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IMPACTS OF SAFETY MANAGEMENT PRACTICES ON PROJECT SUCCESS IN PUNJAB:

THE MEDIATING ROLE OF SAFETY PERFORMANCE AND THE MODERATING ROLE OF SAFETY POLICY

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Abstract

Purpose: *The construction industry is among the most hazardous sectors worldwide, and weak safety management routinely translates into workplace injuries, project delays, cost overruns, and reduced productivity. Despite growing awareness of occupational health and safety, many construction projects in developing countries, including Pakistan, continue to report poor safety outcomes because safety management practices are not consistently implemented. This study examines how safety management practices relate to project success in the construction industry of Punjab, Pakistan, with particular attention to safety performance and safety policy as related organizational constructs.*

Design/Methodology/Approach: A quantitative, cross-sectional survey design was used. Primary data were collected from 200 construction professionals working in public and private construction organizations across Punjab, using a structured questionnaire measuring four constructs: Safety Management Practices, Safety Performance, Safety Policy, and Project Success. Data were analyzed using the Statistical Package for Social Sciences (SPSS), including frequency distribution, descriptive statistics, reliability analysis (Cronbach's Alpha), Pearson correlation, and simple and multiple linear regression.

***Results**: show that Safety Management Practices significantly and positively predicts Project Success (beta = 0.573, $p < .001$), explaining 32.8% of its variance. When Safety Performance and Safety Policy were added to the model, explained variance increased to 52.8%, with all three predictors making significant, unique contributions, and Safety Performance emerging as the strongest predictor. All inter-construct correlations were positive and significant ($p < .001$).*

Practical Implications: *These findings support Heinrich's Domino Theory, Reason's Swiss Cheese Model, Social Exchange Theory, and the Resource-Based View, and suggest that safety performance and safety policy meaningfully strengthen the relationship between safety management practices and project outcomes, although formal mediation and moderation testing is* *recommended as a next step. The study offers practical guidance for construction firms, project managers, and policymakers in Pakistan's construction sector.*

1. Introduction

The construction industry is a major driver of economic growth, infrastructure development, and employment worldwide. It underpins industrialization and urbanization by delivering the roads, bridges, housing, commercial buildings, hospitals, schools, and transport networks that a country depends on. In Pakistan, construction is a significant contributor to national output and employment, and government initiatives such as the China-Pakistan Economic Corridor (CPEC), housing programs, and urban expansion projects have increased activity across the country. Punjab, as the largest province by population and economic output, has seen particularly intense construction activity.

This economic importance sits alongside a difficult safety record. Construction work is inherently hazardous: dynamic sites, heavy equipment, work at height, electrical hazards, excavation, and multiple contractors and subcontractors operating concurrently all raise the risk of injury. International labour statistics consistently show higher rates of occupational injury and fatality in construction than in most other industries. The costs of workplace accidents extend well beyond human suffering; they include medical costs, compensation claims, legal liability, project delays, equipment damage, lost productivity, and reputational harm.

For these reasons, occupational health and safety has become a strategic priority rather than a peripheral compliance issue. Project success itself has traditionally been judged against the "Iron Triangle" of cost, time, and quality, but contemporary project management scholarship argues that success should also account for worker safety, environmental sustainability, stakeholder satisfaction, and organizational performance. Safer sites experience fewer disruptions, higher morale, and a greater likelihood of completing on budget and on schedule.

Safety management practices are the systematic mechanisms organizations use to identify hazards, manage risk, build employee awareness, and maintain regulatory compliance. Four practices in particular, safety training, safety meetings, safety inspections, and safety communication, are consistently identified in the literature as core components of an effective occupational health and safety system. Training builds knowledge and hazard recognition; meetings reinforce safe behaviour and share information; inspections catch hazardous conditions before they cause harm; and communication sustains participation, coordination, and a stronger safety culture.

However, most existing research has focused on the direct effects of these practices, leaving the underlying mechanisms comparatively unexamined. In particular, the roles of safety performance and safety policy in shaping this relationship remain underexplored, especially in developing-country contexts such as Pakistan. This is a meaningful gap: an organization can run a comprehensive safety programme and still see limited benefit if employees do not translate that programme into safer behaviour, or if the organization lacks the policy framework to make the programme stick.

Safety performance captures employees' compliance with safety procedures and their voluntary participation in safety-related activities; it is the behavioural outcome that connects a safety programme to organizational outcomes. Safety policy, meanwhile, is the institutional framework, objectives, responsibilities, procedures, and management commitment, that gives safety management practices direction and legitimacy. A robust safety policy should, in principle, make safety management practices more effective by

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embedding them in a supportive organizational climate.

This study addresses these gaps by examining how safety management practices relate to project success in Punjab's construction industry, with attention to the roles of safety performance and safety policy. Data were collected from construction professionals and analyzed using SPSS to test the direct relationships among these constructs.

The study's relevance extends beyond the academic contribution. For construction companies, it offers evidence on how to improve occupational health and safety while strengthening project performance. For project managers, it underscores the case for building safety into strategic planning and execution rather than treating it as a separate function. For policymakers and regulators, it provides evidence to support stronger occupational health and safety regulation across Pakistan. Theoretically, it draws on four well-established frameworks, Heinrich's Domino Theory, Reason's Swiss Cheese Model, Social Exchange Theory, and the Resource-Based View, within a context where they have rarely been jointly applied.

Ultimately, the argument advanced here is that safety management is not merely a regulatory obligation but a strategic organizational capability that contributes directly to project success. Organizations that invest in safety management practices, strengthen worker safety performance, and implement robust safety policy are better positioned to reduce accidents, improve productivity, satisfy stakeholders, and sustain a competitive advantage in an increasingly complex construction environment.

2. Literature Review

This chapter builds the theoretical and empirical case for the relationship between safety management practices and project success. Rather than simply summarizing prior work, it critically evaluates national and international research to explain how safety management practices translate into stronger project performance in construction, and identifies the gaps this study is designed to address.

Construction is widely recognized as one of the most hazardous industries globally, due to the dynamic nature of site work, the use of heavy machinery, work at height, electrical hazards, and the coordination of multiple contractors and subcontractors. The International Labour Organization (ILO) reports that construction workers face markedly higher rates of occupational injury and fatality than workers in most other sectors. Beyond the human cost, these incidents generate project delays, cost overruns, legal exposure, lost productivity, and reputational damage. Over the past few decades, research has increasingly demonstrated that sound safety management has a direct bearing on organizational performance and project success, and construction firms have correspondingly shifted from treating safety as a regulatory duty to treating it as a strategic capability. This chapter focuses on four core practices, safety training, safety meetings, safety inspections, and safety communication, and how they shape project success through the roles of safety performance and safety policy.

2.1 Theoretical Foundation

This research draws on four complementary theories to explain the relationship between safety management practices and project success.

2.1.1 Heinrich's Domino Theory

Heinrich's Domino Theory (1931) remains one of the most influential accident-causation models in occupational safety research. It describes workplace injuries as the product of a chain of five related events: social environment and personal factors, employee faults, unsafe acts or conditions, the accident itself, and finally injury. Removing any one "domino," particularly an unsafe act or condition, breaks the chain and prevents the accident. This implies that organizations can meaningfully reduce accident frequency through preventive safety management: training builds knowledge and competence, meetings reinforce risk awareness, inspections surface hazardous conditions, and communication encourages hazard reporting before an incident occurs. While later accident theories give greater weight to organizational factors, Heinrich's model still offers a useful conceptual starting point for understanding preventive safety management in construction.

2.1.2 Reason's Swiss Cheese Model

Reason's Swiss Cheese Model extends accident-causation theory by treating an accident as the result of multiple organizational safety barriers failing simultaneously. Each layer of defence has weaknesses ("holes"), and an accident occurs only when those weaknesses align across layers. On a construction project, training, inspection, communication, supervision, procedures, and management commitment each function as a distinct barrier. When these barriers reinforce each other, overall risk falls sharply. The model therefore supports examining safety management practices as a set rather than in isolation, which is the approach this study takes in assessing how these practices jointly shape safety performance and project success.

2.1.3 Social Exchange Theory

Social Exchange Theory frames employee behaviour as a reciprocal exchange between employees and their employer. When an organization visibly invests in employee welfare through safety training, open communication, regular meetings, and systematic inspection, employees tend to reciprocate with stronger organizational commitment, higher safety compliance, and more active participation in safety initiatives. This provides a behavioural explanation for why effective safety management practices improve safety performance and, ultimately, project outcomes.

2.1.4 Resource-Based View (RBV)

The Resource-Based View holds that sustainable competitive advantage comes from resources and capabilities that are valuable, rare, difficult to imitate, and well organized. Safety management can be understood as exactly this kind of capability: construction firms with strong safety cultures, trained staff, effective management structures, and high safety performance tend to achieve better productivity, lower accident-related costs, stronger quality outcomes, and a better reputation with clients. This study treats safety performance as a strategic capability through which safety management practices ultimately drive project success.

2.2 Safety Management Practices

Safety management practices are the policies, procedures, leadership behaviours, and organizational strategies used to identify hazards, manage occupational risk, and improve worker safety behaviour. The literature consistently identifies safety training, safety meetings, safety inspections, and safety communication as the core components of an effective occupational health and safety management system.

2.3 Safety Training

Safety training is widely regarded as one of the most critical elements of an effective safety management system. It gives employees the knowledge, technical skill, and practical competence needed to recognize hazards, follow organizational safety procedures, respond appropriately in emergencies, and carry out construction work safely. Because construction sites are dynamic and hazards change with each project phase, workers need ongoing education, induction programmes for new hires, toolbox training, emergency response drills, refresher courses, equipment operation training, and behavioural safety programmes.

Burke et al. (2006) found that organizations providing comprehensive safety training see significantly lower accident rates and stronger organizational performance. Neal and Griffin (2006) further found that training improves safety knowledge and, through it, both compliance and participation. Vinodkumar and Bhasi (2010) reported that companies investing in training develop stronger safety cultures and better operational performance. In Pakistan's construction sector, where the workforce spans a wide range of educational backgrounds and technical experience, ongoing training is especially important: it reduces unsafe behaviour, improves hazard recognition, strengthens regulatory compliance, and contributes directly to project success.

2.4 Safety Meetings

Safety meetings are structured, routine discussions used to communicate hazards, review past incidents, discuss preventive measures, and reinforce safety expectations. They give employees a forum to raise concerns, suggest improvements, and share practical experience, and they strengthen organizational communication and safety culture more broadly.

Mohamed (2002) found that organizations holding regular safety meetings develop stronger safety cultures and experience fewer injuries. Lingard and Rowlinson (2005) found that regular toolbox meetings improve risk awareness and encourage proactive safety behaviour. Choudhry et al. (2008) found that effective communication in safety meetings improves coordination among contractors and meaningfully reduces unsafe practices. On multi-stakeholder construction projects, regular meetings also improve teamwork and reduce miscommunication among engineers, supervisors, subcontractors, and labourers.

2.5 Safety Inspection

Safety inspection is the systematic process of identifying, evaluating, and controlling workplace hazards before they cause harm. It is a core element of an effective occupational health and safety management system, as it lets organizations catch unsafe conditions, risky acts, equipment deficiencies, and procedural gaps early, and supports continuous improvement and regulatory compliance.

Hinze (1997) identified systematic inspection as one of the most effective approaches for reducing construction accidents and improving project efficiency. Fernández-Muñiz et al. (2009) found that regular inspection strengthens safety performance because continuous monitoring reinforces compliance with organizational procedures. Cheng et al. (2012) found that effective inspection improves project performance by reducing work interruptions and accident-related costs. Fang et al. (2020) found that organizations with structured inspection programmes show better compliance and fewer injuries than organizations relying only on corrective measures after the fact. This relationship is also consistent with Reason's Swiss Cheese Model: inspection is one of several protective barriers, and it reinforces the others by catching weaknesses before they align with gaps elsewhere in the system.

2.6 Safety Communication

Safety communication is the ongoing exchange of safety-related information among management, supervisors, engineers, contractors, and employees, aimed at building hazard awareness, improving coordination, and encouraging safe behaviour. Effective communication ensures employees understand safety policy, work procedures, emergency plans, and hazard controls.

Griffin and Neal (2000) found that effective communication improves safety knowledge, strengthens safety climate, and encourages participation in safety programmes. Vinodkumar and Bhasi (2010) found that organizations with open communication channels experience fewer injuries, stronger commitment, and better organizational performance. Choudhry et al. (2008) found that effective communication supports collaboration among project stakeholders and helps safety management systems succeed. Given the diversity of language, training, and technical experience across Pakistan's construction workforce, effective communication matters even more.

2.7 Safety Performance

Safety performance describes employees' ability to carry out work safely while complying with occupational health and safety procedures. It is generally treated as the behavioural outcome of an effective safety management system, the extent to which employees actively help maintain a safe workplace. Neal and Griffin (2006) split safety performance into two components: safety compliance (adherence to mandatory procedures, correct PPE use, and regulatory compliance) and safety participation (voluntary behaviours such as reporting hazards, attending safety meetings, supporting colleagues, and suggesting improvements).

Christian et al. (2009) concluded that safety performance is the primary mechanism through which safety management practices produce organizational benefits. Vinodkumar and Bhasi (2010) further found that investment in training, communication, inspection, and management meaningfully improves employees' safety performance, which in turn reduces accidents and strengthens organizational performance. This role is also consistent with the Resource-Based View, which treats safety performance as a valuable organizational capability contributing to sustainable competitive advantage.

2.8 Safety Policy

Safety policy is an organization's formal commitment to protecting employee health and safety, expressed through clearly defined objectives, responsibilities, procedures, and management practices. It provides strategic direction for the occupational health and safety system and sets organizational expectations about workplace safety. Cooper (2000) argued that safety policy is the foundation of organizational safety culture because it communicates management's priorities. Fernández-Muñiz et al. (2009) found that organizations with comprehensive safety policies consistently show stronger safety climates, better employee safety behaviour, and better organizational performance. Teo and Ling (2005) found that construction firms with formal safety policies achieve better safety performance because clearly defined responsibilities strengthen accountability throughout the organization. In Pakistan's construction sector, organizational commitment to occupational safety varies considerably; firms whose policies align with international standards such as ISO 45001 tend to show stronger regulatory compliance and more effective implementation of safety management systems.

2.9 Project Success

Project success has historically been judged against the "Iron Triangle" of cost, time, and quality. Contemporary project management scholarship, however, recognizes that successful projects must also meet broader organizational goals, stakeholder satisfaction, environmental sustainability, worker well-being, operational efficiency, and workplace safety. Shenhar and Dvir (2007) argued that project success extends beyond budget and schedule to longer-term organizational benefit and client satisfaction, and PMI (2021) further frames project success as the achievement of organizational objectives through effective management of resources, risk, quality, stakeholder expectations, and safety.

Construction projects with strong occupational health and safety management typically experience fewer accidents, fewer delays, lower financial loss, higher productivity, stronger morale, and greater stakeholder confidence. This study therefore treats project success as a multidimensional construct that combines traditional project management objectives with occupational health and safety outcomes.

2.10 Empirical Literature Review

Over the past few decades, researchers have extensively studied the relationship between safety management practices and organizational performance, particularly in construction. Most empirical work concludes that effective safety management improves workplace safety, raises productivity, reduces accident-related costs, and supports successful project delivery. However, prior studies have commonly examined individual safety management practices in isolation, with comparatively little research on the combined effect of training, meetings, inspection, and communication together with the roles of safety performance and safety policy.

Burke et al. (2006), in a meta-analysis, found that safety training significantly improves safety knowledge, hazard recognition, and procedural compliance. Neal and Griffin (2006) found that training positively affects both safety compliance and participation. Vinodkumar and Bhasi (2010), studying industrial organizations, found that management commitment, communication, employee involvement, and training significantly improve safety performance.

Mohamed (2002) found that safety meetings and employee participation are central to building organizational safety culture. Choudhry et al. (2008) found that organizations holding regular safety meetings achieve lower accident rates because employees become more actively involved in identifying hazards and implementing preventive measures.

Hinze (1997) found that systematic inspection is among the most effective techniques for reducing construction accidents. Fernández-Muñiz et al. (2009) found that comprehensive inspection programmes are consistently associated with stronger safety performance and organizational effectiveness.

Griffin and Neal (2000) highlighted the role of safety communication in building a positive safety climate. Christian et al. (2009) provided robust meta-analytic evidence that safety performance is the behavioural mechanism through which safety initiatives generate organizational benefit.

More recent work has given greater weight to the strategic role of safety policy. Cooper (2000) argued that formal safety policy signals management commitment and establishes organizational accountability. Fernández-Muñiz et al. (2009) found that organizations with comprehensive safety policy consistently show stronger safety cultures and better performance.

Research in developing-country contexts has increasingly emphasized the value of integrated safety management systems. Sajid et al. (2023) found that organizations implementing multiple safety management practices collectively achieve significantly better project performance than those pursuing isolated interventions.

Together, this body of evidence suggests that comprehensive safety management systems improve organizational performance by strengthening worker safety behaviour, reducing accident frequency, raising productivity, and supporting successful project completion. However, empirical evidence specific to Pakistan's construction industry remains limited, a gap this study addresses.

2.11 Research Gap

First, most studies examine individual safety management practices independently rather than considering the combined effect of training, meetings, inspection, and communication within a single framework.

Second, existing literature has focused primarily on the direct relationship between safety management practices and organizational performance, with comparatively little attention to how that relationship works through safety performance.

Third, the role of safety policy has received limited empirical attention. Relatively few studies have statistically examined whether safety policy strengthens the effectiveness of safety management practices, a gap this study addresses by including safety policy as a related organizational construct.

Fourth, most existing empirical work comes from developed-country settings such as the United States, Australia, China, and Europe, leaving these

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relationships comparatively underexamined within Pakistan's construction industry.

Finally, few studies examine direct relationships among safety management practices, safety performance, safety policy, and project success within a single, integrated survey-based model in a Pakistani construction context. This study contributes an empirically tested framework suited to that context, and identifies formal mediation and moderation testing as a natural next step for future research.

2.12 Hypotheses Development

Based on the theoretical foundation and empirical literature reviewed above, this study tests the following hypotheses:

H1: Safety Management Practices has a significant positive relationship with Project Success.

H2: Safety Performance has a significant positive relationship with Project Success.

H3: Safety Policy has a significant positive relationship with Project Success.

H4: Safety Management Practices, Safety Performance, and Safety Policy jointly and significantly predict Project Success.

3. Methodology and Methods

3.1 Research Design

This study adopted a quantitative, cross-sectional survey research design, consistent with prior studies examining relationships among safety management constructs in construction (e.g., Vinodkumar & Bhasi, 2010; Fernández-Muñiz et al., 2009). A structured, self-administered questionnaire was used to collect primary data at a single point in time.

3.2 Population and Sampling

The target population consisted of construction professionals working in public and private construction organizations across Punjab, Pakistan, including private employees, government employees, business owners, construction workers, and students with relevant industry exposure. A non-probability convenience sampling technique was used to recruit respondents, given the practical constraints of accessing a comprehensive sampling frame for construction professionals across the province. A total of 200 valid responses were retained for analysis after data screening.

3.3 Research Instrument

Data were collected using a structured questionnaire comprising two sections. Section A captured respondent demographics (gender, age, education, occupation, and years of industry experience). Section B measured four constructs, Safety Management Practices (6 items), Safety Performance (6 items), Safety Policy (5 items), and Project Success (6 items), using a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

3.4 Data Collection Procedure

The questionnaire was distributed to construction professionals across Punjab. Respondents were informed of the academic purpose of the study, assured of confidentiality, and participated voluntarily.

3.5 Data Analysis Techniques

Data were analyzed using the Statistical Package for Social Sciences (SPSS). Analysis proceeded in the following stages: (1) response rate calculation, (2) frequency distribution of demographic variables, (3) descriptive statistics for each construct, (4) reliability analysis using Cronbach's Alpha, (5) Pearson correlation analysis among constructs, and (6) simple and multiple linear regression analysis to test the hypothesized relationships.

3.6 Ethical Considerations

Participation in the survey was voluntary, and respondents were informed that their responses would be used strictly for academic purposes and kept confidential. No personally identifying information was retained in the analysis dataset.

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4. Results

4.1 Response Rate

A total of 200 valid and usable responses were collected and retained for analysis after data screening. [Insert number of questionnaires originally distributed to calculate the exact response rate percentage.

4.2 Demographic Profile of Respondents

Table 1 presents the demographic characteristics of the 200 survey respondents.

Table 1: Demographic Profile of Respondents (N = 200)

Demographic Variable	Category	n	%
Gender	Male	135	67.5
	Female	65	32.5
Age	Below 25	41	20.5
	25-34	99	49.5
	35-44	49	24.5
	45-54	10	5.0
	Above 54	1	0.5
Education	Matric	69	34.5
	Intermediate	58	29.0
	Bachelor's	48	24.0
	Master's	19	9.5
	Other	6	3.0
Occupation	Private Employee	94	47.0
	Government Employee	55	27.5
	Student	40	20.0
	Construction Worker	6	3.0
	Other	5	2.5
Experience	Less than 2 years	26	13.0
	2-5 years	73	36.5
	6-10 years	43	21.5
	Above 10 years	14	7.0
	Not reported	44	22.0

The majority of respondents were male (67.5%) and fell within the 25-34 age bracket (49.5%). Nearly half were Private Employees (47.0%), and 36.5% reported 2-5 years of industry experience.

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4.3 Descriptive Analysis

Composite mean scores were computed for each construct. Table 2 presents the descriptive statistics.

Table 2: Descriptive Statistics for Study Constructs

Construct	Items	Mean	SD	Min	Max
Safety Management Practices (SMP)	6	3.871	0.539	2.17	5.00
Safety Performance (SP)	6	3.807	0.585	2.00	5.00
Safety Policy (SPol)	5	3.822	0.619	1.80	5.00
Project Success (PS)	6	3.782	0.648	1.83	5.00

All four constructs recorded mean scores above the scale midpoint of 3.00, indicating generally favorable perceptions of safety management practices, safety performance, safety policy, and project success among respondents.

4.4 Reliability Analysis (Cronbach's Alpha)

Table 3: Reliability Statistics

Construct	Items	Cronbach's Alpha	Interpretation
Safety Management Practices	6	0.615	Questionable
Safety Performance	6	0.696	Questionable
Safety Policy	5	0.673	Questionable
Project Success	6	0.759	Acceptable

Project Success demonstrated acceptable internal consistency (alpha = 0.759). The remaining three constructs fell in the questionable range (0.61-0.70), below the conventional 0.70 threshold, which is discussed as a limitation in Section 5.4.

4.5 Correlation Analysis

Table 4: Pearson Correlation Matrix (** p < .001, two-tailed)

Construct	SMP	SP	SPol	PS
SMP	1			
SP	0.563**	1		
SPol	0.561**	0.576**	1	
PS	0.573**	0.663**	0.584**	1

All construct pairs showed positive, statistically significant correlations ($p < .001$), in the moderate-to-strong range (0.56-0.66), supporting the hypothesized relationships and justifying regression analysis.

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4.6 Regression Analysis

4.6.1 Simple Linear Regression: SMP to PS

Table 5: Model Summary, Simple Regression

Model	R	R²	Adj. R²	F	df	Sig.
SMP -> PS	0.573	0.328	0.325	96.70	1, 198	< .001

Table 6: Coefficients, Simple Regression

Predictor	B	SE	Beta	t	Sig.
(Constant)	1.117	0.274	-	4.083	< .001
SMP	0.689	0.070	0.573	9.833	< .001

The model was significant, $F(1, 198) = 96.70$, $p < .001$, with SMP accounting for 32.8% of the variance in PS ($R^2 = 0.328$). SMP significantly and positively predicted PS (beta = 0.573, t = 9.833, $p < .001$).

4.6.2 Multiple Regression: SMP, SP, and SPol to PS

Table 7: Model Summary, Multiple Regression

Model	R	R²	Adj. R²	F	df	Sig.
Full Model	0.727	0.528	0.521	73.20	3, 196	< .001

Table 8: Coefficients, Multiple Regression

Predictor	B	SE	Beta	t	Sig.
(Constant)	0.143	0.254	-	0.561	0.575
SMP	0.256	0.076	0.213	3.364	0.001
SP	0.456	0.071	0.412	6.418	< .001
SPol	0.238	0.067	0.228	3.557	< .001

The overall model was significant, $F(3, 196) = 73.20$, $p < .001$, explaining 52.8% of the variance in PS ($R^2 = 0.528$; Adj. $R^2 = 0.521$). All three predictors made significant, unique contributions: SP was the strongest predictor (beta = 0.412, $p < .001$), followed by SPol (beta = 0.228, $p < .001$) and SMP (beta = 0.213, $p = .001$).

5. Discussion

5.1 Discussion of Research Hypotheses

H1: Safety Management Practices has a significant positive relationship with Project Success — Supported

The simple regression results show that Safety Management Practices significantly and positively predicts Project Success (beta = 0.573, t = 9.833, $p < .001$), explaining 32.8% of the variance in Project Success. This finding is consistent with Burke et al. (2006), Neal and Griffin (2006), and Vinodkumar and Bhasi (2010), who similarly found that structured safety practices meaningfully

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improve organizational and project outcomes. The result also aligns with Heinrich's Domino Theory: organizations that consistently train, inspect, meet, and communicate about safety remove "dominoes" from the accident chain, reducing disruption and supporting project performance.

H2: Safety Performance has a significant positive relationship with Project Success — Supported

Safety Performance showed the strongest correlation with Project Success ($r = 0.663$, $p < .001$) among all construct pairs, and emerged as the strongest predictor in the multiple regression model (beta = 0.412, $p < .001$). This is consistent with Christian et al. (2009) and Vinodkumar and Bhasi (2010), who identified safety performance as the primary behavioural mechanism through which safety management practices generate organizational benefit. It also supports the Resource-Based View: employees who translate safety programmes into safe behaviour represent a valuable, difficult-to-imitate organizational capability that drives better project outcomes.

H3: Safety Policy has a significant positive relationship with Project Success — Supported

Safety Policy was significantly correlated with Project Success ($r = 0.584$, $p < .001$) and remained a significant predictor in the multiple regression model (beta = 0.228, $p < .001$), even after accounting for Safety Management Practices and Safety Performance. This supports Cooper (2000), Fernández-Muñiz et al. (2009), and Teo and Ling (2005), who argue that formal safety policy provides the institutional backbone that allows other safety management practices to function coherently.

H4: SMP, SP, and SPol jointly and significantly predict Project Success — Supported

The multiple regression model was statistically significant, $F(3, 196) = 73.20$, $p < .001$, explaining 52.8% of the variance in Project Success, a substantial increase over the 32.8% explained by Safety Management Practices alone. This pattern is consistent with Reason's Swiss Cheese Model, which frames safety as the product of multiple reinforcing organizational barriers rather than a single practice: Safety Management Practices, Safety Performance, and Safety Policy each independently strengthen project outcomes, and together they explain substantially more variance than any one construct alone.

These patterns are broadly consistent with the theorized mediating role of Safety Performance and moderating role of Safety Policy proposed in this study's conceptual framework, Safety Performance's especially strong effect is consistent with it acting as a behavioural pathway between practices and outcomes, and Safety Policy's persistence as a significant predictor alongside the other two constructs is consistent with it strengthening the practice-outcome relationship. However, these patterns are suggestive rather than confirmatory: this study tested direct relationships only, and formal mediation testing (e.g., bootstrapped indirect effects via Hayes' PROCESS macro) and moderation testing (interaction-term regression) would be needed to statistically confirm these mechanisms.

5.2 Theoretical Implications

This study contributes to construction safety literature by jointly testing the direct relationships among safety management practices, safety performance, safety policy, and project success within a single Pakistani construction sample, a combination rarely tested together in developing-country contexts. The findings support the applicability of Heinrich's Domino Theory, Reason's Swiss Cheese Model, Social Exchange Theory, and the Resource-Based View to this setting, and provide an empirical foundation for future studies to formally test safety performance as a mediator and safety policy as a moderator using structural equation modelling.

5.3 Practical Implications

For construction firms, the results suggest that structured safety management practices meaningfully support project success, but that this effect is substantially strengthened by parallel investment in safety performance (translating programmes into behaviour) and safety policy (institutional backing). Project managers should treat safety as an integrated system rather than a checklist. Policymakers and regulators in Punjab may use these findings to support stronger enforcement of safety policy requirements across construction firms of varying size and ownership.

5.4 Limitations

Three of the four measured constructs (Safety Management Practices, Safety Performance, and Safety Policy) recorded Cronbach's Alpha values between 0.61 and 0.70, below the conventional 0.70 threshold, suggesting the item sets could be refined in future research. The convenience sampling approach and cross-sectional design also limit causal inference and generalizability beyond the sampled population. Finally, this study tested direct relationships only; formal mediation and moderation analysis was not conducted and is recommended as a follow-up study.

6. Conclusion

6.1 Conclusion

This study examined the relationship between safety management practices and project success in Punjab's construction industry, with attention to the roles of safety performance and safety policy. Using data from 200 construction professionals, the results show that safety management practices significantly predict project success, and that this relationship strengthens considerably when safety performance and safety policy are considered alongside it. All four hypotheses were supported.Safety Management Practices significantly and positively predicts Project Success, explaining 32.8% of its variance. When Safety Performance and Safety Policy were added to the model, the variance explained increased substantially to 52.8%. All three predictors—Safety Management Practices, Safety Performance, and Safety Policy, made significant, unique contributions to Project Success. Safety Performance emerged as the strongest predictor, followed by Safety Policy and Safety Management Practices. All inter-construct correlations were positive and significant ($p < .001$), ranging from moderate to strong (0.56-0.66), supporting the hypothesized relationships. All four hypotheses (H1, H2, H3, H4) were supported, confirming that Safety Management Practices, Safety Performance, and Safety Policy jointly and individually predict Project Success in Punjab's construction industry

6.2 Recommendations

Construction organizations in Punjab should invest in comprehensive, ongoing safety training, regular safety meetings, systematic inspections, and open safety communication. These practices should be paired with clear, formally documented safety policies and mechanisms to encourage and monitor employee safety compliance and participation, since these appear to substantially amplify the benefit of safety management practices on project outcomes.

6.3 Future Research Directions

Future research should formally test safety performance as a mediator and safety policy as a moderator using techniques such as Hayes' PROCESS macro or Partial Least Squares Structural Equation Modelling (PLS-SEM), employ probability-based sampling to improve generalizability, and consider longitudinal designs to support stronger causal claims.

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