



INHIBITING FACTORS OF COST PERFORMANCE IN CONSTRUCTION PROJECTS - A CRITICAL REVIEW

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Citation:

M. M. Elserougy, L. M. Khodeir, F. Fathy, " Inhibiting Factors Of Cost Performance In Construction Projects - A Critical Review", Journal of Al-Azhar University Engineering Sector, vol. 19, pp. 1121 - 1146, 2024.

Received: 4 July 2024

Revised: 11 August 2024

Accepted: 20 August 2024

DOI: 10.21608/aej.2024.304403.1684

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ABSTRACT

Building projects worldwide face significant cost performance challenges due to cost overruns, with 30% underperforming on cost. Overruns were 80% of the global building projects, and this issue was a repetitive phenomenon. The study performed an investigation for the elements of poor construction cost performance due to exceeding budgeted costs. Comparative analysis was conducted at a global level, identifying common factors affecting project expenses. Also, The paper analyzed the driven elements contributing to this problem, focusing on understanding the causative elements. Following PRISMA guidelines. the study identified prevailed overruns factors affected project budgets and presented mitigation measures. Comprehensive guidelines were established to direct project costs management and control budget overruns. A protocol was developed to identify, evaluate, and manage key elements leading to overruns, helping to avoid overruns, stay on budget, and achieve economic benefits.

KEYWORDS: Projects, Cost, Underperformance, Factors, Overruns

العوامل المثبطة لأداء التكلفة في مشاريع البناء – مراجعة نقدية

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المخلص

تواجه مشاريع البناء في جميع أنحاء العالم تحديات كبيرة في أداء التكلفة بسبب تجاوز التكاليف، مع انخفاض أداء التكلفة بنسبة 30%. وكانت التجاوزات تمثل 80% من مشاريع البناء العالمية، وكانت هذه المشكلة ظاهرة متكررة. قامت الدراسة بدراسة عناصر ضعف أداء تكلفة البناء بسبب تجاوز التكاليف المدرجة في الميزانية. تم إجراء تحليل مقارنة على المستوى العالمي، لتحديد العوامل المشتركة التي تؤثر على نفقات المشروع. كما قامت الورقة بتحليل العناصر الدافعة المساهمة في هذه المشكلة، مع التركيز على فهم العناصر المسببة. اتباع إرشادات PRISMA. وحددت الدراسة عوامل التجاوزات السائدة التي أثرت على ميزانيات المشاريع وعرضت تدابير التخفيف. تم وضع مبادئ توجيهية شاملة لتوجيه إدارة تكاليف المشروع ومراقبة تجاوزات الميزانية. وقد تم تطوير بروتوكول لتحديد العناصر الأساسية وتقييمها وإدارتها التي تؤدي إلى التجاوزات، مما يساعد على تجنب التجاوزات والحفاظ على الميزانية وتحقيق فوائد اقتصادية.

الكلمات المفتاحية: المشاريع، التكلفة، ضعف الأداء، العوامل، التجاوزات.

1. INTRODUCTION

The construction activity a multifaceted and intricate sector that performs a crucial part in worldwide economic progress. It serves a significant function in enhancing the socioeconomic development of nations since it contributes to the national economy and generates greater employment opportunities [1-4]. The project becomes successful when it was completed within the assigned budget, adheres to the agreement with the contract duration, and yields the anticipated profit margin.

Observing construction projects not being completed within pre-determined constrained budget was a frequent occurrence, threatening the project's success and formatted a significant factor leading to failure. Cost overruns arise since the actual expenses exceed the budgeted expenditures, resulting in poor construction cost performance due to overruns of project costs.

Numerous studies clarified that a significant proportion, approximately 30%, of projects worldwide face inadequate cost performance and suffer from cost overruns [4]. Also, through a comprehensive analysis of international building projects, found that the probability of overruns occurrence in the construction activity was estimated to around up to 86% [5]. This issue occurred on all projects, and the elements and factors causing them vary greatly from project to project. The study's aimed to investigate the underperformance of project expenses in the worldwide construction industry and understand the fundamental attributes of overruns issues in various nations.

The paper conducted an extensive investigation to elucidate the phenomenon of poor construction cost performance that results from cost overrun, which arises from exceeding budgeted costs. It also performed a comparative analysis for the prevailed factors that impact projects costs in Egypt and other locations. This analysis was conducted by drawing on previous research that aimed to compare the similarity of these factors conducted in various countries. This included identifying the common prevalent factors on global level that impacted the expenses of building projects that contribute to the incidence of overruns. Also, Analyzed and interpreted the driving elements that contribute to this problem with a particular focus on comprehending the causative elements that affect the phenomenon of poor performance of construction costs.

1. METHODOLOGY

The study was undertaken by a comprehensive literature analysis, which involved analyzing research papers obtained from scientific electronic databases. The methodology adopted followed a systematic manner, as depicted in Fig.1. The study employed the PRISMA protocol standards to guarantee the inclusion of recommended reporting components for meta-analysis. The study in the domain of cost performance relies on Scopus and ResearchGate as the primary sources for obtaining the necessary information. The selection was according to their ability to offer extensive coverage of research papers across diverse academic disciplines. The reserch was carried out using consecutive approaches outlined in the accompanying flowchart (See Fig. 1) and further explained in the subsequent sections.

i) The search of the database encompassed subjects, abstracts and titles utilizing search phrases such as "construction industry", "Project budget", "Cost Overrun", "Cost Management", "Contributing Factors", "Causative factors", and "Cost Performance". A grand total of 97 published

publications were acquired, consisting of 37 articles procured from ScienceDirect and 60 articles procured from ResearchGate.

ii) The gathered articles were methodically identified and screened. Out of the 97 scientific database engine publications, 16 were excluded from the study. The research exclusively encompassed on publications published from 2010 to 2022, ensuring that there were no duplicate papers from the two platforms.

iii) The abstracts of the papers underwent an initial inspection, during which 9 out of the 81 examined papers were excluded through a screening process. The exclusion was determined by contrasts between the titles of the articles and their abstracts and also a lack of direct pertinence to the subject of the study.

iv) After establishing identification and screening processes on the obtained articles. selection process were applied, excluded publications that were available through open access. A total of 59 thorough research publications emerged from the investigation.

v) All relevant articles thoroughly examined used exclusion criteria, congruence between the article body and the study core, the divergence of article outcomes from the research objective, and the adequacy of literature and analysis in the article body. Due to the selection approach, the quantity of research articles was limited to 54.

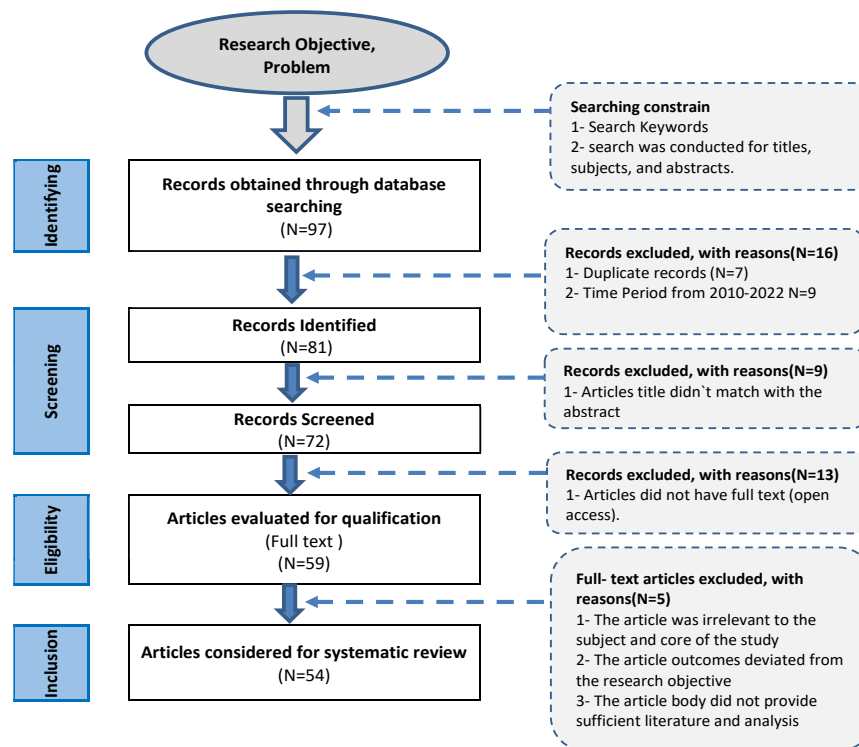


Fig. 1. Literature Review Diagram based on PRISMA

2. LITERATURE SURVEY & ANALYSIS

Cost performance issues had been among the biggest concerns faced by construction projects around the world, Which results from the problem of costs overrun that projects suffer from around the world. Observing construction projects not being completed within pre-determined budget constraints was a common occurrence.

Many scientific studies carried out to study the problem of overruns in projects. Prior research has mostly focused on identifying the factors that lead to project overruns, without thoroughly analyzing and interpreting the driving elements that contribute to this problem and studying the causative elements that affect the phenomenon of poor performance of construction costs. Poor performance of construction cost that attributed to costs overrun had been a very repetitive phenomenon, Costs that exceeded the budget threaten the success of the project and constitute a major cause of failure.

Cost overruns frequently occur on all projects, and the elements and factors causing them vary greatly from project to project. Consequently, numerous investigations were done, which ultimately resulted in many concepts and terminologies about the occurred overruns. According to Prior researchs, The problem of costs in projects arises when the project expenses overcome their original budget, which is referred to as a "cost overrun" [5, 6]. cost overrun defined as "The disparity between the actual and planned expenditure is known as cost overrun" [7-8]. According to many studies "Budget overrun" is often called "cost overrun," "cost variance," or "cost escalation" were all essentially the same thing [9-19]. Noting that these definitions have been embraced in this study.

This study covered these aspects based on identified the common overriding factors shared between various studies in the field of construction projects that affect the performance of project costs, Studied how to manage them effectively, which is what this paper attempts to cover.

3.1. Overrun Of Construction Projects Costs

The reviewed studies focused on four critical aspects within this subject, which are discussed below and summarized in Table 1. These aspects encompass the key characteristics of overrun issues in various countries and the understanding of overruns, the analysis of overrun factors and their corresponding measures for mitigation, the examination of the causative elements that hinder the cost performance of projects, and the exploration the approaches for achieving optimization regards project cost performance.

The first axial dimension reviewed the underperformance of costs issues in global projects resulting from cost overruns during the construction phase, Explored the concepts and definitions related to costs overrun. [7-9] expressed as the variation between projected and actual construction expenses, provides an overview of the final construction costs that were defined as accounted construction costs at the time of project completion. In a compatible direction, A studies by [11, 21, 28, 34] Highlight the main features that contribute to costs overruns. All reviewed studies found that cost overruns issues can vary across different countries due to variations in local contexts, economic conditions, regulatory frameworks, and organizational environment. However, despite some differences in viewpoints several main features commonly characterize construction cost overrun issues worldwide there were significant similarities in the findings from all countries.

Numerous research had investigated the second direction that explored and analyzed the factors that impact the cost performance of such projects. A collective of studies [4, 12, 13, 18, 27, 35, 37, 41, 46, 47, 49] went to explore and investigate the most important overruns factors in various study locations. They conducted an analysis and explained these factors, as well as the resulting impact on the project budget and the final resolution of the project. For Example, Tebeje &Aregaw (2015) Identify the five important overruns factores commonly shared by project stakeholders to achieve effective project success that were poor planning, material price fluctuation, labor low productivity, inflationary pressure, and project financing in descending order

[47]. Also, Alinatwe et al. (2013) concluded that schedule delays had a strong influence on project costs and were the deciding factor that caused overruns [49].

Another body of research [6, 39,40, 42-44] has gone to establish a risk map to evaluate the cost overrun factors identified in projects, It serves as a valuable tool to assess the effectiveness of overrun factors that impact construction projects. This promotes the prioritization of efforts to minimize or prevent damage. Through identified these crucial elements that contribute to overruns, proactive steps may be implemented to address and rectify these risks. For Example, Abusfiya & Suliman (2017) Issued a risk map for the examined factors of project overrun It consists of a grid with three zones or levels: low, medium and high risk. The developed risk map focuses on prioritizing elements that contribute to project overruns, resulting in a thorough comprehension of the risks connected with overruns and their potential consequences influence on projects. which offered to decision-makers to define unforeseen situations more reliably ahead of time and take corrective measures in projects [40]. While another group of research presented best practices for mitigation against the significant overrun factors that resulted from the study [5, 26, 30,31, 50,51, 53], these measures aim to enhance project cost performance and minimize the occurrence of cost overruns.

Limited studies went through a discussion for the third dimension that studied the causative fundamental elements that inhibit the performance of project costs[1,2, 17, 19, 23, 29, 32, 45]. That delves into the fundamental drivers for projects' cost performance, By comprehending these drivers and categories them, stakeholders can proactively address them to enhance the performance of project cost. A study accomplished by Elsaid & Ghareeb(2021) revealed that the vital elements for contractors to avoid overruns[23]. Also, Akrm et al.(2017) carried out a study that discussed the main attributes that contribute to projects overruns in Pakistan, it revealed that inadequate management, design changes, unrealistic time schedules, insufficient planning, and ineffective project controls were the causative elements that drove projects overruns, It concluded that by addressing these attributes, stakeholders had minimized the occurrence of cost overruns [32]. Furthermore, a study by Alzebdh et al. (2015) organized the root elements that cause project overruns in a hierarchical structure which demonstrates their interactions effectively, and proposed an approach for deciding on the project using ISM modeling [45].

Other researchers clustered the potential project overruns factors based on origination group [1, 36] which led to figuring out the pinpoint of the primary elements of building project overruns, By addressing these elements, stakeholders minimize the occurrence of overruns. Karnakran et al. (2018) carried out a study that examined the fundamental drivers that influence on the performance of projects costs , The study classified these drivers into seven distinct categories. The categories related variables were project, contract, client, contractor, consultant, labor, and external[1]. Furthermore, Drdyv et al. (2021) performed an investigation on residential construction and identified five categories of factors that contribute to costs overruns in this sector, These categories included macroeconomics, labor, project financing, management, and other external factors. The issues in these types of projects were shown to be caused by insufficient management of resources, including human, technical, and material resources [36].

Examined approaches to prevent overruns and achieve control over the performance of projects costs were the final axial dimensions for the optimization of project cost performance. Some studies established guidelines and protocols utilized in projects to control project performance based on a group of knowledge and lessons learned. The reviewed studies drew a guideline for construction stakeholders to achieve effective cost management in building projects

[3, 10, 14,15,16, 24,25, 48, 52]. Also, a body of studies formulated prevention strategies, that lead to avoiding the driven elements that cause overruns [16, 33]. Furthermore, certain research has proposed approaches to regulate the underperformance of project costs and methods to forecast and quantify cost overruns based on the determinants that were analyzed [20, 22, 38].

Table 1. Summary of analyzed research concerning cost overrun factors

Study Focus Area	Study Outcome	Author
Reviewed poor performance of cost performance issues in construction that resulted from cost overruns.	<ul style="list-style-type: none"> Examined the concepts of overruns in projects. 	[7,8,9, 11, 21, 28, 34, 54]
	<ul style="list-style-type: none"> highlighted the main features of overruns issues in different countries. 	
Investigated, evaluated, and analyzed the factors of overruns influence in the projects.	<ul style="list-style-type: none"> Analyzed and explained the common cost overruns factors. 	[4, 12,13, 18, 27, 35, 37, 41, 46,47, 49]
	<ul style="list-style-type: none"> Issued risk map to assess the effectiveness of the overruns factors that impact the project. 	[6, 39, 40, 42,43,44]
	<ul style="list-style-type: none"> Developed mitigation measures against the significant overrun factors. 	[5, 26, 30, 31, 50,51, 53]
Studied the causative elements that affect construction projects' cost performance	<ul style="list-style-type: none"> Analyzed the fundamental drivers that impact on the performance of project costs 	[2, 17, 19, 23, 29, 32, 45]
	<ul style="list-style-type: none"> Categorization and clustering of potential cost overruns factors according to their originating groups. 	[1, 36]
Determined the approach to prevent budget overruns and achieve control over project cost performance	<ul style="list-style-type: none"> Drawn a guideline to prohibit budget overruns and control the performance of project costs. 	[3, 10, 14, 15, 24, 25, 48, 52]
	<ul style="list-style-type: none"> Formulating prevention strategies, that lead to avoiding the elements that cause overruns. 	[16, 33]
	<ul style="list-style-type: none"> Proposed methods to anticipate and measure overruns. 	[20, 22, 38]

3. RESULTS

The study analyzed 97 research papers. fifty-four papers were extracted for study based on the evaluation and screening criteria, As illustrated in Fig. 2. Identified four research trends related to cost performance topic in projects. Eight studies analyzed project costs issues in the global construction sector, focusing on cost overruns. Twenty-four papers examined overrun factors and

its mitigation measures, nine paper studied causative factors hindering cost performance, and thirteen examined the approaches for achieving project cost performance optimization.

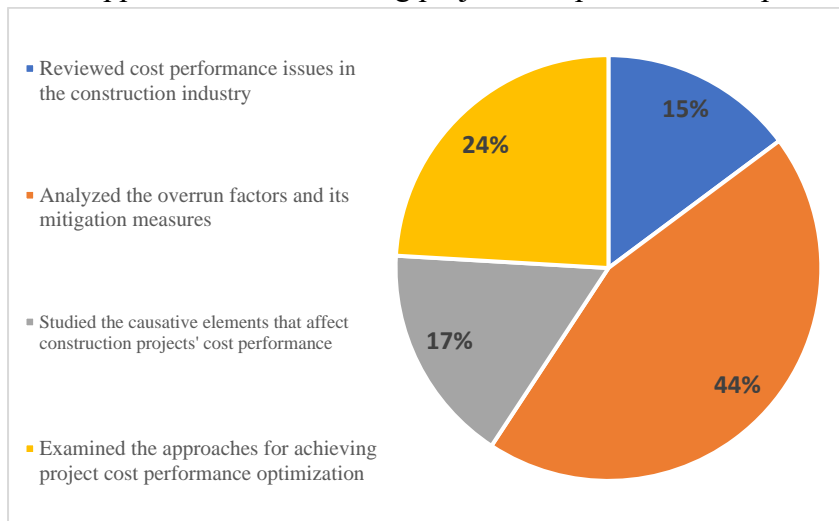


Fig. 2. Division Of Papers According To The Covered Themes

The complete literature review yielded results that were categorized into seven distinct areas related to the subject of the inhibiting elements of cost performance in building projects, As demonstrated in the graphic provided below Fig. 3.

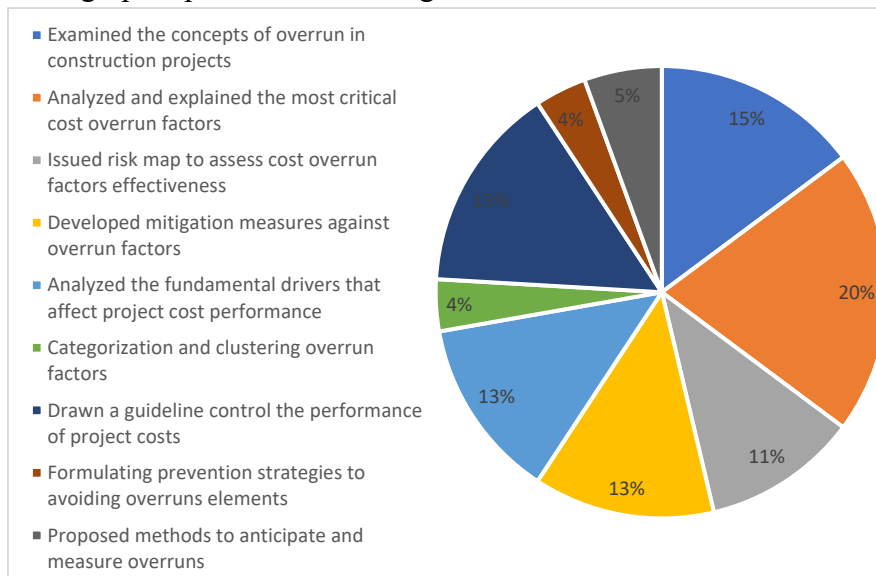


Fig. 3. Division Of Themes According To Study Outcome

The chosen papers were categorized according to their year of publication, as shown in the figure below (See Fig. 4), spanning from 2010 to 2022.

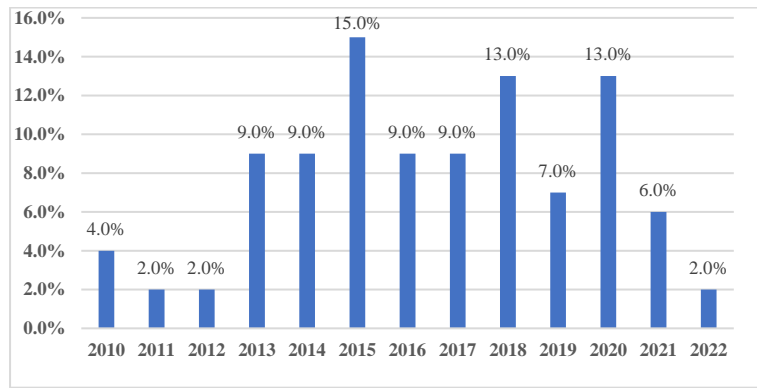


Fig. 4. Percentages of Analyzed Researches According to Publication year

The study has conducted a comprehensive examination of pertinent academic sources and has identified and expounded upon thirty-eight prevalent elements that contribute to building cost overruns worldwide. As provided in Table .2.

Table 2. Factors Affecting Project Budget Identified from Literature Review

No.	Overrun Factor	Reference	No.	Overrun Factor	Reference
1	Unforeseen field condition	[1-5], [8,9], [15-18], [26], [48]	20	Client interface during construction	[10, 12], [19- 25], [36], [38- 40]
2	Project Location	[33]	21	Delay in deciding	[1- 5], [10,11], [15-18], [26-32], [36], [39-41]
3	Weather condition	[27-32], [41]	22	Rework due to mistakes	[13], [27-29], [34,35, 41]
4	Chang in Government regulation & legislation	[14], [27-29], [45-49], [51-53]	23	Poor communication among project stakeholders	[1-5], [8,9], [15-18], [26-35], [38, 45,46]
5	Corruption	[30-32], [41], [47-53]	24	Shortage in Exported Material	[12], [19-25], [33, 41]
6	Regulatory Environment	[14], [41], [47,48], [51-53]	25	Increase in material prices	[1-5], [8-9], [12], [14-33], [36, 41], [43-47], [50]
7	Economic instability	[14], [34,35], [42-44], [53]	26	High cost of labor	[14, 36], [45-50], [53]
8	market Inflation	[12], [19-25], [27-32], [34,35], [42-53]	27	Shortage /Low productivity of labors	[1-5], [13], [15-18], [26, 36, 40,41, 47, 52]
9	Currency Fluctuation	[12], [19-25], [27-32], [34,35], [42,43], [46-52]	28	Shortage of equipment	[27-29], [42]
10	Insufficient scope definition	[33],[38]	29	Increased Equipment Costs	[27-29], [36, 41, 45,46]

No.	Overrun Factor	Reference	No.	Overrun Factor	Reference
11	Change / Modification in project scope	[1-4], [8-12], [15-26], [33], [36], [39], [45-46]	30	Non-performance of sub-contractor	[1-5], [10,11], [13-18], [26-29], [34-36], [38, 42, 48, 53]
12	Poor / Mistakes of Design	[1-4], [12,13], [15-32], [39-41], [47-52]	31	Inaccurate Estimation / Budget	[8-13], [19-25], [27-36], [38,39, 48, 50, 53]
13	Frequent Design changes	[10-12], [19-25], [36], [38-40], [45-53]	32	Bidding awarding policy based on selection of lowest Price	[12], [19-25], [27-29], [39]
14	Design changes during construction	[10-12], [14-26], [30-32], [34-40], [47], [49-50], [53]	33	Improper planning	[1-5], [8-11], [13-18], [26-32], [34-36], [39,40], [42-44], [47-53]
15	Complexity of construction works	[10,11], [36], [39], [47], [51-53]	34	Unrealistic Project Schedule (Acceleration)	[1-5], [12], [19-25], [30-32], [38,39, 41, 44,45], [47-53]
16	Poor technical Coordination	[8,9], [15-18], [26-35], [38], [45,46]	35	Inefficient schedule management	[13], [27-29], [33, 34, 35, 41, 45, 46]
17	Inappropriate Procurement Plan/ Method	[1-5], [10,11], [15-18], [26-29], [33], [36], [38], [44,45]	36	Inefficient monitoring & controlling project cost	[1-5], [10,11, 13,14], [30-32], [34-36], [38, 40, 42, 43, 44], [47-53]
18	Poor construction management & supervision	[13], [15-18], [26-32], [34,35], [39,40], [42], [45,46], [50]	37	Cash Flow & Financial difficulties	[1-5], [8,9, 12,13], [15-26], [30-32], [34,35, 43,44, 47]
19	Poor material management (Wastage)	[14], [27-32], [47], [49], [50-52]	38	Delayed Payment	[12, 14], [19-25], [30-32], [39-44], [48,49, 51-53]

Several studies in various countries had been undertaken to examine the elements that lead to overruns and impact projects costs performance worldwide. Nevertheless, it is vital to acknowledge that each country had its owned distinct set of factors that must be considered. The study conducted a comparative analysis for underperformance in construction costs caused by cost overrun issues in the study area and other countries. This analysis was based on examination the factors that contributing to project overruns, The analysis was carried out utilized data from prior research undertaken in various countries. The aim was to assess the similarities between these factors. These countries were categorized into three distinct geographical regions, as illustrated in the figure below (See Fig. 5), each region containing several countries that showed similar characteristics of overruns problems in projects in addition to Egypt. These regions encompassed,

Arab region research conducted in Saudi Arabia, the United Emirates, Qatar, Jordan, Bahrain, Yemen, and Oman [10,11, 37-46]. African region encompassed research undertaken in Zimbabwe, Ethiopia, Uganda, Ghana, Nigeria, Tanzania, and South Africa. The references are [14] and [47-54]. Moreover, the Asian region encompassed research carried out in Malaysia, India, Pakistan, Iran, Cambodia, and Taiwan [1-5, 13-18, 26-35]. A thorough investigation was ultimately carried out in the designated research location [12, 19-25].

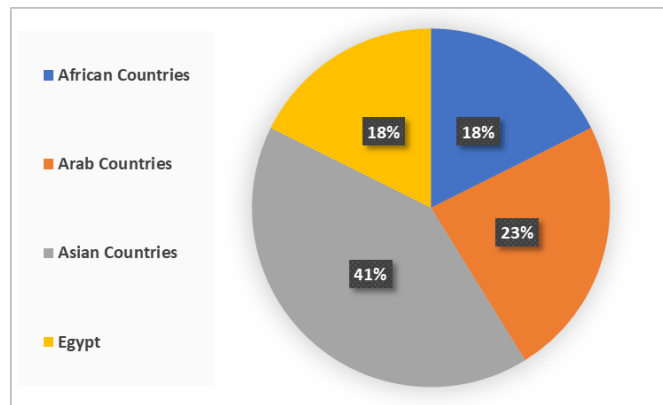


Fig. 5. Percentage Of Analyzed Papers According To Study Area

The following Table (See Table 3) presented an comparative analysis of the projects prevailing overruns factors in Egypt and other countries based on a literature review and previous research in different countries. The factors were arranged in descending order by citation frequency.

Table 3. Prevailing Overrun Factors Among Different Regions Worldwide

No.	Cost Overrun Factor	Egypt	Asian Countries	Arab Countries	African Countries
1	Corruption				√
2	Regulatory Environment				√
3	Economic instability				√
4	Inflation in the market	√	√		√
5	Currency Fluctuation	√	√		√
6	Poor / Mistakes of Design	√	√		√
7	Frequent Design changes	√	√	√	
8	Design changes during construction	√	√	√	
9	Inappropriate Procurement Plan/ Method		√	√	
10	Poor construction management & supervision		√	√	
11	Client interface during construction	√		√	
12	Delay in deciding		√	√	
13	Rework due to mistakes		√		
14	Increase in material prices	√	√		√
15	High cost of labor				√
16	Shortage /Low productivity of labors				√

No.	Cost Overrun Factor	Egypt	Asian Countries	Arab Countries	African Countries
17	Non-performance of sub-contractor		√		√
18	Inaccurate Estimation / Budget	√		√	√
19	Bidding awarding policy	√			
20	Improper planning	√	√	√	√
21	Unrealistic Project Schedule (Acceleration)	√		√	
22	Inefficient monitoring & controlling project cost	√		√	√
23	Cash Flow & Financial difficulties	√	√		√
24	Delayed Payment	√			

The following table (See Table 4) presents the findings of these studies, which focused on the of projects percentages that went over budget in each country, as well as the projects percentages that went over budget in comparison to the expected budget that was stated for the research region.

Table 4. Summary Of Project Cost Overrun By Study Area

No	Study area	Average overrun	Projects Overrun	Reference
1	Malaysia	55%	20%	[1-3], [5], [15-18], [26]
2	Ghana	90%	34%	[14, 54]
3	India	54%	15%	[27-29]
4	Pakistan	60%	10%	[4], [30-32]
5	Qatar	54%	15%	[38]
6	UAE	89%	12%	[10-11], [37]
7	Ethiopia	75%	28%	[47]
8	Iran	25%	15%	[34-35]
9	Bahrain	86%	10%	[40]
10	Oman	80%	10%	[45-46]
11	Palestine (West Bank)	100%	15%	[43-44]
12	Yamen	40%	33%	[42]
13	Nigeria	55%	13%	[51-52]

The above table provides information on various countries, Projects Overrun (%) indicates the percentages of project overruns for each study area, It represents the extent of which the actual projects costs exceeded the initially estimated values. Average Overrun represents the average percentage of project overruns for each study area, It provides an average measure of how much projects in a particular study area tend to deviate from their initial estimates, As illustrated in the below figure (See Fig. 6).

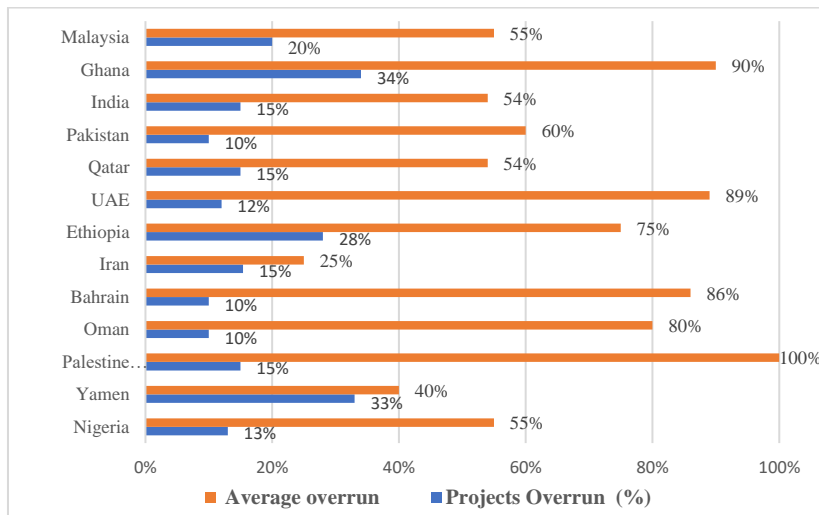


Fig. 6. Infographic Displayed The Percentage Of Project Costs Overrun By Study Area

The figure below (See Fig. 7) shows the citation frequency for the common overrun factors that were identified from the previous studies.

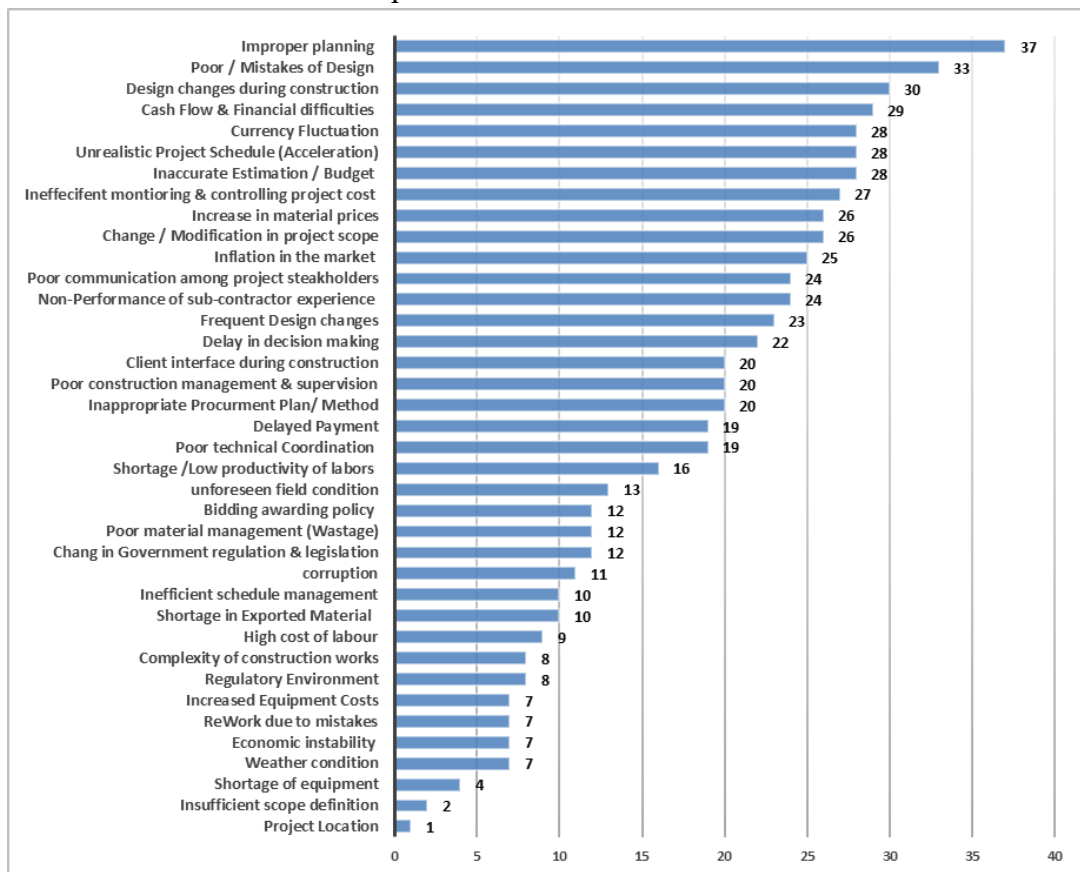


Fig. 7. Citation Frequency for budget overrun factors

As illustrated in the above figure the prevalent top factors of costs overruns in projects were Change/modification in project scope, Material prices increase, Inefficient monitoring & controlling project cost, Inaccurate estimation/budget, Unrealistic project schedule (acceleration), Currency fluctuation, Cash flow & financial difficulties, change in Design during construction, Poor / Mistakes of design, Improper planning organized sequentially from lowest to highest. Also,

the study provided a full outline for each of the 10 prevalent characteristics, in addition to an overview of how these factors impact project costs as illustrated below (See table 5)

Table 5. The Top Prevalent Cost Overrun Factors Identified From Previous Studies

#	Factor	Description
1	Improper planning	It is a crucial element that significantly contributes to projects overruns. It was raised due to insufficient initial evaluation, absence of comprehensive project scope, incorrect allocation of resources, and failure to detect possible risks.
2	Poor/Mistakes of Design	Incomplete design documentation, incorrect drawings, and inadequate design professional coordination cause construction problems and rework. These design difficulties always caused delays, material and labor cost increases, and project quality issues.
3	Changes in design During execution	It raised due to requests from clients, site unforeseen conditions, or errors in the initial design. The applied of the changes requires additional time, resources, and materials, leading to increased expenses and disrupting the progress of the workflow.
4	Cash Flow & Financial Difficulties	: The financial difficulties that result from Delays in payments, inadequate funding, or financial instability lead to a slowdown in project progress. Cash flow problems impact significantly the smooth execution of projects.
5	Currency Fluctuation	The exchange rates of the currency rates affects the cost of supplies that were imported and equipment, thereby resulting in excessive spending. Also, it created an uncertainty to accurately of estimate and challenges in managing project expenses.
6	Unrealistic Schedule (Acceleration)	Compressing the timeline without considering the resources needed to finish the project swiftly leads to the urge to finish quickly. These tight deadlines sap project resources, lower quality, cause errors, rework, and raise expenses.
7	Inaccurate Estimation/Budget	Limited information, competence, or project needs analysis might lead to inaccurate projections. Construction budget losses stemmed from ignoring expenses and eventualities.
8	Inefficient Monitoring & Controlling Project Cost	Budget irregularities were hard to spot and fix without accurate spending tracking and analysis. Inadequate control mechanisms and a lack of transparency in cost which led to overspending.
9	Material Price Increase	When the cost of essential goods used in the project rise unexpectedly, led to challenges in procuring necessary materials within the allocated cost, What produces overruns in overall project expenses.

#	Factor	Description
10	Change/Modification in Scope of Project	These changes need plan adjustments, additional personnel, and possibly delays and higher costs. Changes often result from client requests or unforeseen events.

Theoretical data used to classify the 38 overrun causes from prior investigations, As shown in below Figure(See fig. 8). Six groupings of factors were distributed per project phase. Site, market situation, project formulation, construction, resource, and management groups were included. The groups were classified into 15 categories with several criteria that were similar in nature and project phase.

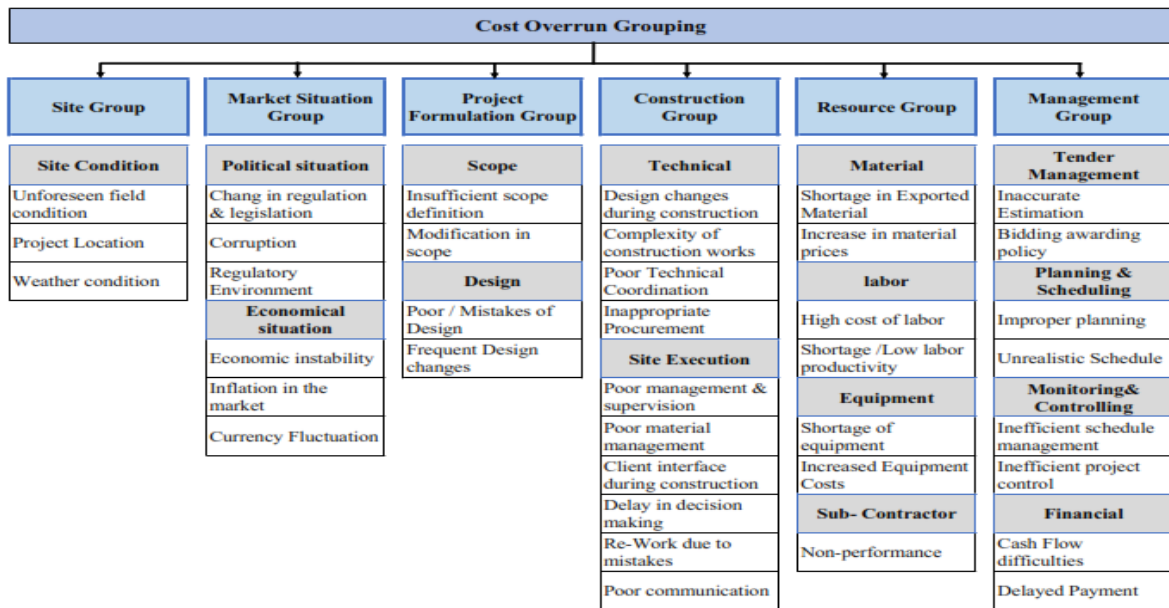


Fig. 8. Classification of factors affecting project cost performance

The dominant groups and categories of characteristics that impact project cost performance were identified by analyzing the frequency of citations in academic sources worldwide, as depicted in Fig. 9. The citation frequency percentage for the key factor categories that impact project costs were presented.

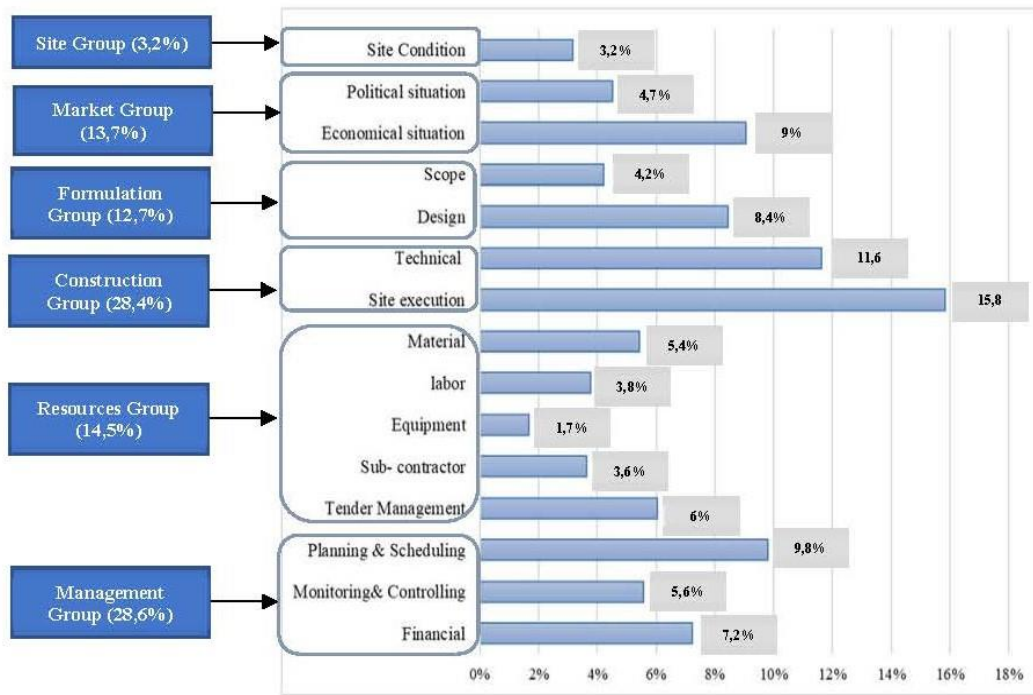


Fig. 9. Categorized of factors groups that affect project costs from Previous Studies

The figure above indicates that group of management factors was the most overriding in projects. This group focuses on project management aspects, starting from bid management and award stage, planning stage, performance monitoring, and financial management. Following closely behind was the construction factors group, which encompasses the technical and executive elements that contribute to overruns of cost in projects. In third place was the resources group which indicates to the various elements, including materials, equipment, labor, and finances, required to successfully plan, execute, and complete the project. These resources are essential for execution and carry out projects efficiently and effectively. The project formulation group comes in fourth ranked which refers to developing a comprehensive design prior to execution. that establishes the project's goals and criteria, as well as the specific deadlines and strategies to be followed. In the penultimate position in the group of factors affecting project costs, it comes the market situation group in the country where the project is located from the economic and political standpoints. Lastly, the site condition group contained the topographical and climatic elements of the site.

4. DISCUSSION

Overruns were a widespread problem in different types of projects, as evidenced by multiple studies conducted by researchers from many countries in different regions. These studies regularly reveal that a large percentage of projects face violations. The paper developed mitigation measures against prevalent overruns factors identified from previous studies as mentioned previously (See Table 3), Mitigation measures were actions taken to address and minimize the occurrence of significant factors that affect project costs. It serves as a scientific approach to reduce the likelihood or severity of these burdens. In essence, they represent systematic actions undertaken to identified and countered potential threats to project budgets. The conceptual foundation of mitigation measures lies in the implemented procedures to avoid the effect of overrun factors. The below table

(See Table 6) illustrated the measures of mitigation against prevalent overrun factors that identified from previous studies.

Table 6. Proposed Mitigation Measures For Prevalent Overrun Factors

No	Overrun Factor	Mitigation Measure
1	Improper Planning	<ul style="list-style-type: none"> ● Develop an in-depth project feasibility analysis and management plan. Identify precise project objectives, Establish a feasible schedule and budget, Evaluate risks, and allocate resources. This clear strategy helps the team to grasp goals, requirements, and restrictions.
2	Poor/Mistakes of Design	<ul style="list-style-type: none"> ● Establish a comprehensive design review cycle with all project stakeholders, it saves construction delays and rework by finding and fixing design faults early. ● Enhance communication and collaboration to minimize errors. By fostering cooperation and communication, the design team shall address problems, increase coordination, and ensure correctness and feasibility.
3	Design Changes During Construction	<ul style="list-style-type: none"> ● Develop a structured change management procedure for evaluating and recording design alterations. Design modifications are thoroughly examined and assessed for project impact using a systematic change management procedure. ● Set criteria for evaluating their influence on project timeline, cost, and resources to make informed decisions.
4	Financial Difficulties	<ul style="list-style-type: none"> ● Establish precise payment terms and milestones in contracts to reduce cash flow difficulties since participants understand their financial obligations. ● Consistently evaluate cash flow and strategize financial planning in order to identifies issues early and allow proactive responses. ● Keep communication channels open with project owners and stakeholders on payment schedules “Transparent communication speeds financial resolution.”. ● Investigate alternate finance options or project financing.
5	Currency Fluctuation	<ul style="list-style-type: none"> ● Mitigate currency swings by employing appropriate contract formulas. ● Addressing currency fluctuation risks in contracts helps parties control exchange rates. ● Utilize hedging techniques or financial tools to reduce the impact of currency fluctuations. ● Monitor exchange rates to promptly adjust project budgets and prevent currency swings.
6		<ul style="list-style-type: none"> ● Assess the project timetable realistically considering available resources, site circumstances, and any risks.

No	Overrun Factor	Mitigation Measure
	Unrealistic Project Schedule (Acceleration)	<ul style="list-style-type: none"> ● Engage the project team in the scheduling process to use their skills and ideas, making timetables more feasible. ● Utilize software to track progress and predict timetable deviations.
7	Inaccurate Estimation/Budget	<ul style="list-style-type: none"> ● Conduct a comprehensive cost estimation analysis, taking into account project requirements and contingencies to avoid budget gaps and unforeseen issues. ● Employ skilled estimators or consultants to ensure precision. ● Maintain project budget by consistently incorporating current data.
8	Inefficient Monitoring & Controlling Project Cost	<ul style="list-style-type: none"> ● Implement efficient project monitoring and reporting systems to catch cost abnormalities early for speedy adjustment. ● Utilize tools or techniques to oversee project costs. ● Conduct routine cost assessments and analysis to identify budget discrepancies.
9	Increase in Prices of Material	<ul style="list-style-type: none"> ● Perform market research to anticipate fluctuations in material prices. ● Include price escalation Formula for material price increases. ● Explore other suppliers or materials to reduce the effect of price hikes. ● Keep open channels for communication with suppliers to stay informed about changes in material prices and alter procurement strategies.
10	Change/Modification in Project Scope	<ul style="list-style-type: none"> ● Utilize a comprehensive strategy to assess and record scope modifications. ● Create precise procedures for requesting and evaluating the changes. ● Assess the effects of changes on project Time, Cost, and resources before execution. ● Transfer changes promptly to stakeholders to avoid confusion.

The paper revealed that construction cost overrun issues vary across different countries due to variations that inherent to each specific context. These variations include local contexts, economic situations, regulatory frameworks, and organizational environment. As discussed comprehensively in the below table (See Table 7) for more elaboration.

Table 7. The Elements Of Variations Inherent Between Different Countries For Overruns Issues

#	Element	Description	Impact
1	Local Contexts	The specific conditions and qualities of a country or region affect construction	● It is crucial in determining construction cost overruns and strongly affects project costs. Regions with limited building material

#	Element	Description	Impact
		projects. Geography, climate, resources, and infrastructure are examples.	access may have greater transportation costs, hurting project budgets.
2	Economic situation	It refers to market indices including inflation, exchange rates, GDP, and market stability. These characteristics interact, making construction projects complicated.	<ul style="list-style-type: none"> ● In countries with significant inflation, labor, material, and equipment costs may rise rapidly, leading to cost overruns. ● Exchange rate fluctuations can effect project budgets by affecting the cost of imported supplies. ● Economic recessions or market instability can increase uncertainty and risk, resulting in cost overruns from supply and demand variations.
3	Regulatory Frameworks	Each country has its own construction norms and requirements. Building codes, permits, environmental norms, and safety are examples.	<ul style="list-style-type: none"> ● Construction projects incur significant expenditures due to compliance with certain requirements. Complex or uneven regulatory systems might delay licenses or permits, increasing costs and risking overruns.
4	Organizational Environment	It refers to market culture, practices and norms related to communication and coordination, and decision-making processes that impact time and cost of projects	<ul style="list-style-type: none"> ● Delays and higher expenses may result from extensive discussions or negotiations with stakeholders before making crucial choices. ● Organizational differences in work methods, communication styles, and problem-solving can impact project coordination and potentially impacting cost management.

In summary, construction cost overrun issues vary across different countries due to a combination of elements. Local contexts, economic situations, regulatory frameworks, and organizational environment all contribute to these variations. Recognizing and understanding these factors is essential for effectively managing construction projects and ensuring their successful completion within budgetary constrain. By accounting for these variations, stakeholders made decisions, accurately estimate costs, and implement appropriate strategies to mitigate the risk of cost overruns. Ultimately, a comprehensive understanding was essential for ensuring the successful and cost-effective delivery of construction projects worldwide.

Identified and understood the driven elements of cost overruns in projects is a critical concept in the field of construction management. The concept of driven elements for overruns in projects refers to the influential forces or factors that play a significant role in causing project costs to increase beyond the initially estimated budget. The study found that there were several key common features in construction cost overrun issues worldwide, Which represent the causative elements that drive poor performance in construction projects.

It is important to note that while these features contribute to cost overruns, they were not exclusive to any particular country. These common features were summarized and explained as illustrated in the below table (See table 8). However, by understanding the common features associated with these overruns, stakeholders can take proactive measures to mitigate their impact. Proper management, risk assessment, and effective communication between stakeholders can help mitigate cost overruns regardless of the country.

Table 8. Main Features In Construction Cost Overrun Issues Worldwide

#	Feature	Discription
1	Inaccurate Cost Estimation	Cost overruns in construction are caused by poor cost estimation. Construction budget shortfalls can result from unrealistically low initial cost projections, incomplete material and labor cost forecasts, and failing to account for inflation or market variations. Employing skilled cost estimators, using historical data, and conducting frequent cost reviews helps improve cost estimation and reduce overruns.
2	Scope Changes and Design Modifications	Scope, design, specifications, and customer needs might change. Project costs are affected by poorly managed scope changes without budget and schedule modifications.
3	Inadequate Risk Management	Projects were susceptible to various risks, including design changes, budgetary constraints, supply chain disruptions, and unforeseen events. Failure to identify and address potential risks adequately resulted in cost overruns. It stemmed from inadequate risk identification and mitigation.
4	Poor Scheduling and Planning	They were crucial project management actions when inefficiency had raised expenses. Cost overruns may resulted from rushed construction, overtime, and missed deadlines.
5	Inadequate Project Controls and Monitoring	Poor project controls and monitoring impair cost management. Without comprehensive project controls like cost monitoring, financial reporting, and cost forecasting, cost concerns are hard to spot and fix.

The above table revealed that inadequate project planning and insufficient feasibility studies had emerged as significant contributors to cost overruns. Insufficient understanding of project requirements, inaccurate estimates, and incomplete risk assessments resulted in unexpected expenses during construction. Thorough planning, including comprehensive feasibility studies, detailed cost estimation, and thorough risk analysis. While the specific features of overruns issues in construction cost similar across countries, addressing these common challenges can successfully reduce cost overruns and enhance cost performance.

The paper established a comprehensive guidelines that outline clear procedures for cost management. These guidelines encompass accurate methods of estimation, robust project planning techniques, and proactive risk management strategies. By adhering to the proposed prescribed guidelines (See Table 9), project stakeholders can minimize the occurrence of budget overruns and maintain control over project costs.

Table 9. Guidelines For Projects Cost Management

Nr.	GuideLine	Description
1	Accurate cost estimating	<ul style="list-style-type: none"> ● Ensured that their cost estimates were as accurate by using historical data. ● Consulting with subject matter experts, and accounting for all necessary costs, including unforeseen contingencies.
2	Effective change management	<ul style="list-style-type: none"> ● Issued a clear change management process in place that includes a system for documented changes. ● Assessed their impact on the project budget, and obtained approval from the appropriate stakeholders before making any changes.
3	Robust risk management:	<ul style="list-style-type: none"> ● Identify potential risks to the project budget and developed a risk management plan that includes strategies for mitigating or avoiding these risks.
4	Efficient resource management:	<ul style="list-style-type: none"> ● Scheduled labor and equipment usage efficiently to avoid unnecessary overtime costs and equipment rental costs. ● Ensured that the project team is adequately trained and had the necessary skills to complete the project on time and within budget.
5	Effective communication and coordination	<ul style="list-style-type: none"> ● Maintained open and effective communication with the project team and stakeholders to ensure that everyone was aware of project changes or issues that may impact the budget. ● Established clear lines of communication and decision-making processes.
6	Continuous monitoring and control	<ul style="list-style-type: none"> ● Monitored the project's progress and compared it to the budget to identify any deviations and take corrective action promptly. ● Used various cost control techniques such as value engineering, cost monitoring, and change management to manage the project's costs effectively.

The paper developed a protocol against the driven elements of poor performance of project costs, this procedure was proposed to address this critical issue. It included a methodical approach to identified, evaluated and addressed the key elements that lead to cost overruns. The formulation of prevention strategies were actions taken to addressed and reduced the occurrence of causative elements that lead to abuses. By implementing the prescribed protocol, projects successfully control budgeting overrun factors and ensure that their construction projects remain within budget and deliver the expected economic value.

1- Factors Identification: Conduct a comprehensive analysis of previous projects and industry data to identify the key elements that have historically caused cost overruns.

2- Issuance of risk matrix: It serves as a framework to evaluate the effectiveness of cost overrun factors that impact construction projects. It visualizes the risk of overrun factors, their

interdependencies, and their severity. Assessing each factor's likelihood and influence helps discover opportunities for improvement. Regularly updating the risk register throughout the project's lifecycle ensures that emerging risks were promptly identified and addressed.

3- Factors Prioritization: Once the significant factors contributing to cost overruns have been identified, prioritize them based on their potential impact on project costs.

4- Develop action plans: For each prioritized factor, develop specific action plans that outline the steps to be taken to mitigate the risk and minimize its impact on project costs. These action plans should be tailored to address the unique characteristics and challenges of the project.

5- Implement preventive measures: Execute the action plans by implementing preventive measures to address the identified cost overrun factors. This may involve refining project planning processes, improving cost estimation techniques, implementing effective change management procedures, and enhancing project controls.

6-Monitor and evaluate: Continuously monitor the effectiveness of the implemented mitigation measures and evaluate their impact on cost overruns.

By utilizing this procedure, project stakeholders Obtain perspectives into the risks, prioritize risk mitigation efforts, and make informed decisions to ensure the project's financial success.

CONCLUSION

A complex and multi-dimensional industry, building plays an essential role in the global economy's upward trajectory. It serves a significant function in enhancing the socioeconomic development of nations and generates greater employment opportunities. The project becomes successful when it was completed within the assigned budget, adheres to the agreement with the contract duration, and yields the anticipated profit margin. Cost performance issues had been among the biggest concerns faced by construction projects around the world, Which results from the problem of costs overrun that most projects suffer worldwide. Poor performance of costs that attributed to overruns had been a repetitive phenomenon. Costs that exceed the budget Pose a significant risk to the project's success and constitute a primary factor leading to the failure of projects.

A large studies clarified that a significant proportion, approximately 30%, of projects worldwide face costs poor performance and suffer from cost overruns. Also, through a comprehensive analysis of international building projects, found that the occurrence probability of overruns in the construction activity was estimated to around up to 86%. This issue occurred on all projects, and the elements and factors causing them vary greatly from project to project. Many scientific studies carried out to study the problem of overruns in projects, Prior research had mostly focused on identifying those factors that resulted in a project overruns, without thoroughly analyzing and interpreting the driving elements that contribute to this problem and studying the causative elements that affect poor performance phenomenon of construction costs.

The study conducted a comparative analysis for underperformance in construction costs caused by cost overrun issues in the study area and other countries. This analysis was based on examination the elements that contributing to project overruns, The analysis was carried out utilized data from prior research undertaken in various countries. The aim was to assess the similarities between these factors. These countries were categorized into three distinct geographical regions, each region containing several countries that showed similar characteristics of overruns problems in projects in addition to the paper study area. These regions encompassed countries from Arab region, African region, Asian region and Egypt.

The paper identified and elaborated thirty eight common factors globally that contribute to building cost overruns worldwide. The common prevalent top factors arranged in ascending order were change/modification in scope, increase material prices, inefficient monitoring controlling, inaccurate estimation/budget, Unrealistic schedule (acceleration), currency fluctuation, cash flow, financial difficulties, changes in design during construction, poor / mistakes of Design, improper planning. The paper suggested mitigation measures against the prevalent overruns factors, Mitigation strategies were based on overrun prevention processes. They were systematic efforts to detect and mitigate project financial risks. The global common overruns factors identified in earlier scholarly research had been categorized into six main groups based on their originated source, these included Site, market situation, project formulation, construction, resource, and management groups. These groups were divided into multiple categories with a total of 15 categories, with each category encompassing many factors that exhibit similarities in terms of the inherent characteristics of a factor and the project stage it affects. The prevalent overrun drivers that affect project costs were management problems, according to data analysis. The building factors group followed closely. The resources group placed third. The project formulation group ranks fourth. Market environment ranks last in project cost variables. Finally, the site condition group covers topography and climate.

The study found that construction overruns issues vary across different countries due to variations that inherent to each specific context. These variations include local contexts, economic situations, regulatory frameworks, and organizational environment and were discussed comprehensively in the paper. Recognizing and understanding these factors is essential for ensured the successful completion of projects within budgetary constrains. Also, The study defined the concept of driven elements of projects overruns, which refers to the influential forces or the causative elements that drive poor performance in projects. These elements represented shared features in overruns issues worldwide. These features were Inaccurate Estimation, Scope Changes and Design Modifications, Inadequate Risk Management, Poor Scheduling and Planning, Inadequate Project Controls and Monitoring. It is important to note that while these features contribute to costs overruns, they are not exclusive to any particular country.

A guidelines were established to direct projects costs. These guidelines encompass accurate methods of cost estimation, robust project planning techniques, and proactive risk management strategies. By following these guidelines, project stakeholders achieved the minimization of budget overruns occurrence and maintained control over project costs. Furthermore. Also, The paper developed a protocol against the driven elements of poor performance of project costs, this procedure was proposed to identified, evaluated and addressed the key elements that lead to costs overruns. By implementing these protocol, projects successfully control overruns factors and ensure that their projects remain within budget and deliver the expected economic value.

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