

# Understanding Reasons for Cost Overruns in Construction Projects from Contractors' Standpoint

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**Abstract.** The construction sector represents one of the most significant contributors to the Georgian economy; it holds 8% of the country's total GDP. Additionally, 8.83% of Georgia's employed labour force works in construction throughout all industries. Therefore, it is essential to understand the challenges that the industry faces. Worldwide, project teams have finished nine out of ten projects with budget overruns. Many researchers have studied the factors influencing cost overruns across countries, regions, and project types. Most of these studies define cost overruns as the difference between the initially outlined budget and the final actual costs incurred. This definition simultaneously takes into account the viewpoints of all project stakeholders. In this particular research, the focus is on the point of view of construction companies. The research process is divided into three parts. The first part focuses on creating a list of all factors causing the construction project cost overruns. The second phase is dedicated to creating a questionnaire based on the final shortlist and gathering answers from experts working in construction. During the last phase, the survey results are analysed, and further desk research is conducted to provide recommendations for risk mitigation. As a result, sixteen factors are studied, the most frequent and severe ones identified as inflation, delays in getting approval from the client regarding the decisions concerning the project during the construction, and poor estimates of the project pre-construction. Several recommendations and tools are given for risk mitigation of cost overrun and protection against financial losses. Construction companies cannot eliminate all risks but can use best practices to address the most common factors they face.

**Keywords:** Construction Financial Management; Construction Cost Optimisation; Project Risk Mitigation

## INTRODUCTION

The construction industry refers to the industrial branch of manufacturing and trade related to building, repairing, renovating, and maintaining infrastructures [1]. Construction projects can be divided into two main types: Non-residential and residential. Residential construction, on its own, can be further broken down into heavy industrial, institutional, commercial, and engineering projects.

The construction sector represents one of the most significant contributors to the Georgian economy. Based on the data of 2022 of the sec-

toral structure breakdown of Georgia's GDP (Figure 1), the construction industry holds 8% of the total GDP of Georgia. It comes fourth in size (after trade, manufacturing, and natural estate-related industries) [2].

On the global scale, Georgia holds eighth place in the construction industry's contribution to the country's economy [3]. The first place in this ranking is held by Andorra, followed by Albania, the Republic of Moldova, Romania, Tajikistan, Iceland, Kyrgyzstan, and Georgia.

According to the information published by the National Statistics Office of Georgia, there has

been a growth tendency in the number of employed people in the construction industry for the past four years, from 85,232 persons in 2020 to 117,853 employees in 2023. In 2023, that was the latest data available; in total, 1,334,559 people were employed in the construction sector of Georgia, which means that around 8.83% of the total employed labour force of the country throughout all sectors worked in the construction industry; this makes the construction sector the country's fifth most significant employer industry. Number one is agriculture, forestry, fishing, wholesale and retail trade, motor vehicle repair, motorcycle industry, and education.

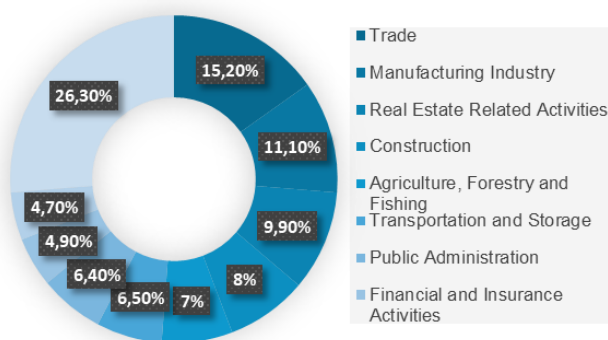


Figure 1 – Sectoral Structure of Georgia's GDP, 2022 [2]

The numbers and statistics mentioned above highlight the importance of the construction industry to the Georgian economy. As the sector plays a significant role in the country's development, it is essential to understand the processes and challenges faced by the industry.

*Construction Processes Explained.* On the Website "Designing Buildings", which is considered to be the construction wiki, the 'construction process' is defined as "the physical processes of building, landscaping or refurbishing plus all the associated activities, such as demolition, site clearance, administration and so on [4].

According to the author [5], building construction processes can be divided into three phases: pre-, construction, and post-construction. The pre-construction phase is basically where all the planning happens. It includes developing detailed drawings, plans, schedules, budgets, and projections with contractors. In this phase, the contractor and client work together to understand the project's goal, decide on the materials to be used, and establish the budget, timeline, and overall

design; they also identify potential risks. Correctly planned processes can be incredibly beneficial in future for avoiding delays, overspending and other complications. Gerardi divides the second construction phase into two main steps in his paper: site preparation and construction. Site preparation includes removing unnecessary rubbish, equipment, materials, and machinery from the construction territory. It may also include demolition of already existing buildings. Afterwards comes the construction activities itself. These activities start with excavation and finish with interior and exterior works. The last step in the building construction process is post-construction. It is the final walk-through before handing the finished product to the client [5].

*Value Chain in the Construction Industry – Explained.* In the construction industry, the value chain refers to the business model that includes all the activities necessary for the project. It is used for a project to deliver maximum value with the least expenditure, ensuring the highest profit. Raw materials, product manufacturing, design and engineering, construction, operations, and maintenance are the five critical value chain elements that can be used for every project. Two additional aspects may not be relevant for all construction projects: demolition of existing buildings and renovation of the old buildings. The value chain ensures the construction team implements the process smoothly with minimal complications [6].

*Process of Budget Preparation for Construction Project – Explained.* Cost estimation and budget creation is an integral part of the pre-construction phase. Here, all the calculations are made, and the final price and constructor's profit from the project are determined. Therefore, it is essential to create precise budget estimates.

To understand this process, one of the research respondents, the CFO of a large-scale Georgian construction company, was asked to break down how the construction company estimates the costs, budgets, and prices for projects.

The sequence of the budgeting process can be described as follows. Initially, the construction company gets a list of documents needed from the owner/buyer of the project. These documents include architectural drawings, construction projects and designs, engineering (MEP) drawings, documents describing geological conditions, and others. This list may differ depending on the type and features of the project. It repre-

sents a base for estimation for construction companies. Afterwards, a technical engineer creates a bill of quantities (BOQ) for this project. BOQ is a

document that lists all the materials, such as concrete, steel, brick, etc., and the quantity needed for the project.



Figure 2 – Construction Project Cost Estimation and Pricing Process Explained (researchers' findings)

After determining the required materials and labour, the team performs the following cost estimation step. Here, the purchasing agent lists the current prices for the materials given in BOQ, and the project manager indicates the workforce costs. The relevant department is involved in estimating the needed equipment, and the manager calculates what machinery and equipment must be used in construction and how much the cost of using them will be; this sums up the total built costs, meaning the direct expenditure that forms the project. Afterwards, indirect costs are calculated. Those expenditures include security, indirect labour, additional workers, maintenance, utilities, etc. The project manager also determines these costs, as he knows what and how much will be needed during the construction process; this sums up the cost estimation part of the budgeting process. After the total expenditures for the project are calculated, it is time to determine the price. The finance department gets involved only in this part of the process. A finance guy can have a say in the overhead percentage and profit margin that has to be included in the final Invoice.

*Research Problem and Objectives.* Nine out of ten projects commonly experience cost overrun [7]. Different construction industry stakeholders have confirmed that cost overburdens have been one of the sector's most significant challenges. A representative of the finance department of one of the largest construction companies in Georgia confirms that most of the projects are finished with budget overruns, very few are within the budget, and almost none are within the budget economy.

According to the study of authors [8] conducted for transportation, nine out of ten big projects (which they refer to as megaprojects) are finished with a cost overrun, and the costs escalate on average by 28%. Once again, this highlights the problem of budget management in the construction industry.

It is essential to accurately determine how much a construction company profits from each project for the correct financial management of the firm, as the finance departments base their general organisational budgets on those profit estimations. However, the finance manager makes little contribution and has little control over the project budgeting process. Therefore, few tools are in his hands to control costs and revenues. It is essential to understand and find examples of best practices that can help the finance departments of construction companies to hedge their risks of cost estimations and manage thin profit margins.

To sum up, this study focuses on the constructors' point of view. The research aims to understand what factors lead to construction project cost overruns in Georgia, which are most severe and frequent, and how and which finance tools can help mitigate the risks and manage the results.

Because the involvement of the finance department is minimal during the project cost estimation process, there are a few ways that the finance manager can control this process. Also, as cost overruns are one of the biggest challenges facing the construction industry, the research aims to find tools and ways to mitigate risks and ensure profitable completion of projects. The objectives that this study wants to achieve can be summarised as follows:

- 1) Find the cost overrun factors in other countries and regions.
- 2) Understand which factors lead to budget overruns by the construction company.
- 3) Discover what factors are relevant to the Georgian construction industry.
- 4) Give suggestions and best practice examples for tools that can be used to mitigate risks and results of cost overruns.

*Research Novelty.* All other works that have been conducted beforehand define cost overrun as a difference between the final total cost of the project and the initial estimate or valuation of the project's cost. For this research, the cost overrun is the additional cost or expense a construction company bears, reducing the project's profit. The study aims to find tools for construction companies to deal with the cost overrun problem and ensure the soundness of their financial performance.

As the constructors' point of view is studied, the research is looking for profit optimisation tools for the construction companies. It wants to find ways to make the project budgeting process more precise with the involvement of the finance guy and financial tools.

This study focuses on Georgian reality and is based on the practical experiences of people working in the sector.

*Practical Value of Research.* This research aims to identify tools and practices for mitigating the risk of budget overages in construction projects. As a result of the study, the recommendations for the best practices will be defined for the finance departments of construction companies. The examples provided practical tools for construction companies to deal with the challenges of proper budget planning.

## Literature Review

The diversity of past studies conducted to investigate construction project cost overrun reasons can be considered a hint that cost overruns are a global problem for the construction industry. The research has examined the reasons for project cost overruns in different countries, regions, and types of construction. In Korea, the average cost overrun for seven megaprojects (projects that cost more than \$1 billion) equalled 122.4%. As to the medium size projects (which cost between

\$50 million and \$1 billion), the average cost overrun amounted to 32.5% [9]. A study conducted in the Netherlands found an average cost overrun in seventy-eight projects investigated to be 16.5% [10]. Another study conducted to research 258 transport projects from 20 countries found that the overall average cost overrun equals 28% [11]. Many studies focus on cost escalation, project timing, and delay problems.

In their research, authors [7] found 173 causes of cost overrun from seventeen contexts, the most common being contractors' financing, frequent design changes, lack of contractor experience, payment delay from completed works, poor cost estimation, poor material management and poor tendering documentation.

In their work titled Construction Project Cost Escalation Factors, authors [12] have studied the cost overrun factors in highway construction projects. Through thorough literature analysis and case study, followed by interviews with over 20 state highway agencies, the authors divided cost escalation factors into two types: external and internal. Internal factors were defined as ones that the construction project owner can control, whereas the external factors are those outside their control. The researchers highlighted eighteen factors, naming scope creep, schedule delays, and inflation as the major ones. Scope creep refers to project modifications, such as design, size, type, or location. As to schedule delays, they may change the timing of income and expenditures, which affect the annual or, in the case of some firms, biannual budget [12].

Authors [13] researched construction cost overruns in Georgia's neighbouring country, Türkiye, in 2014. The article is named Factors affecting cost overruns in micro-scaled construction companies. As seen in the title, the study focuses on macro-scaled construction companies, which means that the companies that have been researched have fewer than ten employees and an annual turnover below \$2 million. Seven categories of cost overrun factors were identified and studied in groups. These categories are contract-related factors, time-related factors, cost-related factors, quality-related factors, human resource-related factors, communications-related factors, and Risk-related factors. The result of the research showed that the most common cause for cost overrun in Türkiye is design problems, which refers to changes in designs during the construction process, delays in design approvals

and issues with constructability authors [13] of those designs.

In his work, the author [14] discusses the case of government infrastructure projects for the Canadian market, but some international examples are also considered. The causes for cost overruns are classified into technical challenges, over-optimism, and strategic misrepresentation. Those groups consist of varied factors. In technical challenges, Matti Siemiatycki refers to scope changes and change of orders, problems of project handover, incomplete studies of the project before the approval phase, inflation in labour and material costs and inaccurate forecasting, which includes unforeseen events, shifts in external conditions and usage of inappropriate methods or inaccurate assumptions based on incomplete or data of inadequate quality. Optimism bias is explained as people displaying over-optimism about their abilities and skills. Project planners and evaluators sometimes exaggerate the possibilities by assuming they can complete tasks with fewer expenditures or less time. However, reality shows that these deadlines and budgets cannot be met, leading to cost overages and delays. This study focuses on government projects, and as the author explains, when the government finances the project, different objectives and incentives exist. Taxpayers mainly bear the cost, and the governmental representatives have incentives to misrepresent initial budgets to get approval, knowing that once work begins, few projects are ever halted [14]. The author classifies this phenomenon as a strategic misrepresentation. Authors [14] dot down several cures for the cost overrun problem, such as enhancement of performance monitoring, reporting and information sharing, a reward system for superior performance, enhancement of staff management capabilities, applying state-of-the-art Forecasting techniques, and selective use of Public-Private Partnerships. He suggests a systematic tracking system as one of the solutions. No particular technical details are given in the research paper describing this tracking system.

Still, the general idea is that information about past and present projects should be exchanged promptly, allowing relevant parties to monitor and keep up with the ongoing projects and learn from past details. The author profoundly believes in the 'Power of Big Data.' He also explains the solution to the current tendering system using the examples of Hong Kong and Singapore. The existing tender rules award the bid to the lowest

price, encouraging companies to reduce costs to offer the lowest price and win artificially; this often causes budget overruns, as those initial numbers cannot be met.

On the other hand, in Hong Kong and Singapore, companies participating in a tender are valued not only based on their bids but also on their past performance and quality. Historically, a better-performing company gets extra points, meaning that a firm can bid higher than a competitor but still win based on its past excellence. Tti Siemiatycki thinks that effective strategies against cost overburdens exist, and the only question preventing their implementation is whether the will to execute them in Ontario exists [14].

Author [15] surveyed five hundred participants from the most significant towns in each of the ten regions in the UK. The goal was to determine why the construction project's final costs exceeded the initial estimations. In total, 114 participants were questioned, and 341 reasons given. The researchers created fifteen groups for further analysis based on those factors. As a result, the research showed that ranked number one, the most significant risks and issues in construction budget overrun in the UK are the design changes and incomplete designs [15].

In 2015, author [16] studied 'Cost Overrun in Construction Projects in Saudi Arabia: Contractors' Perspective'. The researchers used a similar approach to the ones described above. Through literature analysis, they listed thirty-four reasons for cost overruns. Afterwards, the author distributed a questionnaire to forty-three contractors working in The Northern Province of Saudi Arabia for further investigation. The questionnaire was divided into two parts. The first part gathered general information about the respondent, and the second part consisted of the list of previously identified cost overrun factors. Respondents were asked to rate these factors according to their severity and frequency. The researchers identified the most severe and frequent causes using the risk matrix. This study showed that frequent design changes are a significant problem for construction projects in Saudi Arabia. Other four top factors were named to be bid award for the lowest price, improper planning, lengthy period between design and time of implementation and delays in payments [16].

Some years later, researchers carried out similar research in a neighbouring UAE. The study titled

Time and Cost Overruns in the UAE Construction Industry: Critical Analysis was conducted in 2018 by the authors [17]. The focus was on construction projects in Dubai, and the goal was to study the reasons for budget overruns. The researchers identified thirty primary reasons through questionnaires and interviews. The researchers introduced Likert-scale analyses using the weighted-score method for further elimination. As a result, the Authors provided the top five causes for construction cost overruns in the UAE industry. Like Saudi Arabia, design variations were one of the most common reasons behind cost overruns. Other causes mentioned were poor cost estimations, delays in the client's decision-making process, financial constraints of the client and inappropriate procurement methods [17].

Analysis of Cost and Schedule Overrun in Construction Projects by authors [18] was aimed at finding mitigation tools for practitioners to use in the planning stage of a construction project to implement a successful project. This study was conducted with the help of expert opinion from the industry and a questionnaire, which asked the participants to rate the factors identified by the literature review by their severity. As a result, design errors, unexpected site conditions, increases in project scope, and weather conditions were the primary reasons behind cost escalation and budget overruns. In addition to those mentioned above, other severe and frequent factors in the study are design changes, slow decision-making, lack of planning, political risk, and extra claims [18]. Even though the study aimed to highlight mitigation strategies, the authors did not discuss any practical or specific tools in the paper.

The aim of the author's [19] paper 'Factors Leading to Cost Overrun Occurrence in Construction Projects' is to "identify the latest top major factors causing construction cost overrun in both developed and developing countries (in particular) during last three decades". The researchers conducted the study through literature analysis. The researchers named twenty reasons; some were relevant to developing countries, some were developed, and they identified seven factors. According to this study, site conditions, client characteristics, project characteristics, project technical complexity, scope creeping, organisation variables, and poor control of external resources are the most common factors for cost overruns in developed countries. On the other

hand, material shortage, inadequate funding, lousy coordination among project parties, fluctuation of material prices, fraudulent practices and kickbacks and poor experience in contracts were considered top factors in developing countries. Common reasons for construction cost overruns in developing and developed countries are poor estimation, poor planning, additional works, unqualified labour, design changes, delay in project completion and environmental factors. In further literature review where cases of particular countries and regions are analysed, some of these factors are also mentioned, proving the intercorrelation between previously carried out research.

The study by authors [20] named Investigating the causes of delay and cost-overrun in the construction industry focuses on North Iraq. Similar to the previously discussed research, the method used was a questionnaire based on a thorough literature review. This study is unique and exciting as it divides and ranks cost-overrun causes into groups of responsible parties. These groups are owners, contractors, consultants, designs, equipment, labour, external, project and materials. Using 5-scale Likert grading, in most cases, the project owner is the reason behind the cost overrun factors, and the second place is the contractor- the construction company. Equipment, labour, and other external factors hold equal importance in this ranking. The authors highlighted the three most common reasons for the cost escalation: inadequate labour and skill available on the market, the construction industry authors [20] being dominated by foreign firms and aids and inappropriate contractor policies.

Another research held in the same area is by authors [21] titled Significant Factors Causing Cost Overruns in the Construction Industry of Afghanistan. The methodology used in the research is similar to others. After reviewing the literature, the researchers distributed a questionnaire and analysed the results using the Likert scale grading. Similarly to Rezaei & Jalal, the authors group the causes of cost overruns into categories: Client, Contractor, Labor, Material and Equipment and External. In total, sixty-nine causes are listed, but, as a conclusion of the research, the top four causes were identified. Those factors include corruption, delay in progress payment by the client, difficulties in financing projects by contractors and security [21].

The authors [22] identified ten reasons for cost escalation in their research in Pakistan's neigh-

bouring country, including cost overrun factors in Pakistan's construction industry. After reviewing the literature, the researchers interviewed to gather expert opinions from developing countries, and then they researched forty-two shortlisted reasons through a questionnaire. This study lists the top ten cost overrun factors, divided into three categories: macroeconomic, business, and regulatory environment and management factors. According to authors [22], the list of the top ten looks like this:

- 1) Fluctuation in prices of raw materials (macroeconomic factor);
- 2) Unstable cost of manufactured materials (macroeconomic factor);
- 3) Inflated cost of machinery (macroeconomic factor);
- 4) Lowest bidding procurement method (Business and Regulatory Environment);
- 5) Poor project (site) management/ Poor cost control (Management Factor);
- 6) Lengthy period between design and time of bidding/ tendering (Business and Regulatory Environment);
- 7) Wrong method of cost estimation (Business and Regulatory Environment);
- 8) Additional work (Management Factor);
- 9) Improper planning (Management Factor);
- 10) Inappropriate government policies (Business and Regulatory Environment).

In Pakistan, another research was carried out by authors [23], named "Most Common Factors Causing Cost Overrun with its Mitigation Measure for Pakistan Construction Industry". The ten most common causes of cost overrun were identified in this research, too. Some of those factors are similar to the ones highlighted in the previous research, such as mistakes in making proper estimations and poor planning by the client. Other factors that have not been named in preceding studies and were noted in this one are crisis faced by the client, delay in getting approval from the client, faults in drawings, incompetency of contractor, delay in payment to the contractor, poor supervision of the consultant, communication gap between parties and natural disaster [23].

Another Asian country, India, has been the target of extensive research. Authors [24] focused on Indian infrastructure projects when studying the cost overrun factors in their paper 'Study of Fac-

tors Influencing Cost Overruns: An Overview'. This research divides the factors into seven categories: design-related, material-related, site-related, finance-related, owner-related, contractor related and miscellaneous factors. Material-related factors include fluctuations in construction materials and delays in the supply of those materials and equipment. Site-related factors include site layouts, land acquisition delays, and unknown subsoil and geological conditions. Poor financial control, the cash problem during the construction, and the project owner's poor economic condition are listed as finance-related factors. The reasons for cost escalation related to the owner are changes in the scope of the project, delays in decision-making, delays in primarily handing over the project site and conflict among the different project participants. Contractor-related factors are explained as the inadequate allocation of workers, lack of technical expertise and experience, mistakes during construction, and project abandonment midway through the process. As to the miscellaneous factors, the authors listed unavailability of water and electricity, lack of coordination with local neighbours, severe weather conditions and execution of non-tendering items [24].

Another study targeted the Indian construction market by authors [25] and was named 'Investment of Significant Factors Influencing Time and Cost Overruns in Indian Construction Project'. This research was based on the literature review where authors identified fifty-four factors causing cost escalation; these factors were further reviewed and analysed using a questionnaire and Likert 5-point scale methodology. As a result, three significant cost and time overrun causes were identified. These causes are high transportation costs, changes in material specifications and escalation of materials prices [25].

Authors [26] used this approach in their study 'Causes of Cost Overrun in Construction'. This research also concentrates on the Indian construction industry, and the methodology is similar. The authors conducted a desk study and questionnaire with close-ended questions and Likert Scale options. As a result, nine different causes for cost overrun can be identified from this paper: Slow decision making, Poor schedule management, increase in material and machine prices, Poor contract management, Poor design, or delay in providing design, rework due to wrong work, problems in land acquisition, wrong

estimation method and long period between design and time of bidding/tendering [26].

As we can see, three different studies were conducted focusing on the Indian construction industry at separate times. The methodology of this research is more or less similar, and the findings are diverse. The studies identify some causes of escalation factors, such as increased material prices, problems or delays in land acquisition, and slow decision-making.

Two studies were carried out concerning the Malaysian construction industry within four years. In 2013, authors [27] published a paper titled 'Significant Factors Causing Cost Overruns in Large Construction Projects in Malaysia'. According to the statistics in the paper, only 46.8% of public and 37.2% of private sector construction projects are performed within the initial budget, meaning Malaysia faces a cost overburden problem in the construction industry. The authors gathered factors from a thorough literature review for their questionnaire and then grouped them into seven categories. Before starting the data collection process, the authors conducted five interviews with industry experts to validate the questionnaire. The results were analysed using the relative importance index method. The seven categories included in the questionnaire were:

- 1) Contractor's site management-related factors;
- 2) Design and Documentation related factors;
- 3) Financial management factors;
- 4) Information and communication technology-related factors;
- 5) Labor management-related factors;
- 6) Material and machinery-related factors;
- 7) Project management and contract administration-related factors.

As a result of the research, the top three most essential and common cost escalation factors were identified: Fluctuation of materials prices, poor site management and supervision, cash flow, and financial difficulties caused by contractors.

Four years later, in 2017, another study was conducted that focused on the Malaysian construction industry. The paper by authors [28] is titled 'Categorisation of Potential project cost overrun factors in the construction industry'. Similarly to previously done research, the authors created seven groups for construction cost escalation fac-

tors: labour, project, client, contractor, consultant, contract and external. The paper analysed the previously conducted studies and grouped information into those seven categories. When comparing to the research of the Malaysian construction industry of 2013, we see that some categories are mentioned in both of these studies, such as contractor-related factors project and labour-related factors [28].

The research carried out in Jordan was focused on infrastructure engineering projects. In a research process, final reports of 40 infrastructure projects implemented from 2000-2008 were collected and analysed [29]. The study in Jordan showed that, on average, projects overran the initial budget by 214%. Researchers identified twenty-seven reasons for this cost escalation through report analyses and then ranked these reasons with input from practitioner discussions. They concluded that terrain and weather conditions were the most common and critical factors behind project cost overruns in Jordan.

As is evident from existing literature, studies have been carried out in different countries and for diverse construction projects. The research process of those papers is more or less similar. The results show that some factors are common for various countries and regions, and some are extremely specific and local to a particular area. How most of these other studies define cost and time overruns means that even if the constructor performs the duties within the contracted time and budget, if the owner expected the project to be finished earlier or cheaper, it is considered to be performed over budget and delayed. In the case of this research, we define the cost overrun so that we can see the contractor's – the construction company's- point of view. Overall, the list of factors gathered from the literature review is long and provides a good base for researching the Georgian market.

*Contractors' All Risk Insurance (CAR)*. Construction All Risk Insurance, also known as CAR, is an insurance instrument that covers property damage and third-party injury or damage claims. CAR encompasses a wide range of risks, making it easier to manage and understand in which cases it is contractor-protected. It is a non-standard policy, and its scope may vary depending on and tailored to the project's specific needs. The total sum insured with CAR depends on the project's total value. There is no pre-defined formula for

premium definition; it is calculated precisely for each project [30].

Not to be mistaken with General Liability Insurance, CAR ends when the project is finished; as to the General Liability Insurance, it can be extended for some time after the completion of the project and/or sale of the property. From the CAR policies, it is concluded that the coverage period starts directly upon commencement of the project or after the unloading of the items entered into the schedule (the project description provided to the insurance company) at the site. The end of the period of cover of CAR is linked to the project completion, can also be a specified date in the agreement and is the subject of prolongation [31].

Usually, the CAR policy is taken out jointly by the contractor (the construction company) and the project owner. Other parties, for example, suppliers, subcontractors, and manufacturers can also be named in the policy [31].

In addition, CAR is unique in that it covers both first-party losses and third-party liabilities. Under the CAR policy, the third party, including subcontractors, are insured against damages and injuries they may incur while working on the project. Other third-party liabilities covered with CAR include damage to another person's property, legal liabilities due to accidental loss of goods or machinery on construction premises, and fatal or non-fatal injuries to workers other than the insured party's employees [30].

Perils are the scenarios under which the CAR policy covers the losses. And on the contrary, exclusions are situations not covered by the insurance policy. Typical exclusions to CAR policy include but are not limited to, damages caused by war, nuclear accidents, and terrorism [32].

One of the most significant benefits of CAR is that if an insured accident happens, the insurance company reimburses the losses and expenses without further charging the responsible party; this means that the insurance company is the sole bearer of the costs in the event of perils; this benefits all parties named in the CAR policy as their financial risks are mitigated [30].

Generally, and most commonly, CARs consist of two parts: damages to the project and liability (or third-party liability) insurance. However, occasionally, some contracts may have an additional optional third party called Delay in Start-Up (DSU) coverage. This part ensures that in case of

project completion, delays in the CAR policy protect the holder against the financial losses incurred [32].

The author [33] represents a leading global reinsurance company in the insurance industry. Its list of clients includes companies, corporations, and governments worldwide. According to their description of CAR policy, the general description of the risks that are covered by this insurance instrument are:

- 1) Physical loss or damage to contract works.
- 2) Physical loss or damage to the constructor's construction plant and temporary building.
- 3) Liability for hired employees in construction plants and temporary buildings.
- 4) Physical loss of or damage to employee tools.

The premium policyholders should pay for the CAR, calculated based on the specific project. The premium amount depends on various factors, such as the sum insured, the type of construction project, the location, and the duration. Policy Bazaar [34] is a webpage that provides a tool for understanding and comparing different insurance policies and their providers. This webpage breaks down factors affecting the pricing and premium of CAR policy. The list was last updated in February 2024, making it relatively new. According to this webpage, the factors considered in calculating premiums are:

- 1) Project Scope and Size – the premium may be higher for the larger projects.
- 2) Construction material and techniques – projects with innovative or unconventional materials and methods bear higher risk. Therefore, it leads to higher premiums.
- 3) Location and environment – if a construction site is located in an area with a high probability of natural disasters or challenging environmental conditions, the premium for insurance may be higher.
- 4) Experience and History of the construction company – the experience of the construction company is one of the risk factors. Based on proven expertise, the premium may be lower.
- 5) Contract Value and Duration – the higher the value or the duration of the contract and the project, the higher the risks it bears, hence the higher the premium on the insurance.

6) Risk mitigation measures- if a contractor has defined risk mitigation and safety measures, it decreases the project's risk, positively impacting the insurance premium.

7) Period of testing – the perils included in CAR are divided into two parts – construction and testing phases. Equipment and the project's completed structure are tested during the testing phase. The duration of this phase affects the policy premium. The testing phase has a higher risk than the construction phase; therefore, the longer the testing phase, the higher the policy premium.

*Bank Guarantees.* Banks issue bank guarantees (BGs) to meet contractual liabilities. A bank guarantee involves three parties: the issuer bank, the beneficiary, and the applicant. The applicant is the party with contractual obligations to fulfil, the beneficiary is the party who benefits from the guarantee and is insured against financial risks, and the issuer bank acts as an intermediary between these two. When an applicant company is not fulfilling its obligations, a bank guarantee is a reassurance that the issuer bank will reimburse the second party for the costs or losses incurred. Therefore, BGs reduce financial risks for the beneficiary. Those risks are transferred to the guarantee-issuer bank. Several types of bank guarantees exist, including advance payment guarantees, guarantees of payment, performance guarantees, and defect liability guarantees. In the case of an advance payment guarantee, the bank is responsible for reimbursing the beneficiary if the applicant does not perform the job or deliver goods for which the advance has already been paid. BG is a security for a beneficiary company that will not lose the prepaid money.

The amount for this type of guarantee usually equals the amount of advance payment. In the case of a payment guarantee, the bank reassures the beneficiary that it will receive the payment from the applicant according to the terms of the agreement as long as all the conditions are met. If the applicant cannot make the payments, the bank guarantees the beneficiary will get its money. In the case of a performance guarantee, the beneficiary is reimbursed by the bank if the applicant does not perform the obligations defined in the contract improperly or incompletely. In this case, not the prepayment but the total value of the job or goods is considered. For this type of bank guarantee (BG), parties can set the amount as either a fixed sum, a percentage of the contract

value, or a predetermined upper limit. In the case of a defect liability guarantee, the bank agrees to pay the beneficiary if it finds defects after the applicant completes the work and does not address them upon the beneficiary's request. This guarantee usually follows the performance guarantee, and parties generally calculate the guarantee amount as a percentage of the contract value [35].

*The example of the Tendering systems of Singapore and Denmark.* The fact that only 50% of public sector contracts were awarded to the lowest bidder firms proves that in Singapore, not only is the bid price considered in the selection process [36]. Here, as well as in Hong Kong, firms that previously performed with high-quality construction and better budget certainty are assigned extra points when their bids are evaluated [14].

Singapore's government tendering system is distinctive because of its complete feedback information, where all bidder's and bids' identities, the name of the winner, and the winning contract value are publicly available. Singapore has a centralised registry system for construction companies, where every firm that wants to participate in bidding has to sign up. The registered companies are grouped into Civil Engineering and General Building. For each category, further grading is conducted based on the company's financial capacity, personnel, record of accomplishment, management, and development. Depending on which group a construction company is assigned, it has a limit of total project value that bids for and undertakes. These groups are A1 (has no limits), A2 (limit for the project value - \$85 million), B1 (limit - \$40 million), B2 (limit - \$13 million), C1 (limit - \$4 million), C2 (limit - \$1.3 million) and C3 (limit - \$0.65 million); this means that the lowest bidder may not always win but incentivises construction companies to rigorously evaluate the project and provide precise offers during the tender process [36].

In the case of Denmark, there are different options for the selection and assignment of a construction company for a project. Invited tender with a prequalification phase or open procedure tender is used for selection criteria. Only the companies that have completed the prequalification phase and have sufficient resources (such as labour, capital, and financial stability) can participate in bidding during the invited tender. Companies have broader access to bidding in an open

procedure tender, which may lead to better price offers. But on the other hand, unlimited offers bring the risk of the contractors' qualification. For assignment criteria, either the lowest price or the most economically advantageous is used. The lowest price method is self-explanatory; the bid offering the lowest price wins. In the case of the most economically advantageous bid, planned percentages of importance are assigned to different criteria (such as architecture, price, functionality, education level, level of quality management and personal skills of the bidder). It can be used to find the best offer based on pre-planned priorities [37].

Based on the selection and assignment criteria described above, procurement officials can create four different combinations of procurement methods: invited tenders with prequalification based on the lowest price, invited tenders with prequalification for the most economically advantageous offer, open procedure tenders with the lowest price, and open procedure tenders with the most financially beneficial offer.

The Danish construction sector invited tenders with a prequalification phase, and the lowest price as a choosing criterion is the most common method used. Combining these two provides the benefit of filtering eligible and most suitable candidates before the bidding process and ensures that the bidder with the lowest price will secure the deal. This results in the right balance between the lowest price and the proper requirements [37].

**Research Description.** The researchers break down the research process of this paper into three parts: the pre-survey phase, the survey phase, and the post-survey phase. The goal of the first phase is to create a list of all factors causing the construction project cost overruns, which are gathered from the literature. After writing down all those factors, two interviews were conducted to analyse them and create a final shortlist for further investigation. The second phase is creating a questionnaire based on the final shortlist and gathering answers from construction workers. The last phase aims to analyse the information provided by the respondents to the questionnaire and conduct further desk research to provide recommendations for dealing with construction project cost overruns.

The researchers reviewed the literature to create base data and gathered many cost escalation factors from previous studies. Initially, they ana-

lysed the factors collected from the literature review, merged duplicates and factors with similar meanings, and created a final list of unique cost overrun causes for further research.

As mentioned, these studies focused on finding the reasons behind the cost escalation and overall overruns. In this research, the focus is on those factors that affect the profitability of a contractor construction company. Therefore, interviews were conducted to make the list of factors more precise. Those interviews aimed to eliminate the factors that only affect the project owners and do not reduce the contractor's profit. Also, the aim was to clear out those factors that are not relevant to the Georgian market.

The first interview was held with the owner of a medium-sized construction company that primarily works on government-owned infrastructure projects. This respondent has 40 years of experience in the construction industry. The second respondent was the CFO of a large-scale Georgian construction company, which has held this position for 11 years. The respondents' diversity gave different viewpoints on the same problem. The researchers conducted the interviews separately and then compared the answers to ensure that the elimination process of cost escalation factors was objective and more accurate. The answers and results from those interviews were similar.

In conclusion, out of the initial list of eighty cost escalation factors, only sixteen were left for further study. The criteria that were considered when shortlisting the reasons for cost escalation were that firstly, it had to impact the construction company's profitability; if a factor led to the cost escalation that the project owner reimbursed, it was dropped out of the list. Secondly, the researchers ensured the factors were relevant to the Georgian market; for example, they removed bribes and corruption from the list after the interviews. Finally, it affected the project's profitability and budget, not the construction companies in general. Therefore, factors such as high interest rates of banks on loans were also not left for further research. As a result, a final list of sixteen factors for construction project cost escalation was created.

In most studies before this, researchers created categories and groups to study the factors leading to cost overruns. Still, this study takes a different approach, one that is more detailed and systematically analyses the factors. These groups

help to research the topic more systematically, as the number of reasons behind the cost escalation gathered from the literature is relatively high. The same approach is used in this paper. Firstly, the factors were divided based on their direct impact on the construction project's cost or time. Ones that affect the project's time and duration are more likely to cause a delay, which leads to a cost overrun. Afterwards, these factors were further classified based on their characteristics. The researchers created five groups: Managerial Factors, Market Conditions, Rules and Regulations, Time-Related Factors, and Unforeseen/Uncontrollable Factors. They present the final list in Table 1.

**Table 1 – Final List of Factors Causing Construction Project Cost Overrun (researchers' findings)**

Factor Leading to Construction Project Cost Overrun	Affect On Time/ Cost	Group (Classification)
Bias/Poor estimating by contractor about the project (Inaccurate time and/or cost estimation)	Both	Managerial Factors
Frequent breakdown of the construction plant and equipment	Both	Managerial Factors
Faulty execution/ Mistakes in construction	Both	Managerial Factors
Inflation (High cost of machinery, Material price fluctuations, High transportation costs, High machinery maintenance costs)	Cost	Market Conditions
Fluctuation in foreign exchange rate	Cost	Market Conditions
Market conditions (availability of resources, Inadequate labour/skill availability/ Shortage of labour)	Timing	Market Conditions
Government requirements for the construction industry	Cost	Rules and Regulations
Changes in general laws and regulations affecting the construction industry	Cost	Rules and Regulations
Tendering rules: bid award for the lowest price	Cost	Rules and Regulations

Factor Leading to Construction Project Cost Overrun	Affect On Time/ Cost	Group (Classification)
Lengthy bureaucracy in government entities	Timing	Rules and Regulations
Project schedule changes / Sequencing of work according to schedule	Timing	Time-Related Factors
Delay in getting approval from the client (project owner) regarding the construction project	Timing	Time-Related Factors
Delay in payment by the project owner to the contractor (construction company)	Timing	Time-Related Factors
Late delivery of materials and equipment to the construction site	Timing	Time-Related Factors
Weather conditions	Timing	Unforeseen / Uncontrollable Factors
Natural disaster	Timing	Unforeseen / Uncontrollable Factors

Based on this list, the researchers created and distributed a questionnaire to industry stakeholders. After gathering responses, they conducted further research to provide recommendations for risk mitigation against the factors identified in the red zone of the risk matrix based on the questionnaire results. They also conducted additional interviews to analyse some of the tools and best practices offered.

*Research Questions.* The main question research aims to answer is: What are the most common reasons for cost overruns for construction projects in Georgia, and which financial tools can mitigate the risks?

Other questions that are targeted are:

- 1) What are the cost overrun factors for construction projects in other countries and regions?
- 2) Which factors lead to budget overrun by the construction company?
- 3) Which factors are relevant to the Georgian construction industry?
- 4) What tools can mitigate risks and results of cost overruns?

## METHODOLOGY

Choosing the correct research methodology is crucial for every study's objectives. In the case of this research, it was essential to get a comprehensive and insightful understanding of the industry and its stakeholders. Therefore, a mixed research methodology was used to conduct this study. This methodology provides qualitative and quantitative research methods, giving us the results we need to achieve. It enhances the validity of findings by merging different data and perspectives gathered with other methods. The researchers describe the specific techniques used below. As mentioned, they divided the research process into three parts: the first focused on identifying reasons for cost escalation, the second aimed at understanding their relevance to the Georgian market, and the last part focused on discovering solutions and tools for recommending best practices.

This research was conducted using interviews, questionnaires, and desk study. These methods are the primary tools for gathering relevant and comprehensive information and achieving the study's objectives.

In-depth interviews refer to the face-to-face interviews conducted with the stakeholders of Georgian construction projects. In this case, interviews were held in the first and last phases of the research. In the first part, the finance representative of a construction company and the owner of a mid-size construction company, mainly focused on governmental projects, were interviewed. Identifying factors influencing construction project cost overruns from the viewpoint of different parties provided diverse information about the impacts and severity of the problem in the industry. With the open-ended questions, respondents could talk about their experience with construction projects, highlight the factors that lead to cost escalation, and explain their reaction policies. The third part of the research involved interviewing an insurance agent from one of the largest insurance companies and a corporate banker from one of the leading banks in Georgia to understand the tools they offered as mitigation measures against cost escalation factors. This approach enabled the researchers to gather more insightful information and better understand the topic.

In the second part of the research, the researchers developed and distributed a questionnaire and gathered the answers. A questionnaire is

valuable for collecting information from a larger sample of relevant parties. The researchers distributed the questionnaire to identify the reasons behind project budget overruns in the Georgian construction sector and compare these with the reality in other countries. The questionnaire was divided into two parts. In the first part, respondents had to provide information about themselves; this enabled the researchers to analyse the diversity of respondents and their viewpoints. In the second part, before giving the factors from the list created in the first phase of the research, respondents had to provide up to five cost overrun factors from their own experience; this created the opportunity to make sure that all relevant aspects were included in the research. The questions included in the first section of the questionnaire were:

- 1) Please enter the name of your company.
- 2) Please enter your work title.
- 3) How many years of experience do you have in the construction industry?
- 4) What type of construction project does your company work on?
- 5) Residential Buildings
- 6) Reconstruction and Rehabilitation
- 7) Roads, Bridges, and Infrastructure Projects
- 8) Public Service (Commercial) Buildings
- 9) How many years of experience does your company have in the Georgian construction market?
- 10) Please enter the average annual volume of construction contract income of your company
- 11) Approximately how many people are employed in your company?

The second section of the questionnaire aimed to understand the respondent's experience with construction cost escalation factors. Therefore, the questions asked were:

- 1) Please provide up to five primary reasons behind budget cost overruns in construction projects based on your experience.
- 2) Does your company use insurance for construction risks?
- 3) Approximately what percentage of purchases are denominated in foreign currency?
- 4) Approximately what percentage of construction contracts are denominated in foreign currency?

In the third section, respondents were asked to rate the cost escalation factors based on their frequency of occurrence on the 5-point Likert scale (1 expressing very low and five very high frequency). In the final fourth section, the same factors were asked to be rated based on their severity of impact on the 5-scale Likert scale (1 expressing insignificant and 5- severe impact). After gathering the answers, we distributed these factors on the risk matrix to identify the ones that must be addressed the most.

In the third part of the study, we conducted desk research to provide solutions or recommendations for best practices to deal with the given cost escalation factors. During this phase, we needed two additional interviews, which we held with an insurance agent and a corporate banker. The insurance agent provided insightful information regarding the Contractors' Risk Insurance (CAR), and the corporate banker explained how guarantees work in the Georgia buyer-supplier and Project-owner-constructor relationship. We also reviewed additional literature to find more tools for dealing with the challenge of cost overruns in construction.

*Research Sample Selection.* For this research, the purposive selection method was applied to elect the correct candidates for interviews and questionnaires.

We predetermined the criteria for choosing participants for the interviews. Firstly, the respondent had to be a significant player and stakeholder in the construction industry. An essential requirement was for a participant to have expertise, knowledge, and experience working on a construction project or to be an owner or buyer of the construction product. We also needed the diversity of viewpoints to create an inclusive list of cost overrun factors. We require a person with a financial background and an expert with technical knowledge in construction. Therefore, we chose two people for the initial interviews. We got all-inclusive information by selecting a financial officer and the construction company's owner.

We also used purposive selection to distribute the questionnaires. This approach made the study inclusive, actual, and comprehensive. The requirement for choosing respondents was for them to be stakeholders of a construction company, either working in finance, project management, or engineering. They also had to have experience with project budgets and knowledge of cost overrun factors. To achieve this, we ap-

proached each respondent individually with the help of different online platforms. As a result, twenty-two responses were gathered.

*Research Ethics.* We applied several methods to ensure that the interests of the companies and stakeholders studied were secure during this research.

First, every participant had full disclosure about the research topic, purpose, and objectives. They had advanced information about how their participation would influence the research and its outcomes.

Secondly, we granted anonymity and privacy to all participants. Every respondent knew that no private information would be disclosed, and the responses would mainly be used for statistical data analysis. We assured them we would accurately analyse the information gathered without alterations or researchers' representations. We transferred the data from the source to the research readers without manipulation.

Lastly, as we interviewed several stakeholders, we identified a high potential for conflict of interest. We ensured that every participant was informed about any potential risk of conflict. As a result, the research complied with the rules of ethics.

*Research Limitations.* For research to be unbiased, it is essential to understand its limitations. In the case of this specific research, we can highlight several main limitations:

- 1) The size of the sample surveyed may not be as big as desirable; based on the limitations of purposive selection, the availability of respondents was limited. Even in cases where we contacted a potential participant, some of them refused to participate.
- 2) People tend to be biased; therefore, there is always the risk of subjectivity when conducting interviews. Social desirability bias may limit the research and stimulate participants to appeal to the public.
- 3) We cannot disclose all information to the public. The confidentiality and unavailability of the data may constrain the study's comprehensiveness.

These are the three main limitations of this research. With them in mind, relevant methodologies, correct approaches and the right questions had to be drawn up to minimise the exposure to the constraints and get the best results to achieve the objectives.

## RESULTS AND DISCUSSION

We gathered a total of twenty-two responses through questionnaires. Twenty-seven per cent of the respondents were project managers, 30% were from a finance department, 16% were CEOs, and 27% held other managerial positions in different construction companies in Georgia. This diversity is a source of different viewpoints from construction companies. To validate the relevance of the respondents to the research, they were asked about their working experience within the industry. 18.1% have worked in the industry from 1 to 5 years, 36.3% - from 6 to 9 years, 36.3% - from 10 to 20 years and 9.3% of the respondents have worked there for 40+ years.

Respondents were also asked to identify four types of construction projects and which ones their companies were working on. These types are:

- 1) Residential Buildings
- 2) Reconstruction and Rehabilitation
- 3) Roads, Bridges, and Infrastructure Projects
- 4) Public Service (Commercial) Buildings

100% of the twenty-two answers said that they worked on residential buildings, seventeen out of 22 (77.3%) of the companies surveyed worked on public service (commercial) projects, fifteen of them (68.2%) also worked on reconstruction and rehabilitation, and only three of surveyed companies (13.6%) work on roads, bridges, and infrastructure projects. Therefore, this study covers all types of construction projects and factors that lead to their budget overrun. The fact that the respondents cover all kinds of construction projects is an insurance that the research has a broad vision of the construction companies and focuses on the whole sector.

Another essential factor to remember when analysing the respondents' diversity is their experience in the construction industry. Therefore, the questionnaire asked how many years of experience the respondents' company had in the Georgian construction sector. The answers gathered are diverse. 27.3% of respondents have more than thirty years of experience, 40.9% of companies surveyed have experience between ten to twenty years, and 31.8% have been in the construction industry for one to ten years. Therefore, this research studies all construction companies, including those with many years of experience,

those with less experience, and those newly entering the market.

The second part of the questionnaire was designed to determine the most common cost overrun factors among the respondents without giving them a previously prepared list. For this reason, they were asked to provide up to five reasons for cost overrun from their own experience. This way, they were less biased in naming the factors. From the answers provided, no new cause for cost escalation was listed, which was not discovered through the literature review. Each of them had already been a part of the research. Table 2 summarises the results gathered from this question.

Table 2 – Construction Project Cost Escalation Factors Named by the Questionnaire Respondents (researchers' findings)

Factors Named by the Respondents	How many times was the factor named?
Inflation and price escalation of materials and labour force	17
Inaccurate project estimation	11
Inadequate labour force	8
Project delay	8
Changes in the project by the project owner	6
Exchange rate fluctuation	5
Not sufficient project documentation	4
Corruption and the political environment	2
Delays in payment by the project owner	1
Unforeseen events	1

Almost every response named inflation and price escalation of material and labour force as one of the drivers for project budget overrun. Other common factors highlighted were inaccurate project estimation in a pre-construction phase, inadequate labour force available and project delays.

Fluctuation in the foreign exchange rate was also named several times as a common factor for cost escalation. We also identified this factor through literature analyses and interviews. Therefore, the questionnaire included questions aimed at seeing the gap between sales and expenses denominated in foreign currency to understand what per-

centage of the company's turnover was at risk of exchange rate fluctuations. The results show that, on average, 38.42% of purchases related to the construction project are denominated in foreign currency, whereas only 31.8% of the construction contracts are set up in foreign currency; this leaves a gap of 6.6% that is under the risk of foreign exchange currency fluctuations.

The last parts of the questionnaire were designed to allow the participants to evaluate the factors from the initially created list on the 5-point scale based on their frequency of occurrence and severity of impact. From the answers provided, the weighted averages of the points were calculated for each factor on both criteria. Weights to the answers from 1 to 5 were distributed based on the numbers they were chosen as an answer. We then distributed the results on the risk matrix to

analyse which factor fell under which category. We present the final risk matrix in Table 3.

From the results of the survey, it is evident that inflation, delays in getting approval from the client regarding the decisions concerning the project during the construction, and poor estimating about the project pre-construction are the most frequent and severe factors causing the cost escalation falling into the red zone of the risk matrix. Of the sixteen factors, none fell under the green zone of the risk matrix. All other factors fell into the yellow zone and should not be overlooked. The yellow-zone factors are tendering rules, project schedule changes, delays in payment by the project owner to the contractor and market conditions (such as availability of labour and materials).

Table 3 – Risk Matrix of Factors causing construction project cost overruns. (researchers' findings)

		Frequency				
		Shallow frequency	Low frequency	Moderate frequency	High frequency	Extremely high frequency
Severity	Insignificant Impact					
	Minor Impact					
	Moderate Impact		Late delivery of materials and equipment Frequent breakdown of the PPE Weather conditions Natural Disasters	Lengthy bureaucracy in government entities Mistakes in construction Changes in general laws and regulations Government requirements	Tendering rules Project schedule changes	
	Major Impact			Delay in payment by the project owner Market conditions	Inflation Delay in getting approval from the client Poor estimating of the project	
	Severe Impact					

After thoroughly studying all sixteen cost escalation factors for construction projects in Georgia, we conducted further desk research to find best practices and solutions to these challenges. More interviews were held to get information about insurance instruments that can be used to mitigate different risks of construction projects and about the bank tools that can help manage the construction company's relationship with the project owner, subcontractor and/or supplier. We also investigated different types of agreements to find the best practices and solutions to

construction companies' challenges. We gathered information about tendering systems implemented in other countries that differed from those in Georgia. We studied the systems that appeared to perform better than others to recommend them as solutions to the current problem. Based on this supplementary research and the interviews, we generated several recommendations.

During the interviews with industry representatives, it was highlighted that there are two main

types of contracts in the construction industry worldwide: lump-sum and cost-plus.

Lump-sum contracts are fixed-price contracts where the budget for the construction project is fixed and does not change throughout the project duration. The budget allocation, expenditure management, and profit margin calculations are up to the contractor construction company as long as all of these calculations are performed within the given budget. From the project owners' perspective, the total expenditures are fixed. Therefore, the construction company bears price and labour fee fluctuations and other risks. Lump-sum contracts provide an excellent advantage for a project owner as they reassure that the project will be finished within a specific budget unless the project owner makes scope changes or if any unforeseen event happens. However, for the construction company, this type of contract has high financial risk, as the maximum amount received from the project is gapped, and there is a high risk of not getting the desired and precalculated profit.

On the contrary, in cost-plus contracts, also known as the "open book" method, the contractor is reimbursed for every cost associated with the project plus the agreed-upon profit markup. This model guards construction companies against price escalations but gives the project owner more involvement in the construction process, which may lead to frequent changes in project scope.

The literature review discussed CAR – contractors' all-risk insurance policy – and we interviewed a relevant party. During the interview with an insurance broker from one of the Georgian insurance companies, he highlighted that CAR policies worldwide are based on the Munich Re CAR wording. He explained that they could include up to 180 endorsements and perils in a CAR policy and tailor it to the specific needs of policyholders. Still, the base terms are similar globally and taken out from German insurance companies. For this research, both German and Georgian policies were gathered and compared. In the standard case of both Georgian and German policies, the policy has two sections regarding insurance. One is material damage, and the second one is third-party liabilities. According to the presentation provided by one of the leading insurance companies in Georgia, under CAR policy, the insurance covers the following: construction site, materials stored on the project territory,

temporary buildings, warehouses, MEP systems, any property placed on the construction site that is needed for the construction process and machinery. Additionally, they can add existing property and buildings, debris removal, and inland transits to the standard insurance policy.

Based on the results of the questionnaire, only 72% of the companies surveyed use this insurance instrument. Most of them use CAR only based on project owners' requests. According to the chief financial officer of one of the leading construction companies in Georgia, CAR is not used more frequently because it is expensive. To understand the cost of this insurance product, we asked several insurance companies to provide their pricing methods or schemes for the CAR policy. It was discovered that no structural or predetermined pricing model exists.

Bank guarantees are one more tool that is already through literature review. Different types of guarantees are explained. In the case of construction companies, a performance guarantee is the most applicable type of BG to manage relationships with subcontractors and suppliers. For example, when a supplier is late in delivering materials or a subcontractor delays jobs, holding a bank guarantee from that other party will ensure that no additional costs are incurred. Therefore, this will not lead to budget overrun. On the one hand, it incentivises subcontractors and suppliers to deliver the obligations according to agreed-upon terms. Secondly, a bank guarantee provides financial security when the terms and conditions of agreements are not met.

A construction company can also use bank guarantees to regulate the relationship with project owners. Guarantees of payments are an excellent tool to prevent delays in payment by the project owner to the contractor. If the construction company holds a bank guarantee and the terms of payment included in this agreement are violated, the bank will be responsible for the payment. Therefore, construction companies will not endure additional challenges and cost overruns due to the late fee.

The only drawback to using a bank guarantee is that it increases the price of purchased goods and services. Therefore, it leads to a higher price for the project. Similar to using CAR, higher prices are not appealing to buyers, and it is hard to compete in bidding; this highlights the problem of awarding the win for the lowest prices.

After analysing these findings, the remaining question remains whether or not these financial tools are expensive. Industry experts state that the reason for not implementing them in practice is that they are not cheap and increase project costs. To understand if this statement is reasonable, we need to translate the findings of this research into numbers. The first step is identifying how much each factor causes the construction project budgets to overrun. This goal has been achieved through an interview with a finance representative from the construction industry. He was asked to provide an average percentage by which each factor causes the project budget to be overburdened. Based on the information provided, poor estimating by the contractor about the project and the current tendering system leads to the highest cost overrun of 10%, followed by inflation, causing the project expenses to increase on average by 7%, project schedule changes and fluctuation in foreign exchange rate led to overburdens of 5%. Note that we could not provide information for the factor – natural disasters – as it is considered a force majeure situation, and in these cases, we cannot make estimations. The complete information gathered is provided in Table 4 below.

Table 3 – Percentage of budget overrun caused by each factor (researchers' findings)

Factor	By How Much Does the Factor Cause the Budget to Overrun (average %)
Bias/Poor estimating by contractor about the project (Inaccurate time and/or cost estimation)	10
Tendering rules: bid award for the lowest price	10
Inflation (High cost of machinery, Material price fluctuations, High transportation costs, High machinery maintenance costs)	7
Project schedule changes / Sequencing of work according to schedule	5
Fluctuation in foreign exchange rate	5
Delay in getting approval from the client (project owner) regarding the construction	3

project	
Market conditions (availability of resources, Inadequate labour/skill availability/ Shortage of labour)	3
Lengthy bureaucracy in government entities	2
Faulty execution/ Mistakes in construction	2
Delay in payment by the project owner to the contractor (construction company)	1
Changes in general laws and regulations affecting the construction industry	1
Government requirements for the construction industry	1
Late delivery of materials and equipment to the construction site	1
Frequent breakdown of the construction plant and equipment	1
Weather conditions	1
Natural disaster	N/A

According to different sources, international construction project profit margins range from 3-7%, or as some sources state, from 8% to 15%. As the finance representative of a Georgian construction company mentioned during the interview, these margins in Georgia range from 5% to 10%, depending on the characteristics and specifications of the project. These percentages are included in the initial project budgets, and construction companies expect to profit from this amount from particular projects. Looking at the latest financial statements of three different Georgian construction companies, which are of varying size and experience, it is evident that for the past two years, the gross profit margin for these companies varied within the range of 6% - 11% and the net profit margin range was 1% - 5%. Comparing these profit margins to the percentage of cost overruns caused by each factor, it is evident that the cost escalation percentages are too high. Therefore, it is essential to understand the mitigation tools' pricing and how much they increase the costs in the project's budget; this provides an opportunity to analyse whether or not it is reasonable to use these tools against the risks of incurring cost overruns.

Table 5 sums up the risk mitigation tools that were identified through research. The illustration also shows the list of factors that each of these

tools can help deal with and the total targeted cost overrun percentage, which represents the sum of the cost overrun percentage caused by each targeted factor; this shows what percentage of cost overrun can be mitigated by implementing each of these tools.

Table 4 – Risk Mitigation Tools and Targeted Overrun Factors (researchers' findings)

Tool for Risk Mitigation	Targeted Cause Overrun Factors	Total Targeted Cost Overrun Percentage, %
Contractors' All Risk Insurance (CAR)	Project schedule changes / Sequencing of work according to schedule Faulty execution/ Mistakes in construction Frequent breakdown of the construction plant and equipment Weather conditions	9
Bank Guarantee	Delay in getting approval from the client (project owner) regarding the construction project Delay in payment by the project owner to the contractor (construction company) Late delivery of materials and equipment to the construction site	5
Open Book Contracts	Inflation. Fluctuation in foreign exchange rate	12
New Tendering Rules	Tendering rules: bid award for the lowest price. Bias/Poor estimating by the contractor about the project	20

We needed to identify the prices for each tool to understand whether or not they were expensive. Georgian insurance companies could not provide

information about the value of the premium for a CAR policy. Therefore, we conducted desk research to gather information from practices in other countries. The table below shows average premium rates of Contractors' All Risk Insurance for different types of construction projects in India:

Table 6 – Rates of CAR Premiums in India (Insurance Information Bureau of India, 2024)

Construction Type	Premium Rates Up to the first 3 months, %	Additional rate per month beyond 3 months
Residential and Commercial Buildings	1-4	0.02-0.05
Theatres, Auditorium, and Cinema Halls	2-2.5	0.02-0.03
Factory sheds, Warehouses, Cold storage, Hangar	2-2.25	0.02
Roads	2-3	0.025-0.04
Flyovers on land	2-3	0.03-0.04

We can use CAR against some of the cost escalation factors identified through this research. As mentioned, we divided the cost escalation factors into groups; we can use CAR as insurance and security against the managerial factors. This cause escalation factor includes poor construction site management and frequent construction plant and equipment breakdowns. Additionally, the identified cost escalation factors were grouped by their impact directly on cost or on the timing of the project. CAR may include an additional non-obligatory section securing the project from delays and extra expenses caused by time overruns. Therefore, adding this optional feature to CAR further increases the policy's coverage and shields the construction company from those sources of cost escalation that lead to delays, as CAR can be used to avoid cost escalation of 9%. Looking at this average price, the premium required from insurance companies for CAR policy seems reasonable compared to the risks it mitigates and benefits provided.

Similarly to CAR premiums, banks could not provide the general framework for the tariffication of bank guarantees. Therefore, the international average is used for this research. The fees

charged by the banks for guarantees differ depending on the type of guarantee, but generally, the fees range between 0.5% to 0.75%. Compared to the risk of an overrun of 5% of the project's budget caused by factors that can be mitigated using BGs, this pricing seems reasonable. The only drawback of using this instrument is that if CAR premium cost is included in the construction project budget, it may increase the project's price. During the contractor selection phase, the project owner always leans towards the cheaper version, not considering future cost escalation risks. Therefore, construction companies have less incentive to incorporate this insurance tool in their practice if not otherwise required by the project owner. This drawback leads to another cost overrun factor – bid award for the lower prices. We will discuss recommendations against this cost overburden cause later.

Regarding open book contracts, construction companies do not always have the freedom of choice; generally, the contract type is predetermined by the project owner. In most cases, especially if contractors are chosen by tender bidding, the project owner decides the kind of contract, and the construction company has to accept it. However, in some cases, especially when a construction company holds bargaining power, the type of contract may be the subject of negotiations. In that case, the open book method is more desirable from the constructors' point of view; this ensures less financial risk for the contractor company. Therefore, the cost-plus contracts may seem to hold less profit markup than initially calculated lump-sum agreements. Still, the questionnaire showed price and labour fee fluctuations are among the most common factors leading to project cost overrun. Therefore, securing against this risk is especially important. From the project owners' point of view, open book contracts carry higher risks; thus, they should offer lower profit margins to secure this type of deal. As research results show, open book contracts can help to avoid up to 12% of cost overrun; therefore, as long as profit from a project is not lowered by more than 12% when offered an open book contract rather than a lump-sum, it is preferable to work with it.

We can target the highest cost overrun percentage by implementing a new tendering system in the country. The current tendering system in Georgia, similar to most other countries worldwide, grants the win to the bidder, offering the lowest price as long as the buyers' requirements

are met. This system fails to ensure the timely and in-budget completion of work. The fact that the one who bids the lowest wins incentivises construction companies to over-value their abilities and under-value the expenses and budget needed for that particular project. As proven by the results of the questionnaire, this is one of the factors leading to construction cost overruns in Georgia.

One way to deal with this problem is by implementing a tendering system that will consider the price offered and the quality of past performance. Singapore and Denmark represent an excellent example of tailoring tendering terms in a way that ensures not only the best price but also the quality of works performed and the experience of the contractor company. The same approach may be applied to the Georgian procurement system, and the approaches may be changed so that not only the lowest bidding price but also the past excellence of the bidder is evaluated and granted the project; this will minimise the incentive to undervalue the project and address the problem of awarding the bid at the lowest price.

Not all factors are directly linked to the tendering systems; for example, bias and poor estimating were named stand-alone factors. However, diving deeper into the issue, it is evident that the incentive to misrepresent or underestimate a project is caused by the fact that the lowest bidders win. Therefore, up to 20% of cost overrun can be avoided by having a tendering system similar to the countries that do not grant the win to the lowest bidder and consider the experience, capabilities, and past excellence of the construction company.

## CONCLUSIONS

Construction is a complex sector. No new project is the same as any previous one. Every project is unique and has different characteristics and, therefore, other requirements for successful completion; this is why there is no one-fits-all solution to the construction industry's challenges. One of the biggest challenges is project cost overruns. This research aimed to identify the most common reasons for budget overburdens and provide examples of the best practices for dealing with them for the Georgian construction industry. We studied the sixteen reasons for cost overruns with the help of interviews and surveys. The results showed that inflation, delays in get-

ting approval from the project owner regarding the project during construction and poor initial estimations are the most severe and frequent factors causing budget overruns in the Georgian construction sector. Also, current tendering rules that award the win to the lowest bidder were identified as a reason behind inaccurate estimations and misrepresentations of numbers to get the project.

We suggested several recommendations for this challenge, such as working with an open book contract that prices the construction works according to the actual costs incurred plus the agreed-upon profit margin. Also, using insurance products such as Constructors' All Risk Policy minimises the impact of the factors covered by the insurance agreement, as the insurance company must reimburse the expenses caused by the events included in the policy. Banks also offer products, such as guarantees, from which construction companies can benefit. Payment guarantees can be used to manage the relationship with project owners. In contrast, performance guarantees can be a good tool in ensuring the financial risks in the agreement with subcontractors or suppliers.

Another challenge facing the construction industry in Georgia is the existing tendering system and awarding the lowest price. The examples of Singapore and Denmark show that prices should not be considered only when making decisions. The participant's past performance should also be a criterion when choosing the contractor for the construction project.

Indeed, we cannot eliminate all risks. The goal is to develop best-practice examples and a toolkit against cost overrun factors. In practice, every construction company should conduct an assessment test (similar to the questionnaire created for this research) to help them make their risk matrix and understand which factors need attention in the red zone. After identifying red-zone factors, we can implement the tools and recommendations in this research to deal with them.

This study has identified sixteen reasons for construction project budget overrun from the con-

tractors' point of view. We identified some tools that can be implemented to deal with this challenge through literature and research. To sum up, we can give the following recommendations to Georgian construction companies. They should determine which of those sixteen cost escalation factors are most common for them and then look into the tools provided for preventing them. Not all risks can be avoided altogether, but identifying red-zone factors can help them maximise profit and minimise the probability of cost overruns.

In several cases, CAR is an insurance instrument that secures construction companies' financial security. This tool prevents up to 9% cost overrun. The recommendation to Georgian construction companies is that as long as the premium price does not exceed 9%, it is not expensive to buy a CAR policy.

Bank guarantees can be used to manage relationships with project owners and/or suppliers and subcontractors. This tool is advantageous for two reasons. For once, they covered the financial risks that the construction company could have incurred. On the other hand, when a construction company holds a BG, it increases the incentive for the other party to perform within the terms of the agreement. Using bank guarantees for construction projects can avoid a 5% cost overrun.

To avoid risks incurred by inflation, we can negotiate open-book contracts. A construction company does not always have the bargaining power to change the type of contract. Still, when it can be a subject to discussion, open book contracts are preferable to lump-sum to avoid the risk of expense escalations.

Finally, the biggest challenge identified through this research is the current tendering system, granting win to the lowest price. Separate construction companies cannot deal with this problem, but the examples of Singapore and Denmark provide an overview of the best practices. Construction companies can defend themselves by changing the current system in Georgia.

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