

AVOIDING UNEXPECTED COSTS IN PUBLIC PROJECTS

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Abstract: *In a constantly changing environment, projects face many challenges. In most public projects, unforeseen events occur that increase costs beyond initial estimates. If some of the estimates are exceeded, the estimates are too high and the estimation method must be revised. Although it is often impossible to predict which activities will cost more than expected, it is safe to assume that some activities will cost more. Assessing the likelihood of such an event occurring is part of the project management task of event occurrence risk analysis. Avoiding unexpected costs in public projects depends on the skills of the project manager. Rather than overestimating all cost, funds are budgeted to cover unplanned but statistically predictable cost increases. Funds allocated for this purpose are called contingency reserves. If this funding is sufficient to cover unplanned expenses, the project will be completed on budget. Considering these facts and focusing on the investment project model, this document aims to avoid unforeseen and the purpose is to explore cost alternatives.*

Key words: *project management, budget, productivity, costs control, estimators.*

JEL Classification: *H400*

1. INTRODUCTION

Avoiding cost overruns of investments in public projects

The main objective of this paper is to identify the primary reasons for cost overruns in challenging investment projects, especially construction and infrastructure investments in Romania, as well as critical success factors that help prevent these costs from being incurred. For this, the existing literature is reviewed, various factors contributing to overcrowding are identified, and a questionnaire is designed. The data was collected using a structured questionnaire between client beneficiary contracting authorities, consultants and contractors in the South-East Region. The statistical method (Method of relative importance) was used for data analysis. After conducting a detailed study of the existing literature and engaging in discussions with industry experts, we have identified 43 common factors that are frequently responsible for causing cost overruns in various projects. We hope that this paper will serve as a valuable resource for project managers and all involved parties and that it will provide actionable insights to help reduce project cost overruns.

The construction industry seems to be struggling with poor cost management, which is leading to significant cost overruns. This problem is prevalent in both developed and developing countries, and it's crucial to address it to improve construction cost performance

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since projects are hardly ever completed within the budget. Flyvbjerg et al.'s study, which explored the issue of cost performance in construction projects worldwide, discovered that cost escalation is a widespread practice, with nearly nine out of ten projects experiencing it, with costs being 28% higher than forecasted. According to the study, average cost growth in Europe was 25.7%, North America 23.6%, and other geographies were 64.6%. The study also found that cost performance in construction projects hasn't improved over time and is in the same order of magnitude today as it was in the 70s. Additionally, The World Bank reported that 63% of the 1778 construction projects financed experienced poor performance, with an average of 40% over budget, as cited by Ameh (2010) and Zujo (2010).

Public projects play a crucial role in the economic development of any country, particularly in developing nations. However, the construction industry in these countries faces various issues that affect the project's time, cost, and quality performance. Successfully completing construction projects within the predetermined budget has become a challenging task. It's rare for a project to be completed within the estimated time, budget, and desired quality. [Stoian, 1993]

Effective cost management is vital for the successful completion of a project. Unfortunately, it's often tough to achieve good cost management, and the project ends up facing significant cost overruns. Efficient cost planning involves linking building designs to their cost so that the project's cost is planned in a way that considers quality, changes, risks, utility, and appearance, ensuring that it stays within the economic limits of expenditure (Stoian, 1993).

Cost overrun constitutes the variance between the originally agreed contract amount and the actual cost incurred. It is quantified by computing the difference between the two figures and dividing it by the original contract value, converting the outcome to a percentage. The resulting percentage value is a useful tool for assessing and comparing cost overruns across diverse projects. The formulaic expression of cost overrun is as follows:

$$\text{Cost overrun} = \frac{\text{Final Contract Amount} - \text{Original Contract Amount}}{\text{Original Contract Amount}}$$

The initial value of the contract

The cost refers to the estimated expenses that a financier agrees to incur in order to create or acquire a fixed asset. Cost overrun, on the other hand, is the difference between the actual final cost of a completed construction project and the initial contract value agreed upon by the contractor and financier during contract signing. Such overruns may take the form of cost escalation, going over budget or other types of cost overruns (Lock, 1999).

To investigate the reasons for cost overruns in public investment projects, a questionnaire was designed and distributed to public project managers in the South-Eastern Region of Romania. A statistical method was used to analyze the opinions of public project managers on the factors that contribute to cost overruns in public investment projects. The questionnaire survey involved the use of an ordinal measurement scale to collect data, and the ranking of each factor was determined based on its relative importance score.

The financier agrees to spend a certain amount of money to create or obtain a desired fixed asset, which is referred to as cost. The discrepancy between the actual final cost of a completed construction project and the initial contract value agreed upon by the contractor and financier at the contract signing is referred to as cost overrun. Cost overruns can manifest in the form of cost escalation, going over budget, or cost overruns. To investigate the causes of cost overruns in public investment projects, a survey was conducted. Public project managers from the South-Eastern Region of Romania were questioned for feedback. The statistical method was used to understand public project managers' perceptions of the factors that contribute to cost overruns in public investment projects. An ordinal measurement scale is used

to quantify data in the questionnaire survey. The questionnaire survey was conducted using a structured questionnaire. The factor's ranking is determined based on the index's relative importance value.

2. LITERATURE REVIEW

A key element to a successful project is sticking to your budget. Furthermore, cost performance is the most important measure of a company's productivity and profitability. Project cost overrun is measured as the difference between the planned cost (estimate) and the actual construction cost at completion. Investors from the Southeast region and beyond are generally unable to complete projects within the originally estimated costs.

Many studies have been conducted to investigate the issues and factors that lead to project cost overruns.

Numerous studies have been conducted on this phenomenon around the world, and a study by Flyvbjerg et al found that 9 out of 10 construction projects experienced cost overruns, with an average budget overrun rate of 28%. They investigated 258 construction projects in 20 countries with very poor cost performance. Another study by Cantarelli et al. showed that cost overruns are a common problem in construction projects. The study looked at 87 projects and found that an average of 10.3% of projects had cost overruns.

In Malaysia, 359 projects (308 public and 51 private) were evaluated. As a result, only 46.8% of public projects and 37.2% of private projects were completed as contracted (Lock, 1999).

If we were to go into detail and examine capital budgeting and decision making for large industrial projects and how unexpected costs are generated and managed, we would find that every decision making incident in this industry leads to unexpected costs. The results show that the capital budgeting process has to manage conflicting interests, which lead to trade-offs, as well as the characteristics of decision processes (sequentiality), which can generate unexpected costs.

Another approach to the life-cycle costs (LCC) of a large-scale environmental impact project can be had after a conceptual discussion of environmental decision-making. The impact on these environmental costs can be so great that the investment project can be prefigured as a premature failure.

Ten LCC-oriented environmental accounting tools were identified and proposed to aid in environmental decision-making. However, adoption in the construction industry appears to be limited and requires conceptual discussion. The purpose of this article is to discuss the theoretical premises and practical usefulness of his LCC approach in green investment decisions. While the expansion of LCC monetary units and scope may favor the use of LCCs, LCCs fail to address irreversible decisions, ignore unowned goods, and do not consider costs to future generations. Furthermore, LCC does not take into account the limited ability of decision makers to make rational decisions under uncertainty. The practicality of LCCs is limited by oversimplification into monetary units, lack of reliable data, complexity of the design process, and conceptual confusion.

Whether a project is delivered to a private or public beneficiary, reliable cost estimates are needed. Without estimates, it would be impossible to perform financial assessments, create business plans, create detailed budgets, control expenses, determine staffing needs, or perform many other management procedures.

It is generally agreed in the accounting community that the word 'cost' should not be used alone without a qualifying adjective. Costing terms that frequently appear in project management include direct costs and indirect costs, which can lead to differences in associated costs.

There are considerable differences between companies in the interpretation of the classification of direct and indirect costs. Therefore, within the projects, the direct related costs (material, labor, machinery, transport) but also indirect costs are paid, in order to recover all these costs from the financier. Some specialists consider that all other costs apart from direct ones are indirect costs and are charged to general expenses. Therefore, the classification of costs as direct or indirect varies from one project to another within each executing company depending on the administrative performance of each one.

Cost estimators and project managers must be clear about the direction between direct costs and direct costs of the performing companies. They must also be aware of any exceptions to the rule caused by special provisions in a project contract that allow the subcontractor to bill for items that would otherwise be covered in overhead.

Accurately estimating costs is essential for successful allocation of resources in both private and public projects. Cost estimates play a crucial role in financial assessments, business planning, budgeting, expense management, labor needs assessment, and other important managerial tasks.

In the field of accounting, it is widely acknowledged that the term "cost" should always be accompanied by a descriptive adjective. Within project management, the usage of phrases like "direct" and "indirect" costs is common, as they can significantly impact project timelines and outcomes. It is imperative to consider these factors while preparing project cost estimates, as they have a direct bearing on the project's profitability and success.

The accuracy of the estimate depends primarily on the elaborated specifications, on the lists of measured quantities, from here the first errors appear or not. However, the possibility of the occurrence of such an error can always be reduced to zero by checks and the resumption of measurements by another specialist. A project is good because it is calculated well and there can be no surprises. However, most of the time the final quantities of the project did not happen to be equal to the initial estimates. In this case, it is possible to not be able to declare with confidence what the real costs are in the realization of a project, due to the complexity of collecting the initial data (works and quantities).

There are clearly several reasons beyond the control of the estimator why the final design costs more than the best possible design estimates. It is much more appropriate to label the early estimates as accurate, because the result can be seen with great certainty, it discourages slippages and with the accuracy it is real it determines that the true costs become known.

Steps can, of course, be taken to eliminate sources of estimation error. Cost estimators should be aware of the problems, but they must not allow them to detract from their primary task, which must always be to use all the necessary data available to produce the best possible estimate - in other words, a very rigorous technical estimate of what the project would cost if everything goes according to plan.

Many studies have been conducted to identify the causes of cost overruns in public investment projects. Among them, it can be said that construction projects face many complex issues such as: Examples: lack of qualified personnel, delays in the delivery of materials and equipment, material shortages, material waste rates, escalation and turnover rates, material prices, quality of equipment and raw materials, ongoing payment delays, project cash flow, change order costs, currency price variances, rework costs, cost management systems, site management, inadequate product quality by owners or other parts. Communication and coordination, conformance specifications, project complexity, project absenteeism rates, planned construction time, time required to correct defects, inadequate planning and scheduling, errors and discrepancies in design documentation, , delays in document review and approval by the advisors and customers.

Other researchers believe that factors contributing to cost overruns include inexperience of contractors and subcontractors, incorrect estimates of time and costs (Abtab Hamed Memon (2010)), or lack of software, incorrect estimates of time and costs, found that these include project funding flows, breakdown, shortage of materials (Yakubu Adisa Olawale (2010)).

Similarly, Ismail Abdul (2013) states that the key factors leading to cost overruns in construction projects are labor shortages, low labor productivity, inexperience of contractors and subcontractors, equipment breakdown, contractor's financial difficulties, unclear and inadequate detail drawing, design modification (Shambalid, 2017).

3. OBJECTIVES OF THE STUDY

- a) To identify the major causes of cost overruns and associated remedies in construction through a thorough literature review.
- b) To determine the primary factors causing cost overruns, conduct a questionnaire survey of project managers and engineering experts.
- c) To recommend possible solutions/prevention to avoid cost overrun.

4. RESEARCH METHODOLOGY

The research method is a systematic way of carrying out a survey activity, which involves several phases, such as literature reviews, data collection, data analysis, and conclusions. In this study, 43 factors influencing cost overruns in the construction industries were identified through specialized literature analysis. The next step was distributing questionnaires to funders, consultants, and contractors to collect data. The respondents involved in the survey had several years of experience in managing different types of projects. Based on the characteristics of the survey respondents, it was observed that most of them work for contractors, followed by consultants and funding authorities.

5. DATA ANALYSIS

The causes of cost overruns were assessed using a 4-point Likert scale from 1 to 4, representing cannot be at all, no, most of the time, and yes, respectively. Data analysis was performed by calculating the Relative Importance Index (RII) through the following formula, adopted from Memon et al. (2013), as the relative importance index (RII) is the most suitable method for the ranking analysis.

Change in scope of project

- $RII = \text{Relative importance index}$
- $W = \text{Weighting given to each factor by respondents, and its ranges from 1-4}$
- $X = \text{Frequency of the response given for each factor}$
- $A = \text{Highest weight (i.e., 4 in case)}$
- $N = \text{Total no. of respondents. (52 validates)}$

6. DATA COLLECTION

A total of 60 sets of questionnaires were distributed to different contracting authorities, construction companies, and project consulting firms. Out of the 60 questionnaires, 52 completed sets (86%) were received and evaluated to determine the significant factors that contribute to cost overruns in investment projects. The data collected from the completed questionnaires is presented below.

Table 1. Demographic Characteristic of Answers

	Frequency	Percentage (%)	Cumulative (%)
Type of Groups			
Customer	14	26.92	26.92
Advisor	7	13.46	40.38
Entrepreneur	31	59.61	100.00
Level of Qualifications			
Master	5	9.61	9.61
Degree	21	40.38	50.0
Diploma	17	32.69	82.69
Others	9	17.31	100.00
Work experience			
8-12 Years	19	36.54	36.54
12-16 Years	16	30.77	67.31
16-20 Years	13	25.00	92.31
More than 20	4	7.69	100.0

Table 2. Arrangement Causes of Cost Overrun Factors Overall

Factor ID	Cause of Cost Overrun	RII	Rank
1.	Lack of competent staff	0.47	41
2.	Labour shortages	0.81	7
3.	Low productivity levels of workers	0.67	21
4.	Inexperience of contractors and sub-contractors	0.61	27
5.	High Labour costs	0.59	29
6.	Labour disputes and strikes	0.46	42
7.	Delays in delivery of materials and equipment	0.60	28
8.	Material Shortages	0.80	8
9.	Material wastage rates	0.55	33
10.	Price increases and fluctuations	0.68	20
11.	Delays in material procurement	0.58	30
12.	Changes in material specification type	0.57	31
13.	Equipment breakdowns	0.69	19
14.	Quality of Equipment and RawMaterial	0.49	39
15.	Inadequate of equipment operating skills	0.59	31
16.	Equipment availability	0.83	6
17.	Lack of modern equipment	0.50	38
18.	Payment delays	0.54	34
19.	Rework costs	0.87	2
20.	Inaccurate Time and Cost Estimates	0.78	10
21.	Contractor Financial Distress	0.85	4
22.	Project Overhead	0.51	37
23.	Financial difficulties of Owner	0.53	35
24.	Incurrence Owner	0.45	43
25.	Financial Distress Poor Site	0.56	32
26.	Financial Management Delays in payment to suppliers and contractors	0.71	17
27.	Error during construction	0.72	16
28.	Inadequate Cost control systems	0.73	15

Factor ID	Cause of Cost Overrun	RII	Rank
29.	Inadequate Supervision	0.74	14
30.	Inadequate Programming	0.86	3
31.	Inadequate Construction Control	0.75	13
32.	Inaccurate Site Management	0.77	11
33.	Inaccurate Quantification	0.65	23
34.	Inadequate communication and coordination by owner and other stakeholders	0.66	22
35.	Compliance to Specification	0.64	24
36.	Changes in project scope	0.76	12
37.	Delays in decision making	0.62	26
38.	Obstacles from government laws and politics	0.79	9
39.	Unclear and insufficiently detailed drawing	0.48	40
40.	Frequent design changes	0.70	18
41.	Errors in drawings	0.63	25
42.	Delays in Preparation and approval of project	0.88	1
43.	Incomplete design at the time	0.84	5
44.	Poor design	0.52	36

7. CONCLUSIONS AND RECOMMENDATION

This study, conducted in the southeastern region, has identified and analyzed the major causes of cost overruns in public projects. The analysis found that significant contributors to cost overruns include delays in the preparation and approval of drawings, the cost of rework, inadequate planning and scheduling, equipment availability, changes in project scope, incomplete design at the time of tender, shortage of labor, inaccurate time and cost estimates, financial difficulties faced by contractors, poor site management, and material shortages.

In addition, the study also identified major factors related to consultants, which include delays in the preparation and approval of drawings, inadequate planning and scheduling, material shortages, changes in project scope, cost of rework, inaccurate time and cost estimates, shortage of labor, poor site management, conformance to specifications, incomplete design at the time of tender, and financial difficulties faced by contractors.

To prevent cost overruns, it is imperative to address all the contributing factors. The following list provides some possible preventive measures.

- Appoint competent staff
- Have approved GFC drawings ready before starting
- Freeze all quantities beforehand
- Allow buffer time between indent and delivery
- Consider multiple contractors
- Finalize specifications before starting
- Use ERP and relevant software
- Analyze contractors' past performances
- A competent person should plan and schedule
- Regular market analysis required
- Check equipment availability
- Finalize the scope of work before the project

Note: Natural calamities (droughts, earthquakes, storms) have not been considered in the research as they are unpredictable.

As solutions to this problem we mention only a few of them: the simplification of the legislation and the development of a system based on reference prices (to eliminate situations such as over- or under-sizing of a contract), the running of public procurement procedures during the project organization stage (in this way the implementation period would not be extended).

On the other hand, aspects related to financial management are elements that, as our analysis shows, affect the quality of the implementation phase. We observe that in the vast majority of situations there is no analysis of the financial capacity of the public beneficiary regarding the development of a project. Therefore, in the implementation stage, many public institutions get stuck with the development of the project, having a limited capacity for pre-financing or co-financing (especially of ineligible expenses per project). We propose the realization at the level of public institutions of some analyzes regarding the ability to finance projects and the inclusion of this indicator in the criteria for granting financing. Even if we consider pre-financing mechanisms through guarantee funds, we observe in many cases the blocking of projects due to lack of financial capacity, because even these mechanisms do not completely solve the problem (for example, in the last installment anyway the beneficiaries must have the money little to secure this tranche) and implementation becomes more expensive than for institutions that do not apply for such funding schemes.

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