engineering proceedings

MDPI

Proceeding Paper

Assessment of Critical Success Factors for Building Projects through Literature

Muhammad Hamza Zahoor * and Majid Ali

Civil Engineering, Capital University of Science and Technology Islamabad, Pakistan; professor.drmajid@gmail.com

* Correspondence: hamza.malik40755@gmail.com; Tel.: (+923099992277)

† Presented at the 1st International Online Conference on Buildings, 24–26 October 2023; Available online: https://iocbd2023.sciforum.net/.

Abstract: A construction project failure encompasses a multifaceted spectrum of disappointments, which may manifest individually or in combination, spanning the domains of cost, time, quality, and effective project management. This study represents a dedicated endeavor to discern the Critical Success Factors (CSFs) that underpin the triumph or failure of construction projects, while simultaneously scrutinizing the intricate interplay between various attributes that contribute to the realization of project success. A comprehensive and thorough examination of prior research endeavors serves as the cornerstone. This extensive review of the literature functions as the lodestar, guiding the identification of CSFs that will subsequently serve as predictive indicators for assessing the likelihood of a project's success. The study endeavors to quantify the individual contributions of these critical success factors to the ultimate outcome of a building project. The overarching aim of this current literature research is to conduct a meticulous and exhaustive exploration of critical success factors within the context of building projects. This undertaking is undertaken with unwavering focus and precision, delving into articles published in highly reputable journals over the past decade. The outcome of this scholarly endeavor promises to shed new light on the dynamics of construction project success, enriching our understanding of the intricate factors that shape the destiny of these endeavors.

Keywords: Success Factors; Building Projects; Critical Factors; Construction Management; Sustainability

Citation: Zahoor, M.H.; Ali, M. Assessment of Critical Success Factors for Building Projects through Literature. Eng. Proc. 2023, 53, x. https://doi.org/10.3390/xxxxx

Academic Editor: Firstname Lastname

Published: 14 November 2023

1. Introduction

A preliminary exploration into Critical Success Factors (CSFs) and the intricate web of relationships between various attributes holds utmost significance in our quest to pinpoint the determinants of project success. These pivotal CSFs wield a direct and undeniable influence on the outcomes of a construction project. In today's fast-evolving landscape, dynamism is the norm across all industries, and the construction sector is no exception. In fact, construction projects are inherently immersed in one of the most dynamic and multifaceted environments imaginable. The construction industry, by its very nature, operates within an ecosystem rife with complexity and constant flux [1]. The surge in uncertainties pertaining to technology, budgetary considerations, and the developmental processes only serves to amplify the dynamism of the construction sector [2,3]. This ever-shifting terrain necessitates a keen understanding of the factors that drive success in this challenging arena. By delving into these dynamic dynamics and embracing the evolving nature of the construction industry, we are poised to unravel the intricate tapestry that defines project success [4].

The specified period spanning from 2020 to 2022, a notable emphasis was placed on fostering substantial advancements in major construction projects within Pakistan. These

encompassed a broad spectrum of endeavors, spanning from civil engineering works to residential and non-residential projects, all of which were deemed critical for the nation's development and progress [5]. Extensive participation from various stakeholders was not only encouraged but also expected. The collective efforts of contractors, developers, and other key players were considered essential in realizing the ambitious goals set forth during this period. The success or failure of these projects bore significant implications, not only for the clients and contractors directly involved but also for a multitude of other stakeholders in the construction ecosystem [3,6]. It is important to recognize that projects falling short of their intended aims carried the potential for adverse consequences. Such outcomes could translate into financial losses, delays in infrastructure development, and missed opportunities for economic growth [7]. A concerted effort and commitment were imperative to ensure that these major construction projects aligned with their objectives and contributed positively to the broader socio-economic landscape.

In countries like Pakistan, characterized by their status as developing nations, the construction industry stands as a linchpin of the economy, exerting both direct and indirect influence over a significant portion of economic activities. The construction sector, with its wide-ranging impact, assumes a pivotal role within the economic landscape, contributing substantially to the Gross Domestic Product (GDP) and fostering intricate interconnections with other sectors [8]. The performance of construction projects holds profound implications for the overall success and vitality of the industry. When a project is brought to fruition within the stipulated timeframe, adhering to budgetary constraints, and attaining its predefined performance benchmarks, it is regarded as a resounding success [3,8]. Nevertheless, it is worth acknowledging that not all construction projects achieve this level of success, with some experiencing delays and setbacks. Hence, it becomes imperative for organizations engaged in construction endeavors to formulate strategic approaches that can steer projects towards success in the future [9]. These strategies must encompass the ability to navigate challenges, mitigate risks, and adapt to the dynamic nature of construction projects, ensuring that they not only meet their objectives but also contribute positively to the growth and stability of the broader economy.

In the construction industry, the established benchmarks of time, cost, and quality have long served as the quintessential metrics for gauging project success. However, alongside these conventional criteria, a plethora of fresh perspectives and concepts have arisen through various researchers' contributions. This progression has notably led to the emergence of the concept of Critical Success Factors (CSFs) in the context of construction projects. This is then followed by the introduction of Critical Success Factors in construction projects. The article will then conclude by summarizing the insights gathered from previous research conducted by other scholars. It's noteworthy that, as far as the author is aware, there is limited documentation available on critical success factors in building projects. Thus, the primary objective of this review paper is to delve into and elucidate these critical success factors as reported in the existing literature. To achieve this goal, we undertake a thorough examination of articles published in highly reputable journals over the past decade, meticulously collecting and analyzing all the published information pertaining to critical success factors in building projects. Exploration commences with an exploration of initial success factors, followed by a broader examination of critical success factors within the broader context of construction projects, and ultimately culminating in a comprehensive exploration of critical success factors specific to building projects.

2. Success/Failure of Construction Projects

The success of construction projects has historically held paramount importance for governments, users, and communities alike. In the context of modern construction, a myriad of formidable challenges confronts both clients and contractors, making the successful delivery of projects a complex endeavor. These challenges stem from the increasing intricacies in project design and the expanding role of stakeholders [10]. Wuni and Shen [12] conducted a study, unearthing a range of critical factors that contribute to schedule delays

and cost overruns in construction projects worldwide. These factors encompassed issues such as frequent design changes, last-minute owner requests, design flaws, inadequate planning, price fluctuations, shifts in the owner's scope of work, incomplete or inadequately detailed designs, and a shortage of expert site staff, among others. Alawag et al. [13] observed that the significance of the project planning process, coupled with the challenges posed by executing complex tasks without sufficient experience, poor design capabilities, and frequent design alterations, played pivotal roles in cost overruns during construction projects. These overruns have also been linked to factors such as insufficient site management, sluggish decision-making processes, and variations initiated by the client. It is crucial for estimators and all parties involved in construction projects to possess the ability to identify and address these elements contributing to cost overruns.

Figure 1. Importance of Iron Triangle.

Project success Project success has traditionally revolved around the achievement of on-time project completion, adherence to budget constraints, and the maintenance of quality standards. Success often translates to surpassing anticipated or standard outcomes in terms of cost, schedule, quality, and safety. However, the evolving landscape of complex projects, involving numerous stakeholders, has introduced layers of intricacy into the very definition of "success." Shayan et al. [13] explored this complexity and found that the concept of project success has evolved to incorporate criteria and standards designed to guide project participants towards achieving optimal results. In essence, a project is considered successful when it meets technical performance specifications, accomplishes its mission, and garners high levels of satisfaction among the organization, project team, and end-users. The attainment of cost, time, and quality objectives is often equated with project management success, which is closely tied to the realization of the overarching project goals. Iqbal et al. [10] conducted a quantitative questionnaire survey to identify factors contributing to project failure, revealing poor risk management, budget overruns, inadequate communication management, schedule delays, and inaccurate estimation practices as the top five culprits behind project failures. Cost overrun-related factors and deficiencies in contractors' site management were identified as critical elements affecting cost performance, as reported by Hussain et al. [9]. Critical Success Factors (CSFs) for construction projects encompass various aspects, including the establishment of clear and realistic project goals, effective project planning, the competence and relevant experience of the project manager, the client's ability to make timely decisions, and the project's value, complexity, and uniqueness. These CSFs have been widely utilized in literature studies to assess project performance.

3. Critical Success Factors for Construction Project

The examination of Critical Success Factors (CSFs) in construction project success reveals four distinct dimensions. The first-dimension centers on achieving the project's

design goals, aligning with contractual agreements made with the client. The second dimension evaluates the advantages realized by end-users, reflecting the benefits they derive from the final project deliverables. The third dimension assesses the advantages that accrue to the organization overseeing the project due to its successful execution. The fourth and final dimension delves into the benefits derived at the national and firm-level technological infrastructure as a result of the project's development process. These dimensions collectively contribute to an all-encompassing evaluation of project success within the realm of construction projects. Wuni et al. [14] have proposed various lists and models of Critical Success Factors (CSFs) in the literature. Over the years, project management efforts have predominantly concentrated on project scheduling challenges, with the belief that improvements in scheduling techniques would lead to enhanced management and, consequently, the successful completion of projects, as explored by Lee et al. [15].

In another study conducted by Ramlee et al. [16] the concept of project success is explored across four distinct dimensions, each associated with specific timeframes. The first dimension, characterized by short-term goals, emphasizes project efficiency and the successful meeting of cost and time targets. The second-dimension shifts to a medium-term horizon, focusing on customer satisfaction and the resolution of customer-triggered project issues. Moving towards a long-term perspective, the third-dimension centers on business success, encompassing factors like commercial achievements and market share expansion, fostering trust, satisfaction, and influence. Finally, the fourth dimension extends into very long-term objectives, encompassing future readiness through the development of new tools, techniques, products, and market exploration. In essence, project success is divided into these four time-dependent dimensions. The first-dimension concentrates on the period spanning from project execution to immediate post-completion, with a focus on on-time and on-budget accomplishment. The second dimension extends shortly after project delivery, examining customer satisfaction and compliance with technical specifications. The third dimension, assessed after achieving a significant level of sales within one to two years, provides insights into organizational performance and sustainability. The final dimension, appraised three to five years after project completion, centered on future preparedness investigated by Rasool et al [17].

Table 1. Critical Success Factors in Construction Projects by Previous Researchers.

Sr. No	Critical Success Factors	Researchers							
		Mashali et al. [3]	Buniya et al. [6]	Ali et al. [7]	Iqbal et al. [10]	Wuni et al. [14]	Lee et al. [14]	Ramlee et al. [16]	Rasool et al. [17]
1	Cost	✓	✓	✓	✓	✓	✓	✓	✓
2	Time	✓	✓	✓	✓	✓	✓	✓	✓
3	Quality	✓	✓	✓	✓	✓	✓	✓	✓
4	Satisfaction	✓	✓				✓		✓
5	Management	✓	✓	✓			✓	✓	✓
6	Safety			✓				✓	
7	Technology	✓	✓		✓	✓		✓	
8	Organization		✓	✓	✓			✓	✓
9	Environment			✓				✓	
10	Resources			✓					

A review of the pertinent literature reveals that various criteria have been proposed by different researchers. The literature reviews conducted by these diverse researchers have been synthesized and presented in Table 1, offering a comprehensive overview of the multifaceted dimensions of project success factors. The criteria for evaluating the success factors of a construction project extend beyond cost, time, and quality considerations; they also encompass project management effectiveness, organizational achievements, and customer satisfaction investigated by Abas et al [18]. According to the Awwad et al. [19] an alternative viewpoint on success criteria is presented in the paper titled 'Criteria of Project Success: an exploratory re-examination.' It suggests that project success should be assessed from various angles, taking into account the perspectives of individual stakeholders such as the owner, developer, contractor, end-user, and the broader public. The criteria for evaluating project success are then categorized into two dimensions: the micro-level and the macro-level perspective. Adabre et al. [20] studied that the delves into the assessment of project success from both micro and macro perspectives. The micro viewpoint focuses on parameters like time, cost, quality, performance, and safety, while the macro perspective considers dimensions such as time, satisfaction, utility, and operational effectiveness as key factors for evaluation. Another perspective underscores the significance of meticulous organizational planning, the unwavering commitment of project managers, and rigorous safety measures to ensure that construction projects are completed within budget, adhere to timelines, follow schedules meticulously, and meet the required quality standards, all contributing to project success factors.

4. Critical Success Factors in Building Projects

Critical Success Factors (CSFs) in building projects are the linchpin elements that can make or break the success of construction endeavors. These factors encapsulate a multifaceted range of considerations, extending far beyond the technical aspects of the project. While cost, time, and quality remain paramount, other dimensions such as effective project management, organizational efficiency, and customer satisfaction carry equal weight in determining the project's success. Sweis et al. [21] studied that CSFs identified through extensive literature reviews, underscores the consensus among researchers on the pivotal role of cost, time, quality, and management. These four pillars serve as the cornerstones of project success. Additionally, factors such as technology, safety, organizational prowess, and environmental considerations emerge as influential contributors, reflecting the complex nature of construction projects investigated by Ali et al. [7]. In essence, CSFs in building projects represent a holistic blend of elements, each integral to achieving project objectives. Success in this context means meeting not only the budget and timeline constraints but also ensuring the highest quality standards, effective teamwork, and a satisfied clientele. The multifaceted nature of these factors underscores the intricate tapestry of considerations that must harmonize to define the success of building projects.

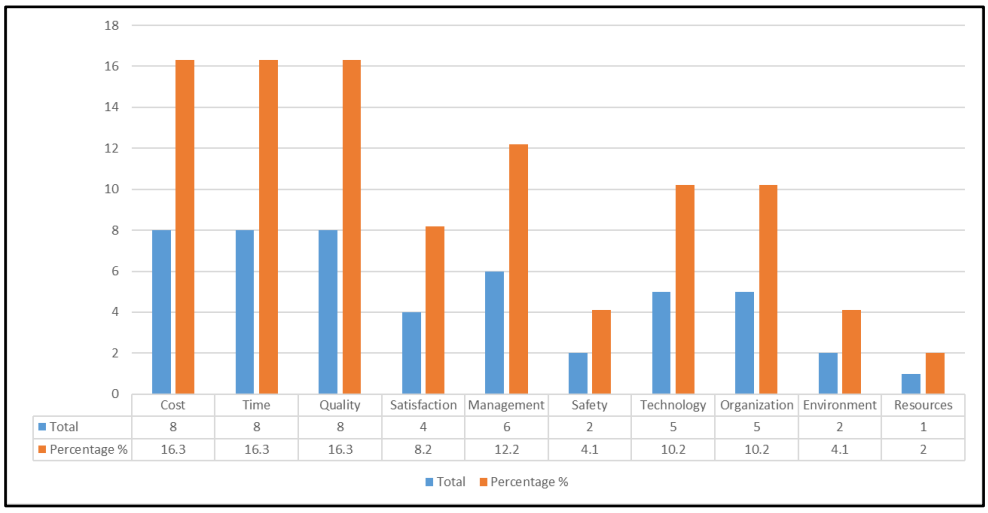

Figure 2. The percentage of Critical Success Factors in Building Projects through Previous Researchers.

In the world of building projects, a wide range of elements comes into play, significantly influencing whether these ventures achieve success or encounter setbacks. As highlighted in Table 1, a comprehensive summary of project evaluation criteria has been compiled by previous researchers. Table 2 provides valuable insights into the percentage of Critical Success Factors (CSFs) identified through an extensive literature review. Pacagnella et al. [22] investigated that resounding consensus emerges among researchers, with cost, time, quality, and management consistently recognized as the foremost CSFs in their literature reviews. From this synthesis of the literature, it becomes evident that a project achieves success when it fulfills a set of crucial criteria. This includes completing the project within the predefined cost parameters, adhering to the stipulated timeline, meticulously following the project schedule, meeting the required quality standards, and benefiting from effective management by a proficient team. Additionally, technology emerges as another influential CSF contributing significantly to the success of construction projects studied by Mashali et al. [3]. Table 2 further quantifies the prevalence of these CSFs, with cost, time, and quality each garnering a substantial 16.3% of the total CSF mentions. Satisfaction, management, technology, and organizational factors also hold significant weight in the equation, contributing to the multifaceted nature of project success. Collectively, these factors underscore the intricate interplay of elements that must align for a construction project to be deemed successful, with each element representing a critical piece of the puzzle.

5. Conclusion

This review paper examines the most critical success factors in building projects, drawing upon articles published in highly reputable journals over the past two decades. The objective of this study is to compile all the published information pertaining to factors, success rates, and critical success factors within the domain of construction and building projects. Based on the extensive literature research conducted, the following conclusions can be drawn:

- Project success and the critical factors contributing to it have been a subject of discussion for a considerable time. However, there is no widely agreed-upon or standardized definition of project success, nor a single comprehensive list of critical success factors. This paper suggests the importance of compiling a prioritized list of critical success factors that must be taken into account to ensure the successful performance of construction projects.

- In the context of project success, scholars have consistently emphasized that the foundational elements contributing to success in construction projects encompass cost, time, quality, and proficient management. It is essential to recognize, though, that there is a growing recognition and significance of additional facets, such as safety, technology, and satisfaction, among others, in this ongoing discourse.
- The prevailing viewpoint among researchers is that the critical factors for achieving success in a project primarily encompass cost (budget), time, quality, and efficient management. Therefore, when a construction project is effectively concluded within the predetermined time, budget, and quality criteria, it inherently attains success. Consequently, these Critical Success Factors (CSFs) play a crucial role as indispensable metrics for assessing the probability of future project success.

This study delves into the critical success factors that impact the success rate of building projects. It aims to establish a ranking of these influential factors, which can serve as a valuable guide for achieving success in building projects.

Acknowledgments: The authors would like everyone who helps them throughout this literature research.

Conflicts of Interest: The authors declare that there is no conflict of interest.

References

1. Wang, T., Xu, J., He, Q., Chan, A. P., & Owusu, E. K. (2023). Studies on the success criteria and critical success factors for mega infrastructure construction projects: A literature review. Engineering, Construction and Architectural Management, 30(5), 1809-1834.
2. Thneibat, M. M., & Al-Shattarat, B. (2023). Critical success factors for value management techniques in construction projects: case in Jordan. International Journal of Construction Management, 23(4), 669-678.
3. Mashali, A., Elbeltagi, E., Motawa, I., & Elshikh, M. (2023). Stakeholder management challenges in mega construction projects: critical success factors. Journal of Engineering, Design and Technology, 21(2), 358-375.
4. Alawag, A. M., Alaloul, W. S., Liew, M. S., Musarat, M. A., Baarimah, A. O., Saad, S., & Ammad, S. (2023). Critical success factors influencing total quality management in industrialised building system: A case of malaysian construction industry. Ain Shams Engineering Journal, 14(2), 101877.
5. Wuni, I. Y., & Shen, G. Q. (2023). Exploring the critical success determinants for supply chain management in modular integrated construction projects. Smart and Sustainable Built Environment, 12(2), 258-276.
6. Buniya, M. K., Othman, I., Sunindijo, R. Y., Karakhan, A. A., Kineber, A. F., & Durdyev, S. (2023). Contributions of safety critical success factors and safety program elements to overall project success. International Journal of Occupational Safety and Ergonomics, 29(1), 129-140.
7. Ali, A. H., Elyamany, A., Ibrahim, A. H., Kineber, A. F., & Daoud, A. O. (2023). Modelling the relationship between modular construction adoption and critical success factors for residential projects in developing countries. International Journal of Construction Management, 1-12.
8. Arowoiya, V. A., Oke, A. E., Akanni, P. O., Kwofie, T. E., & Enih, P. I. (2023). Augmented reality for construction revolution–analysis of critical success factors. International Journal of Construction Management, 23(11), 1867-1874.
9. Hussain, M., Rasool, S. F., Xuetong, W., Asghar, M. Z., & Alalshiekh, A. S. A. (2023). Investigating the nexus between critical success factors, supportive leadership, and entrepreneurial success: evidence from the renewable energy projects. Environmental Science and Pollution Research, 30(17), 49255-49269.
10. Iqbal, M., Ma, J., Ahmad, N., Ullah, Z., & Hassan, A. (2023). Energy-Efficient supply chains in construction industry: An analysis of critical success factors using ISM-MICMAC approach. International Journal of Green Energy, 20(3), 265-283.
11. Wuni, I. Y., & Shen, G. Q. (2022). Developing critical success factors for integrating circular economy into modular construction projects in Hong Kong. Sustainable Production and Consumption, 29, 574-587.
12. Alawag, A. M., Alaloul, W. S., Liew, M. S., Musarat, M. A., Baarimah, A. O., Saad, S., & Ammad, S. (2023). Critical success factors influencing total quality management in industrialised building system: A case of malaysian construction industry. Ain Shams Engineering Journal, 14(2), 101877.
13. Shayan, S., Pyung Kim, K., & Tam, V. W. (2022). Critical success factor analysis for effective risk management at the execution stage of a construction project. International Journal of Construction Management, 22(3), 379-386.
14. Wuni, I. Y., Shen, G. Q., & Osei-Kyei, R. (2022). Quantitative evaluation and ranking of the critical success factors for modular integrated construction projects. International Journal of Construction Management, 22(11), 2108-2120.
15. Lee, Z. P., Rahman, R. A., & Doh, S. I. (2022). Critical success factors for implementing design-build: analysing Malaysian public projects. Journal of Engineering, Design and Technology, 20(5), 1041-1056.

16. Ramlee, N., Tammy, N. J., Raja Mohd Noor, R. N. H., Ainun Musir, A., Abdul Karim, N., Chan, H. B., & Mohd Nasir, S. R. (2016, October). Critical success factors for construction project. In AIP conference Proceedings (Vol. 1774, No. 1). AIP Publishing.
17. Rasool, S. F., Chin, T., Wang, M., Asghar, A., Khan, A., & Zhou, L. (2022). Exploring the role of organizational support, and critical success factors on renewable energy projects of Pakistan. Energy, 243, 122765.
18. Abas, M., Khattak, S. B., Habib, T., & Nadir, U. (2022). Assessment of critical risk and success factors in construction supply chain: a case of Pakistan. International Journal of Construction Management, 22(12), 2258-2266.
19. Awwad, K. A., Shibani, A., & Ghostin, M. (2022). Exploring the critical success factors influencing BIM level 2 implementation in the UK construction industry: the case of SMEs. International Journal of Construction Management, 22(10), 1894-1901.
20. Adabre, M. A., & Chan, A. P. (2019). Critical success factors (CSFs) for sustainable affordable housing. Building and Environment, 156, 203-214.
21. Sweis, R., Nasser, A. H., Alawneh, A., Albalkhy, W., Suifan, T., & Saa'da, R. (2021). ISO-9001 implementation and critical success factors of the Jordanian consulting engineering firms. International Journal of Productivity and Performance Management, 71(4), 1407-1425.
22. Pacagnella Jr, A. C., da Silva, S. L., Pacífico, O., de Arruda Ignacio, P. S., & da Silva, A. L. (2019). Critical success factors for project manufacturing environments. Project Management Journal, 50(2), 243-258.