WEP Warwick Evans Publishing

International Journal of Global Economics and Management

ISSN: 3005-9690 (Print), ISSN: 3005-8090 (Online) | Volume 6, Number 1, Year 2025
DOI: https://doi.org/10.62051/ijgem.v6n1.07
Journal homepage: https://wepub.org/index.php/IJGEM/index

Study on the Factors Affecting Construction Project Cost Overrun

Qian Wu [1, 2, *], Ali Khatibi [2], Jacquline Tham [2]

[1] School of Urban Construction of Anhui Xinhua University, Hefei 230088, Anhui, China

[2] Postgraduate Centre, Management and Science University, University Drive, Off Persiaran Olahraga, 40100 Shah Alam, Selangor, Malaysia

*Corresponding Author: wu2006qian@126.com

ABSTRACT

As a pillar industry that promotes economic development, the construction industry is currently experiencing rapid development and has received strong support from the country and the government. The construction industry faces the challenge of cost overruns, which is a worldwide phenomenon. Cost overruns are a very common phenomenon that is related to almost all projects in the construction industry. Cost overruns refer to the difference between the final actual cost at the completion of a construction project and the contract amount agreed upon by the owner and the contractor when the contract is signed. Cost overruns are considered to be a clear sign of project failure. In construction projects, it is a common phenomenon that the budget exceeds the estimated cost and the settlement exceeds the budget. This paper focuses on the main factors that affect the cost overrun of construction projects to provide a reference for the actual situation.

KEYWORDS

Construction engineering; Cost overrun; Design change; Resource constraints; Contractor experience

1. INTRODUCTION

After entering the new era, with the continuous advancement of urbanization, the development speed of the construction industry has continued to accelerate. Against this background, in construction projects around the world, final cost overruns usually occur after the completion of construction projects. Cost overruns occur when projects have to face various risks due to lack of expected preparation to minimize the risks that lead to delays in the implementation of the work sequence. This is undoubtedly a big problem in the preparation of construction project budgets and a key challenge faced by owners and contractors, so efforts should be made to reduce or avoid construction cost overruns. Therefore, this paper systematically reviews the factors that have affected the cost overruns of construction projects in recent years, providing useful ideas for industry researchers to ensure the quality and efficiency of construction projects.

2. RESEARCH STATUS OF CONSTRUCTION PROJECT COST OVERRUNS

Construction cost overruns not only have an adverse impact on a single project, but may also bring about a series of chain reactions, affecting all aspects of project operations, the financial situation of the project party, and have a wide-ranging negative impact on society and the economy. Therefore, it

is necessary to study the topic of construction cost overruns. Construction projects around the world generally face the problem of construction cost overruns, which is particularly prominent in developing countries due to complex reasons. The limitations of developing countries in terms of resources, technology, management, and policies make construction cost overruns more frequent.

This paper uses the method of literature retrieval to illustrate the development trend of research on factors affecting construction project cost overruns. We entered the keywords “construction project”, “cost overrun”, and “influencing factors” into the China National Knowledge Infrastructure Database and retrieved literature published between 2019 and 2024, finding a total of 20 articles, which is a relatively small number. Considering the limited scope of keyword usage, this paper replaced the above keywords with “construction,” “cost overrun,” and “factors,” expanding the scope of keyword usage and retrieving a total of 467 articles. Among them, the total number of published works in 2019-2023 accounted for 16.27% (76/467), 19.27% (90/467), 18.84% (88/467), 27.19% (127/467), and 17.34% (81/467) respectively. So far, there have been four papers in 2024. As can be seen from Figure 1, the number of publications in this field increased dramatically from 2021 to 2022, with a total of 127 articles published in 2022, ranking first in the past five years. This shows that the construction industry's attention to the problem of project cost overruns has increased significantly during this period, and the research on related influencing factors has become more in-depth. However, the total number of articles published in 2023 decreased to 81, which may be related to the bottleneck of industry development and the updating and iteration of construction engineering related technologies. However, the total number of articles published in 2019 was still above 79, suggesting that the popularity of this research topic has remained relatively stable in recent years.

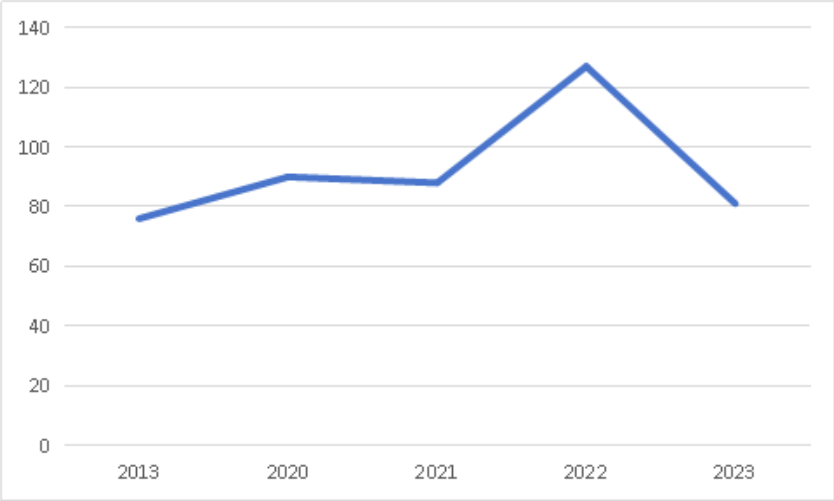

Figure 1. Trends in research papers

There is little research literature on cost overruns in construction projects in my country, which is a real gap in the Chinese literature. The study of this gap has very important theoretical and practical significance for my country's construction industry. This is why the current research topic was chosen: to study the factors affecting construction cost overruns in China.

The current status of research on cost overruns in construction projects shows that the causes of cost overruns are complex and involve many factors, such as design changes, construction delays, insufficient funds, and poor management. Although there are some prediction models and control methods, there are still many challenges, especially in the research of data quality, risk management, and behavioral factors. With the development of information technology and management concepts, future research is expected to better predict, evaluate, and control cost overruns in construction projects through more advanced technologies and methods.

3. ANALYSIS OF FACTORS AFFECTING CONSTRUCTION PROJECT COST OVERRUNS

3.1. Design Changes

Design changes are a common occurrence in construction projects and often have a significant impact on construction costs, leading to cost overruns (Williams, Eden, Ackermann, & Tait, 1995).

Design changes may result in adjustments to the original material specifications, such as substituting more expensive building materials, increasing material quantities, or changing construction techniques. These changes will directly increase the cost of purchasing and transporting materials (Aslam, Baffoe-Twum, & Saleem, 2019). Design changes often require modification of construction drawings, re-review and re-approval, which may result in extended construction schedules. Delays in construction progress mean increased labor costs, and extended construction periods may affect the coordination of other work tasks, resulting in additional costs. Increased labor costs Design changes may require construction crews to re-adjust the way they work, require additional training, or replace parts of completed work (Herrera, Sánchez, Castañeda, & Porras, 2020). In this case, overtime expenses may be incurred or a higher level of expertise may be required, increasing labor costs. Cause rework or redo. If design changes occur during the construction process, it may cause part of the completed project to need to be reworked or redone. This rework usually requires more time and human resources, increasing costs. Affecting the Use of Equipment and Machinery Design changes may require the use of different equipment or adjustments to the way the equipment is used (Siraj & Fayek, 2019). For example, changing the structural design may require replacing or renting a different type of mechanical equipment, which would incur additional costs. When making design changes in a project, the project management team needs to spend more time coordinating with various parties, such as designers, engineers, contractors, etc. This not only increases the workload of project management, but may also result in additional costs for project managers, designers or engineers. Design changes may result in changes or increased demand for raw materials, especially when the materials are uncommon, which may require sourcing through special channels or being sourced from other regions, resulting in increased supply chain costs. Changes in regulations and compliance requirements Design changes may involve new compliance requirements, such as changes in building codes or safety standards (Lee, Lee, Masoud, Krishnan, & Li, 2021). This may require additional design modifications, or re-approval and inspection, which increases costs and time. Design changes may affect the total amount of the project, which in turn may lead to adjustments to taxes such as value-added tax and local taxes, which will further increase the total cost. Design changes are often necessary when owners change their requirements or put forward new demands during the construction process. While these changes may be intended to improve program quality or functionality, they can also result in higher costs, especially if the need was not anticipated.

In general, the impact of design changes on construction cost overruns is very direct and far-reaching, so possible future changes should be taken into account as much as possible during the design phase of the construction project to ensure that the project's budget and time can be effectively controlled.

3.2. Resource Constraints

Resource Constraints refer to the situation in which certain key resources (such as funds, materials, labor, equipment, etc.) are limited or insufficient in a construction project to meet project requirements, resulting in cost overruns (Johnson & Babu, 2020). Insufficient supply or price fluctuations of materials When a construction project faces constraints on material resources, there may be shortages of materials or increases in procurement prices (Lotfi et al., 2022). For example, if suppliers fail to deliver materials on time, or if material prices rise sharply due to changes in market demand, the project will be overspent. Labor constraints may arise from factors such as insufficient skilled workers, rising wages for workers, high worker mobility, and poor management of the labor

force (Afzal, Yunfei, Nazir, & Bhatti, 2021). Labor shortages can lead to delays in construction schedules, requiring higher overtime pay or the recruitment of temporary workers, which in turn increases costs. Construction projects rely on a large number of equipment, such as excavators, tower cranes, concrete mixers, etc. Equipment resource constraints may lead to increased equipment rental costs, or the need to extend the lease period or rent additional equipment due to insufficient equipment. For example: If the project requires more concrete mixers (Abeyasinghe, Greenwood, & Johansen, 2001), but the equipment supplier cannot provide them in time, construction may need to be stopped, causing delays and increasing rental costs or the cost of purchasing additional equipment. Funding is the basis for the smooth progress of construction projects. If the project is underfunded, it may lead to procurement delays, construction progress being hindered, or the need to obtain additional funds through loan sharking, financing, etc., all of which may increase financial costs and lead to budget overruns (Just & Murphy, 1994). If the project cannot pay the contractor in time, it may cause construction delays, resulting in extended construction periods and increased financing costs. Time constraints and extended construction periods Resource constraints often lead to project delays. For example, a shortage of materials or labor may prevent some construction work from being completed on time. Schedule delays often result in additional management fees, equipment rental fees, and worker overtime costs, which increase project costs. Supply chain issues Construction projects often involve complex supply chain management, and the flow of resources such as materials, equipment, and labor needs to be efficiently coordinated (Toklu, 2002). If the supply chain is affected by resource constraints, it may lead to delayed delivery of materials or price fluctuations, which in turn affects project schedules and costs.

Resource constraints have many impacts on construction cost overruns, so it is necessary to mitigate the negative impact of resource constraints through scientific resource management, budget control, and risk prediction.

3.3. Contractor Experience

The impact of contractor experience on construction cost overruns is significant. Experienced contractors are able to better control all aspects of the project, effectively reducing the risk of cost overruns (Memon, Rahman, Abdullah, & Azis, 2010). Conversely, inexperienced or poorly managed contractors may face more challenges, leading to project cost overruns. Experienced contractors usually have strong budget management capabilities, can accurately assess the materials, labor, equipment and other resources required for a project, and can develop reasonable cost plans. Contractors can better control budgets, identify potential overspending risks in a timely manner, and take measures to control them. Inexperienced contractors may underestimate the complexity or resource requirements of a project, resulting in an initial budget estimate that is too low (Mumela, Christine, Limited, & Box, 2015). Once problems arise during project execution, it may not be possible to discover and control costs in a timely manner, resulting in overspending. Experienced contractors are able to foresee potential risks in a project (such as material price fluctuations, labor shortages, construction difficulties, etc.) and take effective countermeasures. Less experienced contractors may overlook certain potential risks or not have effective risk response plans, which may lead to unexpected cost increases and affect the project budget if problems arise (Aje, Odusami, & Ogunsemi, 2009). Experienced contractors usually have strong project management and coordination skills and can efficiently manage the allocation of multiple tasks and resources to ensure that projects are completed on time and reduce additional costs due to construction delays or waste of resources. Effective coordination can optimize construction progress and reduce unnecessary costs. Inexperienced contractors may make mistakes in coordination, leading to schedule delays, wasted resources or poor construction, which can add to additional costs. Experienced contractors are usually more stringent in construction quality and can avoid rework due to quality issues (Amini, Rezvani, Tabassi, & Malek Sadati, 2023). Rework not only wastes time, but also adds additional labor and material expenses. The contractor's experience can help them identify and prevent quality issues and

ensure that construction quality meets standards (Amini et al., 2023). Less experienced contractors may have gaps in construction quality control and may be prone to overlooking details or using inappropriate materials or construction methods. Once quality problems occur, the cost of rework and repair will increase significantly. Experienced contractors are usually able to better manage workers and construction teams, ensure worker productivity, and allocate labor appropriately. Control labor costs by optimizing labor scheduling and avoiding worker idleness or excessive overtime. Inexperienced contractors may have problems with personnel management, such as uneven distribution of labor or improper scheduling, which may result in overtime pay when certain deadlines are tight, or waste of workers' time, leading to higher labor costs (Alshihri, Al-Gahtani, & Almohsen, 2022).

In general, the experience of the contractor has a multi-faceted impact on construction cost overruns. Experienced contractors are able to reduce the possibility of project cost overruns through precise budget management, effective risk control, excellent project coordination, and high-quality construction. Inexperienced contractors, on the other hand, may face risks such as poor budget control, schedule delays, and quality issues, leading to project cost overruns. Therefore, choosing experienced contractors with strong management capabilities is crucial to controlling the cost of construction projects.

4. SUGGESTIONS FOR CONSTRUCTION COST OVERRUNS

(1) Reduce design changes and optimize design management: Design changes are an important factor leading to insufficient construction planning and construction cost overruns. Frequent design changes will not only disrupt the construction plan, but may also lead to an increase in construction costs. Therefore, project managers should try to avoid unnecessary design changes. By strengthening communication and cooperation with the design team, the feasibility and completeness of the design plan can be ensured, thereby reducing the need for design changes during construction. During the design phase, all changes should be strictly approved, and the possible impact of the changes should be fully evaluated and controlled. This management strategy can effectively reduce cost fluctuations caused by design changes, thereby maintaining the stability of the project budget.

(2) Optimize resource allocation and deal with resource constraints: Resource constraints, especially labor shortages, directly affect construction planning and project progress, leading to cost overruns. To this end, the project manager should conduct detailed resource planning in the early stages of the project to ensure that all resources required for construction can be in place on time to avoid affecting the construction progress due to resource shortages. In terms of labor management, it is recommended to recruit and train personnel in advance to ensure that the professional skills and number of construction personnel can meet project needs. At the same time, optimize the allocation of resources, increase the supply channels of external resources, and provide flexible resource support for the project. This resource management strategy can effectively reduce problems in construction planning and thus control project costs.

(3) Improve contractor experience and capabilities: The experience and capabilities of contractors are crucial to construction planning and cost control. To ensure the smooth progress of the project, it is recommended to give priority to their past project experience and performance when selecting contractors. Experienced contractors can effectively reduce uncertainties in the construction process and avoid problems in construction planning due to technical or management deficiencies. In addition, regular training and experience sharing can be used to improve the technical level and management capabilities of contractors to help them better cope with project complexity. The contractor's experience not only helps them to efficiently handle technical challenges in construction, but also optimizes resource allocation and reduces project delays caused by insufficient planning and lack of experience, thereby controlling construction costs.

5. CONCLUSION

Based on the perspective of scientometrics, this paper studies the cost overrun problem of construction projects through literature retrieval, review and summary. The study found that design changes, resource constraints, and contractor experience are all key influencing factors of cost overruns. Based on these influencing factors, construction units should strengthen project cost control, avoid unnecessary cost consumption during construction, generate greater economic value for construction projects, and ensure that the economic benefits of construction units are not affected.

REFERENCES

[1] Abeyasinghe, M. C. L., Greenwood, D. J., & Johansen, D. E. (2001). An efficient method for scheduling construction projects with resource constraints. International journal of project Management, 19(1), 29-45.

[2] Afzal, F., Yunfei, S., Nazir, M., & Bhatti, S. M. (2021). A review of artificial intelligence based risk assessment methods for capturing complexity-risk interdependencies: Cost overrun in construction projects. International Journal of Managing Projects in Business, 14(2), 300-328.

[3] Aje, O., Odusami, K., & Ogunsemi, D. (2009). The impact of contractors' management capability on cost and time performance of construction projects in Nigeria. Journal of financial management of property and construction, 14(2), 171-187.

[4] Alshihri, S., Al-Gahtani, K., & Almohsen, A. (2022). Risk factors that lead to time and cost overruns of building projects in Saudi Arabia. Buildings, 12(7), 902.

[5] Amini, S., Rezvani, A., Tabassi, M., & Malek Sadati, S. S. (2023). Causes of cost overruns in building construction projects in Asian countries; Iran as a case study. Engineering, construction and architectural management, 30(7), 2739-2766.

[6] Aslam, M., Baffoe-Twum, E. E., & Saleem, F. (2019). Design changes in construction projects causes and impact on the cost. Civil Engineering Journal, 5(7), 1647-1655.

[7] Herrera, R. F., Sánchez, O., Castañeda, K., & Porras, H. (2020). Cost overrun causative factors in road infrastructure projects: A frequency and importance analysis. Applied Sciences, 10(16), 5506.

[8] Johnson, R. M., & Babu, R. I. I. (2020). Time and cost overruns in the UAE construction industry: a critical analysis. International Journal of Construction Management, 20(5), 402-411.

[9] Just, M. R., & Murphy, J. P. (1994). The effect of resource constraints on project schedules. AACE International Transactions, 1994, DCL2. 1.

[10] Lee, D., Lee, S. H., Masoud, N., Krishnan, M., & Li, V. C. (2021). Integrated digital twin and blockchain framework to support accountable information sharing in construction projects. Automation in construction, 127, 103688.

[11] Lotfi, R., Yadegari, Z., Hosseini, S., Khameneh, A., Tirkolaee, E., & Weber, G. (2022). A robust time-cost-quality-energy-environment trade-off with resource-constrained in project management: A case study for a bridge construction project. Journal of Industrial and Management Optimization, 18(1).

[12] Memon, A. H., Rahman, I. A., Abdullah, M. R., & Azis, A. A. A. (2010). Factors affecting construction cost in Mara large construction project: perspective of project management consultant. International Journal of Sustainable Construction Engineering and Technology, 1(2), 41-54.

[13] Mumela, M. E., Christine, N., Limited, R., & Box, P. (2015). Effect of Contractor Knowledge and Experience on Cost Estimation in Plant Infrastructure Projects in Kenya. International Journal of Science and Research (IJSR).

[14] Siraj, N. B., & Fayek, A. R. (2019). Risk identification and common risks in construction: Literature review and content analysis. Journal of construction engineering and management, 145(9), 03119004.

[15] Toklu, Y. C. (2002). Application of genetic algorithms to construction scheduling with or without resource constraints. Canadian Journal of Civil Engineering, 29(3), 421-429.

[16] Williams, T., Eden, C., Ackermann, F., & Tait, A. (1995). The effects of design changes and delays on project costs. Journal of the Operational Research Society, 46(7), 809-818.