

Cost overrun factors leading to construction claims in a multi-contractor set-up

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Abstract:

Mega construction projects have various scopes executed by more than one contractor. Poor coordination of the scheduling and execution of the contractors can lead to exorbitant claims. The purpose of this study was to determine cost overrun factors that could lead to construction claims in a multi-contractor set-up for a mega project. The study employed a quantitative research approach. The study adopted a purposive sampling technique with a sample size of 50 respondents. Data was collected with a survey questionnaire from professionals involved in the design and execution of projects within the construction industry, based in Gauteng province in South Africa. The respondents include Construction Project Managers and Quantity Surveyors. Results of the survey were analysed using the relative importance index statistical method, which resulted in the identification of the cost overruns factors that could lead to construction claims for a multi-contractor construction project. The findings of the study reveal that cost overrun factors responsible for construction claims include design changes, construction complexity, contracts management, access to site, and coordination of the work of the contractors, incompetence of the contractor and poor planning. Construction management companies should work together with the employer to develop practices to manage construction activities in order to avoid construction claims.

Keywords:

Construction claims, contracts management, cost overrun factors, multi-contractor construction

1 Introduction

The scope of work for a mega infrastructure projects is mostly executed by more than one contractor and this arrangement constitutes a multi-contractor set-up. The project owner awards a contract to each of the construction companies on site and the execution of the project is subjected to a multi-contractor set-up. Access to site for some of the contractors is dependent on other contractors, for an example Civils' infrastructure contractor needs to complete its work before a Mechanical contractor could have access to the construction site. The construction works need to be certified for quality and other related aspects such as health and safety. Any delay in handing over the site by a Civils contractor will cause delay for access to the site by the Mechanical contractor. This creates a problem of cost overruns for the project owner in the form of an extension of time due to late access to site by other contractors. The contractor affected by an extension of time is entitled to delay damages which is mostly referred to as construction claims. The other problem is when multiple contractors work on the same

construction site. This create a problem of contractors' interface and coordination of the construction activities and more especially those that are common such as health and safety. Poor coordination among contractors working on the same site also create a problem of cost overruns which leads to an extension of time claims. Construction companies working in a multi-contractor set-up need to understand the project complexity to avoid the risk of project cost overruns which could result in construction claims such as an extension of time. The main aim of this study was to evaluate the cost overrun factors that contribute to construction claims. Identifying these factors at early stage of the project will assist project managers to providing mitigations against possible construction claims.

2 Literature Review

There are several factors that contribute to construction cost overruns for a mega construction project whose scope is executed by more than one contractor. The literature review for this study identified several costs overrun factors that could lead to construction claims. These factors are grouped into seven categories as depicted in table 1 below.

Table 1: Cost overrun factors leading to construction claims

Factors	Reference
Poor procurement preparation	Lal & Mathew, 2022
Inadequate planning	Oluwajana, Ukoje, Okosun, & Aje, 2022; Ammar, Abdel-Monem & El-Dash, 2022
Inaccurate cost estimation	Ammar, Abdel-Monem & El-Dash, 2022; Fashina et al., 2021; Oluwajana, Ukoje, Okosun, & Aje, 2022
Design changes, Change orders, Scope changes	Ammar, Abdel-Monem & El-Dash, 2022; Albtoush, AL-Btoush, Rahman, 2022; Lal, & Mathew, 2022; Rustandi, Muktiyanto, & Srimindart, (2022); Ajibike et al. 2022; Ahmed & Arocho, 2021; Oluwajana, Ukoje, Okosun, & Aje, 2022; Tahmasebinia and Song, 2022; Alekhya, Shashikanth & Prasad, 2021
Project experience of the contractor	Namous & Mohammed Al Battah, 2021; Oluwajana, Ukoje, Okosun, & Aje, 2022; Tahmasebinia & Song, 2022; Alekhya, Shashikanth & Prasad, 2021
Site management and supervision	Radzi, Alauddin & Derus, 2022; Faham Tahmasebinia, & Song, 2022; Alekhya, Shashikanth & Prasad, 2021
Project construction complexity	Oluwajana, Ukoje, Okosun & Aje, 2022

2.1 Poor procurement preparation

Procurement plays an importance role in terms of contracting, sourcing of goods and services. Poor procurement preparation is one of the factors that could lead to construction claims (Lal & Mathew, 2022). Delay in procurement could also lead to a

delay in providing access of the contractor to site (Amoatey & Ankrah, 2017). This affects the construction schedule which would result in a claim due to an extension of time. Poor procurement planning can also affect the construction activities during the execution stage of the project. Contractors experience delays in executing construction activities due to late delivery of construction material (Ajibike et al. 2022; Namous & Al Battah, 2021; Oluwajana et al., 2022; Tahmasebinia & Vicheth Song, 2022). The late delivery of construction material is influenced by the procurement not adequately being aware of the lead times of the construction materials and due to the shortage of the material in the market (Enshass et al., 2009; Habibi & Kermanshachi, 2018). The delay in delivery of construction material will affect construction activities of all contractors involved in the affected project site. This will result in multiple claims from various contractors. The claim will be based on access to site for contractors whose construction activities are affected by the contractor who experiences shortage of material on site and an extension of time for all contractors working on the site. All construction projects must have procurement strategy which outlines the plan and sourcing of goods and services.

2.2 Inadequate planning

Inadequate planning affects project cost and schedule (Oluwajana et al., 2022; Ammar et al., 2022). The project might not be adequately prepared for planning and execution (El-Maaty et al., 2017). This could also result in poor contract planning (Asiedu & Adaku, 2020; Arantes & Ferreira, 2020). This could lead to unrealistic contract duration (Albtoush et al., 2022; Badawy et al., 2022; Shashikanth & Prasad, 2021). The consequence of unrealistic contract duration imposed by the project owner, i.e., the employer, is project cost overruns which could result in claim for an extension of time for the affected contractors (Famiyeh et al., 2017; Arantes & Ferreira, 2020). Poor planning could also affect delay in the delivery of materials on site (Ajibike et al. 2022; Namous & Al Battah, 2021; Oluwajana et al., 2022; Tahmasebinia & Song, 2022) and inadequate sourcing of equipment (Oluwajana et al., 2022).

2.3 Inaccurate cost estimation

Some of contractors underestimate their cost in order to get the bid to do the works (Famiyeh et al., 2017). Inaccurate project cost estimate causes project cost overruns due to change orders which lead to construction claims (Ammar, Abdel-Monem & El-Dash, 2022; Fashina et al., 2021; Oluwajana, Ukoje, Okosun, & Aje, 2022). Poorly defined scope of work contributes to poor cost estimates and poor estimation techniques (Famiyeh et al., 2017).

2.4 Design changes, change orders, scope changes

Changes in design, change orders and scope changes have more impact on the project cost and schedule (Ammar et al., 2022; Albtoush et al., 2022; Lal, & Mathew, 2022; Rustandi et al., 2022; Ajibike et al. 2022; Ahmed & Arocho, 2021; Oluwajana et al., 2022; Tahmasebinia & Song, 2022; Alekhya et al., 2021). Other scholars emphasised how scope changes substantially change the project cost and extended delays in the project schedule (Amoatey & Ankrah, 2017; Asiedu & Adaku, 2020; Mahamid, 2017; Prasad et al., 2019). Design changes due to poorly defined scope of work (Famiyeh et

al., 2017) also have a huge impact on project scope and schedule (Famiyeh et al., 2017; Habibi & Kermanshachi, 2018; Prasad et al., 2019). Not managing changes relating to scope and design could lead to a claim for extension of time (Rustandi et al., 2022).

2.5 Project experience of the contractor

A multi-contractor set-up requires contractors with project experience for similar construction works. Inexperience of the contractor affects the construction site activities in terms of project execution and scheduling (Namous & Al Battah, 2021; Oluwajana et al., 2022; Tahmasebinia & Song, 2022; Alekhya, et al., 2021). Amoatey and Ankrah (2017) also found that inadequate contractor experience contributes to project cost overruns. This is also consistent with Mahamid (2017) whose study found that poor project coordination is associated with inexperience of the contractor in executing the construction activities.

2.6 Site management and supervision

Site management and supervision of construction activities is key in reducing the possibility of project cost overruns (Radzi et al., 2022; Tahmasebinia, & Song, 2022; Alekhya et al., 2021). Poor site management and supervision is mostly caused by inadequate management skills (Vivek & Rao, 2021; Namous & Al Battah, 2021; Tahmasebinia & Song, 2022; Alekhya et al., 2021). Other studies found that project cost overruns are caused by lack of management and technical skills of the project personnel, human capacity, lack of understanding and knowledge of the local context (Santoso & Gallage, 2019; Durdyev & Hosseini, 2020). Other factors contributing to poor site management include supervision and control (Asiedu & Adaku, 2020), poor inspection and supervision of projects by contractors (Famiyeh et al., 2017; Habibi & Kermanshachi, 2018), poor project coordination (Mahamid, 2017), project site management (Famiyeh et al., 2017; Habibi & Kermanshachi, 2018; Durdyev & Hosseini, 2020; Arantes & Ferreira, 2020).

2.7 Project construction complexity

Contractors executing works in a site which has multiple scopes executed by different contractors, need to understand project construction complexity (Oluwajana et al., 2022; Famiyeh et al., 2017). This requires planning and coordination of common activities such as health and safety. Understanding the project environment will also allow the contractors to adequately plan their activities in terms of schedule and site access. Lack of access can lead to a claim for an extension of time and construction planning. The delay to access site might also impact on the constructability of other contractors. Famiyeh et al. (2017) also identified inappropriate construction methods used by contractors as a factor that could lead to construction claims. The claim could also arise from rework due to the poor quality of the works.

3 Research Methodology

The study adopted a quantitative research approach. Data was collected through a survey questionnaire. A five-point Likert scale was used to measure the relative importance of the factors the cost overruns factors that leads to construction claims (1 -

very low to 5 - very high). The survey questionnaire was completed by fifty participants across the built environment industry, mainly professionals with more than 3 years' experience. The respondents included all industry practitioners both in the public and private sector who worked in a multi-contractor set-up. The participants included Construction Project managers and Quantity surveyors. Purposive sampling was used to solicit research information from industry practitioners. The questionnaire composed of Section A: Biographical Information and Section B: Cost overruns factors causing construction claims.

A total of thirty-nine factors that could lead to cost overruns claims in a multi-contractor set up were listed for respondents to rank. Respondents presented their views on the project risk factors by indicating on a 5-point Likert scale where 1 represented 'no influence' and 5 represented a 'very serious influence'. The rationale for using the scale was to establish the level agreement amongst the professionals on which factors, exposes the projects to the risk construction claims. The contribution of each of the factors to construction claims was examined and the ranking of the attributes in terms of their criticality as perceived by the respondents was done by using Relative Importance Index (RII) which was computed using equation below:

$$RII = W / A * N \quad (0 \leq RII \leq 1)$$

Where:

W – Is the weight given to each factor by the respondents and ranges from 1 to 5, (where “1” is “1” “Minor Influence” and “5” is “Major Influence”)

A – Is the highest weight (i.e., 5 in this case) and.

N – Is the total number of respondents

The RII method was used in this study to assess the relative importance of the factors the cost overruns factors that leads to construction claims. The method has been used in similar studies such as (Sambasivan & Soon, 2007; Fallahnejad, 2013).

4 Findings and Discussion

Table 1 summarises the biographical information of the respondents and the results of the analysis of the RII factors are presented in Table 3.

4.1 Biographical data

The results show that respondents are highly educated (70%), with extensive project experience of more than 10 years (67%) and majority in senior management (73%).

Table 2: Demographic profile of respondents

Respondents' characteristics	Frequency (%)
Highest Educational Level	
Degree (Bachelor, Honours and Masters)	35 (70%)
National Higher Diploma	13 (27%)
College Certificate	2 (3%)
Work Experience	
More than 10 years	33 (67%)
2 - 6 years	17 (33%)
Roles in the project	
Middle, seniors and executive management level	37 (73%)
Intermediate level	10 (20%)
Entry level	4 (7%)

4.2 Description of the results

The results shows that six out of seven construction risk factors identified in the literature appear on the top ten of the RII raking in table 2. Incomplete design during tender stage (ranked 5 and RII = 0.6945). This factor, if not mitigated, leads to other factors such as: Design changes during project execution (RII = 0.6560), scope creep (RII of 0.6530) and unrealistic design development periods (RII of 0.6530). This factor (Design variations/Modifying) was ranked number two (RII =0.792) by Ammar et al. (2022) as a contributing factor for cost overruns for road network projects in Egypt during the implementation phase.

Inaccurate cost estimation (Insufficient planning and Inaccurate cost estimation) is ranked number one (RII = 0.729). This factor, if not mitigated, leads to other factors such as: Underestimation of cost the moment of budgeting (RII = 0.6530), Lack of value management (RII = 0.6150), Weak project controls and regulations (RII = 0.6145) and Ineffective project governance and oversight (RII = 0.6145). This factor was ranked number one (RII =0.824) by Ammar et al. (2022) as a contributing factor for cost overruns for road network projects in Egypt during the implementation phase. Inaccurate estimation will impact construction activity as the project would run out of budget. This will result in a standing claim and an extension of time claim for the affected contractors, while the project owner sources additional fund to allow affect activities to continue.

Project construction complexity is ranked number six (RII =0.6875). This factor if not mitigated, can lead to other factors such as: Insufficient planning and inaccurate estimates (RII = 0.7290), Poor project controls (RII = 0.7085), Lacking appropriate planning (RII = 0.6805), Poor risk identification, management, and response (RII = 0.6665), Poor project management (RII =0.6635), Poor project definition (RII = 0.6355), Inadequate survey and investigations of existing site condition (RII =0.5900), Lack of risk assessment during planning stage (RII = 0.6560). The results are consistent with Famiyeh et al. (2017) who found that inappropriate construction methods used by contractors as a factor that could lead to construction claims.

Inadequate planning is ranked seven (RII = 0.6805). This factor, if not mitigated, can lead to other factors such as: Insufficient planning and inaccurate estimates (RII = 0.7290), Poor project controls (RII = 0.7085), Inadequate communication and slow decision-making (RII = 0.6805), Poor risk identification, management, and response (RII = 0.6665), Poor project management (RII = 0.6635), Poor contract management (RII = 0.6565), Unrealistic design development periods (RII = 0.6530). Inadequate planning affects the project cost and schedule (Oluwajana et al., 2022; Ammar et al., 2022). This will lead to construction claim of cost and an extension of time.

Project experience of the contractor (Incompetent contractors) is ranked number three (RII = 0.7150). This factor, if not mitigated, can lead to other factors such as: Lack of project risk governance structure (RII = 0.7290), Poor project controls (RII = 0.7085), Lack of appropriate planning (RII = 0.6805), Poor risk identification, management, and response (RII = 0.6665), Poor project management (RII = 0.6635), Poor contracts management (RII = 0.6565), Lack of managerial and technical knowledge (RII = 0.6425). The results are consistent with literature that inexperience of the contractor affects the construction site activities in terms of project execution and scheduling (Namous & Al Battah, 2021; Oluwajana et al., 2022; Tahmasebinia & Song, 2022; Alekhya, et al., 2021). Inexperience of the contractor would significantly affect both cost and time for the project due to poor coordination among contractors on site and poor resourcing of construction activities. The resultant claim would be cost associated with access to site for the contractors, interface related cost, and an extension of time for all affected contractors.

Poor procurement (corruption during procurement stage) is ranked number nine (RII = 0.6735). This factor, if not mitigated, can lead to other factors such as: Lack of appropriate planning (RII = 0.6805), Strategic misrepresentation (0.6700), Poor risk identification, management, and response (RII = 0.6665), Poor project management (RII = 0.6635), Poor contract management (RII = 0.6565), Lack of risk assessment during planning stage (RII = 0.6560), Ineffective decision-making process (RII = 0.6355), Project fraud and corruption practices (RII = 0.6215). Poor procurement could affect contractors in executing construction activities due to late delivery of construction material (Ajibike et al. 2022; Namous and Al Battah, 2021; Oluwajana, Ukoje, Okosun, and Aje, 2022; Tahmasebinia and Vicheth Song, 2022). The implication for a multi-contractor set-up is a delayed access to site, interface related issues and coordination of construction activities among the contractors. The resultant claim would include cost associated with access to site for the contractors, interface related cost, and an extension of time for all affected contractors.

Project site management and supervision (lack of competent site supervision) is ranked number 27 (RII = 0.6180). This factor is related to the following factors: Inexperienced management team (RII = 0.6320), Lack of managerial and technical knowledge (RII = 0.6425), Lack of leadership skill in the managerial position (RII = 0.6115). The results are consistent with literature which found that inadequate management skills contribute to poor site supervision (Vivek & Rao, 2021; Namous & Al Battah, 2021; Tahmasebinia & Song, 2022; Alekhya et al., 2021). Project owners must invest in training to improve the supervisory skills of the project personnel. Poor site management and supervision affect the construction activities and schedule. Construction works that is poorly

supervised would most likely affect the quality and schedule of construction activities. The resultant claim would for a rework due to poor quality and an extension of time.

Table 3: RII ranking

No	Cost Overruns factors leading to construction claims	RII	Ranking
1	Lack of project risk governance structure	0,7290	1
2	Insufficient planning and inaccurate estimates	0,7290	1
3	Incompetent contractors	0,7150	3
4	Poor project controls (cost and schedule)	0,7085	4
5	Incomplete designs at tender stage	0,6945	5
6	Lack of knowledge about the project and its complexity	0,6875	6
7	Inadequate communication and slow decision making	0,6805	7
8	Lack of appropriate planning	0,6805	7
9	Corruption during procurement stage	0,6735	9
10	Payment delays by clients	0,6705	10
11	Strategic misrepresentation	0,6700	11
12	Poor risk identification, management, and response	0,6665	12
13	Poor project management	0,6635	13
14	Poor contract management	0,6565	14
15	Lack of risk assessment during planning stage	0,6560	15
16	Design Changes	0,6560	15
17	Underestimation of cost the moment of budgeting	0,6530	17
18	Scope creep	0,6530	17
19	Unrealistic construction periods	0,6530	17
20	Unrealistic design development periods	0,6530	17
21	Lack of managerial and technical knowledge	0,6425	21
22	Ineffective decision-making process	0,6355	22
23	Poor project definition	0,6355	22
24	Inexperienced management team	0,6320	24
25	The absence of a plan that takes into account, geological, designs and specifications changes	0,6285	25
26	Project fraud and corruption practices	0,6215	26
27	Lack of competent site supervision	0,6180	27
28	Lack of value management	0,6150	28
29	In effective project governance and oversight	0,6145	29
30	Weak project controls and regulations	0,6145	29
31	Lack of leadership skill in the managerial position	0,6115	31
32	Inadequate survey and investigations of existing site condition	0,5900	32
33	Misinterpretation contract and project specifications	0,5555	33
34	Labour disputes (Strike)	0,5000	34

5 Conclusion and Further Research

Cost overrun factors responsible for construction claims for a multi-contractor construction project affect the project in both cost and schedule. The most prominent project cost overrun factors identified by this research are: Lack of project risk governance structure, Insufficient planning and inaccurate estimates, Incompetent contractors, Poor project controls (cost and schedule), Incomplete designs at tender stage, Lack of knowledge about the project and its complexity, Inadequate

communication and slow decision making, and Lack of appropriate planning. These factors, if not mitigated, can lead to construction claims such as delayed access to site, standing time, material related costs, interfacing with other contractors and an extension of time for the affected contractors. Project governance structure and risk management process must be in place to mitigate against construction claims.

The contribution of this study is that the project cost overruns factors must be identified and managed at early stages of the project. Proper planning of construction project activities will ensure accurate cost estimation and scheduling. This should be accompanied by a development of project risk governance structure. The project risk governance structure will fulfil an oversight role of managing the project cost overrun factors that contribute to construction claims. Further research should focus on the project cost overruns factors that contribute to concurrent claims by more than one contractor working on site.

6 References

- Ahmed, S. & Arocho, I. (2021), 'Analysis of cost comparison and effects of change orders during construction: Study of a mass timber and a concrete building project', *Journal of Building Engineering*, 33 (2021) 101856.
- Ajibike, W.A., Adeleke, A.Q., Muuka, G.N., Bamgbade, J.A, & Darun, T.D. (2022), 'Impacts of Oil and Gas Internal Risk Factors on Project Success: Moderating Role of Government Support', *Construction Economics and Building*, 22(1), pp. 47-69.
- Alekhyia, G.B.S., Shashikanth, K. & Prasad, M.A. (2021), 'Risk assessment of cost overrun using fuzzy logic model', *Materials Today: Proceedings*, <https://doi.org/10.1016/j.matpr.2021.12.415>
- Ammar, T., Abdel-Monem, M., & El-Dash, K. (2022), 'Risk factors causing cost overruns in road networks', *Ain Shams Engineering Journal*, 13 (2022), 101720.
- Durdyev, S., Ismail, S. & Bakar, N.A. (2012), 'Factors causing cost overruns in construction of residential projects: Case Study of Turkey', *International Journal of Science and Management*, 1(1), pp.3-12.
- Fallahnejad, M.H. (2013), 'Delay causes in Iran gas pipeline projects', *International Journal of Project Management*, 31(1), pp. 136-146.
- Famiyeh, S., Amoatey, C.T., Adaku, E., & Agbenohevi, C.S. (2017), 'Major causes of construction time and cost overruns A case of selected educational sector projects in Ghana', *Journal of Engineering, Design and Technology*, 15 (2), pp. 181-198 © Emerald Publishing Limited 1726-0531.
- Fashina, A.A., Omar, M.A., Sheikh, A.A., & Fakunle, F.F. (2021), 'Exploring the significant factors that influence delays in construction projects in Hargeisa', *Heliyon*, 7 (2021). <https://doi.org/10.1016/j.heliyon.2021.e06826>.
- Kumar, K.S. & Narayanan, R.M. (2021), 'Review on construction risk and development of risk management procedural index – A case study from Chennai construction sector', *Materials Today: Proceedings*, 43 (2021), pp.1141–1146.
- Lal, N.S. & Mathew, A.M. (2022), 'Identification of risk factors leading to cost and time overrun in B-O-T projects', *Sustainability, Agri, Food and Environmental Research*, (ISSN: 0719-3726), 10(X).

- Namous, E.A., & Al Battah, M. (2021), 'Evaluating the Factors That Cause Cost and Time Overrun in the Residential Construction Projects in the UAE: Project Manager Perspective. ZEMCH 2021 International Conference | 26-28 October | Dubai | UAE
- Oluwajana, S.M., Ukoje, J.E., Okosun, S.E. & Aje, I. O, 'Factors affecting time and cost performance of road construction projects in Nigeria', *African Journal of Applied Research*, 8(1), (2022), pp. 72-84.
- Radzi, N.M., Alauddin, K. & Derus, M.M. (2022), 'Improving the Effectiveness of Risk Management Among Sub-Contractors in the Northern State of Malaysia', *Built Environment Journal*, 19(1), pp.23-31.
- Rehman, M.A. & Ishak, M.S.B. (2021), 'Moderating role of government Acts, laws and policies between team competency and skills and construction risk management among KSA contractors', *International Journal of Construction Supply Chain Management*, 11(2), pp. 144-165. DOI: 10.14424/ijcscm110221-144-165.
- Rustandi, Muktiyanto, A., & Srimindart, C. (2022), 'Cost overruns on Railway Signalling Project: Qualitative case study on lrs company', *Jurnal Riset Bisnis dan Manajemen*, 15(1), February 2022.
- Sambasivan, M. & Soon, Y.W. (2007), 'Causes and effects of delays in Malaysian construction Industry', *International Journal of Project Management*, 25 (5), pp. 517-526, doi: 10.1016/j.ijproman.2006.11.007.
- Sharma, S. and Goyal, P. (2014), 'Cost Overrun Assessment Model in Fuzzy Environment', *American Journal of Engineering Research*, 3(7), pp-44-53.
- Tahmasebinia, F. & Song, V. (2022), 'Significant Factors Causing Delay in the Cambodian Construction Industry', *Sustainability*, 2(14), 3521.
- Vivek, A. & Rao, C.H.H. (2021), Identification and analysing of risk factors affecting cost of construction projects, *Materials Today: Proceedings*, <https://doi.org/10.1016/j.matpr.2021.12.228>