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EXPLORING COST ESTIMATION ACCURACY AND ITS IMPLICATIONS FOR COST OVERRUNS AND DELAYS IN SMALL-SCALE CONSTRUCTION PROJECTS: EVIDENCE FROM SRI LANKA

J. Wadu Mesthrige[1], L.H.U.W. Abeydeera[2], T. Maqsood[3], G.G.N. Chandani[4]

ABSTRACT

This study investigates the relationship between cost estimation accuracy and project outcomes, specifically cost overruns and project delays in small-scale construction projects in Sri Lanka. A qualitative research approach was adopted, supported by a descriptive-analytical, cross-sectional design. Data were collected through semi-structured interviews with construction professionals, including contractors, project managers, and quantity surveyors. Thematic analysis was employed to identify key patterns and relationships, while findings were contextualised through a review of relevant literature. The results reveal that cost estimation inaccuracies are widespread and arise from multiple interrelated factors, including incomplete project scope, lack of reliable cost data, limited professional expertise, and significant material price volatility. These inaccuracies were found to have a direct and substantial impact on project performance, with cost overruns commonly ranging between 20–40% and delays frequently extending project timelines. The study also highlights the presence of a "cost-delay spiral," where financial shortfalls lead to project interruptions, further escalating both time and cost. Additionally, systemic factors such as competitive bidding pressures, client preferences for low estimates, and informal contractual practices contribute to the persistence of estimation inaccuracies. Study concludes that improving cost estimation accuracy requires a holistic approach, including enhanced professional engagement, improved data systems, and stronger contractual frameworks. These improvements are essential for enhancing the reliability and sustainability of small-scale construction projects in Sri Lanka.

Keywords: *Cost Estimation Accuracy; Cost Overruns; Project Delays; Small-Scale Construction; Sri Lanka.*

[1] Senior Lecturer, School of Property, Construction and Project Management, RMIT University, wadu.jayantha@rmit.edu.au
[2] PhD Candidate, School of Property, Construction and Project Management, RMIT University, Australia, S3855817@student.rmit.edu.au*
[3] Senior Lecturer, School of Property, Construction and Project Management, RMIT University, tayyab.maqsood@rmit.edu.au
[4] Lecturer, Department of Facilities Management, University of Moratuwa, Sri Lanka, navodag@uom.lk

1. INTRODUCTION

The construction industry is widely recognised as one of the most complex and resource-intensive sectors, characterised by high levels of uncertainty, capital investment, and coordination demands. Project success is evaluated against three core criteria: completion within the stipulated time, adherence to the approved budget, and achievement of the required quality standards (Alsharef et al., 2024). Challenges such as institutional constraints, market volatility, and limited resource availability collectively pose significant challenges to the simultaneous attainment of these three project objectives (Alaloul et al., 2020).

Within this context, construction cost estimation plays a critical role in shaping project outcomes. It serves as the foundation for financial planning, procurement strategies, contractual agreements, and overall project control. Accurate cost estimates enable construction project stakeholders, including clients, contractors, and quantity surveyors, to make informed decisions and allocate resources efficiently (Sayed et al., 2023). Conversely, inaccurate estimates can significantly distort project planning and execution. Empirical evidence suggests that cost overruns are a pervasive issue in construction; for instance, Flyvbjerg (2006) reports that approximately 90% of large-scale construction projects experience cost overruns, with average increases exceeding 28% of initial estimates. Such discrepancies often trigger cascading effects, including delays, scope reductions, and compromised quality.

Despite extensive research on cost estimation in large-scale infrastructure projects, small-scale construction has received comparatively less attention from the research community (Amade & Akpan, 2014). This gap is significant, as small-scale projects constitute the majority of construction activities in many developing countries. These projects are typically constrained by limited budgets, informal management practices, and reduced access to professional expertise, making them particularly vulnerable to estimation inaccuracies (Rowe, 2020).

Sri Lanka provides a pertinent case for examining these challenges. The country's construction sector has expanded due to urbanisation, post-conflict reconstruction, and infrastructure development; however, the 2022 economic crisis substantially intensified uncertainty in the sector. Recent studies report that currency depreciation, inflation, import restrictions, fuel shortages, and sharp material price escalation disrupted construction planning and delivery, particularly among smaller contractors with limited financial resilience (Perera et al., 2023; Rajapaksha et al., 2025; Weerakoon et al., 2023). These conditions made traditional estimating approaches less reliable because assumptions made at tender or planning stage were often invalidated during project execution.

Against this background, the aim of this study is to explore how cost estimation inaccuracies influence cost overruns and project delays in small-scale construction projects in Sri Lanka. The study is guided by four objectives: (1) to identify the key factors affecting cost estimation accuracy in Sri Lankan small-scale construction projects; (2) to examine how inaccurate estimates contribute to cost overruns; (3) to examine how inaccurate estimates contribute to project delays; and (4) to propose practical recommendations for improving estimation reliability within the small-scale construction context.

2. LITERATURE REVIEW

Cost estimation is widely recognised as a central pillar of construction project management, as it shapes early decision-making and establishes the financial boundaries within which a project must be delivered. At its core, cost estimation involves forecasting the total expenditure required to complete a defined scope of work, combining technical measurement with informed professional judgement (Flyvbjerg, 2006; Holm & Schaufelberger, 2021). Because these estimates guide procurement planning, cash flow allocation, and contractual commitments, their accuracy plays a decisive role throughout the project lifecycle. This is particularly true in small-scale construction projects, where financial buffers are limited and even minor deviations from the estimated cost can have significant consequences.

When cost estimates are inaccurate, most commonly due to underestimation, the effects tend to emerge progressively as the project moves from planning into execution. One of the earliest and most immediate consequences is financial strain. As actual costs begin to exceed the initial budget, clients and contractors may face funding shortfalls, forcing them to pause work while seeking additional resources or reconsidering project scope (Sayed et al., 2023). These interruptions disrupt construction schedules, lead to the withdrawal of labour and equipment, and create inefficiencies that are often difficult to reverse (Potts & Ankrah, 2014). In small-scale construction projects, where access to additional financing is often constrained, such disruptions can quickly translate into substantial project delays.

Closely linked to this is the impact of estimation accuracy on procurement. Reliable cost estimates enable project teams to plan the timing, quantity, and specification of materials and resources with a reasonable degree of confidence (Fry et al., 2016). However, when estimates are flawed, procurement plans become misaligned with actual project needs. This may result in insufficient funds to secure essential materials or delays in ordering key inputs. In developing countries such as Sri Lanka, where construction supply chains are frequently affected by long lead times and import dependencies, these disruptions can halt progress for extended periods (Oke & Ogunsemi, 2011). As a result, initial estimation errors begin to cascade, affecting both time and cost performance simultaneously.

The connection between cost estimation and cost overruns is even more direct. By definition, a cost overrun occurs when actual expenditure exceeds the original estimate, meaning that inaccurate estimation inherently increases the likelihood of such outcomes. Research has consistently shown that underestimation is often driven by factors such as optimism bias, incomplete project definition, and insufficient allowance for risk (Bayram & Al-Jibouri, 2016; Flyvbjerg, 2006). In small-scale construction, these challenges are often intensified by limited access to reliable cost data, informal estimation practices, and the absence of structured contingency planning.

2.1 SMALL CONSTRUCTION PROJECTS IN SRI LANKA

For the purpose of this study, small-scale construction projects in Sri Lanka are defined as projects undertaken by lower-grade contractors registered under the Construction Industry Development Authority (CIDA), specifically contractors classified within Grades C6 to C9. This classification is considered appropriate because the CIDA contractor registration and grading system serves as the nationally recognized framework for categorizing contractors according to their financial capability, technical competence,

availability of skilled personnel and equipment, and previous construction experience (Shivananthan, 2017).

Under the current CIDA grading structure for main construction contractors, Grade C6 contractors are eligible to undertake projects valued above LKR 20 million and below LKR 50 million, Grade C7 contractors are authorized for projects above LKR 10 million and below LKR 20 million, Grade C8 contractors for projects above LKR 4 million and below LKR 10 million, while Grade C9 contractors are limited to projects below LKR 4 million (Shivananthan, 2017). Accordingly, this study conceptualizes small-scale construction projects as projects generally not exceeding LKR 50 million and predominantly executed by contractors operating within the C6–C9 grading categories. This definition is consistent with prior construction management studies, which commonly classify project scale based on contractor capacity, financial thresholds, and organizational resources, particularly in developing-country construction contexts where contractor grading systems are used as industry benchmarks for project categorization (Ofori, 2012). Therefore, adopting the CIDA grading framework provides an industry-recognized and contextually relevant basis for defining small-scale construction projects in Sri Lanka.

Sri Lanka's construction sector operates within a context that presents a unique and particularly challenging environment for accurate cost estimation. While many of the difficulties associated with estimation are consistent with those identified in international literature, recent economic disruptions have significantly intensified these challenges. The 2022 economic crisis, in particular, exposed the vulnerability of existing estimation practices (Weerakoon et al., 2023). Projects that were costed under relatively stable conditions in 2021 were subsequently executed in an environment characterised by rapid inflation, currency depreciation, and severe supply constraints. As a result, contractors were often compelled to deliver projects under conditions that differed substantially from those assumed at the estimation stage (Perera et al., 2023).

A key structural issue underpinning this challenge is the heavy import dependency of Sri Lanka's construction materials market. Essential inputs such as steel, electrical components, and finishing materials are either directly imported or rely on imported raw materials. Consequently, fluctuations in exchange rates and restrictions on foreign currency availability have a direct and often unpredictable impact on construction costs. Under such conditions, traditional estimation approaches, typically based on stable pricing assumptions, become less reliable (Rajapaksha et al., 2025). This necessitates a greater emphasis on incorporating realistic escalation allowances and flexible contractual provisions to manage price variability. Labour market conditions further complicate the estimation process. Even prior to the crisis, the sector experienced shortages of skilled workers; however, this issue has been exacerbated by increased labour migration (Sivachelvy & Seneviratne, 2023). The resulting scarcity not only drives up wage rates but also affects productivity, as contractors may need to rely on less experienced workers. These dynamics introduce additional uncertainty into labour cost forecasting, making it difficult to accurately predict both cost and project duration (Pathirana, 2021). Finally, the prevalence of informal or weakly structured contractual arrangements adds another layer of complexity. In the absence of clearly defined mechanisms for variation pricing, payment scheduling, and dispute resolution, cost overruns and delays become more difficult to manage effectively. This often leads to misunderstandings and disputes, further undermining project performance and stakeholder relationships.

3. METHODOLOGY

This study employed a qualitative, descriptive–analytical, cross-sectional research design to examine how cost estimation inaccuracies contribute to cost overruns and project delays in Sri Lankan small-scale construction projects. Rather than statistically testing causal relationships, the study explored perceived relationship patterns through the experiences of industry practitioners, focusing on how estimation errors influence financial and schedule performance during project delivery. A cross-sectional design was considered appropriate because the research sought to capture prevailing industry conditions at a specific point in time, particularly in the context of Sri Lanka's recent economic instability. However, this approach does not permit the observation of changes in estimation practices over time, and this limitation is acknowledged in the study.

A qualitative approach was adopted because cost estimation practices in small-scale construction are frequently informal, context-specific, and influenced by professional judgement, client behaviour, market conditions, and contractual arrangements (Dandan et al., 2020; Lim et al., 2016). The study was guided by a deductive orientation grounded in established concepts such as estimation accuracy, optimism bias, incomplete project information, contingency planning, and project performance, while remaining sufficiently flexible to capture context-specific insights emerging from the data. Data were collected through semi-structured interviews, which are well suited to exploring practitioners' experiences and perceptions while allowing relevant themes to emerge during discussion (Evans & Lewis, 2017). 12 Participants were selected using purposive sampling based on three criteria: (i) direct involvement in cost estimation or project delivery, (ii) experience in small-scale construction projects, and (iii) familiarity with cost overruns or project delays encountered during project execution. The participant group comprised contractors, project managers, and quantity surveyors as shown in Table 1.

Table 1: Interviewee profiles

Code	Position	Years Experience
QS1	Quantity Surveyor	12
QS2	Quantity Surveyor	8
QS3	Quantity Surveyor	7
QS4	Quantity Surveyor	9
QS5	Quantity Surveyor	10
QS6	Quantity Surveyor	8
PM1	Project Manager	15
PM2	Project Manager	10
PM3	Project Manager	11
CT1	Contractor	18
CT2	Contractor	11
CT3	Contractor	9

Interview data were analysed using thematic analysis, following a process of transcript familiarisation, initial coding, theme development, comparison across participant categories, and interpretation of relationships between estimation inaccuracies and project outcomes (Evans & Lewis, 2017). As the analysis was qualitative and interpretive, the reported relationships represent practice-based thematic insights rather than statistically verified associations.

4. RESEARCH FINDINGS

This section presents a structured discussion of the findings in relation to the research objectives, with a focus on cost estimation accuracy, its determinants, and its implications for project delays and cost overruns in Sri Lanka's small-scale construction sector. The discussion is organised into four interrelated thematic areas to ensure clarity and analytical coherence.

Table 2: Analytical link between cost estimation inaccuracy and project outcomes

Estimation issue	Small-scale project context	Effect on cost overrun	Effect on delay
Incomplete scope/design information	Projects often commence with limited drawings or changing client requirements.	Variations and rework increase actual costs beyond the original estimate.	Design clarifications and changes interrupt work sequencing.
Limited professional estimating input	Clients may avoid QS involvement to reduce upfront cost.	Missing items, weak measurement, and insufficient allowances increase budget gaps.	Incorrect resource planning delays procurement and mobilisation.
Lack of reliable cost data	Small contractors rely heavily on experience and supplier quotations.	Outdated prices and weak benchmarking lead to underestimation.	Budget shortfalls slow down purchasing and progress payments.
Material price volatility	Import dependency and crisis-related inflation affect prices.	Escalation increases actual expenditure, especially under fixed-price arrangements.	Delayed purchasing exposes projects to further price and supply shocks.
Weak contingency and contractual mechanisms	Informal agreements often lack price-adjustment provisions.	Unexpected costs are not absorbed within the original budget.	Disputes and renegotiations extend project duration.

Table 2 illustrates the analytical link between cost estimation inaccuracies and project outcomes in Sri Lankan small-scale construction projects. The findings indicate that estimation errors typically originate from incomplete project information, limited professional involvement, inadequate cost data, material price volatility, and weak contingency or contractual mechanisms. These issues contribute directly to cost overruns through variations, rework, inaccurate measurements, underestimation of costs, and unplanned expenditure. At the same time, they adversely affect project schedules by

disrupting procurement, delaying decision-making, causing funding shortages, and triggering disputes or renegotiations. The table demonstrates that cost overruns and project delays are interconnected consequences of estimation inaccuracies, highlighting the critical importance of improving estimation practices to enhance overall project performance.

4.1 DETERMINANTS OF COST ESTIMATION ACCURACY

The findings indicate that cost estimation inaccuracies in small-scale construction are not incidental but arise from a combination of structural and practice-based limitations. Key factors identified include incomplete project scope at the estimation stage, limited professional expertise, lack of access to reliable cost data, and heightened material price volatility. These findings are consistent with established literature, which emphasises the importance of project definition and estimator competence in achieving reliable cost forecasts (Oberlender & Trost, 2001; Odeyinka et al., 2008).

Evidence from the interview data provides deeper insight into how these factors manifest in practice. Several respondents emphasised that estimates are often prepared based on incomplete or evolving designs, which significantly undermines accuracy. *QS3* noted that "in many small projects, we are asked to price based on basic drawings or even verbal descriptions, and later design changes make the original estimate irrelevant." This highlights the practical consequences of inadequate scope definition, where early estimates are built on assumptions that are subsequently invalidated. This phenomenon is not unique to Sri Lanka but is widely documented across developing countries, particularly within small-scale construction sectors where formal design processes are often compressed or bypassed. Studies have consistently shown that incomplete project definition at the estimation stage is one of the most significant predictors of cost inaccuracy (Oberlender & Trost, 2001). Similarly, research in developing construction contexts indicates that projects frequently commence before detailed designs are finalised, leading to continuous revisions that disrupt both cost and schedule performance (Mahamid, 2015).

The issue of limited professional expertise also emerged strongly. *CT2* explained that "most small contractors do their own estimates without involving a quantity surveyor, mainly to reduce costs, but this leads to mistakes that only become visible during construction." This reflects a broader structural challenge in which professional cost management services are underutilised, resulting in a reliance on experience-based rather than methodologically rigorous estimation practices. This challenge is widely recognised in construction literature, particularly in developing country contexts where access to qualified professionals is uneven. Studies have consistently demonstrated that the competence and formal training of the estimator are among the most critical determinants of estimation accuracy (Ekung et al., 2021; Odeyinka et al., 2008). When estimates are prepared without the involvement of trained professionals, there is a greater tendency to overlook key cost components, underestimate risks, and rely on informal heuristics rather than systematic measurement and pricing methods.

Another recurring theme was the absence of reliable and up-to-date cost data. Respondents consistently highlighted the difficulty of accessing accurate local pricing information, particularly in a volatile economic environment. As *PM1* stated, "we don't have a proper database to rely on, everyone uses their own past experience, but prices are changing too fast for that to be reliable." This limitation directly constrains the ability of

practitioners to benchmark estimates or apply data-driven techniques. Research has shown that the quality and availability of cost data are critical determinants of estimation accuracy, often outweighing even the choice of estimation technique (Sayed et al., 2023). In rapidly changing economic environments, such as those characterised by inflation and supply chain disruptions, historical data quickly becomes outdated, further diminishing its usefulness. Studies in developing construction sectors also highlight that the absence of centralised cost information systems limits knowledge sharing and prevents the development of industry-wide benchmarks (Fazil et al., 2021).

Material price volatility was identified as an especially critical factor in the Sri Lankan context. Interviewees described how rapid and unpredictable cost fluctuations, particularly following the 2022 economic crisis, have made traditional estimation approaches increasingly unreliable. *QS5* observed that "even if you prepare a careful estimate today, within a few months the prices can double, and the estimate becomes useless." This reinforces the need for incorporating realistic escalation allowances and adaptive estimation practices. failure to adequately account for price escalation is a key contributor to cost overruns, especially in projects with longer durations where exposure to market changes is greater (Ekung et al., 2021). Furthermore, Flyvbjerg (2006) highlights that traditional estimation practices often underestimate uncertainty, leading to systematic bias in cost forecasts. In the context of rapidly changing material prices, this tendency is exacerbated, as estimators may rely on outdated cost data or assume short-term price stability that does not hold in practice. Collectively, these insights demonstrate that cost estimation inaccuracies are not merely technical errors but are shaped by systemic constraints within the industry. Furthermore, the absence of structured cost data limits the application of advanced forecasting approaches such as reference class forecasting, which depend on historical benchmarks to improve estimation reliability.

4.2 IMPACT OF COST ESTIMATION ON COST OVERRUNS

The analysis confirms a strong and direct relationship between cost estimation accuracy and the occurrence of cost overruns. A substantial proportion of projects examined in this study experienced cost increases in the range of 20–40% above initial estimates, aligning with prior findings in the Sri Lankan context (Kawmudi & Jayasooriya, 2020). These overruns are largely attributable to underestimated material costs, inadequate contingency allowances, and changes in project scope.

Insights from the interview data provide a more grounded understanding of how these overruns unfold in practice. Several respondents highlighted that cost overruns are often anticipated but difficult to prevent under current industry conditions. *CT1* noted that "almost every project we do goes over budget, it's not because we don't try to estimate properly, but because too many things change after we start." This reflects a shared perception among practitioners that cost overruns are not exceptional events but rather a normalised feature of small-scale construction projects. This perception is strongly supported by existing research, which consistently identifies cost overruns as a widespread and systemic issue in construction projects across both developed and developing contexts. Flyvbjerg (2006) found that cost overruns occur in the vast majority of projects globally, suggesting that they are not anomalies but predictable outcomes of underlying structural and behavioural factors. Similarly, Awosina et al. (2018) demonstrated that systematic underestimation is embedded within project planning

processes, reinforcing the idea that overruns are, to a large extent, institutionalised within industry practice.

Respondents also emphasised the role of insufficient contingency planning in amplifying overruns. *QS2* explained that "clients usually resist adding contingencies because they want to keep the budget low, but later they end up paying much more when unexpected costs come in." This highlights a disconnect between initial budgeting expectations and the realities of construction risk, where the absence of adequate financial buffers leaves projects vulnerable to even routine uncertainties. Empirical studies further suggest that resistance to contingency inclusion is often driven by client expectations and competitive pressures. Flyvbjerg (2006) argues that initial project budgets are frequently shaped by optimism bias, where stakeholders prefer lower estimates to secure project approval, even at the expense of realism. Similarly, Asiedu and Adaku (2020) found that inadequate contingency planning is a recurring cause of cost overruns, particularly in environments where clients prioritise affordability over risk preparedness during the early stages of project planning.

Beyond technical limitations, the findings indicate that systemic and behavioural factors significantly influence cost overruns. In particular, competitive bidding pressures were repeatedly identified as a key driver of underestimation. As *PM3* observed, "if you price the job realistically, you won't win it, so many contractors submit lower estimates just to secure the project and deal with the consequences later." This aligns with the concept of strategic underestimation described in the literature, where initial bids may be deliberately or unconsciously optimistic in order to remain competitive (Flyvbjerg, 2006). Research by Shane et al. (2009) further highlights the prevalence of the "low-bid" phenomenon, where contractors knowingly underprice projects to secure contracts, accepting the risk of future financial adjustments. In many cases, this behaviour is reinforced by information asymmetry between clients and contractors, where clients may lack the technical expertise to critically evaluate whether a bid is realistically priced. This creates conditions in which underestimation becomes a rational, albeit risky, strategy within the market. More broadly, these findings suggest that cost overruns in small-scale construction are not solely the result of isolated estimation errors but emerge from an interplay of technical shortcomings, market dynamics, and client expectations. The persistence of these patterns indicates a systemic issue, where industry practices and incentive structures collectively reinforce estimation inaccuracies. As a result, cost overruns become embedded within the project delivery process, rather than being treated as deviations from expected outcomes.

4.3 IMPACT OF COST ESTIMATION ON PROJECT DELAYS

The study highlights a clear and consistent linkage between inaccurate cost estimation and the occurrence of project delays. Delays were frequently reported by respondents, with many indicating extensions ranging from several weeks to a few months beyond the planned completion period. Interview data provides valuable insight into how these delays materialise in practice. *CT2* explained that "when the money runs short halfway, everything slows down, we have to stop work, wait for the client to arrange funds, and by then the schedule is already affected." This illustrates the central role of financial disruption as a key mechanism through which estimation inaccuracies translate into delays. In developing country contexts, this issue is often more pronounced due to limited access to contingency funding and weaker financial planning mechanisms. Research by

Rathi et al. (2016) demonstrated that cost overruns and delays are closely interrelated, with financial shortfalls frequently triggering work stoppages and prolonging project duration. This aligns closely with the experiences reported by respondents in this study, who described delays as a direct consequence of insufficient funds resulting from inaccurate initial estimates.

Respondents also emphasised that such disruptions are rarely isolated incidents but tend to cascade across project activities. *PM3* noted that "once there is a delay in one part, like funding or materials, it affects everything else, and it's very difficult to bring the project back on track." This reflects the interconnected nature of construction processes, where delays in one component can quickly propagate through the entire project schedule. This observation is consistent with established research, which identifies construction projects as complex systems in which time, cost, and resource flows are tightly linked (Sambasivan & Soon, 2007). Delays in critical path activities, in particular, have a disproportionate impact, often leading to cumulative schedule slippage that is difficult to recover without significant additional resources. Furthermore, studies have shown that once a project falls behind schedule, corrective measures such as acceleration or resequencing often introduce inefficiencies and increased costs, further compounding the initial disruption (Rathi et al., 2016).

In addition to financial constraints, procurement-related challenges were repeatedly identified as a major contributing factor. Several interviewees highlighted that inaccurate estimates often lead to insufficient budgeting for materials, resulting in delays in procurement and mobilisation. *PM2* stated, "sometimes we realise too late that the allocated budget is not enough to purchase materials at current prices, so we have to wait or change plans." In the Sri Lankan context, where construction supply chains are highly sensitive to economic fluctuations and import dependencies, such disruptions can be particularly severe. This finding aligns with research that emphasises the critical role of procurement planning in project performance, where inaccuracies in early cost estimation can lead to misaligned purchasing schedules and resource shortages (Oke & Ogunsemi, 2011). In developing country contexts, these challenges are often intensified by supply chain constraints, including long lead times, import dependencies, and market volatility. Studies have shown that disruptions in material supply not only delay construction activities but also create knock-on effects such as labour idle time and increased overhead costs (Panova & Hilletofth, 2018). These findings reinforce the concept of the "cost-delay spiral," whereby initial estimation inaccuracies lead to delays, which in turn generate additional costs through extended overheads, labour inefficiencies, and exposure to price escalation. Respondents' experiences suggest that this cycle is not only theoretically valid but also a common reality in small-scale construction projects.

4.4 PROFESSIONAL AND CONTEXTUAL INFLUENCES

The research reveals that cost estimation practices are deeply shaped by the professional and market context in which projects are delivered. While many experienced professionals demonstrate a strong understanding of the factors contributing to estimation inaccuracies, they often operate within constraints that limit their ability to apply best practices. Interview responses consistently pointed to market pressures and client expectations as key limiting factors. *QS4* noted that "even if we know the correct way to estimate, clients often push for lower figures, and there is pressure to adjust the estimate to match their budget." This highlights the tension between professional judgement and

commercial realities. Similar dynamics have been identified in previous studies, where client-driven budget constraints often override technical recommendations, leading to compromised estimation accuracy (Odeyinka et al., 2008). Moreover, research by Flyvbjerg (2006) suggests that such pressures contribute to optimism bias, where estimates are adjusted downward to align with stakeholder expectations rather than realistic cost projections.

Client preference for the lowest bid was identified as a particularly influential factor. Respondents indicated that this practice discourages realistic pricing and incentivises underestimation. *CT1* explained that "clients usually compare only the final price, not how the estimate is prepared, so naturally contractors try to keep it as low as possible to win the job." This reinforces a competitive environment in which accuracy is often secondary to affordability, ultimately contributing to downstream project challenges. This finding aligns with the well-documented "lowest-bid procurement" problem, where selection based primarily on cost encourages contractors to submit unrealistically low bids (Shane et al., 2009). Studies have shown that such procurement practices are strongly associated with increased risks of cost overruns, disputes, and compromised project performance, particularly in developing construction markets (Sambasivan & Soon, 2007).

The limited willingness to engage professional estimation services also emerged as a recurring concern. Several respondents observed that small-scale clients tend to view quantity surveying services as an unnecessary expense. As *PM2* stated, "many clients think hiring a QS is an extra cost, but they don't realise that it can actually save money by avoiding mistakes." This perception restricts the involvement of trained professionals and increases reliance on informal estimation practices. Existing literature supports this observation, indicating that professional expertise plays a critical role in improving estimation reliability and overall project cost control (Oberlender & Trost, 2001). However, in small-scale and cost-sensitive projects, the perceived short-term cost of professional services often outweighs their long-term benefits, leading to their underutilisation (Wang & Cheng, 2020).

Contractual informality further compounds these challenges. Respondents highlighted that many small-scale projects operate under loosely defined agreements, lacking clear provisions for cost adjustments, variations, or dispute resolution. This creates uncertainty in managing cost overruns and delays. As a result, contractors, particularly smaller firms, face significant financial exposure when estimates prove inaccurate. *CT1* remarked that "sometimes we just have to absorb the loss because there is no proper agreement to recover additional costs." This finding is consistent with agency theory, which emphasises the risks arising from weak contractual frameworks and information asymmetry between project stakeholders (Shane et al., 2009). Collectively, these insights suggest that cost estimation challenges in Sri Lanka's small-scale construction sector are not solely technical but are deeply embedded in the broader professional, economic, and institutional context. Addressing these issues therefore requires systemic improvements, including greater professional engagement, improved cost data infrastructure, and more robust and transparent contractual practices.

5. CONCLUSIONS

This study set out to examine the relationship between cost estimation accuracy and project performance in small-scale construction projects in Sri Lanka, with particular emphasis on cost overruns and project delays. The findings clearly demonstrate that cost estimation accuracy is a critical determinant of project success, influencing not only financial outcomes but also the timely completion of projects. The research reveals that estimation inaccuracies are not isolated technical errors but are rooted in a combination of structural, professional, and contextual challenges. Factors such as incomplete project scope, limited access to reliable cost data, insufficient professional expertise, and material price volatility significantly undermine the reliability of cost estimates. These challenges are further intensified within the Sri Lankan context by economic instability, supply chain disruptions, and labour market constraints. As a result, estimators often operate under conditions of high uncertainty, limiting their ability to produce accurate and reliable forecasts.

The study also establishes a strong and direct link between inaccurate cost estimation and the occurrence of cost overruns and project delays. Cost overruns were found to be widespread, frequently ranging between 20 - 40% above initial estimates, while delays were commonly attributed to financial disruptions and procurement challenges arising from estimation errors. Importantly, these issues are not independent; rather, they form a reinforcing cycle, where cost overruns contribute to delays, and delays further escalate project costs. This "cost-delay spiral" highlights the systemic nature of the problem. Furthermore, the research underscores the influence of market dynamics and professional practices on estimation outcomes. Competitive bidding pressures, client preference for low-cost estimates, underutilisation of professional services, and informal contractual arrangements collectively contribute to a culture in which estimation inaccuracies are often normalised. In conclusion, improving cost estimation accuracy in Sri Lanka's small-scale construction sector requires a holistic approach. This includes enhancing professional engagement, improving access to reliable cost data, incorporating realistic contingency and escalation provisions, and strengthening contractual frameworks. Addressing these issues is essential not only for improving project performance but also for enhancing the overall sustainability and credibility of the construction industry in Sri Lanka.

6. LIMITATIONS AND FUTURE RESEARCH

This study is subject to several limitations. First, the qualitative and cross-sectional research design facilitated an in-depth exploration of practitioners' experiences and perceptions; however, it does not enable statistical examination of the magnitude or causality of relationships between cost estimation inaccuracies, cost overruns, and project delays. Consequently, the findings should be interpreted as thematic and practice-based insights rather than empirically verified causal associations. Second, the study relied on purposively selected construction professionals, and therefore the findings reflect the perspectives of the participants involved and may not fully represent the diversity of small-scale construction projects across Sri Lanka. Third, the scope of the research was confined to small-scale construction projects; therefore, caution should be exercised when applying the findings to large-scale infrastructure developments or more complex construction projects operating under different organisational and contractual conditions.

Future research could build upon these findings by adopting quantitative or mixed method approaches to examine the relationship between cost estimation accuracy and project performance across a larger and more representative sample of projects. Longitudinal studies would also provide valuable insights into how cost estimates evolve throughout the project lifecycle and how estimation accuracy is affected by changing project and market conditions. Furthermore, future investigations could focus on the development of industry-specific cost databases, price escalation forecasting models, and decision-support tools tailored to the Sri Lankan small-scale construction sector, particularly in response to persistent challenges associated with market volatility, inflation, and supply chain disruptions.

7. REFERENCES

Alaloul, W. S., Liew, M. S., Zawawi, N. A. W. A., & Kennedy, I. B. (2020). Industrial Revolution 4.0 in the construction industry: Challenges and opportunities for stakeholders. *Ain Shams Engineering Journal, 11*(1), 225–230. https://doi.org/10.1016/j.asej.2019.08.010

Alsharef, A., Ovid, A., Uddin, S. M. J., & Albert, A. (2024). Biggest challenges facing the construction industry. In *Construction Research Congress 2024*. https://doi.org/10.1061/9780784485286.065.

Amade, B., & Akpan, E. O. P. (2014). Project cost estimation: Issues and possible solutions. *International Journal of Engineering and Technical Research, 2*(5), 181–188. https://www.researchgate.net/publication/280805190_Project_Cost_Estimation_Issues_and_the_Possible_Solutions

Awosina, A., Ndihokubwayo, R., & Fapohunda, J. (2018). Effects of inaccurate cost estimate on construction project stakeholders. *Journal of Construction Project Management and Innovation, 8*(2), 1886–1904.https://doi.org/10.36615/jcpmi.v8i2.164

Bayram, S., & Al-Jibouri, S. (2016). Efficacy of estimation methods in forecasting building projects' costs. *Journal of Construction Engineering and Management, 142*(11), Article 05016012. https://doi.org/10.1061/(ASCE)CO.1943-7862.0001188

Dandan, T. H., Sweis, G. J., Sukkari, L., & Sweis, R. J. (2020). Factors affecting the accuracy of cost estimate during various design stages. *Journal of Engineering, Design and Technology, 18*(4), 787–819. https://doi.org/10.1108/JEDT-08-2019-0202

Ekung, S., Lashinde, A., & Adu, E. (2021). Critical risks to construction cost estimation. *Journal of Engineering, Project, and Production Management, 11*(1), 1–13. https://doi.org/10.2478/jeppm-2021-0003

Evans, C., & Lewis, J. (2017). *Analysing Semi-Structured Interviews using thematic Analysis: Exploring voluntary civic participation among adults*. https://doi.org/10.4135/9781526439284

Fazil, M. W., Lee, C. K., & Tamyez, P. F. M. (2021). Cost estimation performance in construction projects: A systematic review and future directions. *International Journal of Industrial Management, 11*, 217–234. https://doi.org/10.15282/ijim.11.0.2021.6170

Flyvbjerg, B. (2006). From Nobel Prize to project management: Getting risks right. *Project Management Journal, 37*(3), 5–15. https://doi.org/10.1177/875697280603700302

Fry, T. D., Leitch, R. A., Philipoom, P. R., & Tian, Y. (2016). Empirical analysis of cost estimation accuracy in procurement auctions. *International Journal of Business and Management, 11*(3), 1–13. https://doi.org/10.5539/ijbm.v11n3p1

Holm, L., & Schaufelberger, J. E. (2021). *Construction cost estimating (2nd ed.).* Routledge.

Kawmudi, N., & Jayasooriya, S. (2020). Identification of significant factors influencing cost overruns in construction projects of Sri Lanka. In *Annual Technical Sessions of the Institute of Quantity Surveyors Sri Lanka (IQSSL),* 37- 46. https://iqssl.lk/docs/publications/publication-iqssl-2020-08-27-uid661.pdf

Lim, B. T. M., Nepal, M. P., Skitmore, M., & Xiong, B. (2016). Drivers of the accuracy of developers' early-stage cost estimates in residential construction. *Journal of Financial Management of Property and Construction, 21*(1), 4–20. https://doi.org/10.1108/JFMPC-01-2015-0002

Mahamid, I. (2015). Factors affecting cost estimate accuracy: Evidence from Palestinian construction projects. *International Journal of Management Science and Engineering Management, 10*(2), 117–125. https://doi.org/10.1080/17509653.2014.936802

Oberlender, G. D., & Trost, S. M. (2001). Predicting accuracy of early cost estimates based on estimate quality. *Journal of Construction Engineering and Management, 127*(3), 173–182. https://doi.org/10.1061/(ASCE)0733-9364(2001)127:3(173)

Odeyinka, H. A., Lowe, J., & Kaka, A. P. (2008). An evaluation of risk factors impacting construction cash flow forecast. *Journal of Financial Management of Property and Construction, 13*(1), 5–17. https://doi.org/10.1108/13664380810882099

Ofori, G. (2012). Developing the Construction Industry in Ghana: the case for a central agency. *A concept paper prepared for improving the construction industry in Ghana. National University of Singapore, 13*(1), 3-18. https://ghanatrade.com.gh/old/file/Developing%20the%20Construction%20Industry%20in%20Ghana%20BUILDING.pdf

Oke, A. E., & Ogunsemi, D. R. (2011). Value management in the Nigerian construction industry: Militating factors and perceived benefits. In *Proceedings of the Second International Conference on Advances in Engineering and Technology* (pp. 353–359). Makerere University. https://ghanatrade.com.gh/old/file/Developing%20the%20Construction%20Industry%20in%20Ghana%20BUILDING.pdf

Panova, Y., & Hilletofth, P. (2018). Managing supply chain risks and delays in construction projects. *Industrial Management & Data Systems, 118*(7), 1413–1431. https://doi.org/10.1108/IMDS-09-2017-0422

Pathirana, L. (2021). Construction industry and factor condition prospective of Sri Lanka: A special reference to skill labour shortage. *Journal of Business and Management, 23*(2), 35–41. https://www.researchgate.net/publication/349656955_Construction_Industry_and_Factor_Condition_Prospective_of_Sri_Lanka_A_Special_Reference_to_Skill_Labour_Shortage

Perera, M., Gunarathna, K., & Karunaratne, B. (2023). Effect of current economic crisis on construction contractors in Sri Lanka: An exploratory study on small-scale contractors. In Proceedings of the International Conference on Sustainable Built Environment (ICSBE 2023) (p. 1077). https://www.researchgate.net/publication/380401958_EFFECT_OF_CURRENT_ECONOMIC_CRISIS_ON_CONSTRUCTION_CONTRACTORS_IN_SRI_LANKA_AN_EXPLORATORY_STUDY_ON_SMALL-_SCALE_CONTRACTORS

Potts, K., & Ankrah, N. (2014). *Construction cost management: Learning from case studies.* Routledge.

Rajapaksha, A., Perera, B., & Liyanawatta, T. (2025). Framework for avoidance of disputes arising in the construction industry due to the economic crisis. *Journal of Legal Affairs and Dispute Resolution in Engineering and Construction, 17*(1), Article 04524039. https://doi.org/10.1061/JLADAH.LADR-1104

Rathi, A., Khandve, P., El-Kholy, M., Patel, C. H., Chaturvedi, H., Megha, R., Rao, P., Katta, K., Prasad, Overrun, N., Azhar, R., Farooqui, Syed, M., Ahmed, Apolot, R., Alinaitwe, H., & Tindiwensi, D. (2016). Study of Factors Influencing cost Overruns: An Overview. *International Journal of Science and Research, 5*(3), 334–336. https://doi.org/10.21275/v5i3.nov161792

Rowe, S. F. (2020). *Project management for small projects.* Berrett-Koehler Publishers.

Sambasivan, M., & Soon, Y. W. (2007). Causes and effects of delays in Malaysian construction industry. *International Journal of Project Management, 25*(5), 517–526. https://doi.org/10.1016/j.ijproman.2006.11.007

Sayed, M., Abdel-Hamid, M., & El-Dash, K. (2023). Improving cost estimation in construction projects. *International Journal of Construction Management, 23*(1), 135–143. https://doi.org/10.1080/15623599.2021.1886839

Shane, J. S., Molenaar, K. R., Anderson, S., & Schexnayder, C. (2009). Construction project cost escalation factors. *Journal of Management in Engineering, 25*(4), 221–229. https://doi.org/10.1061/(ASCE)0742-597X(2009)25:4(221)

Shivananthan, S. (2017). *Study on the evaluation of contractor selection criteria in Sri Lanka. http://ir.lib.seu.ac.lk/handle/123456789/5326.*

Sivachelvy, U., & Seneviratne, S. (2023). The impact of challenges of the current economic crisis on the performance of Sri Lankan building construction projects. *International Research Symposium*. https://www.researchgate.net/profile/K-T-P-C-Somarathna/publication/383605700_Implementation_of_School-Based_Management_School_Leadership_Challenges_and_Opportunities_Faced_by_School_Principals/links/66d34fbffa5e11512c432742/Implementation-of-School-Based-Management-School-Leadership-Challenges-and-Opportunities-Faced-by-School-Principals.pdf#page=487

Wang, X., & Cheng, Z. (2020). Cross-sectional studies: Strengths, weaknesses, and recommendations. Chest, 158(1 Suppl.), S65–S71. https://doi.org/10.1016/j.chest.2020.03.012

Weerakoon, T. G., Wimalasena, S., & Fedotova, K. (2023). Economic crisis adaptation in the Sri Lankan construction industry: Pathway to prosperity. *Baltic Journal of Real Estate Economics and Construction Management, 11*(1), 240–256. https://doi.org/10.2478/bjreecm-2023-0019