

Key Determinants of Time-Related Preliminary and General (P&G) Costs in Construction Projects

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Abstract

Time-related Preliminary and General (P&G) costs represent a significant portion of construction project expenditures. This study aims to identify the key determinants influencing time-related P&G costs in construction projects to support better cost control and project management.

This study adopts a qualitative research design using content analysis as the primary methodological approach. The study was conducted across major academic databases using predefined keywords and inclusion criteria. Peer-reviewed journal articles and conference papers addressing construction cost management, site overheads, and project duration were analysed. The literature was categorised to identify recurring determinants and their impact on time-related P&G costs.

Project duration is identified as the primary driver of time-related P&G costs. Other significant determinants include project size and complexity, procurement and contract conditions, planning and scheduling efficiency, and contractor management capability. External factors, such as adverse weather, regulatory compliance, and industrial action, further extend project timelines. Client-related factors, particularly scope changes, also exacerbate cost escalation.

Overall, the study concludes that time-related P&G costs are predominantly shaped by interconnected managerial and organisational factors rather than discrete technical issues. Effective coordination, competent contractor capability, and robust site management practices emerge as critical levers for minimising delays and controlling cost escalation. The findings imply that project stakeholders should prioritise integrated planning, strengthen contractor selection criteria, and adopt collaborative coordination mechanisms to improve time and cost performance. These insights provide a foundation for more proactive and system-oriented approaches to managing time-related construction costs in complex project environments.

Keywords: Time-related costs, Preliminary and General (P&G) costs, Construction project management, Cost determinants, Systematic literature review

1. Introduction

Time-related Preliminary and General (P&G) costs constitute a significant portion of total construction project expenditures, particularly in mega infrastructure projects executed by multiple contractors. In such environments, the project owner appoints multiple contractors, each responsible for specific components of the work. However, the interdependent nature of these activities, for instance, a civil contractor must complete certain works before a mechanical contractor can access the site, introduces a high risk of delays. These delays directly impact project duration, which in turn escalates time-related P&G costs, including site establishment, supervision, security, and temporary services.

Moreover, construction activities must comply with stringent quality assurance and health and safety requirements, further increasing the complexity of coordination among contractors. Inefficiencies in managing contractor interfaces, particularly when multiple contractors operate simultaneously on-site,

often lead to poor coordination, duplication of effort, and disruptions to planned schedules. Such challenges contribute to extended project durations, thereby increasing time-related P&G costs and exposing the project to extension-of-time (EoT) claims.

Delays in site handover or access caused by underperformance by preceding contractors have a cascading effect on subsequent contractors, leading to claims for additional time and associated costs. These claims significantly inflate the project's overall cost and impose a financial burden on the project owner. Therefore, understanding the determinants that influence time-related P&G costs is critical in multi-contractor project environments.

This study aims to identify and evaluate the key factors contributing to increased time-related P&G costs in construction projects. Early identification of these determinants will enable project managers to implement proactive mitigation strategies, improve coordination among contractors, and enhance overall cost control and project performance.

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2. Literature Review

There are several key determinants of time-related preliminary and general (P&G) costs in construction projects where the scope of work is executed by multiple contractors. Within the context of this study, these determinants are particularly important in understanding how project complexity and multi-contractor arrangements influence cost escalation and the occurrence of construction claims.

2.1. Procurement preparation

Procurement plays a critical role in construction projects, particularly in the contracting and sourcing of goods and services and has a direct influence on time-related Preliminary and General (P&G) costs. Inadequate procurement planning is a key factor contributing to construction claims (Lal & Mathew, 2022), as it often leads to delays that disrupt project timelines. For instance, delays in procurement processes can postpone contractor access to the site (Amoatey & Ankrah, 2017), thereby affecting the construction schedule and resulting in extension of time (EoT) claims. Such delays prolong project duration and consequently increase time-related P&G costs, including site overheads, supervision, and temporary facilities.

Furthermore, poor procurement planning during the execution phase can significantly hinder construction activities. Contractors frequently experience delays due to the late delivery of construction materials (Ajibike et al., 2022; Namous & Al Battah, 2021; Oluwajana et al., 2022; Tahmasebinia & Vicheth Song, 2022). These delays are often attributed to inadequate consideration of material lead times and market shortages (Enshassi et al., 2009; Habibi & Kermanshachi, 2018). When materials are not delivered as scheduled, construction activities are disrupted across multiple contractors on-site, particularly in multi-contractor environments where tasks are highly interdependent.

The resulting delays have a cascading effect, leading to multiple claims from affected contractors. These claims may arise from restricted access to the site or from extended project durations caused by material shortages experienced by other contractors. Consequently, the accumulation of such delays significantly escalates time-related P&G costs and increases the project owner's financial burden.

Therefore, the development and implementation of a well-defined procurement strategy is essential for effective project delivery. Such a strategy should clearly outline the planning and sourcing of goods and services, with careful consideration of lead times, market conditions, and contractor coordination. By strengthening procurement planning and execution, project managers can mitigate delays, reduce the

likelihood of construction claims, and improve control over time-related P&G costs.

2.2. Planning

Inadequate project planning is a critical factor affecting both project cost and schedule performance (Oluwajana et al., 2022; Ammar et al., 2022), with direct implications for time-related Preliminary and General (P&G) costs. Insufficient planning at the early stages of a project often results in poor preparedness for both planning and execution phases (El-Maaty et al., 2017). This lack of preparedness extends to contract planning, where deficiencies may lead to poorly structured contracts and unrealistic project parameters (Asiedu & Adaku, 2020; Arantes & Ferreira, 2020).

One of the key consequences of poor contract planning is the establishment of unrealistic contract durations (Albtoush et al., 2022; Badawy et al., 2022; Shashikanth & Prasad, 2021). When project owners impose impractical timelines, contractors are unable to execute work efficiently, resulting in delays and disruptions to the construction schedule. These delays often lead to cost overruns and give rise to extension-of-time (EoT) claims by affected contractors (Famiyeh et al., 2017; Arantes & Ferreira, 2020). The extension of project duration consequently increases time-related P&G costs, including site overheads, supervision, and temporary facilities.

Furthermore, inadequate planning negatively impacts the timely delivery of construction materials and the effective sourcing of equipment. Delays in material delivery (Ajibike et al., 2022; Namous & Al Battah, 2021; Oluwajana et al., 2022; Tahmasebinia & Song, 2022) and insufficient equipment availability (Oluwajana et al., 2022) disrupt construction activities and reduce productivity on-site. In multi-contractor environments, such disruptions have a cascading effect, delaying dependent activities and further extending the project timeline.

Overall, inadequate planning contributes significantly to prolonged project durations, increased likelihood of construction claims, and escalation of time-related P&G costs. Addressing planning deficiencies in the early stages of a project is therefore essential to enhance schedule reliability, improve coordination, and strengthen cost-control mechanisms.

2.3. Cost estimation

Inaccurate cost estimation is a significant contributor to project inefficiencies and has direct implications for time-related Preliminary and General (P&G) costs. In some instances, contractors deliberately underestimate project costs in order to secure contract awards (Famiyeh et al., 2017). While this strategy may increase the likelihood of winning bids, it often results in unrealistic budgets that do not align with the project's actual scope and complexity.

Inaccurate project cost estimates frequently lead to cost overruns, particularly when adjustments are required during project execution, such as change orders (Ammar, Abdel-Monem & El-Dash, 2022; Fashina et al., 2021; Mekonen, 2025; Oluwajana et al., 2022). These change orders often disrupt planned schedules, resulting in delays that give rise to extension-of-time (EoT) claims. Consequently, prolonged project durations increase time-related P&G costs, including site overheads, supervision, and temporary facilities.

A key underlying factor contributing to inaccurate cost estimation is a poorly defined scope of work. When the project scope is unclear or inadequately specified, estimators cannot accurately quantify resources, durations, or associated costs. This limitation is further exacerbated by the use of inappropriate or outdated estimation techniques (Famiyeh et al., 2017). The combination of scope ambiguity and weak estimation practices increases the likelihood of budget inaccuracies, schedule disruptions, and subsequent construction claims.

Therefore, improving the accuracy of cost estimation through a clearly defined project scope and the adoption of robust estimation techniques is essential for controlling project duration and minimising time-related P&G cost escalation.

2.4. Design changes

Changes in design, change orders, and scope variations are widely recognised as significant factors affecting both project cost and schedule performance (Ammar et al., 2022; Albtouch 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). These changes often disrupt planned construction activities, leading to rework, resource reallocation, and inefficiencies that extend project duration. As a result, prolonged timelines directly increase time-related Preliminary and General (P&G) costs, including site overheads, supervision, and temporary facilities.

Several studies further emphasise that scope changes substantially escalate project costs and contribute to significant delays in project schedules (Amoatey & Ankrah, 2017; Asiedu & Adaku, 2020; Mahamid, 2017; Prasad et al., 2019). Design changes, often stemming from a poorly defined scope of work (Famiyeh et al., 2017), exacerbate these challenges by introducing uncertainties and requiring adjustments during execution. Such modifications not only affect productivity but also disrupt the coordination of activities, particularly in complex, multi-contractor environments.

Failure to effectively manage scope and design changes can result in substantial delays, ultimately leading to claims for extension of time (EoT) (Rustandi et al.,

2022). These claims further increase time-related P&G costs, placing additional financial pressure on the project owner.

Therefore, effective management of design and scope changes—through clear scope definition, robust change control processes, and proactive planning, is essential to minimise disruptions, control project duration, and reduce the escalation of time-related P&G costs.

2.5. Project experience of the contractor

Contractor inexperience represents an important determinant of time-related preliminary and general (P&G) costs, particularly within multi-contractor construction environments. A multi-contractor set-up requires contractors with proven experience in similar construction works to ensure efficient coordination, execution, and scheduling of project activities. However, contractor inexperience has been shown to negatively affect site operations, particularly through disrupted project execution, poor activity sequencing, and scheduling delays (Namous & Al Battah, 2021; Oluwajana et al., 2022; Tahmasebinia & Song, 2022; Alekhya et al., 2021).

Furthermore, inadequate contractor experience has been identified as a contributing factor to increased project costs, including time-related P&G costs, due to inefficiencies and extended project durations (Amoatey & Ankrah, 2017). In addition, poor coordination among project stakeholders, often linked to contractor inexperience, has been associated with ineffective management of construction activities, leading to delays and cost escalations (Mahamid, 2017).

Accordingly, within the scope of this study, contractor experience is considered a key determinant to be systematically reviewed, categorised, and evaluated as part of the broader investigation into the factors influencing time-related P&G costs in the South African construction industry.

2.6. Site management and supervision

Site management and supervision of construction activities are critical determinants of time-related preliminary and general (P&G) costs, as they directly influence project efficiency and the likelihood of cost overruns. Effective site management and supervision have been shown to reduce the probability of project cost escalations by ensuring proper coordination, control, and monitoring of construction activities (Radzi et al., 2022; Tahmasebinia & Song, 2022; Alekhya et al., 2021).

Conversely, poor site management and supervision are frequently attributed to inadequate management skills among project personnel (Vivek & Rao, 2021; Namous & Al Battah, 2021; Tahmasebinia & Song, 2022; Alekhya et al., 2021). Studies further indicate that cost overruns are often linked to deficiencies in managerial

and technical competencies, limited human capacity, and insufficient understanding of the local construction context (Santoso & Gallage, 2019; Durdyev & Hosseini, 2020).

Additional contributing factors include weak supervision and control mechanisms (Asiedu & Adaku, 2020), inadequate inspection and oversight by contractors (Famiyeh et al., 2017; Habibi & Kermanshachi, 2018), and poor project coordination (Mahamid, 2017). Collectively, these deficiencies in site management practices have been widely associated with ineffective project execution and increased project site management challenges, ultimately leading to higher project costs and delays (Famiyeh et al., 2017; Habibi & Kermanshachi, 2018; Durdyev & Hosseini, 2020; Arantes & Ferreira, 2020).

2.7. Project construction complexity

In the context of this study, contractors operating in multi-contractor construction environments must have a clear understanding of project complexity to effectively manage time-related preliminary and general (P&G) costs. Where multiple contractors execute different scopes of work on the same site, adequate planning and coordination of shared activities, such as health and safety management, site logistics, and access arrangements, becomes essential to ensure smooth project execution (Oluwajana et al., 2022; Famiyeh et al., 2017).

A sound understanding of the project environment enables contractors to properly sequence activities, plan work schedules, and manage site access requirements. Conversely, restricted or delayed site access can disrupt planned activities, potentially resulting in claims for time extensions and increased construction planning costs. Such delays may also negatively affect the constructability and productivity of other contractors working on the same site, thereby compounding overall project inefficiencies.

Furthermore, Famiyeh et al. (2017) identify the use of inappropriate construction methods as a contributing factor to construction claims. In addition, claims may arise from rework necessitated by poor workmanship and substandard quality of the completed works, both of which further increase time-related costs and reduce project efficiency.

3. Research Methodology

This study adopts a qualitative research design using content analysis as the primary methodological approach. Content analysis is appropriate for systematically examining and interpreting existing literature to identify patterns, themes, and relationships among variables.

The approach enables the study to synthesise fragmented knowledge from published academic sources and industry reports to develop a comprehensive understanding of the key determinants influencing time-related P&G cost escalation in multi-contractor construction environments.

Data for this study is collected from secondary sources, including:

- Peer-reviewed journal articles

Databases such as Scopus, Google Scholar, Web of Science, and ScienceDirect are used to retrieve relevant literature. Sources range 2000 -2025

Inclusion criteria:

- Studies focusing on construction cost overruns and delays
- Studies addressing P&G costs or related site overhead costs
- Research on multi-contractor or complex construction environments
- Studies discussing causes of Extension of Time (EoT) claims

Exclusion criteria:

- Non-construction-related studies
- Articles without peer review or academic credibility
- Studies not addressing time-related cost implications

To enhance methodological transparency, the study follows a structured literature review process comprising three key stages: identification, screening, and synthesis. A total of 19 peer-reviewed journal articles were systematically reviewed using structured identification, screening, and selection criteria.

In the identification stage, a systematic search strategy is employed using predefined keywords and Boolean combinations (e.g., “construction cost overruns,” “P&G costs,” “site overheads,” “extension of time,” and “multi-contractor projects”).

During the screening stage, retrieved studies were assessed against the predefined inclusion and exclusion criteria. This involves an initial title and abstract review to eliminate irrelevant studies, followed by a full-text assessment of remaining articles to confirm their alignment with the research objectives. Duplicate records were removed, and only peer-reviewed and methodologically sound studies were retained for analysis.

In the synthesis stage, the selected studies were systematically analysed using thematic content

analysis. Relevant data are iteratively extracted and coded, enabling the identification of recurring patterns, relationships, and dominant themes. These themes were then refined and grouped into higher-order categories that explain the key drivers of time-related cost escalation for P&G in multi-contractor construction environments.

This structured approach improves the reliability, replicability, and rigour of the review process, ensuring that the findings are grounded in a transparent and systematic analysis of the literature.

4. Findings and Discussion

The reviewed literature indicates that several interrelated factors significantly influence time-related preliminary and general (P&G) costs in construction projects, particularly within multi-contractor environments. A key finding is that contractor experience plays a critical role in project performance, where inexperience contributes to poor execution, inadequate scheduling, and weak coordination, ultimately leading to delays and increased project costs. Similarly, deficiencies in site management and supervision are a major driver of cost overruns, largely due to inadequate managerial and technical skills, limited human capacity, and weak oversight mechanisms.

The findings further highlight that construction complexity in multi-contractor settings requires effective planning and coordination of shared activities, including health and safety management and site access. Poor understanding of the project environment often results in delayed site access, disruptions to work sequencing, and reduced constructability across contractors, thereby increasing the likelihood of claims for extensions of time. In addition, inappropriate construction methods and poor workmanship contribute to rework, which further escalates both time-related costs and the incidence of construction claims.

Overall, the findings suggest that time-related P&G costs cannot be attributed to isolated variables but rather arise from the interaction among contractor capability, site management effectiveness, coordination quality, and project complexity. This has theoretical implications, as it challenges linear models of cost-overrun causation and instead supports a systems-based

perspective on project performance. Practically, it underscores the need for integrated, proactive site management practices, as well as institutional mechanisms that enhance contractor capabilities and coordination in multi-contractor environments. Addressing these interdependencies is critical to improving project efficiency, reducing claims, and controlling time-related cost escalation.

5. Conclusion and Further Research

This study systematically reviewed and synthesised existing literature on the determinants of time-related preliminary and general (P&G) costs in construction projects. The review identified that contractor experience, site management and supervision, project complexity, coordination effectiveness, and construction methods are key interrelated factors influencing time-related P&G costs. Collectively, these factors contribute to project inefficiencies, delays, claims, and cost overruns, demonstrating that effective management and coordination are central to controlling time-related project expenditures.

The study further highlights that time-related P&G costs are largely driven by systemic and organisational issues rather than isolated operational challenges. Weaknesses in contractor capability, inadequate planning of site activities, and poor coordination among multiple contractors significantly increase the risk of project delays and associated cost escalation.

The implications for practice are that: project stakeholders should adopt more rigorous contractor evaluation processes, invest in strengthening site management and supervisory capacity, and implement structured coordination frameworks, particularly in multi-contractor environments. From a theoretical perspective, the study contributes by consolidating dispersed literature into a coherent framework that explains the underlying drivers of time-related P&G costs. However, the reliance on secondary data highlights the need for empirical validation. Future research should focus on quantifying the relative influence of identified determinants, developing predictive models for cost escalation, and evaluating the effectiveness of integrated delivery approaches in diverse project contexts.

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