



Pakistan Journal of Social Sciences

ISSN (E) 2708-4175 ISSN (P) 2074-2061

Volume 44: Issue 3 September 2024

Journal homepage: <https://pjss.bzu.edu.pk>

Exploring the Influence of Project Management Practices on Project Success with the Moderating Role of Infrastructural Sustainability

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ARTICLE DETAILS

History:

Accepted: 20 August, 2024

Available Online: 13 September, 2024

Keywords:

Project Success, Project Management Practice, Infrastructure Sustainability,

ABSTRACT

Purpose: Fueling global urban growth relies on sustaining infrastructure. While previous literature explores Project Management Practices (PMPs), Infrastructural Sustainability (IS), and Project Success (PS) through qualitative research, this research stands out by pioneering an in-depth exploration of the dynamic interplay between PMPs and Project Success, along with a fresh examination of Project Success dimensions. The study specifically focuses on understanding how Project Management Practices shape success and the far-reaching impact of Infrastructural Sustainability. Additionally, our study introduces a unique perspective by delving into the moderating influence of Infrastructural Sustainability, contributing a novel dimension to the existing knowledge landscape.

Design/Methodology/Approach: The research follows an exploratory approach with a quantitative focus, particularly drawing from the fields of construction and engineering projects. Primary data is collected through a well-structured questionnaire distributed via various channels, targeting national companies involved in such projects. The questionnaire design aligns with prior studies, utilizing Likert scales for PMPs, IS, and PS.

Findings: The analysis, performed using Smart PLS 3, demonstrates Project Management Practices (PMPs) exhibit a robustly positive influence on Project Success (PS), with a highly significant t-value of 5.997 (p-value = 0.000). This underscores a substantial and positive correlation. Notably, Infrastructural Sustainability (IS) demonstrates a significantly positive correlation with Project Success (PS), reflected in a t-value of 9.503 (p-value = 0.000). Moreover, the moderation effect of Infrastructural Sustainability (IS) in the relationship between Project Management Practices (PMPs) and Project Success (PS) is noteworthy. The p-value of 0.033 indicates its significance, and the positive coefficient (0.059) coupled with a t-value of 2.131 highlights its substantial impact.

Implications/Originality/Value: The research findings emphasize that integrating PMPs with a focus on IS improves project success and organizational sustainability and contributes valuable theoretical insights by establishing IS's moderating role in this dynamic. This research offers important implications for practitioners and policymakers, encouraging adopting practices that lead to sustainable project and organizational success.



Recommended Citation:

Mubasher, A., Aslam, S., Rehman, S., & Saeed, K. (2024). Exploring the Influence of Project Management Practices on Project Success with the Moderating Role of Infrastructural Sustainability. *Pakistan Journal of Social Sciences*, 44(3), 475-496. DOI: 10.5281/zenodo.13758546

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1. Introduction

This research is motivated by the growing significance of sustainability in projects and businesses. Given that Project Management Practices (PMPs) play a pivotal role in project implementation, it is crucial to explore key factors that can gauge PM practices and project success, with infrastructure sustainability serving as potential moderators to assess any moderating effects (Mubasher 2022). The heightened demand for infrastructure sustainability aligns with organizational efforts to meet international market contracts. This research aims to forecast the impacts of implementing Project Management Practices (PMPs) in various industrial projects within developing countries, where such practices are critically needed during project planning. It has examined the significance of Project Management Practices in driving project success and explores how Infrastructure Sustainability influences PMPs and Project Success. The study has also addressed the dimensions essential for maintaining Infrastructure Sustainability and the roles of PM strategy, implementation, culture, and efficiency in achieving project success. By providing insights into these areas, the research will assist project managers and stakeholders in maintaining effective PM practices and achieving significant project outcomes.

Recognizing the important role of sustainable infrastructures in the construction industry, the study highlights their profound impact on urbanization. Infrastructural sustainability is a driving force for inner-city economic growth, social utility enhancement, and environmental harmony (Mubasher 2022). Uniquely, the study explores infrastructural sustainability as a moderating variable between Project Management Practices (PMPs) and Project Success (PS), uncovering dimensions like “Social Utilities, Project Economy, and Environmental Implications. “Formalized Project Management Practices have proven invaluable in various industries, improving processes, products, and resource utilization (Mubasher 2022). This research delves into PMPs, focusing on dimensions such as “PM Strategy, PM Implementations, Culture, and Efficiency,” providing fresh insights into their impact on project success.

Although Project Management Practices (PMPs) are widely acknowledged for their role in driving project success, there is a significant gap in research regarding their application within the challenging and resource-limited environments of developing countries. Additionally, the interaction between PMPs and Infrastructure Sustainability (IS) in these settings is not thoroughly understood, especially in terms of how IS might enhance or influence the effectiveness of PMPs. Much of the existing literature focuses on developed nations, leaving a crucial gap in understanding how these practices can be tailored and optimized for developing countries, where infrastructure and sustainability challenges are more acute. This study aims to fill this gap by exploring how the strategic integration of PMPs and IS can help address these challenges, leading to sustainable project outcomes in developing economies (Mubasher 2022). Research findings hold significant implications for practitioners and policymakers, urging organizations to adopt practices that ensure project success and sustainability.

The research highlights the importance of integrating sustainable infrastructure practices with robust project management for project success and organizational growth, particularly in developing countries, offering a blueprint for immediate project outcomes and sustainable infrastructure development (Mubasher 2022).

The paper's upcoming sessions are set up as follows. The literature review is briefly described in Section 2, and the Methodology is provided in Section 3. Results and findings are detailed in Section 4. While final thoughts are covered in Section 5.

2. Background / Theoretical support

This research examines sustainability in Project Management Practices (PMPs) and project success, focusing on infrastructure sustainability as a moderating factor, to optimize project outcomes and ensure long-term viability. Embracing an environment encouraging efficient practices and sustainability aligns with the 'Goal Setting Theory' (Abhari & Vaghefi, 2022). The goal-setting theory serves as a foundational framework for this research model.

It has been employed to analyze the positive correlation between goal complexity and task performance, demonstrated across individual, group, and organizational levels (Liu, Bin, Junna, Xingbin, & Ting, 2020). This theory provides infrastructure experts with a valuable tool for predicting performance in infrastructural sustainability based on the impacts of goal setting within Project Management Practices (PMPs). The key to achieving organizational goals or project success within PMPs lies in the development, implementation, and adaptation of PMPs guided by the Plan-Do-Check-Act (PDCA) ideology and sustainable infrastructure principles (Haniff & Galloway, 2022).

3. Literature Review

The relevant literature has been reviewed and presented in sections below.

3.1. Project Success

Recent Project Management literature emphasizes the pivotal role of project success (Volden & Welde, 2022). The achievement of desired goals is viewed through a multidimensional lens, considering factors like efficient project management, consumer consequences awareness, team building, and business success (Mubarak et al., 2022; Pace, 2019). Traditionally, project success is assessed based on the scope, time, and cost triangle, with various matrices and criteria in place (Latif et al., 2021). In Project Management discourse, project success is delineated into two key concepts: success factors and success criteria. Success factors are changeable elements enhancing success likelihood, while success criteria are metrics defining project conclusion success (Volden & Welde, 2022).

The "Model of Project Excellence" integrates success elements and criteria across leadership, team, policy, strategy, stakeholder management, resources, contracting, project management, scheduling, money, organization, quality, information, risks, and other key factors (Salman et al., 2021). Critical success criteria include project outcomes, client satisfaction, and stakeholder engagement (Durmic, 2020). While technical issues are often blamed for project failures, managerial failures are recognized as frequent root causes, prompting calls for management system improvements (Leone & Schiavone, 2019). The impact of Project Management on project success is strong, with sustainability emerging as a significant success factor (Leone & Schiavone, 2019; Buniya et al., 2022). Sustainability and relevance, efficiency, effectiveness, and impact contribute to overall project success (Buniya et al., 2022). Achieving a consensus on project success criteria remains debated, with perceptions often tied to meeting quality requirements, task completion, and stakeholder satisfaction (Taufiq et al., 2020).

3.1.1. Business Success

Project success is multifaceted, gauged through both tangible and intangible factors, and often best evaluated by stakeholders, particularly primary sponsors (Khalife & Hamzeh, 2020). Successful project completion, aligning with the time, cost, and outcomes triangle, signifies success and excellence in project performance, meeting technical specifications, and high-level requirements (Mubasher 2022).

In decision-making, projects entail evaluating technical, economic, social, and environmental considerations, requiring systematic decision analysis, risk assessment, and pre-established planning by top management for effective execution (Ahmad, Aibinu, & Stephan, 2021; Jääskä et al., 2022). Effective coordination, encapsulated in the 4C's—coordination, communication, collaboration, and cohesiveness— is foundational for integrated project management (Shakeri & Khalilzadeh, 2020). Cross-functional frameworks facilitate knowledge exchange and task completion across diverse sectors, contributing to successful process improvement projects (Sandberg et al., 2022). Synchronizing tasks and information is vital for preventing unforeseen costs, delivery delays, and risks to long-term client relationships, thereby ensuring project success (Mubasher 2022).

3.1.2. Impact on Customer

Customer impact is a pivotal dimension for project success, gauged by how the project outcome enhances lives or businesses and meets explicit indicators of customer demands (Kerzner, 2022; Maqbool, Deng, & Rashid, 2020). This dimension, focusing on product performance metrics and technical specifications, directly influences customer satisfaction, happiness, and intentions for future engagements (Mubasher 2022).

Increasingly, customer-centric activities such as collaborative product creation and financial services are demanded, prompting the adoption of practices like Customer Relationship Management (CRM) and dedicated account management for enhanced customer relationships (Gompers et al., 2020; Ayuninggati, Lutfiani, & Millah, 2021). Customer priority and asset management, emphasizing the maintenance of a customer profile based on valuable inputs, are crucial for success, especially in new product development programs (Malik et al., 2021). Despite recognizing the importance of value co-creation and customer desires, a gap exists in addressing customer integration at the project portfolio level (Paluch et al., 2022). The role of the customer in Project Portfolio Management (PPM) remains underexplored, warranting further research to determine the extent of customer involvement and integration into PPM frameworks (Kirsch, 2022).

3.1.3. Impact on Team

Team impact is a vital dimension in assessing how a project influences team members, encompassing satisfaction, morale, loyalty, and post-project turnover (Robinson et al., 2022; Paros, Kelly, & Sprinkle, 2022). It also gauges the organization's investment in team learning, development, and acquired abilities, particularly crucial in professional sectors like structural engineering (Sepúlveda-Rivillas, Alegre, & Oltra, 2022; Maker, 2022). Investing in team growth ensures superior performance, emphasizing the need for organizations to prioritize talent development through internal opportunities, international exposure, and specialized training (Arias-Contreras & Moore, 2022).

Regular practice and training are essential for coupling conceptual understanding with practical application in highly professional domains (Guo et al., 2022). Effective teams go beyond individuals working toward a common goal, relying on each member's efforts and unique qualities.

Collaboration involves resource sharing, power, and responsibility, with monitoring, face-to-face communication, and individual accountability contributing to successful team dynamics (Alanzi & Alhalafawy, 2022). This research aims to uncover intricate relationships between project management practices, infrastructural sustainability, and project success, offering insights for practitioners, policymakers, and academics in the context of a developing country. Thus, we hypothesize:

3.2. Project Management Practices (PMPs)

Best practices are proven methods that consistently yield positive outcomes, and when combined with benchmarking, organizations can enhance performance and achieve long-term success through continuous improvement. By incorporating best practices, project management techniques help organizations accomplish

goals quickly, encourage departmental consistency, and guarantee seamless operations (Mubasher 2022).

Finding best practices that complement the unique aims and objectives of an organization may be a complicated undertaking. Best practices for organizational success are covered in detail in this part. These practices include developing a project management strategy, putting these principles into Implementation successfully, creating a positive organizational culture, and improving operational efficiency (Mubasher 2022).

3.2.1. PM Strategy

Establishing a robust link between the Project Management (PM) Strategy and the strategic plan is pivotal for project success. Many organizations grapple with comprehending a project's significance and aligning it with the strategic plan, resulting in underutilized resources, a challenge particularly pronounced for larger firms (Job, Becken, & Lane, 2020). Projects must contribute value to the company's strategic plan to meet goals and future consumer demands (Chatterjee et al., 2022). Unfortunately, some businesses neglect the procedure to link project selection with the strategic plan, leading to resource underutilization (Biondi & Russo, 2022). PM strategies, encompassing various management domains, play a pivotal role (Mubasher 2022). The research underscores the impact of strategy omissions during decision-making processes, leading to unsatisfactory project management outcomes (Mubasher 2022). Strengthening and stabilizing project strategy necessitates political support, collaboration, and adaptability for successful implementation (Cezarino et al., 2022; Shamim, 2022).

In technological innovation, project-level research often neglects scientific development in PC projects, creating gaps in understanding. Developers, as key decision-makers, prioritize political interventions over market activities (Han, Yan, & Piroozfar, 2022). The interplay between governments, developers, and vendors warrants more attention in PC development, particularly in developing countries (Gan, Liu, & Wen, 2022; Yamoah et al., 2022). In China, government involvement differs, acting as an overseer and participant rather than a coordinator and service provider (Yamoah et al., 2022). Emphasizing and promoting strategy is crucial in the rapidly evolving world of projects, ensuring their continued significance (Shamim, 2022).

3.2.2. PM Implementation

Leveraging projects as a strategic tool for territorial community development attracts additional resources from the state budget, financial institution subsidies, and investor participation (Kyrylov et al., 2022). Yet, the inadequate project competency of many community managements team's hampers idea generation and successful implementation (Boamah et al., 2022). The project selection by the State Fund for Regional Development, particularly for common community infrastructure in Ukraine, reflects low quality, as highlighted by experts (Berezhna et al., 2022). Challenges with systematic project support in local self-government authorities further compound the situation (Domazet).

Business experience underscores the significance of team knowledge and human skills for organizational maturity in project management (Peng et al., 2022). Project management maturity models, exemplified by Gareeb and Rwelamila (2022), identify factors correlated with an organization's project development stage, offering a strategic path to attain project management excellence. The concept of project management competence, gaining prominence since 2001, is discussed by K. and J. Pennypacker, encompassing various forms of organizational development (Karpenko et al., 2022). Evolving models of product development maturity span from basic to highly sophisticated (Karpenko et al., 2022).

3.2.3. Culture

Culture plays a pivotal role in shaping activities within organizational and project environments, with its depth significantly influencing organizational performance efficacy (Gomes Silva et al., 2022). Organizational culture,

characterized by standard operating procedures and leadership guidance, functions as a value system (Kim & Jung, 2022). In contrast, project management culture defines enterprise goals, impacting decision-making processes and operational efficiency in goal attainment (Gomes Silva et al., 2022). Scholars have explored the connections between corporate culture and project outcomes within organizational contexts (Triguero-Sánchez, Peña-Vinces, & Ferreira, 2022). Differences between Western and Eastern European nations exist regarding how corporate cultures relate to managerial leadership in construction projects (Ma & Cheok, 2022). Subsequent research has investigated whether national culture influences project management practices in building projects (Reyes, Ghosh, & Mporu, 2022).

Experimental observations highlight the influence of corporate culture on project performance, including disruptions in timetables and quality assurance. A proposed corporate culture structure comprises seven crucial variables aimed at guiding successful project management in building projects, covering goal setting, a sense of accomplishment, teamwork, integration and coordination efficiency emphasis, organizational innovation, member participation, and reward orientation (Mubasher 2022). Given the diverse organizational cultures represented by various project stakeholders, project management culture becomes inter-organizational (D., Guo, & Zhao, 2022). Ongoing research explores the linkages between inter-organizational collaboration, cultural factors, and project performance in the construction sector, revealing connections between collaboration and assignment/task performance (Lægneid & Rykkja, 2022).

3.2.4. Efficiency

Project managers and suppliers, when evaluating project success, prioritize specific elements such as time, cost, and scope, along with identifying project efficiency and performance outcomes (Mubasher 2022). Attaining project goals and fulfilling scope requirements necessitate the efficiency of project management practices to avoid poor outcomes, time and cost wastage, and erosion of customer confidence (Fey & Kock, 2022). Higher performance standards demand enhanced efficiency in project management practices (Tezel & Koskela, 2023). In the academic sector, efficiency contributes significantly to performance in university projects through regular monitoring, fostering effective project management, and informed decision-making (Mubasher 2022).

Multiple definitions of project management exist in the literature. According to J. Davidson Frame, it involves “likely the most efficient project execution in terms of time, money, and resources that may be secured within a particular budget, and technical needs” (Toljaga-Nikolić et al., 2020). Project management encompasses managerial tasks, techniques, and tools to achieve specific goals within time, cost, and quality constraints (Tariq et al., 2020). It is also described as “a method of monitoring and applying existing information, skills, tools, and approaches to meet the goals of project stakeholders” (Tariq et al., 2020). In the project management process, the strategic acquisition of critical people, material, financial, and information resources is essential to achieving the project’s goal (Brandl et al., 2021). Consequently, project management ensures project delivery is aligned with set objectives and scope, on schedule, utilizing appropriate resources, techniques, and means for effective completion. Thus, we hypothesize that:

H1: Project Management Practices (PMPs) should have a significant impact on Project Success (PS).

3.3. Infrastructure Sustainability (IS)

Infrastructure sustainability stands as a critical determinant of infrastructure project success (Delanka-Pedige et al., 2021). In developed economic systems, the process of ensuring infrastructural sustainability is considered pivotal for overall economic and social development (Grum & Kobal Grum, 2020). To align project success with sustainability objectives, Umar et al. (2020) propose PM sustainability, integrating economic, social, and environmental factors into project delivery procedures through scheduling, monitoring, and supervision.

This research emphasizes the long-term success (IS) of infrastructure within its lifecycle, highlighting the

preservation of shape, usability, and functional values (Mamirkulova et al., 2020). However, evaluating infrastructure performance poses challenges in simultaneously acquiring knowledge of project management. The success or failure of a project hinges on factors such as the process's ability to meet technical goals within scope, time, and cost constraints; perceived usefulness by stakeholders; and the project's performance and sustainability (Mubasher 2022).

3.3.1. Social Utilities

Sustainability in business extends to its societal impact, encompassing social dimensions such as community support, interactions, and corporate social responsibility (CSR) (Fraze et al., 2019; Cole, Epstein, & McGinnis, 2019). The success of socially focused programs relies on consumer choices, perceptions, and support, with crucial roles played by employee motivation, consumer attitudes, and achieved business objectives in social sustainability efforts (Galichon & Salanié, 2022). Under the dual pressures of environmental and social considerations, businesses face increasing demands to demonstrate their contributions to society (Mubasher 2022). Marketing practices, covering economic, environmental, and social aspects, involve the real or perceived impact of organizational decisions on the social environment, termed social impact (Milli et al., 2019).

Social impacts encompass a broad spectrum of changes in individuals' physiological states, experiences, motives, emotions, cognitive distortions, and beliefs, whether intended or unintended, predicted or unpredicted (Duffy, Tandoc, & Ling, 2020). Changes in the way individuals live, experience, sustain, and operate within society, resulting from organizational choices and behavior patterns, define social impacts. Public opinion serves as a boundary-spanning function, involving the transmission of information, relationship management, and meaning creation (Schwartz et al., 2019).

3.3.2. Project Economy

The economic dimension of sustainability, focusing on value creation and improved financial performance, has gained prominence among the three sustainability dimensions. Economic studies have delved into the relationships between marketing resources, competencies, assets, and performance (Abadi, Moore, & Sammuneh, 2021). Emphasizing the acquisition of marketing resources and capabilities for competitive advantage is vital for enhanced economic performance, aligning with sustainability goals (Chembessi, Beaurain, & Cloutier, 2022).

In the context of IT projects, persistent challenges, including cost and schedule overruns and difficulties in realizing projected benefits, persist. Success criteria for IT systems in emerging and developing economies may significantly differ from those in industrialized nations. Emerging economies, marked by low GDP per capita, limited industrial foundations, and inadequate infrastructure, face unique challenges (Angelis-Dimakis et al., 2022). While the terms "emerging" and "developing" are sometimes used interchangeably, certain emerging economies exhibit robust, continuous economic growth and rising per capita income, distinguishing them from less active developing countries (González-Domínguez et al., 2020). The term "emerging market economy" refers to a nation or region undergoing rapid economic expansion, often facilitated by committed leaders promoting liberalization (González-Domínguez et al., 2020). In contrast, some developing nations or economic areas may not demonstrate continuous significant growth, possibly due to a lack of resources, administrative willingness to adopt changes, or deliberate adherence to existing regulatory systems (Mannina et al., 2021).

3.3.3. Environmental Implications

Businesses increasingly prioritize corporate environmental management and natural resource conservation due to growing environmental sustainability concerns. In today's economy, corporate environmental responsibilities have become more significant. Initial research has primarily focused on factors influencing the adoption of environmental strategies and their outcomes (García de Soto et al., 2022). While the economic and energy sectors have shown improvement, the primary emphasis remains on positive environmental impact. Environmental risk

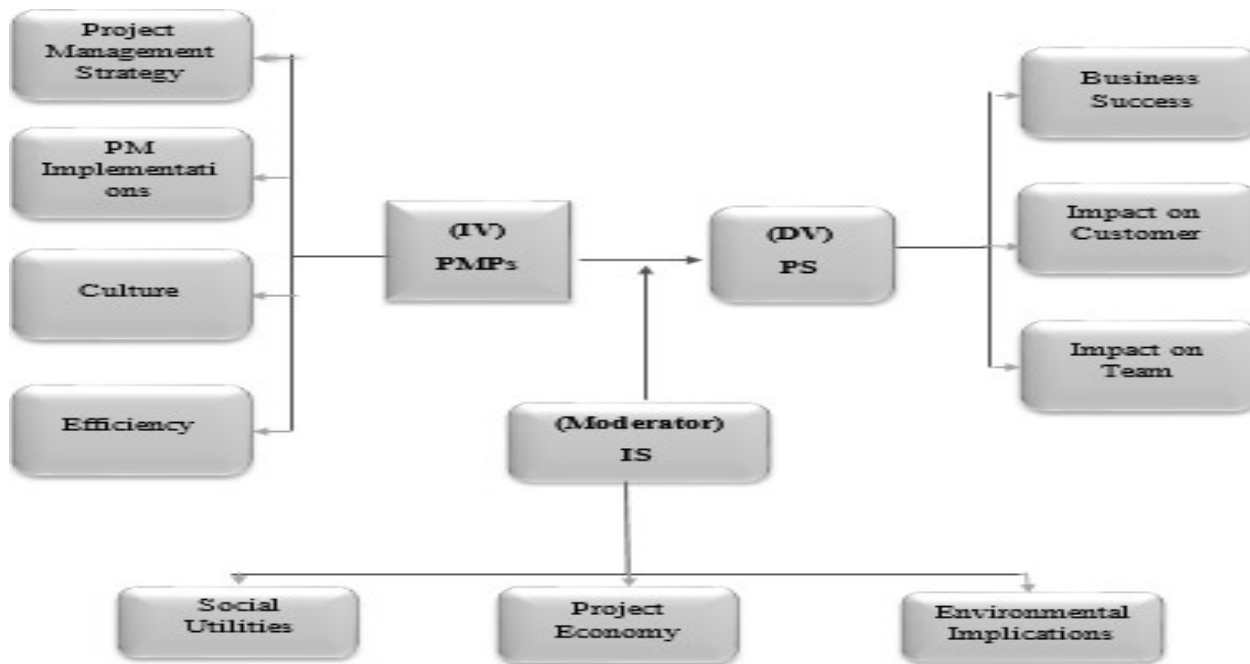
assessment, mandated by national environmental legislation, is crucial, especially in densely populated countries like China and Pakistan. The China-Pakistan Economic Corridor (CPEC) project faces notable environmental risks, including air quality and water scarcity. Road development contributes to air and water quality degradation, environmental resource depletion, and biodiversity loss. Effective management strategies are essential to promote sustainability and address these concerns (Opoku, 2019). The CPEC project has gained international collaboration and support, with Saudi Arabia joining as a third partner in 2018, investing \$10 billion. This investment is expected to expedite development activities, particularly in infrastructure and Pakistan’s mining sector. The project has not only shaped the economies of China and Pakistan but has also significantly enhanced international relations through collaboration and investments from various nations (Opoku, 2019). Throughout the whole life cycle of infrastructure projects, IS focuses on effectively meeting human requirements in a resource-efficient, environmentally sustainable, and well-managed manner (Mubasher 2022). Hence it is hypothesized that:

H2: Infrastructural Sustainability (IS) should have a strong positive impact on Project Success (PS).

H3: Infrastructural Sustainability (IS) should have a strong positive moderating impact on Project Success (PS).

The conceptual model conceived as a result of literature review is presented below in figure 1

Figure 01
Conceptual Model



4. Research Methodology

This study adopts a comprehensive research design to address objectives related to the impact of Project Management Practices (PMPs) on Project Success (PS), the influence of Infrastructural Sustainability (IS) on project success, and the reciprocal relationship between PMPs and IS. Integrating theoretical insights from systematic literature reviews with empirical survey methods, the research follows an exploratory approach with a quantitative focus, particularly drawing from the construction and engineering projects fields.

In Table 1 the description of variables, their dimensions and abbreviations used for those variables in this study, are presented.

Table 01*Description of Variables and Abbreviations*

PS	Project Success The scope, time, and cost triangle is crucial for project success, focusing on mission effectiveness, customer implications, team building, company success, and future direction.
BS	Business Success Profitability can be enhanced by minimizing expenses, establishing a positive reputation, and increasing sales and market share.
IC	Impact on Customer The goal is to enhance the quality of life, offer value, and meet the needs of the customers.
IT	Impact on Team Performance evaluation significantly impacts an individual's performance, affecting the organization, team development, motivation, productivity, project loyalty, and learning enhancement.
PMP	Project Management Practices Project management practices involve the strategic application of processes, strategies, implementations, culture, and experience to achieve specific project objectives within agreed parameters.
ST	Strategy The project's ultimate goals should be oriented through specific steps and strategies.
IM	Implementations Effective resource utilization techniques and management tools for achieving project objectives.
CUL	Culture The organization's culture is largely influenced by its leaders' effective staff management techniques and leadership style.
EFF	Efficiency The task involves ensuring that quality, product standards, cost, time, and scope are met.
IS	Infrastructural Sustainability To be considered sustainable infrastructure, a project's delivery methods, scheduling, monitoring, and supervision must consider economic, social, and environmental aspects at every stage of its lifecycle.
SU	Social utility This involves managing client interactions, fostering connections with nearby communities, and overseeing labor practices.
PE	Project Economy The project aims to enhance working conditions, labor health, profit maximization, reputation building, and infrastructure maintenance during its operational period.
EI	Environmental Implications Promoting sustainable behaviors requires reducing non-renewable resource use, waste, pollution, efficient energy use, and increasing biodiversity.

4.1. Sampling, Data Collection Method

Primary data is collected through a well-structured questionnaire distributed via various channels, targeting national companies involved in such projects. The questionnaire design aligns with prior studies, utilizing Likert scales for PMPs, IS, and PS. 400 questionnaires were distributed through emails, Google surveys, and by hand to the target population of the study, the returned filled questionnaires were 353 which is 88.25% of the sample size.

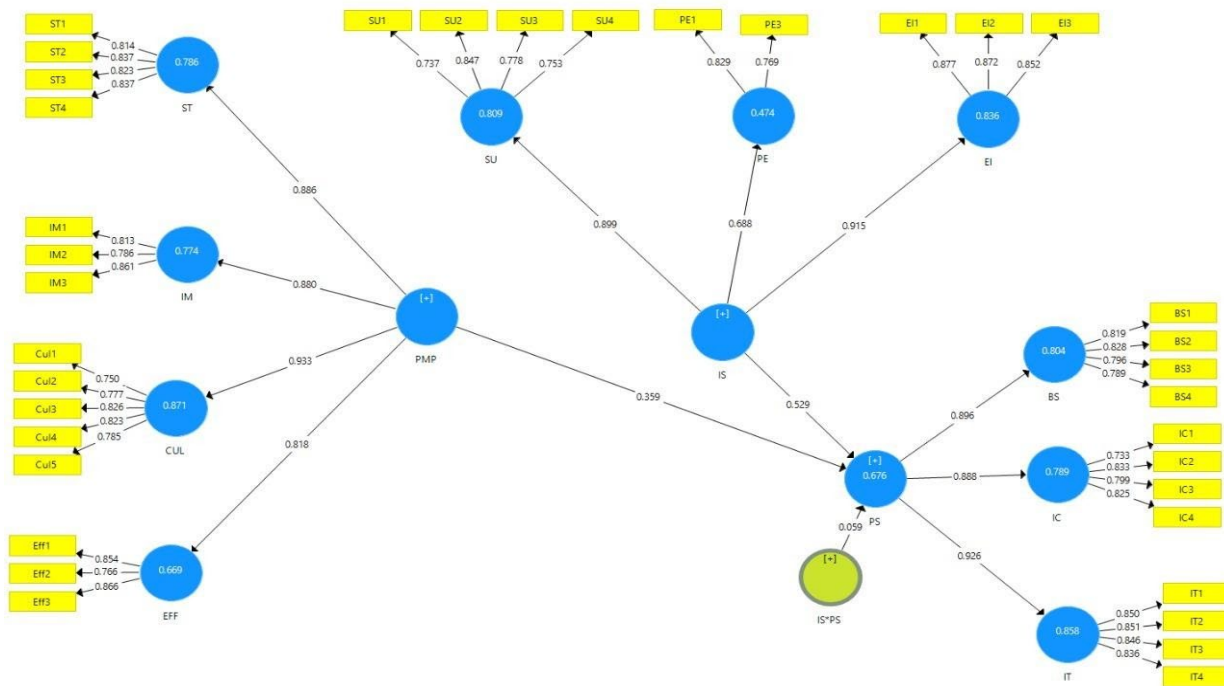
4.2. Data Analysis Methods

The analysis is conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM), chosen for its suitability in handling complex structural models and exploratory research involving multiple constructs and indicators. PLS-SEM's flexibility in modeling relationships between latent variables and indicators makes it particularly well-suited for the multidimensional model employed in this study. Rigorous assessments for convergent validity, construct reliability, average variance extracted, cross-loadings, and discriminant validity ensure a robust exploration of the relationships between PMPs, IS, and PS in the context of domestic projects in Pakistan (Velte, 2022; Joe F Hair Jr et al., 2020; Bell, Hopkin, & Forrester, 2019; Skiendziel et al., 2019).

5. Data Analysis

Relationships of Project Management Practices and Infrastructural Sustainability with Project Success are shown in figure 2, and in tables presented in next part, the results have been presented and discussed.

Figure 02
Structural Model



The results for factor loadings of items, reliability and validity of scales for measurement of constructs used in this study are presented in Table 2.

Table 02
Validity and Reliability Scores

Constructs & their Items	Factor Loadings	Composite Reliability	AVE
Project management Practices (PMPs)		0.939	0.544
Strategy (ST)		0.897	0.685
ST1	0.814		
ST2	0.837		
ST3	0.823		
ST4	0.837		
Implementations (IM)		0.861	0.674
IM1	0.813		
IM2	0.786		
IM3	0.861		
Culture (CUL)		0.894	0.628
Cul1	0.750		
Cul2	0.777		
Cul3	0.826		
Cul4	0.823		
Cul5	0.785		
Efficiency (Eff)		0.869	0.688
Eff1	0.854		
Eff2	0.766		
Eff3	0.866		

Eff1	0.854		
Eff2	0.766		
Eff3	0.866		
Infrastructural Sustainability (IS)		0.893	0.583
Social Utility (SU)		0.861	0.608
SU1	0.737		
SU2	0.847		
SU3	0.778		
SU4	0.753		
Project Economy (PE)	0.780		0.639
PE1	0.829		
PE2	-		
PE3	0.769		
Environmental Implications (EI)	0.901		0.752
EI1	0.877		
EI2	0.872		
EI3	0.852		
Project Success (PS)	0.934		0.563
Business Success (BS)	0.883		0.653
BS1	0.819		
BS2	0.828		
BS3	0.796		
BS4	0.789		
Impact on Customer (IC)	0.875		0.638
IC1	0.733		
IC2	0.833		
IC3	0.799		
IC4	0.825		
Impact on Team (IT)	0.910		0.715
IT1	0.850		
IT2	0.851		
IT3	0.846		
IT4	0.836		

Table2 explains the latent variables in this study, encompassing strategy, implementations, culture, efficiency, social utility, project economy, environmental implications, business success, impact on the customer, and impact on the team, meet established criteria for validity and reliability. Outer loading values for all factors/indicators exceed the 0.708 threshold, affirming their reliability. Convergent validity and reliability analysis show Composite Reliability (CR) values exceeding 0.708, indicating internal reliability. PMP was measured using 15 items, the composite reliability for the Project Management Practices (PMP) is 0.939 which is highly significant and the Average Variance (AVE) value is 0.544 which is higher than the threshold value of 0.50, confirming the external validity. Additionally, the value of Composite Reliability of Project Success (PS) is significantly acceptable as 0.934, and the value of AVE is 0.563. The values of CR for Infrastructural Sustainability also exceed the threshold value of 0.708 as 0.893 so significant internal validity and the value of AVE is 0.583 shows significant external validity. Notably, the Composite Reliability for the moderating effect of PMP*IS on PS is a perfect 1.000, signifying high acceptability. Additionally, Average Variance (AVE) values surpassing 0.50 confirm external validity. To optimize factor loadings, item PE2, with a non-significant factor loading of 0.04, below the acceptable threshold, was excluded during the measurement model phase. This strategic elimination aims to enhance the overall significance of loadings in the analysis.

Table 3
Discriminant Validity

	BS	CUL	EFF	EI	IC	IM	IS	IT	PE	PMP	PS	ST	SU
BS							0.808						
CUL	0.643												
EFF	0.588	0.732											
EI	0.707	0.649	0.580										
IC	0.711	0.653	0.593	0.657									
IM	0.582	0.790	0.671	0.580	0.614								
IS	0.763	0.762	0.703	0.815	0.706	0.686							
IT	0.727	0.618	0.571	0.630	0.763	0.583	0.691						
PE	0.479	0.536	0.558	0.475	0.443	0.488	0.688	0.452					
PMP	0.684	0.790	0.818	0.657	0.697	0.780	0.761	0.676	0.567				
PS	0.807	0.697	0.639	0.728	0.788	0.650	0.790	0.826	0.498	0.734			
ST	0.613	0.724	0.625	0.536	0.630	0.738	0.640	0.629	0.460	0.886	0.687		
SU	0.695	0.750	0.705	0.669	0.646	0.678	0.899	0.643	0.754	0.777	0.729	0.649	

Table 3 explains the discriminant validity. The discriminant validity values for the constructs in this study surpass the required thresholds as mentioned by Hair Jr., Hult, Ringle, Sarstedt, Danks, and Ray (2021). The discriminant validity values for each construct, including BS, Cul, Eff, EI, IS, IC, IT, IM, PMP, PS, PE, SU, and ST, range between 0.737 and 0.867. According to results presented in Table, these values demonstrate that the constructs indeed possess discriminant validity, meeting the prescribed criteria.

Table 04
Structural Model

Hypothesis	Path	Sign	Coeff	SD	T Value	P Value	Results
H1	PMP -> PS	+	0.359	0.060	5.997	0.000	Supported
H2	IS -> PS	+	0.529	0.056	9.503	0.000	Supported
H3	PMP*IS -> PS	+	0.059	0.028	2.131	0.033	Supported

Results presented in Table4, corresponding with standards presented by Hair and Black’s (2019) confirm the significance of relationships in the study. This table describes the relationship between Project Management Practices (PMPs) and Project Success (PS) is highly significant (t-value = 5.997, p-value = 0.000). Additionally, Infrastructural Sustainability (IS) significantly impacts PS (t-value = 9.503, p-value = 0.000). The moderating effect of IS between PMPs and PS is also significant (t-value = 2.131, p-value = 0.033), surpassing the 1.96 threshold. These results succinctly highlight the statistical significance of both direct relationships and the moderating effect, providing robust empirical support for the study’s key associations.

Table 05*R-Square*

	R Square	R Square Adjusted
Business success	0.804	0.803
Culture	0.871	0.871
Efficiency	0.669	0.668
Environmental implications	0.836	0.836
Impact on customer	0.789	0.789
Implementations	0.774	0.773
Impact on team	0.858	0.858
Project economy	0.474	0.472
Project success	0.676	0.673
Strategy	0.786	0.785
Social utility	0.809	0.808

Table 5 explains the R-squared and adjusted R-squared statistics originate from general linear model-based analyses (e.g., regression analyses, ANOVA), and they show the percentage of the outcome variable's variance that can be accounted for by the sample's predictor variables (R-squared) and a population estimate (adjusted R-squared). In social science research, an R-squared of 0.50 to 0.99 is considered appropriate, particularly when the majority of the explanatory factors exhibit statistical significance. The sole qualification to this is that multicollinearity or spurious causation among the variables that explain shouldn't be the reason for the high R squared. P. K. Ozili (2023). The dependent variable Project Success has an R square and an adjusted R square of 0.676 and 0.673, respectively, according to the table above. These values range from 0.50 to 0.99. It is inferred that a 67.6% change in Project Success (dependent variable) in loyalty can be accounted for Project Management Practices and Infrastructural sustainability.

6. Conclusion and Implications

This discussion summarizes the key findings and implications of a study investigating the impact of Project Management Practices (PMPs) on Project Success (PS) in the context of a developing country, specifically Pakistan. Literature shows most initiatives are unsuitable for project management, indicating that project success depends on customization to specific goals, indicating that project management techniques are either not directly related or poorly applied (Mubasher 2022; Almashhadani & Almashhadani 2023; Ekemezie & Digitemie, 2024; Digitemie & Ekemezie, 2024; Karamthulla et al., 2024). Previous research has shown significant achievements in assessing development supportability and executive projects. The first research question addressed the impact of PMPs on PS, and the study revealed a highly significant positive relationship. The four dimensions of PMPs (PM Strategy, PM Culture, PM Efficiency, and PM Implementations) were explored, each demonstrating a positive and significant impact on PS.

Studies have explored the relationship between PMPs and IS, highlighting the influence of top supervisors' authority, partner commitment, board knowledge, and greening PMPs for appropriate development. However, there is still a knowledge vacuum regarding the relationship between PMPs and IS (Mubasher 2022; Akomea-Frimpong et al., 2023; Aboagye et al., 2024; Ige et al., 2024). The second question examined the impact of Infrastructural Sustainability (IS) on PS, revealing a strong positive correlation. IS was found to significantly influence Environmental Implications (EI), Project Economy (PE), and Social Utility (SU), further emphasizing its comprehensive impact. The analysis also highlighted positive and significant relationships between PS and Business Success (BS), Impact on Customer (IC), and Impact on Team (IT).

Infrastructure Sustainability (IS) is crucial for urban expansion and preservation, aiming to provide cost-effective benefits for the environment, culture, and budget while preserving long-term value. It requires project

management skills and the ability to maximize positive environmental effects while balancing resources and limits (Mubasher 2022; Tian et al., 2023; Mahmood et al., 2024; Aboagye et al., 2024). In addressing the third question, the study introduced IS as a moderator between PMPs and PS, providing novel insights. The moderating effect of IS was found to be significant, indicating its role in shaping the link between PMPs and PS. This unique perspective contributes to the understanding of the interplay between PMPs, IS, and project success. The conclusion emphasizes the significance of effective PMPs and the novel role of IS in a developing nation's socio-political and economic landscape.

The study's contribution lies in its pioneering approach, shedding light on the intricate dynamics of project success in a challenging context and advances the literature on PMPs by focusing on PS which further improves organization outcomes (turnover and innovation). Overall, the research offers valuable insights for practitioners, policymakers, and researchers, enriching the understanding of how PMPs, IS, and project success intersect in the unique setting of a developing nation.

7. Limitations and Future Recommendations

Only the impact of project management techniques on project success is the subject of this study. One disadvantage of sustainable projects is that their effectiveness cannot be verified. The moderating effect of sustainable infrastructure is the sole subject of this research, which is limited to initiatives in the engineering and construction industries. As a result, the findings cannot be applied to other fields of industry, including project-based work in the IT, education, and food sectors. The research's next recommendation is to examine the moderating role that sustainable project management and plans have, both of which have a significant impact on project success.

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Acknowledgments

The authors are grateful for comments from two anonymous referees.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Disclaimer

The views and opinions expressed in this paper are those of the authors alone and do not necessarily reflect the views of any institution.

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