International Journal of Emerging Engineering and Technology (IJEET)
ISSN (e): 2958-3764
Volume: 5, Number: 1, Pages: 91 - 97, Year: 2026

Construction Claims Evaluation of Public Sector Projects through the Application of Building Information Modelling

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Received: 12/05/2026, Revised:25/07/2026, Accepted:07/08/2026

***Abstract*— Time and cost overruns in construction projects by the public sector in Sindh are characteristic of design modifications and a lack of contract management, which caused repeated claims and disputes. This paper looks at how Building Information Modelling (BIM) could be used to mitigate claims. By enhancing work and documentation. The research methodology was quantitative. A standardised questionnaire survey was used, involving 200 professionals working on public sector projects, yielding 106 valid responses. The results were evaluated using the Relative Importance Index (RII) and the Mean Score methods to identify critical claim variables and assess the claims. The findings show that BIM enhances coordination (RII = 0.67, M = 3.40), Improves the correctness of documentation (RII=0.65, M= 3.24), and minimizes errors (RII = 0.66, M = 3.28), Nevertheless, the lack of proper awareness (RII = 0.72, M = 3.59) and the absence of qualified specialists (RII = 0.71, M = 3.55) are still significant obstacles to its application in the field. The findings confirm that the inclusion of BIM in claim management helps improve transparency, collaboration, and decision effectiveness, thereby reducing the occurrence and severity of construction claims. The report recommends introducing capacity-building programs, establishing policy frameworks, and implementing pilot BIM projects to encourage digital transformation and radical sustainability in Pakistani public-sector projects.**

***Key Terms*— Construction Claims; Building Information Modeling (BIM); Construction Disputes, Delays, Cost overruns.**

I. INTRODUCTION

The construction industry plays a key role in ensuring infrastructure growth and economic growth. Development in Pakistan, whereby government projects, such as institutional buildings, transport infrastructure, healthcare services, and educational buildings, are key to national development. Despite their importance, such projects often face constant delays, budget overruns, changes, and shortcomings in contract management [1-3, 4]. These persistent challenges may lead to construction claims and disputes, which will negatively affect project performance, strain relationships with stakeholders, and increase public spending burdens [5, 6]. Therefore, effective claims management can help to enhance project delivery and protect the state funds [7, 10]. Recent research shows that the rate of claims in government construction projects is affected by communication barriers, poor documentation practices, and bureaucracy, which hinder coordination and prompt decision-making among the stakeholders involved [5, 9, 10]. These hindrances reduce transparency, increase uncertainty, and undermine trust and cooperation within project teams.

Digital technology in the construction sector is rapidly gaining popularity worldwide for coordination and response management in addressing these problems. Building Information Modelling (BIM) has become an essential tool that consolidates project information, improves visualisation, facilitates real-time interaction, and enhances documentation accuracy [11-14, 15]. BIM can significantly reduce the occurrence and severity of claims, as it makes it possible to detect the claims in a timely manner, design issues and making sure that changes are well documented. In Pakistan's public sector, a lack of awareness and technical expertise hinders the adoption of BIM. Implementation costs, and institutional and regulatory deficiency [16].

Time and cost have been identified as the main focus of previous studies in Pakistan public sector construction projects, and it has no consideration of the methodical evaluation and control of construction claims, although global literature focuses on the fact that BIM is able to minimize conflicts and support structured claim management systems [17], empirical research on the implementation of the BIM in the Pakistani public construction sectors are underdeveloped [9]. This aspect of the gap highlights the need to evaluate how BIM could be used to reduce the number of claims and improve claim management processes in government-funded projects. This paper aims to establish the major causes and consequences of construction claims in public-sector projects and to examine the application of BIM in the management and mitigation of these claims. It is expected that the findings would guide the actions of policy makers, consultants and so on, contractors in setting up more transparent, collaborative, and digitally more refined

claim management practices in the Pakistani state-owned construction industry.

II. Literature Review

2.1 Claims in Construction Projects of Public Sector:

Claims in construction form an integral part of the construction process and are recognised as an important source of disagreements between project parties. A claim arises when there is uncertainty in a contract between the parties, with demands for more time, monetary compensation, or both, based on perceived changes or shortcomings in project execution. In the civil sector, lawsuits are occasionally more complex because of bureaucratic forms, strict legislation, and multiple degrees of consent. Previous studies have established that public infrastructure projects are more prone to allegations because of the unclear nature of the processes involved among contractors and governmental bodies [5]. Subpar contract management and a lack of documentation are contributing factors to this problem, resulting in protracted dispute settlements, financial losses for clients and contractors. In Pakistan, government-sponsored building projects experience prolonged delays and cost overruns, primarily due to inadequate planning and ineffective oversight [9]. These obstacles increase project uncertainty and undermine trust and cooperation among stakeholders [10].

2.2 Classifications of Construction Claims

According to the literature, a number of claims shown in Fig. 1 are common to building projects, especially in developing countries. The most common types that are reported are

1. Claims for Delay [4, 12].
2. Claims of alterations or change orders [5, 10].
3. Claims about Payments [8].
4. Arguments on a rise in costs [3, 9].
5. Extension of Time (EoT) Claims [6, 7].
6. Allegations of poor work or quality [13].

Fig. 1: Claims for common building projects.

These assertions are in line with the past studies, which have pointed out delays, inconsistencies, and payment disputes the main hindrances in the construction of buildings in the public [8].

2.3 Origins and Consequences of Construction Claims

Claims have diverse effects, which impact time, cost, and quality efficiency. Delays resulting from unresolved claims often lead to extended project schedules, discontinuous project budget flows, and disputes that escalate into litigation. According to [6], poor management of claims results in lack of productivity, discontentment among stakeholders and unresolved contractual problems. In Pakistan, key claims have been identified as one of the main causes of poor project performance, especially in public sector projects, where bureaucracy slows project approval and settlement procedures [7, 8].

2.4 Effect of Claims on Project Performance

Previous studies have established that claims adversely affect three aspects of the project that are vital to performance: schedule, budget, and relations with stakeholders. Some researchers stated that one-third of the 79% of projects had a delay of over three months due to unresolved claims, and 65% reported cost overruns of greater than 10% [6]. Moreover, around 58% of previous studies have found that allegations tend to cause tension among respondents, government clients, and contractors, which frequently leads to arbitration or litigation [8]. These observations are consistent with global studies indicating that pending claims impede project continuity, increase administrative expenses, and lower productivity [4, 7]. Thus, an efficient claims management system plays an important role in timetabling and control in public-sector construction [18].

2.5 Building Information Modeling (BIM) role in Claims Mitigation

Building Information Modeling (BIM) has become a revolutionary technology in the world construction industry. This aids in the digitalization of a physical and a facility functional features, therefore enhancing coordination of all the stakeholders in the project. BIM enhances visualization, coordination and exchange of information and therefore minimizes significantly two major causes design flaws and contractual ambiguities of construction claims, [8, 19]. Research shows that collaboration in BIM improves the control of claims by making it possible to manage claims in a superior way reporting, real- time sharing of data, and tracking of design changes. [14] By integrating BIM, it is possible to determine the possible issues at an early stage, schedules, budget projections and progress data can prevent disputes [20-22]. In addition, 4D and 5D BIM models enable project teams to anticipate the impact of changes in time and costs pre-implementation, thereby reducing mistakes and contractual disputes. [16, 21] Despite these benefits, the use of BIM in developing countries such as Pakistan remains limited. [20] The obstacles, such as illiteracy, lack of training, economic limitations, and a shortfall of institutional support, impede its successful application [17, 21]. The introduction of BIM into the system of public procurement and contract management can be a revolution in the management and prevention of claims in

the Pakistani construction industry.

2.6 Research Gap

This literature review shows that although substantial research has focused on the causes of cost and time overruns in construction project in Pakistan. There is no evidence of research on the systematic assessment of construction claims and on the future role of BIM as a preventive instrument [12]. The general focus of local studies is on cost efficiency and delay evaluation, rather than a comprehensive claims management exercise [11, 13]. Furthermore, there is also a lack of concrete data regarding the effectiveness of BIM in dealing with claims within the domestic Pakistani public sector; there are high institutional and technological constraints [17]. The present paper addresses this gap by exploring the causes and effects of claims construction in government projects in Pakistan and the role that BIM can play as a strategic tool to minimise claims. The findings will be beneficial in establishing a model for incorporating digital technology into claims management procedures to make processes more transparent, coordinated, and accountable [16].

III. RESEARCH METHODOLOGY

The survey employed a questionnaire administered to contractors, consultants, and clients participating in construction work in Sindh in the public sector. The population was estimated to be around 200 number of professionals with 106 valid responses. The minimum sample size was calculated as follows the formula of Cochran turned out to be 99. (Cronbach's alpha = 0.979) confirmed the reliability of the responses. The Relative Importance Index (RII) and Standard Deviation (SD) were used as analytical tools to rank the effects of BIM and barriers to implementation.

3.1 Research Design

This work is based on a quantitative approach that uses literature analysis and a survey with questionnaires to assess the causes and effects of construction claims in public-sector projects in Pakistan. This paper also examines the possibilities of Building Information Modeling (BIM) to alleviate the accusations of this sort. The research method was based on prior studies on project costs and claim management, focusing on the relationships among contract management, documentation quality, coordination, and technology adoption. An all-inclusive questionnaire was created to gather empirical data from key stakeholders, including government clients, consultants, contractors, and experts involved in public-sector projects. The survey instruments included closed-ended questions, with a five-point Likert scale. Strongly disagree to strongly agree to determine how much BIM has been perceived to be beneficial and challenging to implement.

3.2 Population and Sample Selection

The target groups included the professionals working with building projects on the public sector in Pakistan, involving engineers, project managers, quantity surveyors, and contractors, consultants. The following agencies were chosen to use in the selection of the participants:

a) Public Works Department (PWD),
b) National Highway Authority (NHA),
c) Provincial Works and Services Department
d) Engineering Departments at the municipal level.

The figure of 200 was taken as the population size, calculated as the sum of the numbers of technical and management within these are personnel who have been actively engaged in existing projects in the public sector of construction departments. This team comprises readily available consultants, contractors, engineers and project managers who are directly engaged in planning, managing, and delivering government-funded building projects. It is vital to determine the appropriate sample size to ensure that survey results are sound, statistically valid, and representative of the target population. This study used the Cochran (1977) formula to calculate the sample size, a technique commonly used in social and management sciences for survey-based studies. Finite population correction (FPC) was applied to adjust the sample size because the number of participants (N) was limited to 200 stakeholders relative to the total population size. There were 200 questionnaires distributed online and face-to-face. A total of 106 responses were obtained, which represents a 53 per cent response rate. After data screening, incomplete responses were excluded from the statistical analysis since legitimate responses were discarded. The following distribution of participants was made: 25.4% consultants, 34.9% contractors. 34.9 percent government clients, 16.1 percent professionals, and providing equal representation of the stakeholders.

3.3 Research Instrument and Variables

The questionnaire had three parts:

a. General Details: Obtaining of the participant data (position, level of experience and organization type).
b. Effects of the BIM on Construction Claims: Assessment of the effects of Building Information Modeling (BIM) will ensure that chances of claims are minimized through eradication of design errors, eradication of money delays, explaining the terms of contracts, and enhancing accuracy of documentation.
c. Difficulties in the implementation of BIM: Evaluate factors such as lack of experience, insufficient awareness, high implementation costs, and organization barriers that hinders BIM use in claims management.

3.4 Methodology for Data Analysis

Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS) and Microsoft Excel. Descriptive statistics of the objective benefit of BIM in claims and challenges related to BIM were determined through mean and standard deviation. The standard deviation was used to measure the extent of variation in the responses and the reliability of the participant's perspectives. The Relative Importance Index. The importance of every item was measured using the RII method. Factors with high RII scores indicate the increased importance in influencing or averting claims. Also, correlation and reliability tests were conducted to assess the internal

consistency of the data, as measured by Cronbach's alpha; values greater than 0.70 are considered acceptable for reliability.

IV. Data collection and analysis

4.1 Analysis of Data

The data reviewed based on 106 valid respondents focused on the main difficulties in the use of BIM in public sector projects. A mix of diverse participants comprised a diverse group of government clients, consultants, professionals, and contractors, most of whom have 5 years of industry experience. Analysis of statistical data (use of SPSS) showed that the data were reliable in most cases. Cronbach's alpha of 0.979, which indicates a strong internal reliability of the variables.

4.2 Demographic Segment

The respondents in this research were experts in public-sector building projects in Pakistan, including consultants (25.4), contractors (34.9), owners/clients (23.6), and others (16.1), such as project managers, engineers, and academics. This distribution ensured the involvement of all significant stakeholders and incorporated diverse opinions, thereby increasing the reliability of the data presented in Tables I and II.

Table 1. Respondents by Organization Type.

Organization Type	Freq.	%	Valid %	Cumul. %
Government Client	25	23.6	23.6	23.6
Consultant	27	25.4	25.4	49.0
Contractor	37	34.9	34.9	83.9
Others	17	16.1	16.1	100.0
Total	**106**	**100**	**100**	

Table 2. Respondents by Years of Experience.

Years of Experience	Frequency	Percentage (%)
1-5 years	82	77.3
5-10 years	17	16.1
11-15 years	5	4.7
More than 15 years	2	1.9

4.3 Part of BIM in Claim Mitigation

The second part of the questionnaire measured the value of BIM in reducing claims. The respondents concurred that BIM increased teamwork and reports, which is essential in preventing conflicts. Table III demonstrates the major advantages of BIM concerning claim management.

Table III. Perceived Benefits of BIM for Claim Mitigation.

No.	Benefits of BIM	N	RII	Mean	SD	Rank
01	Visualization and Design Management	106	0.68	3.41	1.34	1
02	Collaboration and Communication	106	0.67	3.40	1.33	2
03	Error Reduction and Quality Control	106	0.66	3.28	1.32	3
04	Project Management	106	0.66	3.28	1.32	3
05	Change Management and Documentation	106	0.65	3.24	1.28	4
06	Data Integration and Information Management	106	0.65	3.23	1.29	4
07	Decision-Making and Coordination	106	0.64	3.17	1.24	5
08	Reduce Reworks and Minimize Scope Gaps	106	0.63	3.15	1.20	6
09	Cost and Time Efficiency	106	0.63	3.14	1.21	6
10	Workflow and Project Execution	106	0.62	3.08	1.19	7

This research involved use of the RII and Mean values as a measure of whether the values were statistically significant or not. the comparative positioning of elements using the impressions of the respondents. RII is a descriptive prioritization technique usually utilized in the research of construction management to determine the aspects perceived by the stakeholders as the most important, and not to determine the statistical significance of their impacts. Therefore, the criteria were ordered according to their RII values and the higher the RII value, the stronger the indicator more perceived significance of the respondent. The findings show that BIM is necessary to minimize design mistakes, supplement proper documentation, and enhancement of coordination, therefore, averting the core relations of the premeditated assertions. Similar conclusions were made by Liu et al. [5] and Rahman et al. [6], discovering that BIM use improves collaborative setting and minimizes conflicts by the use of BIM enhanced information management [22].

4.4 Barriers to BIM Adoption in Public Sector Projects

Although BIM has a potential, its application in the Pakistani public sector is small. Tabular data IV outlines the key issues that were facing the participants.

Table IV. Barriers to BIM Implementation in Public Sector Construction.

No.	Barrier to BIM Adoption	N	RII	Mean	SD	Rank
01	Limited awareness and understanding	106	0.72	3.59	1.29	1
02	Shortage of a skilled workforce	106	0.71	3.55	1.20	2
03	Knowledge and Skill Gaps	106	0.71	3.54	1.29	2
04	Interoperability and standardization	106	0.70	3.48	1.31	3
05	Regulatory and policy barriers	106	0.70	3.48	1.29	3

No.	Barrier to BIM Adoption	N	RII	Mean	SD	Rank
06	Integration with Existing Project Processes	106	0.69	3.46	1.30	4
07	High initial costs	106	0.69	3.46	1.29	4
08	Data Management and Information Issues	106	0.68	3.41	1.25	5
09	Organizational and Traditional Practice Resistance	106	0.67	3.33	1.26	6
10	Return on investment (ROI)	106	0.66	3.31	1.32	7
11	Legal and Contractual Barriers	106	0.66	3.31	1.27	7

The main problems, which include insufficient knowledge, high costs, and the absence of a regulatory framework, will be addressed, representing institutional and technological problems that share characteristics found in poor countries [15]. These results highlight the need of national BIM policies, training and pilot digital transformation and competencies improvement in projects in the public sector.

4.5 Discussion

The results of this research point to poor documentation, design inconsistencies, communication breakdowns, and lengthy decision-making processes as essential factors in construction claims in public-sector projects. These results confirm the inferences from previous research, which suggested that poor coordination and ambiguity in contractual commitments were the key causes of construction project conflicts, particularly in third-world countries [5, 9, 10].

This research shows that the number of claims being made is not only affected by technical problems but also markedly through management practices, stakeholder interactions, and oversight practices. Moreover, the findings on the role of BIM highlight its contributions to enhancing collaboration, documentation preparation, visualisation precision, and the organisation of project stakeholders. This aligns with other research that highlighted the role of BIM in the minimization of design errors and enhancement control description at various stages of construction [14, 15].

Consequently, BIM serves as an effective method of minimizing the number of claims by eliminating miscommunication, minimized rework, and simplifying the process of information flow between contractors, consultants and clients. However, it is found in the study that the application of BIM in the Pakistani construction in the public sector is low, caused by lack of awareness, shortage of skilled workforce, unwilling to leave conventional approaches, and lack of organizational structures that can enable digital adoption progression. Similar obstacles have been witnessed in other studies with regard to emerging construction industries, which means that the challenges of BIM implementation are not caused only by technological aspects, yet as well as institutional and cultural preparedness [16, 17].

Recent international studies show that Building Information Modelling (BIM) has evolved from three-dimensional visualization to an integrated digital platform for contract administration, claim prevention, documentation management and collaborative decision-making [15, 16]. BIM-enabled workflows reduce the likelihood of construction disputes and claims significantly [15, 18] by improving evidence tracking, providing real-time design coordination, automating the documentation of project changes and minimizing contractual ambiguities. In addition, the integration of BIM with Digital Twins, cloud-based Common Data Environments (CDEs), and sophisticated project analytics has improved transparency, accountability and traceability of information throughout the project lifecycle [14, 16]. These technologies have been widely adopted in the developed countries, but empirical evidence on the application of BIM-enabled claim management is still limited in developing economies, particularly in the public construction sector of Pakistan [20, 21]. Therefore, the study fills a significant knowledge gap by evaluating BIM as a strategic tool for mitigating construction claims in Pakistan's public-sector projects.

Therefore, for BIM to perform as a claim management tool, structured training sessions, government policy endorsement, and pilot BIM applications in some public-sector initiatives are required. The discussion shows that mitigation of claims in public construction projects is contingent on access to digital applications such as BIM and the desire of organizations to change, educate experts, and update project management and documentation. The findings underscore the need to align technology implementation with the enhancement of management practices to realise sustainable construction claims in terms of reduction.

4.6 Study Limitation

Like any empirical study, this study has some limitations. First, the study was limited to public-sector construction projects in Sindh, Pakistan, where institutional practices, procurement procedures, and the level of Building Information Modelling (BIM) adoption may differ from those in other provinces. Therefore, the findings may not be fully generalizable to the entire construction industry in Pakistan or to private-sector projects. Secondly, the study used a cross-sectional questionnaire survey, which captured respondents' perceptions at a specific point in time. While the responses provide good insights on the perceived effectiveness of BIM in construction claim management, no causal relationships between BIM adoption and actual reduction in construction claims are established. Thirdly, the study relied on the opinions of construction professionals, such as contractors, consultants, government clients and engineers, rather than examining actual claim records or BIM-based project case studies. Thus, the results are more indicative of practitioners' experiences and perceptions. Finally, although the obtained sample of 106 valid responses was above the minimum sample size calculated with Cochran's formula, a larger sample, covering several provinces and several types of projects, would enhance the robustness and general ability of the results.

4.6 Practical Implications

The findings of this study have significant practical implications for policymakers, government agencies, consultants, contractors, and academic institutions that wish to improve the management of construction claims through the adoption of Building Information Modelling (BIM). The results show that BIM can significantly reduce construction claims by improving project coordination, enhancing documentation accuracy, providing access to real-time information, and supporting transparent decision-making throughout the project life cycle. However, the successful implementation of BIM requires the joint efforts of all stakeholders in the construction industry.

a. **Implications for Government Agencies:** It is recommended that Public Works Department (PWD), National Highway Authority (NHA) and provincial construction departments should formulate comprehensive BIM implementation policies and develop national BIM standards for public infrastructure projects. Including BIM requirements in procurement procedures, tender documents and standard contract conditions would promote wider industry adoption and would enhance transparency and accountability. Government agencies should also pilot BIM projects for large public-sector developments to demonstrate the practical benefits of digital project delivery and claim prevention. Moreover, specific funding should be allocated to enhance institutional capacity for BIM implementation, software acquisition and continuous professional training.
b. **Implications for Consultants:** Consultants have a significant role in ensuring appropriate project documentation and effective coordination among the project stakeholders. BIM can enable consultants to perform early design reviews, clash detection, constructability analysis and systematic documentation of design changes, reducing contractual ambiguities and possible disputes. Consultants should also use documentation produced by BIM to facilitate claim assessment, complete project records, and better communication between clients, contractors and design teams during project execution.
c. **Implications for Contractors:** BIM can be a great advantage for contractors, as it can improve construction planning, scheduling, cost estimation, and progress monitoring. 4D and 5D BIM implementation allows contractors to identify potential scheduling conflicts, optimize resource allocation and minimize costly rework before construction activities start. BIM also offers reliable digital records that can be used as objective evidence in claim preparation, negotiation and dispute resolution. So, construction organizations should acquire BIM software, implement internal digital workflows, and conduct regular professional training to improve the technical skills of their employees.
d. **Implications to Academic Institutions and Professional Bodies:** Professional engineering bodies and universities have a critical role to play in helping to digitally transform Pakistan's construction industry. The future professionals must be ready for the digital delivery of projects, and thus, BIM-related subjects should be included in undergraduate and postgraduate courses for civil engineering and construction management. Moreover, professional bodies and industry associations have a responsibility to organize certification programs, continuing professional development (CPD) courses, workshops and collaborative training initiatives to enhance awareness and technical expertise in BIM among practicing engineers, consultants and contractors.

Overall, the implementation of these recommendations in practice would help in minimizing construction claims, increasing contract transparency, improving the collaboration of project stakeholders and accelerating the digitalization of Pakistan's public sector construction industry. The application of BIM in project planning, contract administration and claim management processes can improve project performance, and can bring more efficiency, accountability and sustainability in the future infrastructure development.

V. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This paper examined the effect of construction claims on government undertakings projects within Pakistan and assessed the possible contribution of Building Information Modeling (BIM) to the alleviation of these claims. The evaluation of 106 responses by contractors, consultants, and government clients has shown that claims occurs mainly due to delayed payment, changes in designs, vague contract formalities, and long procedures. Such problems have resulted in frequent disagreement, time wastage and increased expenses, which eventually jeopardized the project performance and the effectiveness of the projects. The findings show that inadequate contract management and the lack of documentation are fundamental to most of the claims. Weak communication, coordination deficiency between the interested parties, and a lack of documents may lead to misunderstandings contractual problems. In turn, it is the need of efficient claim management within the public sector technical innovation and procedural improvements. The research revealed that BIM had the potential to reduce the claims occurrence significantly. Participants agreed that BIM improves documentation, design collaboration, and communication, therefore, minimizing the likelihood of dispute. However, challenges, such as low awareness, exist in a significant number high costs of implementation, lack of qualified individuals still make BIM adoption in a challenge in Pakistan. This paper concluded that BIM adoption in the management of construction of the public sector goes a long way in enhancing transparency, accountability and efficiency. BIM provides an innovative approach towards lessening claims and helping in generating

sustainable project outcomes in Pakistan by the means of data digitization and improved collaboration on a project.

5.2 Future Research

The research is informative but targets the construction projects of the public sector in Pakistan and use quantitative analysis. Comparison may be featured in the future study research in various sites, synthesis of case studies in available projects in the community, discussion of the similarity between BIM and legal frameworks, as well as, dispute resolution methods. This study enhances the comprehension of the digital claims management and helps in formulating sustainable policy reform in construction industry in Pakistan.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest to report regarding the present study.

AUTHOR CONTRIBUTIONS

Conceptualization, Y.A., and J.S.K; methodology, Y.A., and J.H.M.; validation, J.S.K. and J.H.M.; writing original draft preparation, Y.A. and J.S.K.; writing review and editing, J.S.K., and J.H.M.

FUNDING STATEMENT

This research received no external funding.

INSTITUTIONAL REVIEW BOARD STATEMENT

Not applicable.

INFORMED CONSENT STATEMENT

Not applicable.

DATA AVAILABILITY STATEMENT

Data is available on reasonable request.

REFERENCES

[1] S. H. Khahro, A. H. Memon, N. A. Memon, Z. A. Memon, and R. Naresh, "Influence of social and economic factors on construction project performance in Pakistan," Sustainability, vol. 15, no. 3, p. 2469, 2023.

[2] N. Akram, S. S. Zubair, F. Asghar, Z. Nishtar, and K. Lodhi, "Public-private partnerships (PPPs) in construction projects: A study on the utilization, effectiveness, and challenges in Pakistan," Bulletin of Business and Economics, vol. 12, no. 3, pp. 402–409, 2023.

[3] A. H. Memon, A. Q. Memon, M. A. Soomro, M. A. Memon, and J. S. S. Khan, "Structural model of cost overrun factors affecting Pakistani construction projects," Mehran University Research Journal of Engineering and Technology, vol. 42, no. 2, pp. 108–123, 2023.

[4] R. N. Khan, M. Azam, and I. G. Chaudhry, "Identification and analysis of significant delay factors in construction projects," International Research Journal of Social Sciences and Humanities, vol. 3, no. 1, pp. 544–566, 2024.

[5] H. H. Shaikh, N. Y. Zainun, and S. H. Khahro, "Claims in construction projects: A comprehensive literature review," IOP Conference Series: Earth and Environmental Science, vol. 498, no. 1, Art. no. 012095, May 2020.

[6] F. Antoniou and A. V. Tsioulpa, "Assessing the delay, cost, and quality risks of claims on construction contract performance," Buildings, vol. 14, no. 2, p. 333, 2024.

[7] M. O. Umar and A. D. Ochigbo, "Comprehensive approach to claim assessment in construction project," International Journal of Management & Entrepreneurship Research, vol. 6, no. 7, pp. 2201–2225, 2024.

[8] S. N. Bhangwar, A. H. Memon, and F. A. Memon, "Effect of claims on project performance," Tropical Scientific Journal, vol. 1, no. 2, pp. 41–54, 2022.

[9] H. H. Shaikh, N. Y. Zainun, and S. H. Khahro, "Project cost and time key factors distressing building construction projects of Sindh, Pakistan: A post-pandemic approach," Archives of Civil Engineering, vol. 69, no. 4, 2023.

[10] S. N. Bhangwar, A. H. Memon, M. A. Bhutto, I. A. Rahman, and F. A. Memon, "Risk level of the types and causes of claims on construction projects of Pakistan," Quaid-e-Awam University Research Journal of Engineering, Science & Technology, vol. 20, no. 1, pp. 13–20, 2022.

[11] S. Ahmed and A. Buriro, "Strategies and best practices for managing cost overruns in the construction industry of Pakistan," Propel Journal of Academic Research, vol. 3, no. 1, pp. 28–55, 2023.

[12] M. F. Hasmori, M. H. Memon, and R. Ismail, "Critical factors and mitigating measures of construction delays of Pakistani building construction projects," International Journal of Sustainable Construction Engineering and Technology, vol. 14, no. 2, pp. 240–249, 2023.

[13] M. Nadeem, I. M. Jiskani, M. S. Urwat, S. Uddin, K. Akhtar, and N. H. Khokhar, "Analysing delay factors in construction projects using Z-number approach: Insights from Pakistan," Canadian Journal of Civil Engineering, vol. 50, no. 12, pp. 966–983, 2023.

[14] A. Ali, "GIS and BIM integration model workflow towards digital twin to assess flood impacts on buildings," 2024.

[15] B. S. Alotaibi, A. Waqar, D. Radu, A. M. Khan, Y. Dodo, F. Althoey, and H. Almujibah, "Building information modeling (BIM) adoption for enhanced legal and contractual management in construction projects," Ain Shams Engineering Journal, vol. 15, no. 7, Art. no. 102822, 2024.

[16] B. C. Matos, C. O. Cruz, and F. B. Branco, "Digitalization and procurement in construction projects: An integrated BIM-based approach," Journal of Information Technology in Construction, vol. 29, pp. 400–423, 2024.

[17] A. A. Vighio, A. N. Girano, and N. Month, "Effect of using building information modelling on different phases of the project lifecycle," 2024.

[18] A. Riaz, A. Hussain, and Z. Ud Din, "Strategy for effective claim management based on a FIDIC derivative contract," Journal of Legal Affairs and Dispute Resolution in Engineering and Construction, vol. 15, no. 4, Art. no. 05023002, 2023.

[19] M. Nawaz and N. Azhar, "Analysis of benefits, advantages and challenges of building information modeling (BIM) in Pakistan construction industry," Pakistan Journal of Social Science Review, vol. 5, no. 1, pp. 79–115, 2026.

[20] Z. Ullah, K. Daud, E. A. U. Khan, M. A. Khan, S. Ismail, E. A. R. Khan, and U. Ali, "Implementation of 4D BIM in Pakistan: A systematic review of challenges and opportunities," Spectrum of Engineering Sciences, pp. 1820–1833, 2025.

[21] W. A. Tanoli, "Assessing drivers, barriers and policy interventions for implementing digitalization in the construction industry of Pakistan," Buildings, vol. 15, no. 15, Art. no. 2798, 2025.

[22] M. Khan, I. A. Warraich, N. Sarwar, and O. Yaman, "Benefits of building information modeling (BIM) for construction projects success in Pakistan," Scientific Reports, 2026.