead entrepreneur's digital leadership on digital entrepreneurial success. *Information Processing & Management*, *60*(6), 103498. https://doi.org/10.1016/j.ipm.2023.103498

Xie, L., Lin, G., Hon, C., Xia, B., & Skitmore, M. (2020). *Research into the psychosocial safety climate of engineering construction projects*. Construction Research Congress 2020. https://doi.org/10.1061/9780784482872.026

Yilmaz, D. I., & Artan, D. (2024). An occupational Safety risk management system for coastal construction projects. *IEEE Transactions on Engineering Management*, 1–14. https://doi.org/10.1109/tem.2024.3369550

Zanezi, A. C., & De Carvalho, M. M. (2023). How project management principles affect Lean Six Sigma program and projects. *Brazilian Journal of Operations & Production Management*, *20*(1), 1564. https://doi.org/10.14488/bjopm.1564.2023

Zhai, T., Wang, D., Zhang, Q., Saeidi, P., & Mishra, A. R. (2022). Assessment of the agriculture supply chain risks for investments of agricultural small and medium-sized enterprises (SMEs) using the decision support model. *Ekonomska Istraživanja/Ekonomska IstražIvanja*, *36*(2). https://doi.org/10.1080/1331677x.2022.2126991

Zohar, D. (2010). Thirty years of safety climate research: Reflections and future directions. *Accident Analysis and Prevention*, *42*(5), 1517–1522. https://doi.org/10.1016/j.aap.2009.12.019

Zhou, J. X., Huang, L., Shen, G. Q., Wu, H., & Luo, L. (2023). Modeling stakeholder-associated productivity performance risks in modular integrated construction projects of Hong Kong: A social network analysis. *Journal of Cleaner Production*, *423*, 138699. https://doi.org/10.1016/j.jclepro.2023.138699