

# Causes of Cost Overrun and Solutions in Construction Projects in Somalia

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## Abstract

The construction industry plays a critical role in Somalia's socioeconomic development and has expanded significantly since the end of the civil war; yet, cost overruns remain a major challenge, as many projects exceed their initial budgets. Existing studies indicate that limited skilled personnel, inexperienced managers, and poor communication are contributing factors to this issue. This study aims to identify the causes, solutions, and impacts of cost overruns in Somali construction projects and to analyse the relationships between these variables. A quantitative approach, utilising a structured questionnaire, was employed, yielding 63 valid responses from Grade A contractors, including project managers, engineers, and architects. Descriptive statistics and correlation analysis were used to evaluate the data. The results indicate that unskilled labour, insecurity, lack of insurance, poor project management, and weak infrastructure are the primary causes of cost overruns, while effective cost management, time management, and quality management practices serve as key solutions. Major impacts identified include financial strain on clients, compromised project quality, reputational damage to contractors, and project delays. Correlation analysis revealed a moderate positive relationship between the causes and solutions and a strong positive relationship between the solutions and impacts, suggesting that addressing the root causes is moderately linked to solution effectiveness, whereas implementing the proposed solutions strongly contributes to mitigating the impacts. Overall, the study offers practical insights for improving construction performance and strengthening cost-control mechanisms in Somalia.

## 1. Introduction

The construction industry plays a crucial role in national socioeconomic development and has become increasingly complex, requiring managers to deliver projects on time, within budget, and to the required standard of quality. However, cost overruns remain one of the most persistent challenges globally, with studies showing that up to 90% of construction projects exceed their original budgets (Flyvbjerg, 2002). This issue affects both developed and developing countries, often driven by poor resource planning, weak project supervision, and ineffective cost-control practices (Angelo & Reina, 2002; Vaardini, 2016). Cost overruns are defined as the difference between the actual final cost and the contractually agreed-upon budget (Adawi & Yahia, 2021), resulting in substantial financial strain for clients and contractors, increased project delays, and compromised overall project performance (Akinci & Fischer, 1998; Shen & Sammani, 2022). The inherently fragmented and

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resource-intensive nature of construction projects further elevates the risk of cost deviations (Abdul-Rahman et al., 2013).

In Somalia, construction activity has expanded rapidly, driven by post-conflict reconstruction and the growth of the private sector. Despite this development, the sector continues to suffer from severe and frequent cost overruns, where most projects exceed both time and budget targets (Osman & Mohamud, 2022). Several studies attribute these challenges to the limited availability of skilled labour, inexperienced management teams, inadequate communication, and weak institutional structures (Osman, 2019). Similar to other developing countries, Somalia also faces additional constraints, including material shortages, price volatility, and capacity gaps within the construction workforce (Nega, 2008). International evidence suggests that cost overruns in developing nations may exceed 100% of the original budget (Memon et al., 2011), underscoring the need for improved cost management practices. As construction demand is projected to increase significantly over the next three decades, Somali contractors must strengthen their cost-control capabilities, risk management practices, and overall project governance to align with global standards.

Although cost overruns have been widely studied internationally, a notable research gap remains within the Somali context. Limited empirical work has examined the specific causes, consequences, and mitigation strategies relevant to Somalia's unique economic, social, and institutional conditions. Addressing this gap is crucial for enhancing project delivery and fostering the long-term growth of the country's construction sector. Therefore, this study aims to identify the principal causes of cost overruns in Somalia's construction projects, assess their impacts, and propose solutions to mitigate these issues. The study also examines the relationships between causes and solutions, as well as between solutions and impacts, to provide a more comprehensive understanding of the cost-overrun phenomenon. To achieve these aims, the study addresses key questions relating to the drivers, mitigation strategies, and effects of cost overruns in Somalia. Two hypotheses were developed to test the significance of the relationships between causes, solutions, and impacts.

The study focuses on residential, commercial, and infrastructure projects undertaken by Grade A contractors registered with the Ministry of Public Works and Reconstruction, as these firms possess the capacity to execute large-scale projects and represent a major segment of the Somali construction sector. Data were collected through an online questionnaire targeting project managers, quantity surveyors, engineers, architects, and consultants. The findings are expected to contribute valuable insights for improving cost-control strategies, strengthening project management practices, and enhancing the overall performance of Somalia's construction industry.

## 2. Literature Review

A cost overrun is defined as the actual cost exceeding the budgeted cost (Olawale & Sun, 2010). A cost overrun may alternatively be called "cost escalation," "cost increase," or "budget overrun". As defined by Singh et al. (2010), cost overruns refer to unexpected expenses that exceed the estimated amount due to underestimating the actual cost. Construction costs are divided into several categories: labour, materials, plant and machinery, administrative, and other expenses. These costs are further classified into direct costs, which are directly attributable to specific activities (such as direct material, labour, and other direct expenses), and indirect costs, which cannot be directly linked to a specific task but are necessary for overall project execution. Direct costs include all expenses associated with materials, labour, and additional services for a particular task, while indirect costs encompass broader expenses not directly tied to specific tasks (Subramani et al., 2014). Successful project completion within budget is vital for overall success, with cost performance being a key indicator of an organisation's profitability and productivity (Flyvbjerg et al., 2003; Masrom et al., 2015; Olawale & Sun, 2010). Despite this, poor cost management remains a pervasive issue in the construction industry, leading to significant cost overruns. Research by Flyvbjerg et al (2002) indicates that 90% of projects globally face cost overruns of 50-100%, a trend observed over the past 70 years. Cost overruns are widely recognised in academic literature as major setbacks in construction projects (Shehu et al., 2014) and are considered a severe global issue (Azhar et al., 2008). Addressing the root causes of cost overruns is essential for developing effective solutions and contingencies

### 2.1 Cost Overrun Studies in Developing Nations

The World Bank categorises countries based on their annual Gross National Income (GNI) per capita. Countries with a GNI of \$12,375 or less are considered developing, while those with a GNI of \$12,375 or more are considered developed (World Bank, 2019). However, poor cost performance and overruns are common issues in developed and developing nations (Memon & Rahman, 2014). According to Derakhshanlavijeh & Teixeira (2017), developing nations have not achieved a substantial level of industrialisation compared to their population. It is widely recognised that cost overrun is a widespread phenomenon in projects globally. However, the matter becomes especially imperative in developing countries (Le-Hoai et al., 2008) because of the economic challenges that frequently lead to financial constraints in construction projects (Asiedu & Adaku, 2019). Developing countries face various challenges, including political instability, limited human resources, and the consequences of inflation

(Patrick et al., 2015). The issue of cost performance in developing countries has been extensively studied by various scholars, including Vaardini et al. (2016), Yap et al. (2019), and Gurara et al. (2017), among others. These studies have emphasised the importance of addressing cost overrun problems in building projects within developing countries (Ismail et al., 2021).

In Ghana, cost overruns are prevalent, especially in groundwater construction projects. A study indicated that among 47 projects completed between 1970 and 1999, 33 faced delays, and 38 experienced cost overruns. Notably, 75% of these projects exceeded their planned schedules and budgets, with only 25% being completed on time and within budget (Asiedu & Adaku, 2020).

In Nigeria, a study focused on ongoing building projects in Abuja found that cost overruns varied significantly. The percentage ranged from a minimum of 5.56% for projects that were 90% completed to a maximum of 216.08% for projects that were only 5% completed. On average, the cost overrun was 44.46%, with projects completing an average of 52.4% of their work within 91.4% of the estimated time limit (Saidu & Shakantu, 2017).

## 2.2 Causes of Cost Overrun

The cost overrun can be attributed to one or more essential factors that hinder cost-effective performance (Memon et al., 2011). According to Pourrostan & Ismail (2011), cost overruns are directly caused by "root causes" often associated with preliminary stages, project planning, or design. These root causes include incorrect estimations of project quantities, mistakes or inaccuracies in the project design, changes to the project schedule, alterations to the project scope, unforeseen site conditions, rising material and labour costs (typically linked to inflation), and unexpected events. Endut (2008) further notes that ineffective construction management and poorly developed cost control mechanisms significantly contribute to cost overruns in many projects. Kissi et al. (2016) also identified barriers to effective cost planning, such as poor cost planning and knowledge, insufficient design and planning, and external factors. Various factors cause construction project cost overruns, many of which are difficult to predict and control (Nega, 2008). According to a study by Ibbs, these factors include inaccuracies in the initial cost estimate, the level of government regulation and control, delays in construction completion, the frequency of design changes, and labour-related issues such as the availability of skilled workers and changes in fringe benefits. Chitkara (2011) outlines controllable causes of cost overruns, including inadequate project formulation (poor field investigation, bad cost estimates, lack of experience, and poor feasibility analysis), poor implementation planning (inadequate time, resource, and equipment plans, and poor organization), lack of proper contract planning and management (improper pre-contract actions and poor post-award management), and ineffective project management during execution (insufficient work, delays, scope changes, and legal issues).

## 2.3 Solutions to Cost Overruns

### (a) Cost Management

Project cost management involves four key stages that must be followed to effectively manage costs and prevent overruns. The four steps are creating a budget, estimating expenses, and monitoring and controlling those expenditures. Planning encompasses the first three phases of project cost management, whereas monitoring and controlling involve managing expenses. Setting up project processes and procedures for managing and controlling costs, as well as estimating resource requirements, is all part of the planning phase. The project manager's responsibility is to regularly monitor and update the budget (Riedel & Al-Keim, 2017). Project managers play a crucial role in ensuring effective cost management throughout the project lifecycle. They must accurately estimate all direct and indirect costs and be aware of techniques like analogous or parametric estimation and 3-point estimation in high-risk environments (Khan et al., 2022a; Haseeb et al., 2011). Budgeting means arranging funds that have been identified in the cost estimation process (Mubarik et al., 2021b). The Project Management Institute recommends using tools like expert judgment and historical data to establish a cost baseline (PMBOK 6th edition). Regular cost monitoring, variance analysis, and risk management are crucial for keeping the project within budget and mitigating potential cost overruns (Johari & Jha, 2021; Mazhar et al., 2022; Phan, 2020).

Cost management models such as Earned Value Management (EVM) and Lean management play critical roles in reducing cost overruns in construction projects by enhancing control, predictability, and efficiency. EVM integrates project scope, cost, and schedule to provide a comprehensive view of project performance, enabling managers to compare planned value, earned value, and actual cost in real-time. This enables early detection of cost and schedule variances, facilitating timely corrective actions that keep projects within budget and on schedule (Smith, 2021). EVM also improves forecasting accuracy and accountability, which are essential for mitigating risks associated with cost overruns. On the other hand, Lean management focuses on minimising waste and optimising processes to improve quality and reduce delays. By streamlining workflows and promoting continuous improvement, Lean reduces inefficiencies that often lead to unexpected costs in construction projects (Johnson & Lee, 2023). Combining Lean principles with EVM's quantitative tracking creates a robust framework for managing the project management triangle of cost, time, and quality, thus stabilising project outcomes and preventing overruns. Together, these models enhance decision-making, foster transparency, and drive operational

excellence, making them indispensable tools for controlling costs in the complex environment of construction projects (Garcia, 2022).

#### (b) Time management

Project time management knowledge domains cover the planning, monitoring, and controlling processes. Project time management encompasses seven key elements that must be executed to keep projects on schedule and complete them by the deadline. The first six tasks in the planning process group include selecting activities, arranging activities, estimating resources, estimating activity durations, and generating a plan. The project manager is responsible for managing the timeline within the monitoring and controlling process group. As part of the planning stage, the project manager prepares the project's policies and procedures for the project schedule, specifies the actions necessary to meet deliverables, and maps out the links between various activities and the resources needed. At this phase, the project manager monitors the project's progress, adjusting as necessary to meet the project plan's deadlines and avoid time overruns, which can lead to cost overruns (Riedel & Al-Keim, 2017).

#### (c) Quality management

Project quality management encompasses both quality assurance (planning to meet quality requirements) and quality control (steps taken to monitor results and ensure conformance to requirements) (PMBOK, 2017). Project quality management encompasses three main responsibilities: planning quality management, conducting quality assurance, and controlling quality. These responsibilities are carried out through four processes: planning, executing, monitoring, and controlling. The project manager first defines the project's quality criteria during planning, ensures these standards are implemented during execution, and finally tracks performance and assesses compliance with quality standards during monitoring and controlling (Riedel & AlKeim, 2017). To implement quality management effectively, various tools and techniques can be utilised, such as benefit-cost analysis, benchmarking, flowcharting, design of experiments, cost of quality, quality audits, inspections, control charts, Pareto diagrams, statistical sampling, and trend analysis (Chin-Keng, 2011). Construction projects may fall short of quality standards due to scheduling delays or cost overruns, leading teams to prioritise time or cut costs, which can result in defects and compromised quality (Thelford, 1997; Kerzner, 2017). Success depends on the project manager's experience and ability to balance these triangulations effectively.

## 2.4 Impacts of Cost Overruns

The construction sector has been facing the problem of cost overruns for many decades. The impact of this cost overrun results in a slowdown in the completion of construction projects, affecting all stakeholders (Sohu et al., 2021). These overruns can result in financial constraints due to tying up clients' capital, resource wastage, underutilization, and project abandonment, which further complicate the situation and lead to reduced productivity and profit margins. Additionally, disputes can arise among clients, contractors, and suppliers, potentially leading to legal issues (Ahmed, 2021). Faten Albtouch and Doh (2019) found that cost overruns negatively affect project performance by causing delays, reduced quality, risk of abandonment, and financial losses. Abu Hassan (2017) highlights additional impacts, including damage to the reputations of contractors or consultants and a higher risk of legal disputes. Identifying and addressing the sources of cost overruns is essential to mitigate these negative impacts.

## 3. Research Methodology

Research methodology is a structured and scientific approach used to collect, analyse, and interpret quantitative or qualitative data to answer research questions or test hypotheses and gather information about a topic (Kothari, 2004). This study employs a quantitative research method to identify the causes, solutions, and impacts of cost overruns in construction projects in Somalia. This method is suitable for obtaining numerical data that can be statistically analysed to identify trends and relationships among variables.

### 3.1 Population and Sampling

The research population consists of 127 contractor companies, representing the total number of Grade A contractors registered with the Ministry of Public Works & Reconstruction in Somalia (Ministry of Public Works, 2023). Grade A contractors were chosen as they represent the most experienced and financially capable firms in the country's construction industry (Osman, 2019). These contractors handle large-scale projects, such as infrastructure and commercial developments, making them more likely to encounter and understand cost overrun issues. To ensure the collection of rich and reliable data, a purposive sampling technique was employed to target individuals with direct experience in managing project costs. This approach was selected to enhance the depth and reliability of the data, as it targeted individuals who had first-hand exposure to the causes and impacts of cost

overruns. The sampling process involves selecting a sample from the target population that is equivalent to or representative of the population size. According to Krejcie and Morgan's (1970) sample size determination table, a sample of 97 Grade A contractor companies was deemed sufficient for a population of 127. The study specifically targeted professionals with relevant expertise in project cost management, including project managers, construction managers, consultants, engineers, and quantity surveyors, as respondents, making their insights critical for identifying the causes, solutions, and impacts of cost overruns.

### 3.2 Data Collection

Data collection involves gathering information from multiple sources and using various tools to achieve research objectives and analyse results. This study utilises both primary and secondary data. Primary data were collected through direct contact with respondents, using questionnaires distributed via Google Forms, which were easily accessible online. Secondary data consists of information that has already been collected and analysed by others and obtained from online sources such as journal articles, reports, government records, and other relevant references. A total of 63 responses were received from professionals who are directly involved in managing or overseeing construction projects. These professionals provided insights into the factors contributing to cost overruns in Somalia's construction sector and proposed solutions to mitigate these overruns. The questionnaire, designed as an instrument for data collection, consists of multiple questions and statements. This study was developed based on a comprehensive review of existing literature on cost overruns in construction projects. The questionnaire was structured as a Google Form and organised into four sections: Section A covers demographic information, Section B focuses on factors contributing to cost overruns, Section C addresses solutions to mitigate these overruns, and Section D identifies the impacts of cost overruns. Respondents were asked to rate the importance of various factors on a five-point Likert scale, ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

### 3.3 Pilot Study

According to Altman et al. (2006), a pilot study is a small-scale preliminary study conducted to assess the quality of the instrument used in the actual study. Therefore, validity and reliability are crucial in determining the quality and suitability of the instrument. This study conducted a pilot test with seven Grade A construction companies registered with the Somali Ministry of Public Works & Reconstruction (2023). The participants were construction experts with direct experience in managing project costs. Table 1 presents a Cronbach's alpha value of 0.908 for the 78 questions in the survey, which addresses the study's first three main objectives: the causes, solutions, and impacts of cost overruns. Since a Cronbach's alpha value above 0.7 is considered reliable, the pilot test results confirm the instrument's reliability.

**Table 1** Pilot test reliability

No. Respondents	No. of Items	Cronbach's Alpha
7	79	0.908

### 3.4 Data Analysis

The data collected was analysed using descriptive statistics and correlation analysis utilising IBM SPSS 26.0 software. Descriptive statistics were used to summarise the respondents' demographic characteristics and rank the causes and solutions based on their mean scores. Pearson's correlation was performed to measure the strength and direction of the relationships between the identified causes, solutions, and impacts of cost overruns. The reliability of the questionnaire was measured using Cronbach's Alpha to ensure the consistency of the data. The results were interpreted to determine whether the proposed hypotheses were supported.

#### *(a) Descriptive Analysis*

Descriptive analysis is a fundamental aspect of data analysis that focuses on summarising and interpreting data to highlight its main characteristics. It includes measures of central tendency, such as the mean, median, and mode, which provide insights into the average and most frequent values in a dataset (McClave & Sincich, 2017; Siegel & Castellan, 1988). Additionally, measures of dispersion, including range, variance, and standard deviation, assess how much data points vary from the mean (Freedman & Peters, 1984; Bluman, 2018). In this study, measures of central tendency were used to analyse the data obtained through the questionnaire

**Table 2** Assessment level based on mean score

Mean score	The level of agreement
0.00-1.50	Very Low
1.51-2.50	Low
2.51-3.50	Moderate
3.51-4.50	High
4.51-5.00	Very High

Source: Ghaffar (2003)

*(a) Likert analysis*

Respondents are asked to rate their level of agreement using a 5-point Likert scale, where 1 represents 'strongly disagree,' 2 represents 'disagree,' 3 represents 'neutral,' and 4 and 5 represent 'agree' and 'strongly agree,' respectively, as shown in Table 4. The Likert scale was chosen for the questionnaire due to its simplicity, ease of online distribution, and straightforward analysis.

**Table 3** Likert scale

Item	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Scale	5	4	3	2	1

*(b) Correlation analysis*

Correlation is meant to explore the degree of relationship between two (or more) quantitative variables. Generally, two correlation coefficients are used in applications: Pearson’s Product-Moment Correlation Coefficient and Spearman’s Rank Correlation Coefficient. This research primarily considers the applications of Pearson’s Simple Linear Correlation in exploring the relationship between causes and solutions as well as impacts and solutions, which correspond to research objectives 4 and 5, respectively. Table 5 presents the Pearson Correlation Coefficient scale and its interpretation.

**Table 4** The scale of Pearson’s correlation coefficient

The scale of the correlation coefficient	Interpretation
$0 < r \leq 0.19$	Very Low Correlation
$0.2 \leq r \leq 0.39$	Low Correlation
$0.4 \leq r \leq 0.59$	Moderate Correlation
$0.6 \leq r \leq 0.79$	High Correlation
$0.8 \leq r \leq 1.0$	Very High Correlation

**4. Data Analysis and Results**

**4.1 Background Information of Respondents**

A total of 63 respondents participated in the study, comprising mostly males (82.54%) and individuals aged 31–40 years (54%), indicating a predominantly mid-career workforce. Engineers formed the largest professional group (55.6%), followed by project managers (22.2%), architects (12.7%), and quantity surveyors (9.5%). Most respondents had between 6 and 10 years of experience (36.5%) or 1 and 5 years (31.7%), reflecting a technically experienced sample. In terms of qualifications, the majority held a bachelor’s degree (55.6%), while others possessed a master’s degree (25.4%), a diploma (11.1%), or a PhD (7.9%). The respondents were mainly involved in private construction projects (63.5%), with smaller proportions engaged in government projects (15.9%) or both sectors (20.6%). Company specialisations were dominated by residential construction (58.7%), followed by

infrastructure (22.3%) and commercial projects (19%). Overall, the respondent profile demonstrates a well-distributed representation of professionals actively engaged in Somalia's construction industry.

**Table 5** Respondents' background information

Categories	Frequency	Percentage (%)	Cumulative Percent
<b>Gender</b>			
Male	52	82.54	82.54
Female	11	17.46	100
<b>Respondents' Age</b>			
21-30	13	20.6	20.6
31-40	34	54.0	74.6
41-50	11	17.5	92.1
51-60	3	4.8	96.9
Above 60	2	3.2	100
<b>Position in the Firm</b>			
Architect	8	12.7	12.7
Engineer	35	55.6	68.3
Project Manager	14	22.2	90.5
Quantity Surveyor	6	9.5	100
<b>Experience year</b>			
1-5 years	20	31.7	31.7
11-15 years	14	22.2	53.9
16-20 years	3	4.8	58.7
6-10 years	23	36.5	95.2
Above 20 years	3	4.8	100
<b>Education Level</b>			
Diploma	7	11.1	11.1
Bachelor Degree	35	55.6	66.7
Master Degree	16	25.4	92.1
PhD	5	7.9	100
<b>Type of project</b>			
Private	40	63.5	63.5
Government	10	15.9	79.4
Both government and private	13	20.6	100
<b>Company's Primary Construction</b>			
Residential	37	58.7	58.7
Infrastructure	14	22.3	81
Commercial	12	19.0	100

## 4.2 To Identify the Factors that Cause Cost Overruns in Somalia’s Construction Projects

Section B of the study’s survey was designed to identify the factors causing cost overruns in Somalia’s construction projects. This section comprises 48 questions distributed across nine distinct categories, utilising a Likert scale to measure responses.

The analysed data presented in Table 6 reveal that the study identified 48 factors under these categories, with the highest mean value being 4.87 and the lowest at 3.81, indicating a general consensus among respondents regarding the significance of these factors. The most prominent causes relate to external factors, with "unskilled labour" and "insecurity" emerging as the top two factors, scoring mean values of 4.87 and 4.78, respectively. Additionally, weak infrastructure and the high cost of machinery are also major contributors to cost overruns. Health and safety-related factors ranked second, with concerns such as a lack of insurance, inattention to worker health on the project site, and inadequate training being critical factors that cause budget overruns, as incidents can occur without prior financial coverage. Poor project management practices came in third, with "lack of control over time" and "lack of project planning" scoring 4.60 and 4.59, respectively. Material-related issues, such as "limited material availability" and "inaccurate estimates," significantly contribute to cost overruns, ranking fourth with mean values of 4.63 and 4.58. Client-related factors, notably "changes in client requirements" and "delays in payment," were also identified as key causes, with mean values of 4.59 and 4.57. Contractor-related issues, particularly improper project management, poor planning, and scheduling, ranked fifth. Additionally, a lack of contractor experience in cost estimation and weak management-labour relations were also highlighted. Consultant-related problems, such as "poor contract management" and "underestimation of project duration," and project manager-related issues, including inexperience and a lack of technical expertise, further contributed to cost overruns, with mean values of 4.60 and 4.57, respectively. Financial issues, including a lack of financial planning and fluctuations in exchange rates, ranked lowest; however, addressing them remains critical for effective cost control in construction projects.

**Table 6** Summary of the factors causing cost overruns

No.	Factors causing cost overruns	n	Mean	Agreement level	Rank
<b>1</b>	<b>Factors related to the Project Manager</b>	<b>63</b>	<b>4.39</b>	<b>High</b>	<b>7</b>
	Project manager's inexperience	63	4.48	High	1
	The project manager's lack of technical expertise	63	4.43	High	2
	The project manager's incapability	63	4.40	High	3
	The project manager's lack of leadership abilities	63	4.37	High	4
	A project manager's incapacity to make the right decision	63	4.25	High	5
	<b>2</b>	<b>Factors related to the contractor</b>	<b>63</b>	<b>4.47</b>	<b>High</b>
Improper project management		63	4.56	Very High	1
Improper scheduling of the project		63	4.54	Very High	2
Improper planning of the project		63	4.51	Very High	3
Lack of contract experience		63	4.46	High	4
Lack of relationship between management and labourers		63	4.43	High	5
Lack of cost estimation		63	4.41	High	6
Mistakes during construction	63	4.35	High	7	
<b>3</b>	<b>Factors related to the consultant</b>	<b>63</b>	<b>4.46</b>	<b>High</b>	<b>6</b>
	Poor contract management	63	4.60	Very High	1

No.	Factors causing cost overruns	n	Mean	Agreement level	Rank
	Delay in approval of design changes	63	4.46	High	2
	Underestimate project duration	63	4.44	High	3
	Mistakes in design	63	4.35	High	4
<b>4</b>	<b>Factors related to the client</b>	<b>63</b>	<b>4.51</b>	<b>High</b>	<b>4</b>
	Changes in client requirements	63	4.59	Very High	1
	Delay in payment	63	4.51	Very High	2
	Financial difficulties faced by the owner	63	4.44	High	3
<b>5</b>	<b>Factors Related to Others/ External</b>	<b>63</b>	<b>4.72</b>	<b>Very High</b>	<b>1</b>
	Unskilled labour	63	4.87	Very High	1
	Insecurity	63	4.78	Very High	2
	Shortage of site workers	63	4.67	Very High	3
	Weak infrastructure	63	4.67	Very High	3
	Delay in material procurements	63	4.65	Very High	5
	High cost of machines	63	4.65	Very High	5
<b>6</b>	<b>Factors Related to Materials</b>	<b>63</b>	<b>4.51</b>	<b>High</b>	<b>4</b>
	Limited material availability	63	4.63	Very High	1
	Low-quality materials	63	4.62	Very High	2
	Fluctuation of material prices	63	4.60	Very High	3
	Unsuitability of materials	63	4.54	Very High	4
	Change in material specification	63	4.51	Very High	5
	Extended lead times	63	4.38	High	6
	Wrong estimates of materials	63	4.30	High	7
<b>7</b>	<b>Factors Related to Financial</b>	<b>63</b>	<b>4.27</b>	<b>High</b>	<b>8</b>
	Lack of financial planning	63	4.54	Very High	1
	Lack of financial management	63	4.46	High	2
	Fluctuation in the money exchange rate	63	3.81	High	3
<b>8</b>	<b>Factors Related to Poor Project Management</b>	<b>63</b>	<b>4.53</b>	<b>High</b>	<b>3</b>
	Lack of control over time	63	4.60	Very High	1
	Lack of project planning	63	4.59	Very High	2
	Lack of end-user involvement	63	4.54	Very High	3
	Inadequate risk management	63	4.52	Very High	4

No.	Factors causing cost overruns	n	Mean	Agreement level	Rank
	Lack of project team coordination	63	4.52	Very High	4
	Poor resource coordination	63	4.41	High	5
<b>9</b>	<b>Factors Related to Health and Safety</b>	<b>63</b>	<b>4.64</b>	<b>High</b>	<b>2</b>
	Lack of insurance	63	4.83	Very High	1
	Inattention of health labourers on the project site	63	4.78	Very High	2
	Lack of proper training for workers	63	4.68	Very High	3
	Unreportable accident rate in a project	63	4.67	Very High	4
	Inattention to safety policies in the organisation	63	4.60	Very High	5
	Lack of Personal Protective Equipment (PPE)	63	4.30	High	6

### 4.3 To Identify the Solutions to Cost Overrun in Somalia’s Construction Project

Section C of the questionnaire is designed to identify solutions to mitigate cost overruns in Somalia’s construction projects. This section presents various solutions and techniques designed to address these cost overruns. Respondents were asked to indicate their level of agreement using a Likert scale. Solutions are presented in three distinct sections, each representing a different category: cost management, quality management, and time management. Among the solutions proposed to overcome cost overruns, Time Management (TM) emerged as the top-ranking category, securing the first rank. Quality Management followed closely behind, ranked 2nd, while Cost Management (CM) ranked third.

In the Time Management (TM) section, the first statement was "Estimating accurately activity durations," with a mean score of 4.89 and a ranking of 1st. This suggests that accurately estimating activity durations is crucial to avoiding cost overruns in construction projects. The second highly ranked solution related to time management issues is the "timely creation of plans to avoid delays in project execution," with a mean value of 4.76. Other ranked solutions include "Important to emphasise good project implementation," with a mean value score of 4.75.

In Quality Management (QM), the top-ranked solution statements include "Comprehensive understanding of the project activities" with a mean score of 4.79 and "Integrating modern construction technologies such as BIM," with a mean score of 4.78. highlighting the significance of understanding project complexities and leveraging modern technologies to enhance collaboration and communication between project stakeholders, also to maintain quality standards and minimise costly rework or errors.

In the Cost Management (CM) section, the highest-ranked statement solutions are "employing a skilled workforce," with a mean score of 4.81, and "Comprehensive consideration of estimated expenses," with a mean score of 4.79. This underscores the importance of investing in skilled labour and precise cost estimation to manage project budgets effectively and mitigate the risk of exceeding allocated funds. This analysis indicates that effective time, quality, and cost management strategies are essential for mitigating cost overruns in construction projects.

**Table 7** Summary of Solutions to overcome cost overruns in Somalia’s construction projects

Solution	n	Mean	Agreement level	Rank
<b>Cost Management</b>	<b>6</b>	<b>4.71</b>	<b>Very High</b>	<b>3</b>
Employing a skilled workforce	63	4.81	Very High	1
Comprehensive consideration of estimated expenses is essential.	63	4.79	Very High	2
Building a strong organisational management structure	63	4.78	Very High	3
Implementing strong, detailed project planning	63	4.70	Very High	4
Effective management of plan costs is a priority.	63	4.65	Very High	5
Allocation of contingency funds	63	4.63	Very High	6
Establishing a well-defined budget is a key aspect of successful cost management	63	4.63	Very High	6

<b>Time Management</b>		<b>4.77</b>	<b>Very High</b>	<b>1</b>
Estimating activity durations accurately	63	4.89	Very High	1
Emphasise the timely creation of plans to avoid delays in project execution	63	4.76	Very High	2
Important to emphasise good project implementation.	63	4.75	Very High	3
Realistic project scheduling is important for preventing delays	63	4.75	Very High	3
Accurately estimating the resources needed for the project	63	4.68	Very High	4
<b>Quality Management</b>		<b>4.74</b>	<b>Very High</b>	<b>2</b>
Comprehensive understanding of the project activities	63	4.79	Very High	1
Integrating modern construction technologies such as BIM	63	4.78	Very High	2
Maintain comprehensive documentation of all quality-related processes and inspections.	63	4.78	Very High	2
Implementing effective quality control	63	4.75	Very High	4
Establishing robust quality control measures is a key aspect of project success.	63	4.71	Very High	5
Implementing a robust systematic review process helps to identify deviations from quality standards.	63	4.70	Very High	6
Comprehensive understanding of the execution processes	63	4.70	Very High	6

#### 4.4 To Identify the Impacts of Cost Overruns in Somalia's Construction Project

The third objective of this research is to present and identify the impacts of cost overruns on construction projects in Somalia. Section D of the questionnaire focused on examining the consequences of cost overruns in Somalia's construction projects. In this section, the researcher proposed 12 impacts, each utilizing a Likert scale for responses. After collecting and analysing the data, the summarised impacts of cost overruns on construction projects are presented in Table 8.

**Table 8** *Impacts of cost overruns*

Impacts	n	Mean	Agreement level	Rank
Financial burden to the client	63	4.78	Very High	1
Lower project quality due to the cost-cutting measures	63	4.76	Very High	2
Reputation damage to the contractor	63	4.71	Very High	3
Delayed completion	63	4.71	Very High	3
Increased project cost due to time extension	63	4.68	Very High	5
Unnecessary financial drain on the project	63	4.65	Very High	6
Abandonment of the building project	63	4.65	Very High	6
Reduced profit margins for the contractor	63	4.62	Very High	8
Loss of reputation for the consultant	63	4.60	Very High	9
Dispute between the parties involved	63	4.60	Very High	9
An adversarial relationship between participants of the project	63	4.49	High	11
Legal problem	63	4.44	High	12



According to Table 8, the results indicate that the most significant impact of cost overruns is the "Financial burden to the client," ranked first. This is followed by "Lower project quality due to cost-cutting measures," ranked 2. "Reputation damage to the contractor" and "Delayed completion" are both ranked 3. "Increased project cost due to time extension" is ranked 5. Both "Unnecessary financial drain on the project" and "Abandonment of building project" are ranked 6. "Reduced profit margins for the contractor" is ranked 8, while "Loss of reputation to the consultant" and "Dispute between parties involved" are tied at rank 9. "An adversarial relationship between participants of the project" is ranked 11, and "Legal problems" is ranked 12.

#### 4.5 To Analyse the Relationship Between Causes and Solutions of Cost Overrun in Somalia's Construction Project

The fourth objective of this research is to analyse the relationship between the causes of cost overruns and their solutions. Table 9 presents the correlation results between these causes and solutions. According to Pearson's coefficient scale in Table 5, the data analysis reveals significant positive correlations between the causes of cost overruns and the proposed solutions, indicating that addressing these causes can effectively mitigate cost overruns. The highest correlations are observed between external factors and solutions categorised under cost management, time management, and quality management, with coefficient values of 0.550, 0.677, and 0.645, respectively. Health and safety-related factors also show strong correlations with these solutions ( $r = 0.615$ ,  $r = 0.645$ , and  $r = 0.580$ , respectively), suggesting that improvements in these areas could substantially reduce cost overruns. Similarly, poor project management is highly correlated with cost management and quality management solutions ( $r = 0.588$ ,  $r = 0.615$ , respectively), underscoring the importance of effective project management practices. Moreover, Contractor, consultant, and client factors all show significant positive moderate correlations with cost management and quality management solutions, indicating that these factors are closely associated with the need for cost management and quality management solutions.

On the other hand, several factors exhibit low, positive, significant correlations with solutions. For instance, project managers show a correlation of  $r = 0.321$  with both quality management solutions and cost management solutions, while materials-related factors have a correlation of  $r = 0.261$  with time management solutions. These values indicate a weaker relationship with the solutions compared to other factors. Similarly, financial-related factors demonstrate a weak positive correlation with time and quality management solutions ( $r = 0.221$  and  $r = 0.259$ , respectively); these lower correlations suggest that improvements in these specific areas may have a limited impact on resolving cost overruns compared to other factors. Generally, the data reveal a moderate, positive relationship between the causes of cost overruns and their solutions. According to the research hypothesis:

- H1<sub>1</sub>, suggesting significant relationships between causes and solutions of cost overrun, is supported by the data, as most of the correlations fall within the moderate positive range.
- H0<sub>1</sub>, which proposes no significant relationships, is contradicted by the data since most correlations between causes and solutions have  $p < 0.05$ .

**Table 9** Correlation between causes of cost overrun and solutions

		1	2	3	4	5	6	7	8	9	10	11	12
1. Project manager	Pearson Correlation	1											
	Sig. (2-tailed)												
2. Contractor	Pearson Correlation	.380**	1										
	Sig. (2-tailed)	0.002											
3. Consultant	Pearson Correlation	.398**	.691**	1									
	Sig. (2-tailed)	0.001	0.000										
4. Client	Pearson Correlation	.431**	.349**	.411**	1								
	Sig. (2-tailed)	0.000	0.005	0.001									
5. External/others	Pearson Correlation	.527**	.558**	.600**	.505**	1							
	Sig. (2-tailed)	0.000	0.000	0.000	0.000								
6. Materials	Pearson Correlation	.381**	.600**	.506**	.362**	.540**	1						
	Sig. (2-tailed)	0.002	0.000	0.000	0.004	0.000							
7. Financial	Pearson Correlation	.497**	.526**	.561**	.525**	.465**	.440**	1					
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000						
8. Poor project mgmt.	Pearson Correlation	.397**	.535**	.515**	.479**	.602**	.532**	.600**	1				
	Sig. (2-tailed)	0.001	0.000	0.000	0.000	0.000	0.000	0.000					
9. Health & Safety	Pearson Correlation	.496**	.565**	.649**	.567**	.665**	.519**	.387**	.584**	1			
	Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000				
10. Cost Mgmt. sol.	Pearson Correlation	.321*	.478**	.514**	.525**	.550**	.365**	.325**	.588**	.615**	1		
	Sig. (2-tailed)	0.010	0.000	0.000	0.000	0.000	0.003	0.009	0.000	0.000			
11. Time Mgmt. sol.	Pearson Correlation	.422**	.406**	.467**	.421**	.677**	.261*	0.221*	.469**	.642**	.652**	1	
	Sig. (2-tailed)	0.001	0.001	0.000	0.001	0.000	0.039	0.081	0.000	0.000	0.000		
12. Quality Mgmt. sol.	Pearson Correlation	.321*	.511**	.530**	.445**	.645**	.522**	.259*	.615**	.581**	.638**	.596**	1
	Sig. (2-tailed)	0.010	0.000	0.000	0.000	0.000	0.000	0.040	0.000	0.000	0.000	0.000	

\*\* p< 0.01 level (2-tailed); p< 0.05; N=63

#### 4.6 To Analyse the Relationship Between Solutions and the Impacts of Overruns on Somalia's Construction Project

The fifth objective of the research is to analyse the relationship between the solutions and the impacts of cost overrun. Table 10 presents the correlations between the various solutions and the impacts of cost overruns. Pearson's correlation was used to measure the strength and direction of the linear relationships between the solutions and their impacts. According to Pearson's Coefficient scale presented in Table 5, correlation values for this analysis ranged from 0.6 to 0.79. The correlations between the impacts of cost overruns and the solutions under the categories of Cost Management (CM) and Quality Management (QM) are found to be positively significant and "Strongly correlated." Specifically, the values of the correlation coefficients were  $r = 0.655$  for CM solutions and  $r = 0.636$  for QM solutions, suggesting that effective cost management strategies and improved time management practices can lead to a significant reduction in the impact of cost overruns in Somalia's construction projects. Additionally, the impacts demonstrated a "moderate" correlation with the Time Management (TM) solutions, with a value of  $r=0.528$ , indicating that implementing robust quality management can reduce the negative effects of cost overruns. Generally, the findings emphasise the importance of implementing effective cost, time, and quality management strategies to mitigate the impacts of cost overruns. According to the research hypothesis:

- The alternative hypothesis ( $H_{21}$ ), suggesting a significant relationship between solutions and impacts of cost overrun, is supported by the data as all correlations are statistically significant ( $p < 0.05$ ).
- The null hypothesis ( $H_{20}$ ), which proposes no significant relationships, is contradicted by the data since all correlations are significant

**Table 10** Correlation between solution and impacts

		Impacts	Cost Mgmt. Sol.1	Time Mgmt. Sol.2	Quality Mgmt. Sol.3
Impacts	Pearson Correlation	1			
	Sig. (2-tailed)				
Cost Mgmt. Sol.1	Pearson Correlation	.655**	1		
	Sig. (2-tailed)	.000			
Time Mgmt. Sol. 2	Pearson Correlation	.528**	.652**	1	
	Sig. (2-tailed)	.000	.000		
Quality Mgmt. Sol. 3	Pearson Correlation	.636**	.638**	.596**	1
	Sig. (2-tailed)	.000	.000	.000	

\*\* Correlation is significant at the  $P < 0.01$  (2-tailed).  $N=63$ .

#### 4.7 Practical Implementation Strategies for Proposed Solutions

The construction industry in Somalia faces challenges with cost overruns, driven by factors such as unskilled labour, insecurity, and poor project management. Addressing these issues requires actionable strategies that translate theoretical solutions into practical applications. This discussion outlines practical implementation strategies for solutions under cost, time, and quality management, tailored to Somalia's unique socio-economic and infrastructural context, to enhance project efficiency and ensure successful outcomes.

- The implementation of cost management solutions in Somalia's construction sector begins with fostering a skilled workforce and establishing robust financial planning. The construction industry in Somalia faces significant challenges due to a shortage of formally trained workers, with many relying on practical experience rather than technical education, leading to repeated errors and increased project costs (Hussein et al., 2025). Addressing this requires targeted vocational training programs developed in partnership with local educational institutions to build relevant skills in project management, cost estimation, and technical expertise tailored to Somalia's unique construction environment (UNIDO, 2016). Comprehensive cost estimation also requires the adoption of standardised tools, such as parametric estimation and the use of historical data, as emphasised by the Project Management Institute's PMBOK Guide (PMI, 2017). Furthermore, construction firms can improve budgeting accuracy and contingency planning by implementing specialised software, such as PlanSwift or CostX, which enhances

cost control and forecasting (Hussein et al., 2025). A comprehensive approach to budgeting, encompassing all direct and indirect costs, including labour, materials, and unforeseen risks, is essential to develop realistic budgets that minimise the risk of cost overruns and ensure project sustainability (Hussein et al., 2025; UNIDO, 2016).

- Time management is a fundamental strategy for mitigating cost overruns in Somalia's construction projects, particularly given the country's complex logistical and security challenges. The practical implementation of project scheduling techniques, such as Gantt charts and the Critical Path Method (CPM), through software tools like Primavera P6 or Microsoft Project, enables project managers to establish clear timelines, monitor progress, and allocate resources efficiently (Hassan & Ondara, 2022). These tools support the development of realistic schedules that account for Somalia's infrastructural limitations and frequent delays in material procurement, primarily due to reliance on imported construction materials (Abdullahi & Mohamud, 2022). To ensure effective use of these tools, regular training workshops should be conducted to enhance team capacity and adaptability to local constraints (PMI, 2021). Furthermore, establishing clear communication channels among the project's stakeholders - clients, contractors, and consultants can prevent delays caused by changes in requirements or approvals. Weekly progress meetings, supported by monitoring systems such as dashboards and Earned Value Management (EVM), provide timely insights into project performance, enabling the early detection of schedule deviations and prompt corrective measures (Fleming & Koppelman, 2016). Moreover, Somalia's significant security challenges necessitate the integration of comprehensive risk management frameworks. These frameworks should include security assessments and contingency planning to address security issues, particularly in infrastructure projects, thereby mitigating project vulnerability and preventing delays and cost overruns. Hussein et al. (2025) highlight that inadequate expertise and insufficient risk mitigation strategies exacerbate project vulnerability to budget overruns, underscoring the need for enhanced risk management practices and vocational training tailored to Somalia's unique context.
- Quality management solutions emphasise comprehensive project understanding and the integration of modern technologies like Building Information Modelling (BIM). Implementing BIM requires investment in software and training, but offers long-term benefits by improving collaboration and reducing rework (Ershadi, Jefferies, Davis, & Mojtahedi, 2021). Construction firms can begin with pilot projects to test the feasibility of BIM, gradually scaling their use as expertise grows (Sayidali Ahmed, 2022). Additionally, robust quality control measures, such as regular inspections and standardised checklists, should be enforced to maintain project standards (Mowlid, 2022). To enhance occupational health and safety in environments characterised by limited insurance coverage and a prevalence of untrained workers, construction firms must prioritise robust worker safety programs. This includes mandatory safety training and the provision of Personal Protective Equipment (PPE) to enhance site safety (Mowlid, 2022). In light of the limited availability of insurance as most construction companies operate without formal coverage. Firms should consider alternative risk mitigation approaches, such as leveraging community-based risk pooling schemes, wherein individual contractors contribute to a shared reserve fund designated for emergency situations such as worker injuries or equipment damage (Abdiiaziz, 2015). Finally, fostering a culture of safety is essential through regular audits and incentives for compliance, which can further mitigate risks that lead to costly accidents or delays.

From a human resource perspective, implementation efforts should include investments in local capacity building. Partnerships with academic institutions and the development of vocational training centres can equip emerging professionals with essential technical and managerial skills. Simultaneously, Knowledge transfer programs involving international experts mentoring local teams can accelerate the adoption of global best practices by fostering collaboration and enhancing regional competitiveness (Ratten, 2016). Such programs facilitate the sharing of expertise between universities and firms, promoting innovation and entrepreneurship (Ratten, 2016). These efforts will not only enhance current project delivery but also contribute to the long-term development of the sector in Somalia.

The successful implementation of solutions to address cost overruns in Somalia's construction industry demands a multi-dimensional approach. This approach should commence with industry professionals and extend to strategic partnerships with academic institutions, vocational training centres, and proactive government involvement. Effective coordination among these stakeholders, supported by continuous improvement practices and systematic documentation of lessons learned, can significantly enhance future project outcomes. Moreover, the government must play a critical role in mitigating cost overrun challenges by improving weak infrastructure

and addressing insecurity, both of which were identified in this study as key external contributing factors. These efforts are essential for creating a stable environment that promotes timely project delivery, budget adherence, and overall project quality.

#### 4.8 Conclusion

This research study has provided valuable insights into the causes, solutions, and impacts of cost overruns in construction projects in Somalia. The study has achieved its five key objectives through a comprehensive approach that combines a literature review and survey analysis. The research identified 48 distinct factors across nine categories contributing to Somalia's construction industry cost overruns. The top causes were related to external factors, such as unskilled labour and insecurity, as well as health and safety concerns, including a lack of insurance and inadequate worker training. This detailed understanding of the root causes is essential for implementing effective mitigation strategies. The study identified crucial solutions to address cost overruns, highlighting the importance of Time Management, Quality Management, and Cost Management as the top-ranked solution categories. The recommended solutions emphasise accurate planning, leveraging modern technologies, developing skilled labour, and implementing robust cost-control measures. These measures are essential for enhancing project efficiency and minimising budget overruns by reducing costly reworks and errors. The research also revealed the significant impacts of cost overruns, including financial burdens on clients, compromised project quality, reputational damage to contractors, and delayed project completion. These findings underscore the profound consequences of cost overruns and the urgent need for effective cost-management strategies. Furthermore, the study analysed the relationship between the causes and solutions, as well as the solutions and impacts of cost overruns. The moderate positive correlations observed suggest that addressing the identified causes is moderately linked to the effectiveness of the proposed solutions and that implementing the recommended solutions is strongly correlated with mitigating the impacts of cost overruns. Table 10 summarises the study's findings on the causes of cost overruns in construction projects, their solutions, and the resulting impacts.

**Table 11** Summary of results

Causes	Solutions	Impacts
Insecurity	Realistic project duration	Financial burden to the client
Lack of skilled labourers	Timely creation of plans to avoid delays in project execution	Reduced project quality
Lack of insurance	Employing a skilled workforce	Delay project completion
Poor project management	Leveraging BIM technology	Reputation damage to the contractor

#### 4.9 Limitations of the Study

This research has limitations that should be taken into account when interpreting the findings. Firstly, most of the data was contributed by contractors from Grade A companies, primarily operating in the capital and nearby southern states. This geographical concentration limits the scope of the research, as it does not include insights from contractors working in farther distant regions, such as Puntland in the northeast and Somaliland, a self-declared independent region in the north of Somalia. This geographical limitation may affect the generalizability of the findings nationwide. Secondly, the study focused solely on the main contractors' roles in causing cost overruns, excluding the influence of subcontractors. Furthermore, Somalia's unique socio-economic and political conditions, along with the specific challenges faced by its construction sector, such as security issues, political instability, the absence of insurance, and limited government regulation, render it incomparable to nearby countries in the region. Construction industries in different regions may experience cost overruns due to distinct factors, such as regulatory frameworks, the availability of skilled labour, or technological advancements. Therefore, caution should be exercised when generalising these findings beyond Somalia. Future studies could investigate the country's unique cost overrun factors in greater depth to provide a more comprehensive understanding of effective mitigation strategies.

#### 4.10 Recommendations

To enhance research findings and address the mentioned limitations, the following recommendations are proposed for future studies:

- Future research should aim to include contractors from a more diverse range of geographical locations within Somalia, including regions such as Puntland and Somaliland. This will provide a more comprehensive understanding of cost overrun factors across the nation.

- Future research should explore the roles of subcontractors and suppliers in causing cost overruns to provide a more comprehensive understanding of all factors affecting project costs.

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## Conflict of Interest

Rozlin Zainal declares that there is no conflict of interest regarding the publication of the paper.

## Author Contributions

The authors confirm contribution to the paper as follows: **study conception and design:** Abdi, A.A, Zainal, R.; **data collection:** Abdi, A.A; **analysis and interpretation of results:** Abdi, A.A, Zainal, R.; **draft manuscript preparation:** Abdi, A.A, Zainal, R. All authors reviewed the results and approved the final version of the manuscript

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