Evaluation and Optimizing Project Management for Enhanced Performance in Construction Industry of Developing Countries

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Abstract

Excellent project management is critical to performing well in the ever-changing construction industry which is lacking in developing countries including Pakistan. This research dives into project management by using data analysis methods, including the Relative Importance Index (RII) and rankings based on surveys. These methods help to understand the most important factors for success and subsequently affect project results. The RII designates a number for each factor to display its importance. These values allow stakeholders to gauge the impact of different aspects on project success, guiding resource allocation and decision-making. Ranking these factors adds a layer of clarity, enabling stakeholders to discern priorities and allocate efforts sensibly. Analyzing insights derived from individual questions provides a nuanced perspective on specific aspects. For instance, clear roles and responsibilities (RII: 0.748) emerge as a foundational factor, emphasizing the importance of organizational clarity. Effective communication (RII: 0.655) is a significant challenge, highlighting the need for streamlined information dissemination. Based on these analyses, actionable recommendations arise with subsequent improving communication channels,

enhancing planning processes, investing in skill development, and adopting technology are among the proposed strategies for sustainable development. In the context of the construction industry, the findings resonate profoundly and offer a blueprint for stakeholders to optimize project management processes, driving success in an industry disreputable for its intricacies. By embracing data-driven insights, stakeholders can navigate the complexities of construction projects with informed decisions and strategic actions.

Keywords: Relative Importance Index (RII), SPSS, critical success factors, stakeholders, strategic management

Introduction

The construction industry in developing countries such as Pakistan has witnessed substantial growth and development over the past few decades, owing to rapid urbanization and infrastructural advancements. However, amidst this progress, project management processes have faced numerous challenges that hinder the efficient execution and successful completion of construction projects[1–3]. Understanding and addressing these challenges are crucial for enhancing the overall productivity, cost-effectiveness, and quality of construction projects[4–7]. The efficiency of project management is especially important in the context of Pakistan, a nation that is fast developing and has a thriving construction sector. The complex and multidimensional character of building projects demands a thorough comprehension of the variables affecting the project management process in this area[1, 8, 9].

The project management process encompasses a series of interrelated activities, including time management, planning, organizing, executing, and controlling, to achieve project objectives efficiently. In the context of Pakistan's construction industry, the project management process faces numerous complexities, which are primarily attributed to the unique socio-economic and environmental conditions of the country. Understanding the challenges within this process will enable stakeholders to adopt suitable project management methodologies and best practices for improved project performance [9, 10].

Effective communication is the backbone of successful project management. In the construction industry of developing countries, poor communication among stakeholders often leads to misunderstandings, conflicts, and delays in decision-making, adversely impacting project progress. Identifying the communication barriers and their impact on project outcomes is crucial for fostering better collaboration and coordination among team members and stakeholders [9].

Time management is a critical aspect of project execution in the construction industry. Delays in project completion not only led to increased costs but also resulted in missed opportunities and potential financial losses for all stakeholders involved. In the context of the construction industry, time factors have been consistently identified as one of the major challenges that impede project progress. Understanding the root causes and consequences of delays is essential to devise effective strategies for timely project completion [11]. Cost overruns are a common concern in construction projects worldwide. In the case of Pakistan's construction industry, cost factors play a significant role in shaping project outcomes. Unanticipated expenses, material price fluctuations, and inefficiencies in resource allocation can lead to budgetary constraints, leading to compromised project quality and stakeholder dissatisfaction. Analyzing the various cost factors impacting construction projects will aid in devising cost-effective and sustainable solutions to mitigate financial risks[12, 13]. Studies have found a number of elements that contribute significantly to communication issues in the sector, including unclear communication routes, poor information exchange, and cultural obstacles[9, 14–16]. Clear and open communication among stakeholders promotes greater cooperation, decision-making, and problem-solving, according to prior research[17, 18]. In order to improve collaboration, cooperation, and project success in Pakistan's construction business, efficient communication techniques are essential. Furthermore, the literature analysis on the difficulties and effects of poor planning in building projects analyses shows that planning plays significant role in project success.

According to Dlamini & Cumberlege, (2021), poor planning frequently causes project delays, cost overruns, and impaired project quality [19]. Planning issues have been linked to a number of factors, including inadequate risk assessment, improper resource allocation, and poor project scope specification[20]. Inadequate planning's effects on stakeholder satisfaction and project results as a whole are also examined to mitigate the issues[21]. According to studies, project management software should be integrated and strong planning approaches should be adopted to address these issues [1, 22–24]. Unfortunately, poor or ineffective planning has consistently been a problem in Pakistan's building sector. Project risks can grow and scope creep and improper resource allocation might result from poorly established project plans. By investigating the underlying factors and effects of inadequate planning, comprehensive measures may be developed to guarantee improved project outcomes[25].

The analysis of the literature on budgeting and cost control strategies used in Pakistan's construction sector focuses on the crucial role that financial management plays in building projects. The importance of cost control has been underlined in prior studies as a means of preventing cost overruns and guaranteeing project profitability[26]. According to studies conducted by Yismalet & Patel[27], aspects including a precise cost estimate, efficient resource allocation, and ongoing project expenditure monitoring are crucial for effective cost control[27]. The study and review investigate the use of Earned Value Management (EVM) and other budgeting methods to monitor project expenses and performance [28]. In the context of Pakistan's building sector, it also investigates how regulatory and economic issues affect budgeting[29]. This study summarises pertinent research and emphasises the significance of using efficient cost-control strategies and budgeting approaches for the accomplishment of building projects in Pakistan.

Pakistan's construction sector has grown significantly over the years as a result of urbanisation, population growth, and infrastructure improvement. As a result, planning, resource allocation, risk reduction, stakeholder management, and adherence to stringent deadlines are just a few of the complex interactions that must

take place for construction projects to be successfully completed[8]. The regulatory impairments, shifting economic situations, technical improvements, and resource limitations are just a few of the problems this business faces. Moreover, the stakeholders may better understand the dynamics at work and develop strategies to successfully minimise difficulties by methodically evaluating these elements. The knowledge gained from this study can not only improve project results but also boost Pakistan's construction industry as a whole. To comprehensively investigate the intricate web of variables affecting project management in the Pakistani construction landscape, a holistic approach is imperative. By employing both qualitative and quantitative research methodologies, this study aims to provide a nuanced understanding of the multifaceted challenges and opportunities faced by project managers. This research holds significance not only for professionals directly engaged in the construction industry but also for academia, policymakers, and relevant authorities. By uncovering the underlying determinants of successful project management in Pakistan's construction realm, this study aspires to contribute to the body of knowledge in both project management and construction management domains. As the study unfolded, it has shed light on strategies that can potentially reshape and optimize project management approaches in Pakistan, thereby fostering more efficient and successful project deliveries. In short, this study aims to explore the factors influencing the project management procedure in Pakistan's construction sector, paying particular attention to time variables, cost variables, inadequate communication, and poor planning.

Methodology

In this research, a quantitative approach is used to investigate the factors impacting project management process in the construction industry of Pakistan. This includes the development of a questionnaire as well as the collection of demographic information regarding the respondents encompassing various departments within the construction sector. This also includes the statistical analysis of the data which consists of the reliability analysis and the relative importance

index. Fig. 1a and 1b show methodology and conceptual framework of the research, respectively.
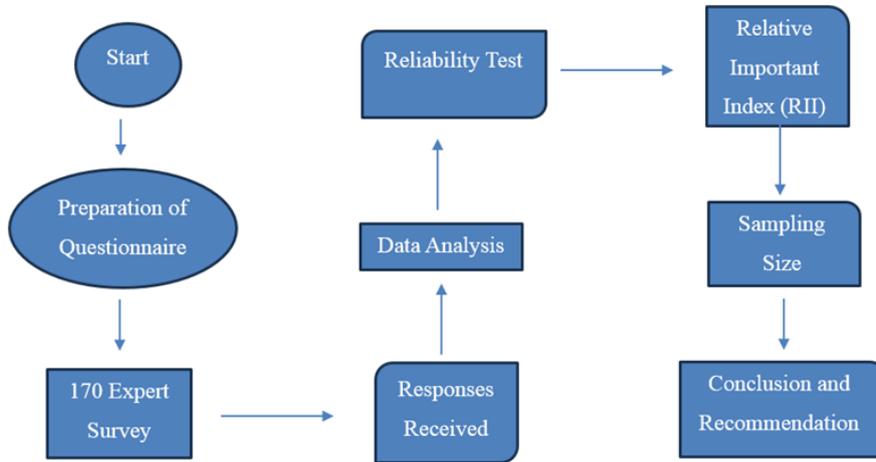

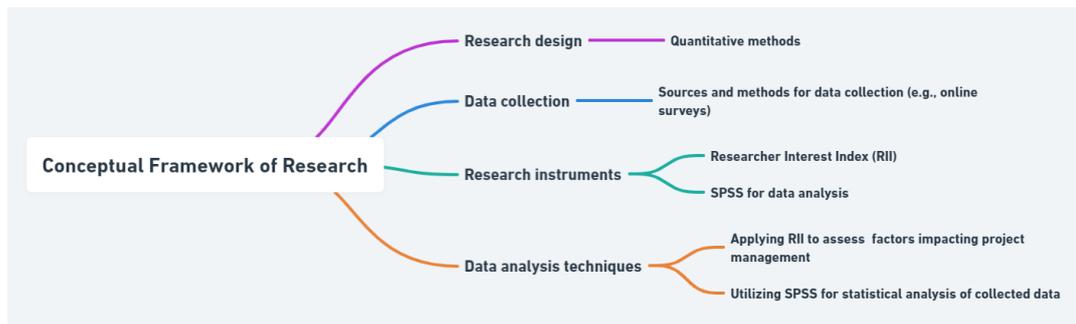Fig. 1a Overview of methodological framework of research

Fig. 2b Illustration of conceptual framework of research

As evident, the research design in a research work guides the collection of the data and analysis of the data[30, 31]. In this research work, closed-ended questionnaires were used to obtain data from the respondents. Interviews were also carried out based on the closed-ended questionnaires to properly coordinate the questionnaire to the respondents. This helped in obtaining more accurate answers and increased the response rate. The research population in the research work was comprised of 45 contracting companies that have valid registration with the Pakistan Engineering Council in the KP Peshawar region, who were taking active part in ongoing projects and the responses received were approximately 170. Subsequently, these responses were used for analysis. In fact, this result has been achieved by

guiding the whole questionnaire process through personal interviews. Selections are made through the sampling process[32]. The representative units are selected through the sampling process and the statistical calculation is used to calculate the sample size. The sample size is calculated through the following formula:

$$SS = \frac{Z^2 \times P \times (1 - P)}{C^2} \dots\dots\dots\dots\dots (i)$$

Where SS = Sample size

Z = Z value (e.g., 1.96 for a 95% confidence interval)

P = Percentage picking a choice, expressed as decimal, (0.50 used for sample size needed)

C = Confidence Interval (0.05)

$$SS = \frac{[1.96^2 \times 0.5 \times (1 - 0.5)]}{0.05^2}$$

 SS= 384

For finite population, the formula is as follows:

$$SS\ new = \frac{SS}{1 + \dfrac{SS - 1}{pop}} \dots\dots\dots\dots. (ii)$$

Where pop refers to the population. In our case the population is of 45 contracting companies. Therefore,

$$SSnew = \frac{384}{1 + (384 - \dfrac{1}{45})}$$

SS new = 40.36

To identify and investigate the factors impacting the project management process on construction projects in Pakistan, an online questionnaire data is collected from different experts in the construction industry via Google Forms. The

web link of the questionnaire is shared with different experts in the industry through electronic media including LinkedIn, emails, WhatsApp, and other educational web pages. A closed-ended questionnaire has also been designed that were related to time factors, cost factors, project management process, poor communication, and poor planning. The different factors have been distributed to groups and the responses are provided to rate each factor on a Likert scale of 1-5 scale. It is the most widely used approach to scaling responses in survey research, such that the term (or more accurately the Likert-type scale) is often used interchangeably with rating scales, although there are other types of rating scales. There are nine types of risks namely environmental, design, physical, political, financial, legal, construction, logistics, and management risks[5]. The risks that have the highest contribution are given the largest weighted score and the weighted score is obtained by summation of the product of a number of respondents to the severity marked by the respondent on the Likert scale (1 for Strongly Disagree, 2 for Disagree, 3 for Neutral, 4 for Agree and 5 for Strongly Agree). Data collected through questionnaires was analyzed using SPSS software and MS Excel. Weights are calculated using an Excel sheet and quantitative statistical techniques are adopted for analysis purposes. The statistical techniques used include reliability analysis (Cronbach Alpha), Kruskal Walliss (as data is not normal), and Spearman correlation analysis.

The following formula was used for RII as follow:

$$\text{RII} = \frac{€W}{A x N}$$

RII is the Relative importance index.

W is the Weight given for each response.

A is the highest weight = 5

N is the total number of Responses.

$$\text{RII} \quad = \frac{5(n5)+4(n4)+3(n3) + 2(n2)+(n1)}{5(n1+n2+n3+n4+n5)}$$

Whereas n1, n2, n3, n4, n5 are the responses which are selected.

Data Analysis

Initially, all responses and feedback were gathered from participants. Subsequently, the acquired data underwent conversion into appropriate units within Microsoft Excel. The transformed data was then imported into the Statistical Package for Social Sciences (SPSS) software to execute a Reliability Test. Following the reliability assessment, a Descriptive Analysis of the data and computation of the Relative Importance Index (RII) was conducted using MS Excel. Cronbach's Alpha is a statistical measure used to assess the internal consistency and reliability of a scale or questionnaire [33, 34]. It quantifies how closely related a set of items are within a measurement tool. It ranges from 0 to 1, where higher values indicate greater internal consistency. Data was collected from responses and analysis and Cronbach's Alpha calculated was 0.728. This value suggests a moderate level of internal consistency among the items in the scale. A Cronbach's Alpha value above 0.7 is generally considered acceptable for research purposes, as it indicates a relatively reliable measurement instrument. The number of items on the scale is 13. This refers to the total count of individual questions that participants responded to in a survey or assessment. The internal consistency calculated through Cronbach's Alpha indicates how well these 13 items collectively measure the same underlying construct. The result that indicated the value of Cronbach alpha coefficient for total items more than 0.744, was considered consistent indicating that our questionnaire is reliable. Note that a reliability coefficient of 0.7 or greater is considered "acceptable" in most social science research situations[33–35]. Proposed questionnaires for analysis are shown in Appendix 1, while response frequencies, RII, and Rank for each question is given in Appendix 2.

Appendix 2 presents a list of questions along with their corresponding labels, Relative Importance Index (RII) values, and ranks. This table appears to be part of an assessment or survey designed to evaluate various aspects of a project's management effectiveness. The questions were grouped for better understanding:

Question Label: Each question is labeled with a description that represents a specific aspect of project management. Relative Important Index (RII): The RII values quantify the relative importance of each question in assessing the overall effectiveness of the project management. These values typically range from 0 to 1, with higher values indicating greater importance. Rank: The rank is based on the RII values and indicates the order of importance among the questions. A lower rank number signifies higher importance. The questions covered a range of topics related to project management, including schedule management, budget management, communication, adaptability to changes, resource allocation, understanding of project scope, planning, risk management, and more. The RII scores demonstrated the perceived importance of each item in terms of adding to the overall evaluation of project management performance. For instance, question the project team had clear roles and responsibilities ("The project team had clear roles and responsibilities") has the highest RII value of 0.748 and is ranked first, indicating that stakeholders consider this question to be of utmost importance in assessing project management. On the other hand, ("The project team did not prioritize tasks effectively") has a low RII value of 0.592 and is ranked 29th, suggesting it is considered less crucial in the assessment. In conclusion, the data provided insights into the perceived significance (Appendix 2) and ordering of various project management components based on the RII values. This information is used to prioritize improvements and focus areas for enhancing the project management process.

Results and Discussion

The proposed research framework for investigating the factors impacting project management processes in Pakistan's construction industry encompasses a structured approach. This organised framework makes sure that the study issue is explored methodically from the outset to insightful conclusions, providing a thorough comprehension of the variables impacting project management in Pakistan's construction industry.

Analysis of factors involved in project management process

To clarify the significance of many crucial success criteria included in the project management procedure in Pakistan's building sector. The data and analytical results provided insights into numerous crucial success elements that have a substantial influence on project management in the context of the Pakistani construction sector. In the construction sector, efficient project time management is essential for ensuring that projects are completed on schedule. According to the statistics, the following elements are important for effective time management:

Effective job prioritization helps project teams keep on time (RII: 0.674, Rank: 12). The project team efficiently controls the project schedule (RII: 0.669, Rank: 13). The project team (RII: 0.679, Rank: 11) is able to adjust well to unforeseen changes in the project timeframe. The project team efficiently manages time using the right project management tools (RII: 0.684, Rank: 9). From the start, the project team was fully aware of the project's timetable (RII: 0.696, Rank: 6). The project team uses excellent prioritization to complete tasks on time (RII: 0.704, Rank: 5). These results (Fig. 2) underline the need of good time management, timeline clarity, and efficient change management for completing projects successfully and on schedule.
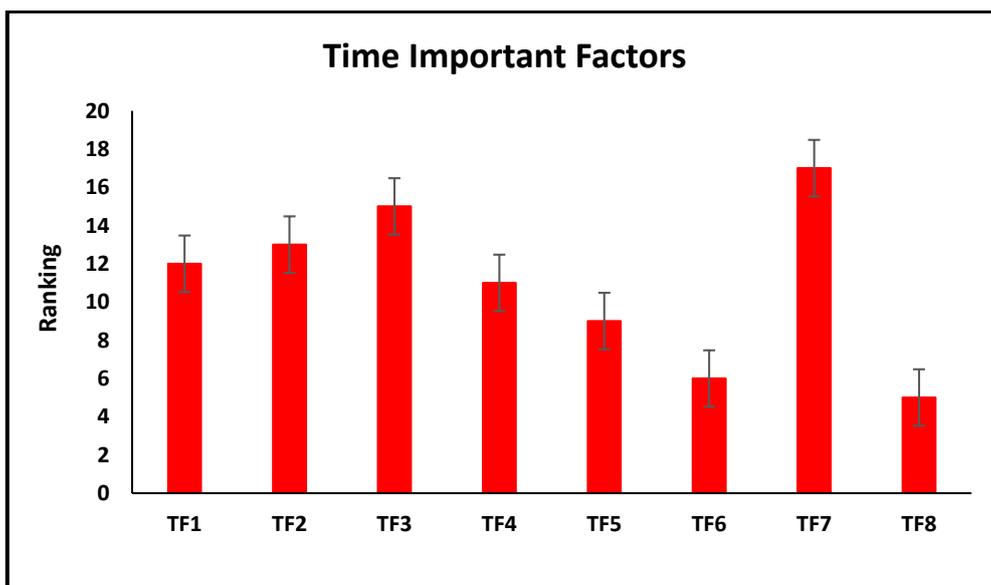

Fig. 2 Success time factors involved in the project management process.

Cost determinants to guarantee that projects are finished on time and under budget, cost management is essential in the construction business. The information draws attention to the following crucial cost-related factors: The project team did a good job of controlling expenses (RII: 0.635, Rank: 23). The project team efficiently managed expenses by utilizing the right project management tools (RII: 0.667, Rank: 14). From the start, the project team was well aware of the project budget (RII: 0.716, Rank: 4). To prevent possible cost overruns, the project team has a strategy in place (RII: 0.680, Rank: 1). These results (Fig. 3) highlight how crucial it is to effectively manage costs, comprehend budgets, and plan ahead to avoid cost overruns.
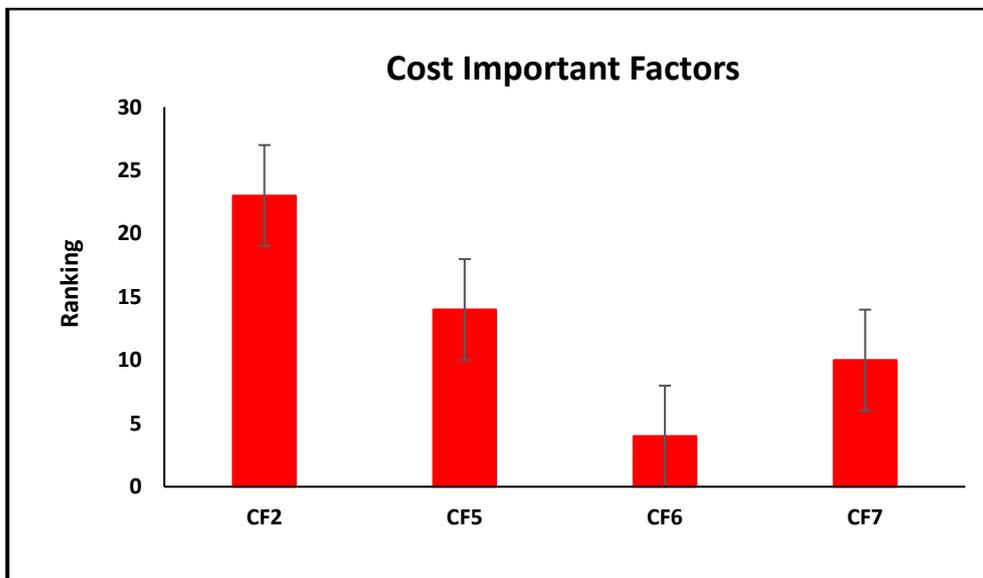

Fig. 3 Critical success costs factors involved in the project management process.

Successful construction projects depend on sound project management procedures. The information highlights the following project management-related factors: The project was successfully managed from beginning to end by the project team (RII: 0.685, Rank: 8). The project team handled project risks successfully (RII: 0.661, Rank: 18). Roles and duties in the project team were crystal clear (RII: 0.748, Rank: 1). The project team's project strategy was clearly established (RII: 0.738, Rank: 2). These results (as shown in Fig. 4) highlight the need of thorough project

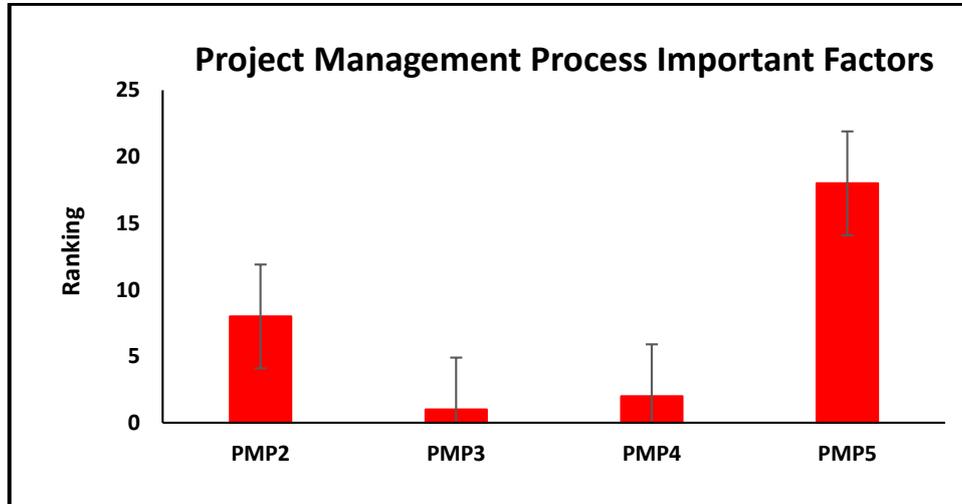planning, risk management, and clearly defined responsibilities to guarantee effective project execution.

Fig. 4 Critical success costs project management process factors involved in the project management process.

Poor Planning and Communication data identifies harmful elements that may prevent project success: Poor communication caused the project team to be delayed (RII: 0.655, Rank: 19), Poor planning caused the project team to be delayed (RII: 0.651, Rank: 20). These findings (Fig. 5) highlight the negative impacts of insufficient planning and communication, emphasizing the requirement for efficient project planning and communication procedures.
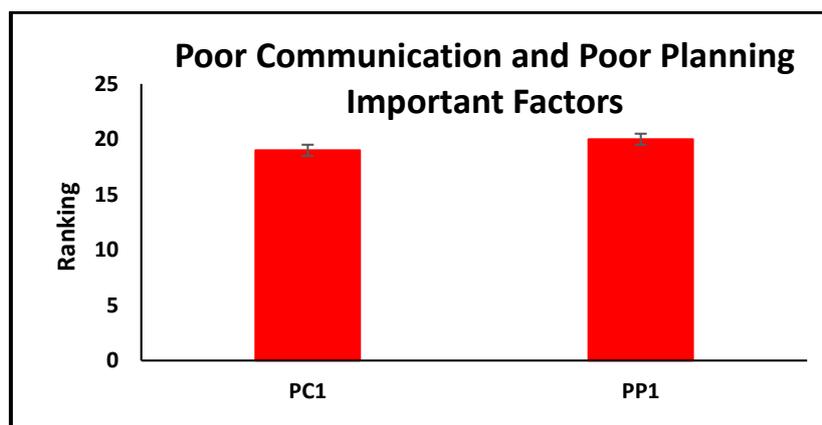

Fig. 5 Poor communication and poor planning factors involved in the project management process.

In conclusion, the analysis of these critical success factors provides valuable insights into improving project management in the construction industry of Pakistan. Effective time and cost management, solid project management processes, clear communication, and comprehensive planning are all vital for achieving successful project outcomes.

Analysis of Factors through Relative Importance Index (RII)

Analyzing the critical success factors using Relative Importance Index (RII) values helped us to understand the significance of each factor in project management. critically analyzed factors based on their RII values is follow:

Effective Task Prioritization and Timeline Management:

RII: 0.674 (the project team effectively prioritized tasks to stay on schedule.), 0.669 (the project team managed the project timeline effectively.), 0.662 (the project team effectively prioritized tasks to stay on schedule.), 0.704 (the project team effectively prioritized tasks to stay on schedule) These factors (Fig. 6) highlight the importance of maintaining schedule adherence through effective task prioritization and timeline management. The relatively high RII values emphasize their contribution to project success.
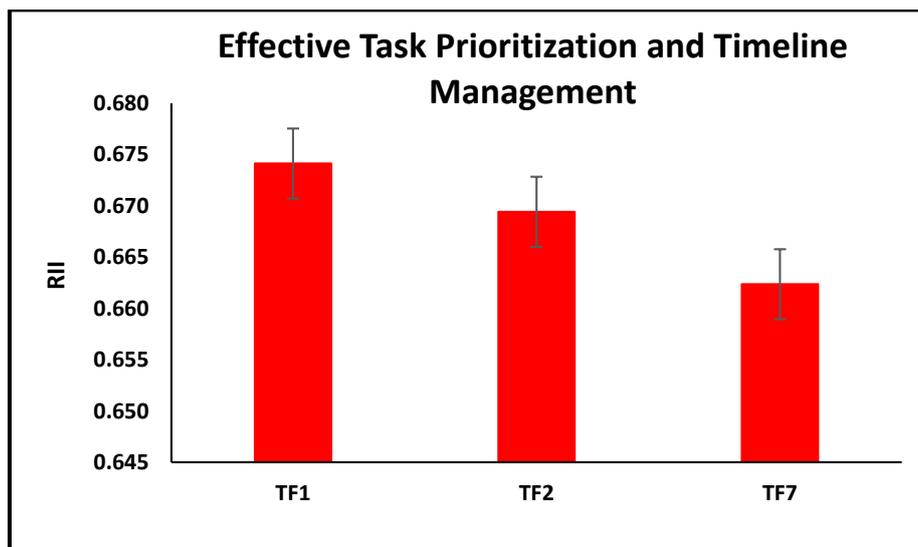

Fig. 6 Critical success factors using (RII), Effective Task Prioritization and Timeline Management

Communication and Adaptability

Timely communication of potential delays and adaptability to unexpected changes are vital. These factors (Fig. 7) play a significant role in preventing disruptions and minimizing negative impacts on project timelines. RII: 0.666 (the project team communicated any potential delays in a timely manner.), 0.679 (the project team adapted well to unexpected changes in the project timeline.), 0.655 (the project was delayed due to poor communication)
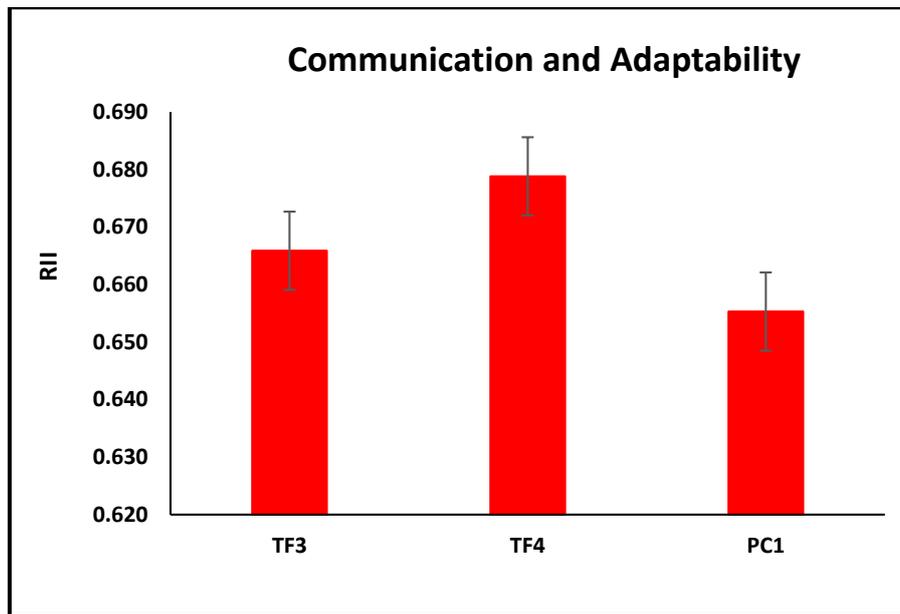

Fig. 7 Critical success factors using (RII), Communication and Adaptability

Project Scope and Management

A clear understanding of project scope and effective project management are essential for successful outcomes. High RII values indicate their substantial contribution to project success. RII: 0.732 (the project team had a clear understanding of the project scope.), 0.685 (the project team managed the project effectively from start to finish.), 0.661 (the project team effectively managed project risks.) (Fig. 8a and Fig. 8b). The underlying factors have high RII scores, indicating a uniform acknowledgment of their importance. This consistency reflects the critical role of efficient resource and budget control in ensuring project success. Furthermore, the close scores of these two factors imply a balanced emphasis on

managing both resources and budgets effectively. In short, the questions with higher RII scores in this category are considered more critical by the respondents. These might represent areas where the respondents feel more emphasis or improvement is needed. The variation indicates differences in how each aspect of communication and stakeholder engagement is valued. A smaller range would suggest more uniformity in the perceived importance of these aspects. Based on Fig. 8b, we can conclude that certain aspects of communication and stakeholder engagement are prioritized over others. This insight could be instrumental for project managers and teams in focusing their efforts on enhancing specific communication areas and stakeholder management strategies.
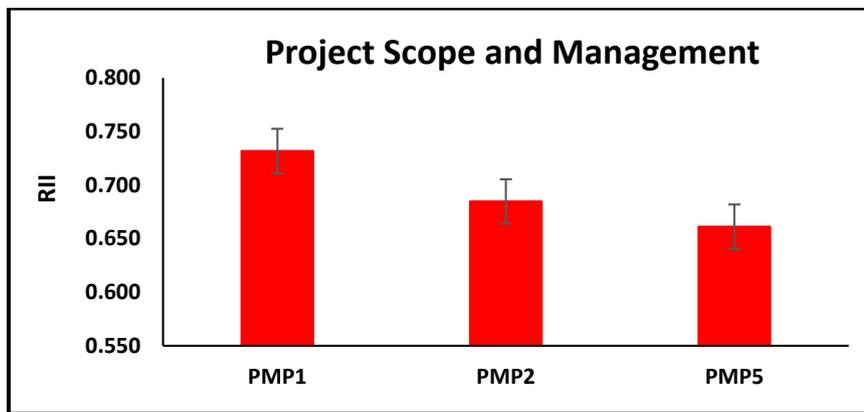

Fig. 8a Critical success factors using (RII), Project Scope and Management
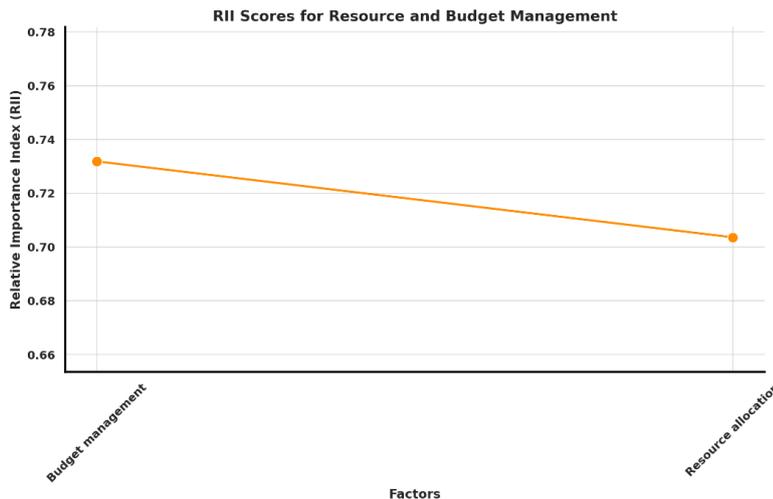

Fig. 8b RII scores based resource and budget management

Cost Management:

The multiple cost-related factors (as shown in Fig. 9) underscore the significance of managing project costs and budgets. While the RII values vary, collectively they highlight the importance of effective cost control. RII: 0.619 (the project was completed within the estimated budget.), 0.635 (the project team managed project costs effectively.), 0.649 (the project team communicated any potential cost overruns in a timely manner.), 0.665 (the project team adapted well to unexpected changes in the project budget.), 0.667 (the project team used appropriate project management tools to manage costs effectively.), 0.716 (the project team had a clear understanding of the project budget from the beginning.), 0.680 (the project team had a plan to mitigate potential cost overruns.), 0.692 (the project team effectively allocated resources to stay within the budget.), 0.639 (the project team did not allocate resources effectively).
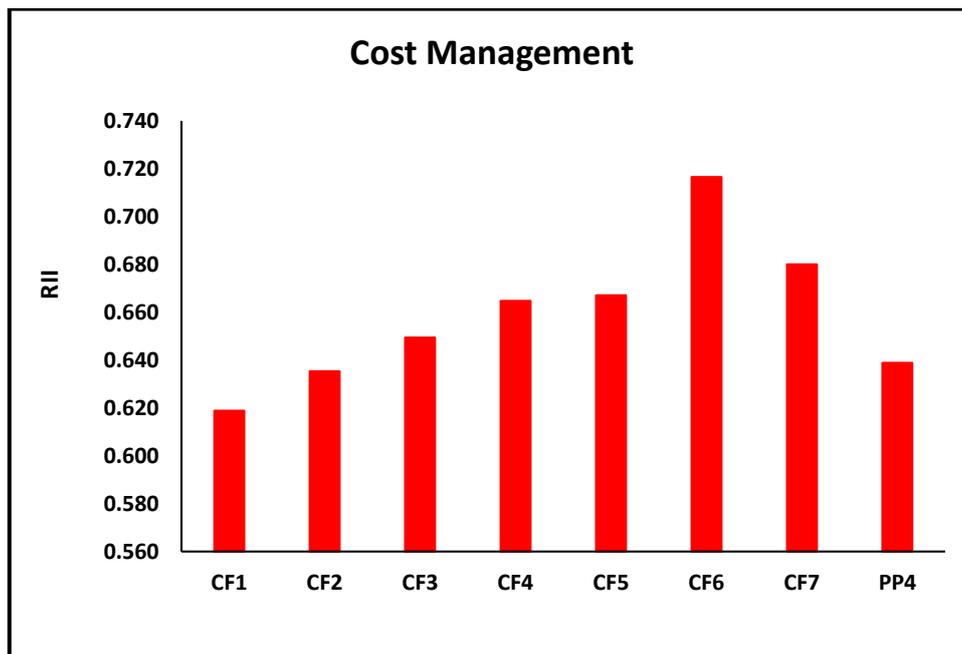

Fig. 9 Critical success factors using (RII), Cost Management

Roles, Responsibilities, and Planning:

Clearly defined roles, well-defined project plans, and proper task prioritization are essential. High RII values for the first two factors contrast with

low RII values for poor planning and task prioritization. RII: 0.748 (the project team had clear roles and responsibilities), 0.738 (the project team had a well-defined project plan.), 0.591 (the project team did not have a well-defined project plan), 0.592. (Fig. 10)
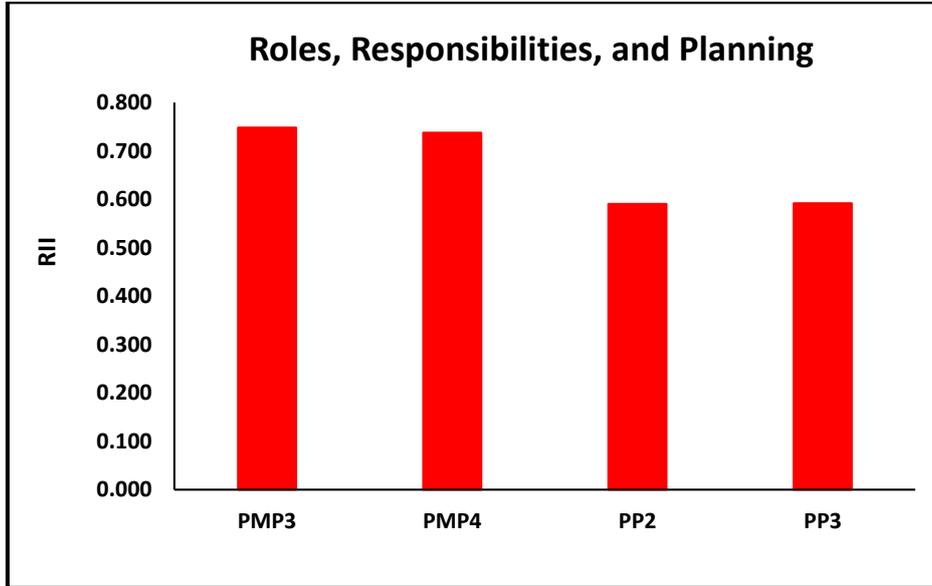

Fig. 10 Critical success factors using (RII), Roles, Responsibilities, and Planning

Communication Effectiveness and Risk Management

Effective communication is crucial to avoid delays and maintain project alignment. While the RII values are moderate, the importance of these factors is highlighted by their direct impact on project progress. For instance, RII values were observed to be 0.685 (meeting deadlines), 0.679 (adaptation), 0.669 (timeline management) and so on (Fig. 11). Based on Fig. 11, it can be concluded that certain aspects of communication and stakeholder engagement are prioritized over others. This insight could be instrumental for project managers and teams in focusing their efforts on enhancing specific communication areas and stakeholder management strategies. Moreover, timeline adherence, risk mitigation, efficient resource allocation, and strict budget management are pivotal for successful construction project management. The lower scoring areas within these categories, especially in "Timeline and Risk Management", might indicate domains where additional

training, resources, or management attention could yield significant improvements. Consequently, the findings suggest the necessity of a balanced approach, focusing not only on quality and performance but also on effectively managing time, risks, resources, and finances. These insights can guide both strategic decision-making and operational improvements in managing construction projects.
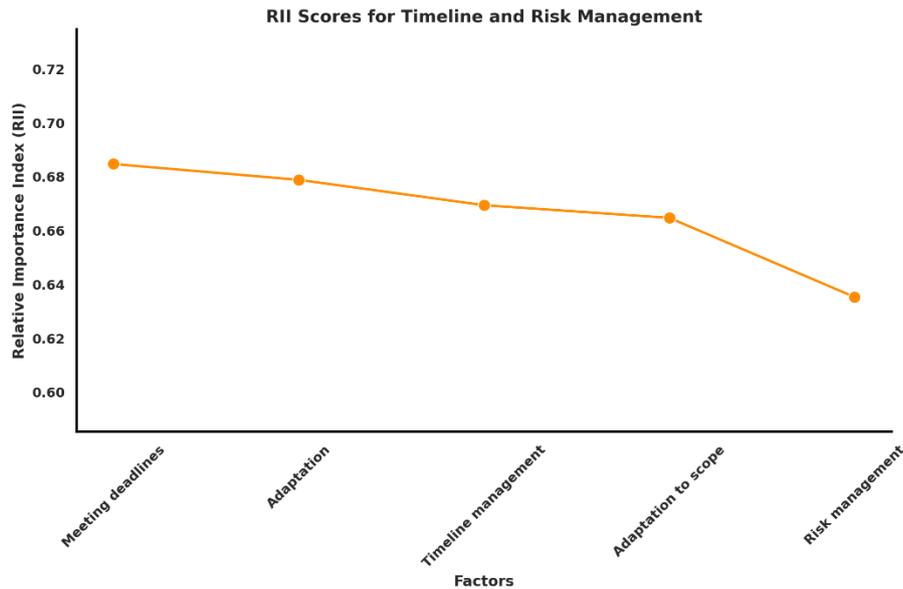
Fig. 11 Critical success factors using (RII), for timeline and risk management

The RII analysis provides insights into the relative importance of different critical success factors in project management within the context of the construction industry in Pakistan. Factors related to effective communication, clear understanding of project elements (scope, timeline, budget), adaptability, and proper planning hold significant importance. These insights can guide stakeholders to prioritize areas for improvement and focus their efforts on aspects that contribute most to project success.

Comparative Analysis of Study

Fig. 12 illustrates the comparative analysis of the research encompassing different critical factors involved in construction management. It shows that quality and performance have the highest RII score across all categories (0.748), indicating their critical importance. The lowest score in this category is still

moderately high (0.619), suggesting an overall strong emphasis on quality and performance. On the other hand, Resource and Budget Management shows a narrow range between its highest (0.732) and lowest (0.704) RII scores, implying consistent emphasis across factors within this category. In addition, team and leadership showed a high maximum RII (0.716), and the minimum score dips to 0.591, indicating some variation in how different aspects of team and leadership are valued.

Quality and performance, team and leadership, innovation, and vision categories showed higher standard deviations, indicating more variability in the importance assigned to different factors within these categories. Moreover, timeline and risk management and resource and budget management have lower standard deviations, suggesting more consistent views on their factors' importance. While categories like quality and performance are not only highly valued but also exhibit some variability, suggesting different sub-factors are more critical than others. In addition, the resource and budget management category, while highly valued, shows consistent importance across its factors, indicating a uniformly recognized need for efficient resource and budget management in construction project management.
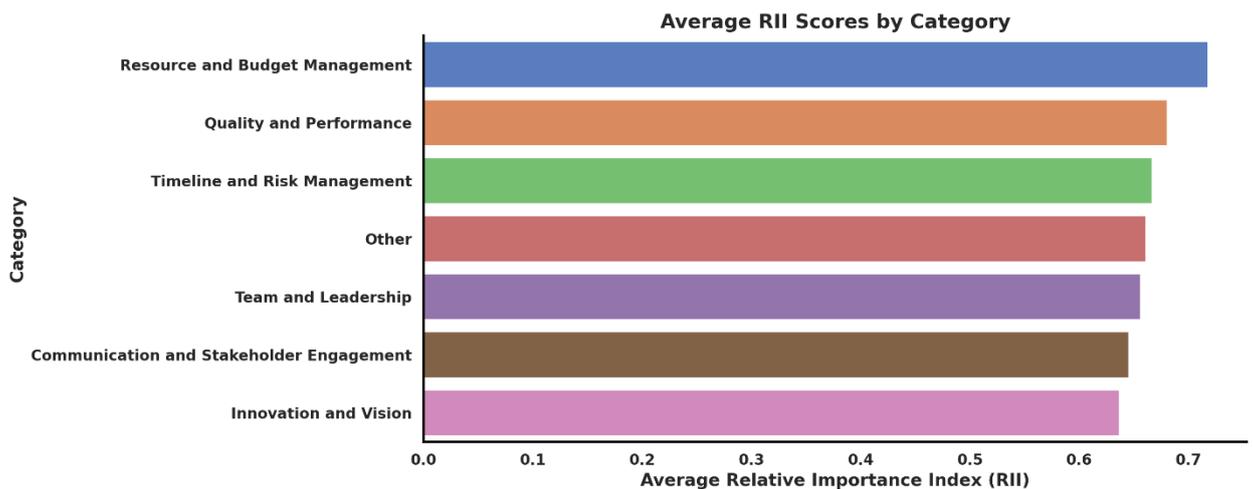

Fig. 12 Comparative illustration of different factors with average RII scores affecting construction projects

Conclusion

In conclusion, examining the Relative Importance Index (RII) values for the essential success variables and their values offers invaluable insights into improving project management procedures in Pakistan's construction sector. In order to ensure the effective execution of projects, the construction industry is a dynamic and sophisticated profession that requires rigorous attention to detail and skilled managerial abilities. This research clarifies the elements that affect building undertakings and determines whether they are successful or unsuccessful.

- The RII values quantify the relative importance of each important success element. These values highlight the importance of different factors and give a more profound knowledge of how they affect project outcomes. Subsequently, this significant element influences a project's success (i.e., the higher the RII value). This data-driven approach enables stakeholders to allocate resources, efforts, and time to the areas that will yield the most substantial benefits.

- The ranking of these factors further refines the prioritization process. It aids in identifying where immediate attention is needed and what aspects have already been well-managed. For instance, factors such as clear roles and responsibilities (RII: 0.748) and a well-defined project plan (RII: 0.738) emerge as top priorities, emphasizing the importance of organizational clarity and comprehensive planning in ensuring project success.

- Data analysis, specifically in the context of construction project management, provides the foundation for evidence-based decision-making. It empowers stakeholders to not only identify areas of concern but also to devise targeted strategies for improvement. For example, factors related to poor planning (RII: 0.651) and poor communication (RII: 0.655) highlight where organizational efforts should be concentrated to prevent delays and miscommunication.

- The critical success factors and RII values collectively offer a roadmap for implementing robust project management processes. These processes encompass a multifaceted approach, ranging from refining communication

channels and enhancing risk management to emphasizing effective time and cost management. By capitalizing on the insights garnered from this analysis, Pakistan's construction industry can work towards the common goal of elevating project outcomes.

- In essence, applying data analysis, RII values, and ranking transforms raw information into actionable insights and empowers stakeholders to make informed decisions that will redefine the construction landscape in Pakistan. This comprehensive approach acknowledges the intricate interplay of factors that can influence project success, ensuring that endeavours in the construction industry are characterized by efficiency, collaboration, and successful outcomes.

Recommendations

Based on the analysis of critical success factors and subsequent Relative Importance Index (RII) values in Pakistan's construction industry, several recommendations can be made to enhance project management processes.

- Recognise the critical importance of good communication to a project's success. Establish regular venues and channels for communication so that all parties may quickly discuss updates, issues, and changes. Implement measures to improve communication and guarantee openness throughout the project's lifespan.
- To strengthen project planning procedures, involve cross-functional teams in defining the project's scope, goals, and milestones. Create an organised project plan that considers probable delays and scope modifications, highlighting the significance of early risk assessment and mitigation.
- Invest in training courses to help team members' project management abilities as well as provide the skills and resources they need to manage projects successfully, enabling them to adjust to unforeseen problems and changes.

- Emphasise strict budget control procedures to avoid cost overruns. Implement ongoing project expenditure tracking and consider including cost management software to guarantee precise tracking and reporting.

- Create effective change management procedures to deal with unforeseen changes. Establish a system for evaluating the effects of changes, obtaining the required consent, and notifying all parties involved of any revisions.

- Engage stakeholders at various project stages to ensure alignment with project goals and expectations. Regularly seek feedback and incorporate suggestions to enhance project outcomes.

- Utilise project management tools to improve time and resource management through technology integration. Investigate software programmes that make collaborative planning, progress monitoring, and resource distribution easier.

- Foster a culture of proactive risk management. Encourage teams to identify potential risks, evaluate their impact, and develop contingency plans to mitigate adverse effects on project timelines and budgets.

- Continuously analyze project performance using data-driven insights. Review project milestones, RII values, and ranking results regularly to refine strategies and ensure ongoing improvement.

- Establish standardized processes for various project management activities, from scope definition to resource allocation. This consistency enhances efficiency and minimizes the likelihood of errors.

Incorporating these recommendations into construction industry of developing countries including Pakistan can improve project management practices, streamline operations, and ultimately, more successful project outcomes. By addressing communication gaps, enhancing planning, nurturing skill development, and embracing technology, the industry can overcome challenges and establish itself as a hub of efficient and effective project execution.

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Appendix-1 Questions for data collection and Analysis

Logical Order	Label	Question
Time Factors	TF1	The project team effectively prioritized tasks to stay on schedule.
	TF2	The project team managed the project timeline effectively.
	TF3	The project team communicated any potential delays in a timely manner.
	TF4	The project team adapted well to unexpected changes in the project timeline.
	TF5	The project team used appropriate project management tools to manage time effectively.
	TF6	The project team had a clear understanding of the project timeline from the beginning.
	TF7	The project team had a plan to mitigate potential delays.
	TF8	The project team effectively prioritized tasks to stay on schedule.
Cost Factors	CF1	The project was completed within the estimated budget.
	CF2	The project team managed project costs effectively.
	CF3	The project team communicated any potential cost overruns in a timely manner.
	CF4	The project team adapted well to unexpected changes in the project budget.
	CF5	The project team used appropriate project management tools to manage costs effectively.
	CF6	The project team had a clear understanding of the project budget from the beginning.
	CF7	The project team had a plan to mitigate potential cost overruns.
	CF8	The project team effectively allocated resources to stay within the budget.
Project Management Process	PMP1	The project team had a clear understanding of the project scope.
	PMP2	The project team managed the project effectively from start to finish.
	PMP3	The project team had clear roles and responsibilities.
	PMP4	The project team had a well-defined project plan.
	PMP5	The project team effectively managed project risks.
Poor Planning	PP1	The project was delayed due to poor planning.
	PP2	The project team did not have a well-defined project plan.
	PP3	The project team did not prioritize tasks effectively.
	PP4	The project team did not allocate resources effectively.
Poor Communication	PC1	The project was delayed due to poor communication.
	PC2	The project team did not communicate changes in the project plan effectively.
	PC3	The project team did not communicate changes in the project budget effectively.
	PC4	The project team did not communicate changes in project timeline effectively.

Appendix-2 Responses Frequencies, RII and Rank for each Question

Label	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total Responses	RII	Rank
TF1	25	24	32	41	48	170	0.674	12
TF2	18	30	35	49	38	170	0.669	13
TF3	18	24	45	50	33	170	0.666	15
TF4	13	30	34	63	30	170	0.679	11
TF5	17	28	32	53	40	170	0.684	9
TF6	14	31	31	47	47	170	0.696	6
TF7	19	22	46	53	30	170	0.662	17
TF8	12	26	36	54	42	170	0.704	5
CF1	34	28	33	38	37	170	0.619	25
CF2	23	29	39	53	26	170	0.635	23
CF3	14	33	42	59	22	170	0.649	21
CF4	16	28	43	51	32	170	0.665	16
CF5	14	34	34	57	31	170	0.667	14
CF6	17	21	30	50	52	170	0.716	4
CF7	11	32	40	52	35	170	0.680	10
CF8	16	26	33	54	41	170	0.692	7
PMP1	17	16	27	58	52	170	0.732	3
PMP2	15	28	37	50	40	170	0.685	8
PMP3	13	19	26	53	59	170	0.748	1
PMP4	15	16	28	59	52	170	0.738	2
PMP5	18	27	42	51	32	170	0.661	18
PP1	28	29	33	32	48	170	0.651	20
PP2	35	39	27	37	32	170	0.591	28
PP3	26	46	34	37	27	170	0.592	29
PP4	23	36	31	45	35	170	0.639	22
PC1	21	36	32	37	44	170	0.655	19
PC2	21	37	42	45	25	170	0.619	26
PC3	21	40	38	45	26	170	0.618	27
PC4	22	36	38	46	28	170	0.626	24