

Identification of Factors Causing Time and Cost Overrun in Construction Projects in India

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Abstract: *Planning is the most important stage of a project's lifecycle. Looking ahead is what planning entails. Planning is essential to ensuring the proper use of human, material, and resource resources to achieve the project's deliverables. A project's success is dependent on proper planning. Planning in any project includes estimates, budget and schedule, sequences of completion of project milestones, manpower planning, and plant and equipment. Planning is the most important stage of a project's lifecycle. Looking ahead is what planning entails. Planning is essential to ensuring the proper use of human, material, and resource resources to achieve the project's deliverables. A project's success is dependent on proper planning. Planning in any project includes estimates, budget and schedule, sequences of completion of project milestones, manpower planning, and plant and equipment. Improper planning, scheduling, and execution of work are the reasons many projects suffer time and cost overruns. Not only are these but there are many factors responsible for time and cost overrun in a project. This study deals with finding out various factors responsible for time and cost overrun in a construction project and ranking them as per their criticality. Because the cost of construction is the most important criterion for project success, the results of construction projects are typically expressed in cost and deviation from the budget. Despite available literature, cost estimation methods, cost indices, and so on, construction projects rarely correspond to budget expenditures. This study focuses on exceeding construction costs and identifying various factors that influence construction costs. Based on a broad review of the literature and industry experts' data, sixty-eight factors that lead to cost overruns were identified. It is concluded that the most important factors in exceeding the cost of construction in no infrastructure Indian projects are creep in the scope, construction delays, processing, and contracting practises of the lowest bidders.*

Keywords: Time and Cost Overrun in Construction.

I. INTRODUCTION

1.1 Construction in India: An Overview

The development industry in India is second biggest after agribusiness industry. It accounts around 11% of India as GDP. It makes a significant commitment to the economy and increments business. There are predominantly three fragments in the development business first the land development which incorporates private and business development and second is foundation building which incorporates streets, railroads, power and so forth and third modern development which comprises of oil and gas processing plants, materials and so on.

The development business working in a few sections varies from one piece to another. Development of homes and streets includes around 75% and 60% of common development individually. The structure of air terminals and ports requires development action in the scope of 40-half. For modern ventures, development action ranges between 15-20%. Inside a specific area likewise development part shifts from various task to project. The development business in India is profoundly divided. There are various players inside the development business which are chipping away at the subcontracting premise. To execute more basic ventures, these days offers are expanding put in a consortium. In any case, the productivity of the development projects changes from various fragment to portions. Complex innovation adroit activities can get higher net revenues from development organizations when contrasted with lesser innovation projects like street development. Different undertakings in the Construction business are working capital escalated. Working capital necessity for any organization is exceptionally subject to the request blend of the organizations.



The development business chips away at the note of agreement understanding. Throughout the long term various sorts of agreements have been being used. It fundamentally relies upon the size and nature of the task, exceptional plan necessities, and yearly prerequisites of assets and intricacies of the gig. Development projects are in many cases emerged by various more modest agreements which are for the most part reliant upon the size of the venture and broadened nature of exercises to be done in the undertaking. Thus, Subcontracting is one of the cycles utilized in the development business.

Because of consistent development, forthcoming framework projects and a rising populace base, the development business in India is in the developing stage. With enormous number of on-going venture valuable open doors, it is the third-biggest supporter in financial development. Additionally, the business utilizes in excess of 40 million individuals and has an enormous pool of minimal expense laborers. In addition, different administrative projects like 'Savvy Cities', 'Lodging for All', 'Make in India' and 'Atal Mission for Urban Rejuvenation and Transformation' (AMRUT) will additionally help being developed. Considering these endeavors the public authority will increment public-private associations with unfamiliar organizations, drawing in greater investment is normal.

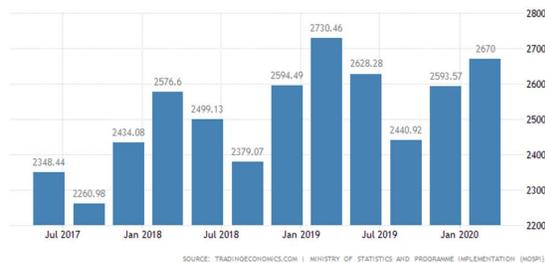


Figure 1: Bar chart showing the GDP growth of construction industry in India

The GDP of India's construction industry increased to 2670 INR Billion in the first quarter of 2020, up from 2593.57 INR Billion in the fourth.

1.2 Cost and Time: At a Glance



Figure 2: Project Management Triangle

The three imperatives alluded in the Project the executives triangle are interrelated.

Expansion in scope implies an expansion in time and cost.

Working inside time requirement could prompt inflated cost and diminished scope.

Working inside financial plan could prompt inflated cost and lessens scope. Whenever a venture neglects to meet any of the three imperatives then it prompts expansion in cost overwhelm and time invade in the task. Cost invade can be characterized as the sum by which the genuine expense of venture surpasses the dispensed undertaking planned or target cost. Time invade is characterized as the augmentation of an undertaking time past the arranged finishing date. By and large, this present circumstance happens because of absence of information and inappropriate preparation and execution.

Cost and time generally work connected at the hip in a task. Any adjustment of cost can influence the timetable of the undertaking as well as the other way around. Cost and time overwhelm are the most well-known explanations behind project disappointment. It not just effects the on-going task of an association yet additionally prevents the capacity to execute future undertakings. From starting a task to arranging, executing, and finishing an undertaking cost assumes a significant part.

Many examinations have demonstrated the way that any expansion in cost can hamper the undertaking plan and could influence the partners and others connected with the venture. To stay away from such outcomes, it is truly critical to have appropriate information on the variables that lead to cost overwhelm. To keep away from these variables, appropriate plans ought to be made and executed in an undertaking.

The development business on the planet faces a ton of difficulties, for example, land procurement issues, unfriendly political and primary changes, deficiency of ability, plan and constructability issues, variety in the expense of various materials, unpracticed specialist, advance innovation gear's, and their accessibility. Work costs additionally shows expanded pattern step by step because of which there is at present a lack of high gifted work/experienced labor force in key city areas. These issues impressively affect delicate costs and venture plans. To conquer these effects organizations, utilize less talented work to finish quick track projects which influence the nature of work.

1.3 The Motivation and Need for Research

The Construction business of India is one of the main enterprises which additionally adds to a significant sum the GDP of the nation and is the super main impetus in Indian public economy. In any case, it faces a great deal of issues that influence time, cost and quality exhibitions. Effective administration and execution of development projects depends on three basic elements for example time, cost and quality. The effective culmination of any development projects inside the booked time has been perhaps the most significant and testing assignments for the Managers, Architects, Engineers and Contractor. The most effective method to accomplish this errand is issue structure many individuals in the business, which ought to be tackled. The principal point of this study is to distinguish the variables which are answerable for invades in time and cost of the development project and to rank them as indicated by their general significance record and propose the reasonable medicinal arrangements. Lack of common sense, unfortunate execution and terrible administration are a portion of the explanations behind time and cost overwhelms in development projects in India. Since a large portion of the reasons are notable and can be controlled assuming that a legitimate administration of work is made.

1.4 Significance of the Study

Conveyance of a fruitful task can be checked by your general expense execution and capacity to finish projects on time. Project administrators need to can distribute time and assets appropriately to oversee spending plan and keep the task on now is the ideal time. Practically all associations search for project supervisors with great task the board abilities since they exhibit your capacity to fit in coordinated and speak with colleagues, particularly while taking care of exceptionally complex activities.

The review will help the chiefs in the accompanying ways-

A ton of undertakings are deferred and over-planned; the review will assist the administrators with staying away from the variables which are justification behind the postponement in time and cost overwhelm.

The chiefs can expand the benefit by appropriate planning and spending plan distribution.

By remembering the distinguished basic factors and utilizing appropriate control estimates will assist the firm with building a decent standing on the lookout.

As the installment for projects is based on the achievements so by finishing the achievements on time and on the assigned spending plan will assist the administrators with getting the cash for work.

This study will assist the administrators with giving consumer loyalty by keeping the task on time and timetable.

II. LITERATURE REVIEW

Reshma Mary Johnson, (2018) adjusted the triangulation technique that is an assortment of information (quantitative, subjective) and investigation of the gathered information of the tasks in UAE. The quantitative information assisted the creator to the readiness of the poll with reviewing. Subjective information assortment in as leading the semi-organized meetings of the master experts in UAE. The poll were sent working specialists out of which a few reactions were gotten



incorporates some undertaking supervisors, engineers, draftsmen, arranging specialists, business administrators, amount specialists, provincial chiefs, wellbeing engineer, site engineers, contract directors and head supervisor.

The semi-organized meetings of two clients, two clients, two plan experts, one undertaking the board specialist, one expense the executives advisor and two primary workers for hire were led. The examination of the reaction got was determined by the utilizing following equation:

$$\text{Normal Ranking Score} = X1W1 + X2W2 + X3W3 \dots + XnWn \div \text{Total}$$

Where, X is the count of respondents for the response decision.'

W is the weightage of the position positioned.

In this manner most significant elements which prompts time and cost overwhelm

(VemuruTarakaram, 2018) Estimates and assesses the variables affecting time and cost invade in the developments project in India, the creator feels that the great obligation of the task in staying away from the time and cost overwhelm is of the Project Managers and General Managers and consequently the paper clears up the preventive measures for be assumed to command and checking of the time and cost overwhelm. It tends to be finished by utilizing fundamental instruments, procedure and programming accessible to stay away from the expense and time overwhelm.

A portion of the variables that were distinguished by the creators are:

- Cost Overrun factors:
- Feeble venture the executives.
- Ill-advised preparing.
- Time Overrun factors:
- Incompetent labor supply.
- Challenges of works.

The system utilized by the creator was acquired worth examination which is plan checking instrument is the skilled apparatus for the development of the project. Cost investigation is finished by Key Performance Indicators.

BCWS: Amount of work that must be done do as such far.

ACWP: The complete expense that has been spent during the advancement of the venture.

BCWP: The aggregate sum of financial plan made arrangements for fruition of undertaking.

The equation for estimation,

$$CV = BCWP - ACWP$$

Where, CV - Cost Variance.

BCWP - Budgeted Cost of Work Performed.

ACWP - Actual Cost of Work Performed.

SV - BCWP-BCWS.

Where, SV - Schedule Variance.

BCWP - Budgeted Cost of Work Performance.

BCWS - Budgeted Cost of Work Scheduled.

Project is in good shape: $CV/SV=0$.

Project is less expense and in front of the schedule: $CV/SV=+ve$

Project is significant expense and behind schedule: $CV/SV= - ve$

Cost execution Index and time Performance Index: It helps in imparting work progress. Not set in stone by CPI (Cost Performance Index)

$$CPI = BCWP/ACWP$$

Plan Performance Index (SPI): It is the proportion of real advancement of the venture to the arranged worth of the task.

$$SPI = BCWS/BCWP$$

The task is on financial plan and the timetable: CPI and $SPI= 1$.

The task is behind the timetable and over financial plan: CPI and $SPI < 1$.

The venture is early and under budget: CPI and $SPI > 1$.

In view of this apparatus the creator decided the different ventures which were running on time or using up all available time.

(S M Renuka, 2017) In this diary, the creator takes care of private, business and modern tasks in metro urban areas like Chennai, Bangalore, Mumbai. What's more, recognized from the writing study and well-qualified assessment was taken. Also, in light of these two variables poll was ready. Also, this survey was coursed in two sections. In the primary various partners of the task were approached to fill the structure and having the substance like:

- Kinds of the tasks.
- Kinds of client
- The original term of the task.

All out No. of long stretches of deferral in the undertaking.

In the second piece of the poll, project supervisors were asked to respond to inquiries like, What is the level of deferral in a specific venture because of labor issues.

The inquiries were posed for material, hardware, money, climate and planning and control related variables to grasp the rate commitment of deferral.

After information assortment, it was broke down by utilizing various straight relapse investigation utilizing SPSS to see out the connection between the level of time overwhelm in the task and the level of postponement by each gathering.

In agreement to this different issues were distinguished and were recorded by creator advertisement recommended this model for guaging the defer span relies on the state of the task and further develop the general undertaking execution.

(Patil, 2017) The diary is on the development work for 3 stories over a current emergency clinic in Pune. This diary centers around the various elements that were answerable for cost invaded in that venture. The creator starts by making sense of the significance of the development business in the nation's economy and improvement. It centers around the different sorts of issues looked in the development business from one side of the planet to the other. Some of them are:

- Land procurement issues.
- Antagonistic political and primary harms.
- Deficiency of ability.
- Plan and constructability issue.
- Rising material and work cost.

On account of enormous framework projects, to defeat these issues the workers for hire increment the general expense of the task by 6% to 9% which results in to increment in the delicate costs, though in more modest ventures they assimilate the inflated expense to stay cutthroat.

The creator attempts to make sense of what cost invade and time overwhelm is. As indicated by this diary cost invade is what is going on where the client has spent more cash than assessed and time overwhelm is what is going on when the continuous of fruition has breathed easy.

The creator additionally centers around the different general factors that are liable for time and cost invade. The variables are:

- Delay in land obtaining and site handover.
- Delay in getting administrative endorsement from a few specialists/organizations.
- Wasteful degree the board.
- Insufficient coordination with different activities.
- Erroneous assessment of undertaking time and cost.
- Takes a chance with vulnerability.
- The intricacy of work.
- Struggle.
- Atmospheric conditions.

The creator likewise makes reference to the elements were seen nearby during the contextual analysis:

- Delay in installment.
- Terrible preparation and planning by the project worker.
- Stormy climate.
- Non-accessibility of experienced specialized staff and workers for hire.
- Over the top work for worker for hire.

- Unfortunate liquidity of workers for hire.
- Deficiency of works.
- Delay in endorsing additional work and variety.
- Unfortunate site the executives and oversight.

The author also mentions some recommendations that may help to avoid the above factors and to complete the project in time and within the cost. the identification of mistakes in the work progress itself.

III. WORKING ADOPTED FOR THE PAPER

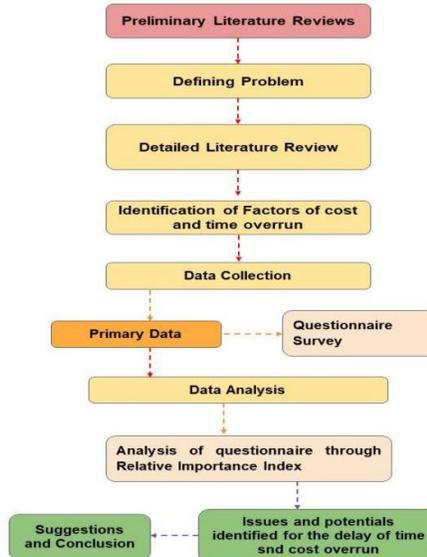


Figure 3: Flowchart showing methodology

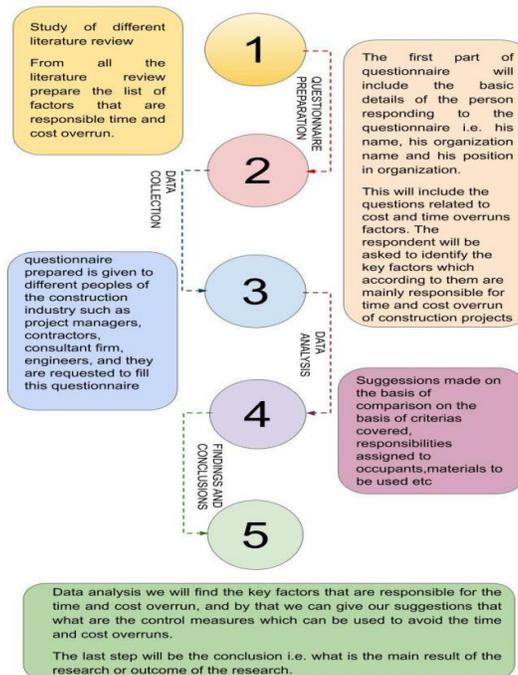


Figure 4: Process Flowchart

IV. RESULT AND DATA COLLECTION

To collect data for the paper, a questionnaire was created. The questionnaire is divided into two parts. The first section of the questionnaire will include the basic information about the person responding to the questionnaire, such as his name, the name of his organisation, and his.

The second section will include questions about cost and time overruns. The respondent will be asked to rate the factors responsible for construction project time and cost overruns on a scale of one (1) to five (5) based on their level of contribution. 1 means strongly disagree, 2 means disagree, 3 means neutral, 4 means agree, and 5 means strongly agree.



Survey about the identification of key factors responsible for time and cost overrun in construction projects.

As students of the National Institute of Construction Management and Research (NICMAR), Pune. We are trying to find out factors that are responsible for time and cost overrun for the projects.

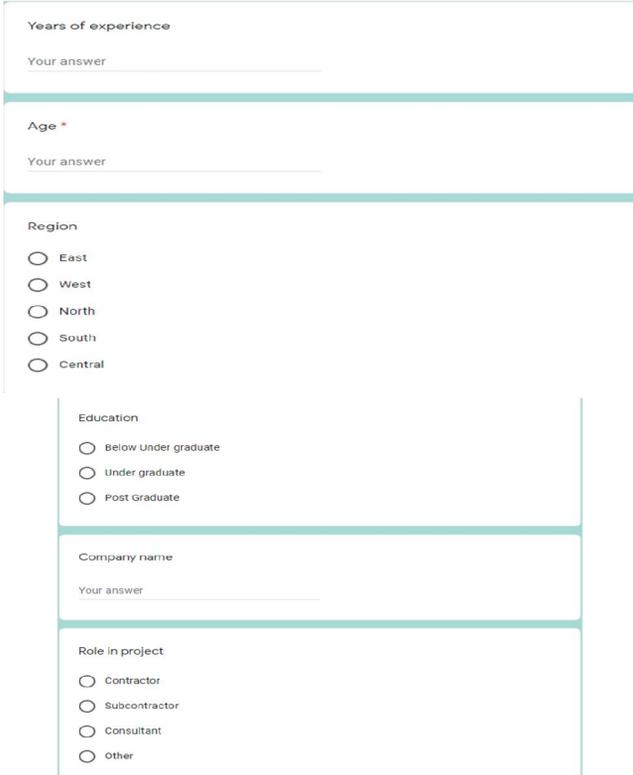
We wanted to hear your feedback so we can determine the factors which are responsible for time and cost overrun. Please fill this quick survey and let us know your thoughts.

***Required**

Name of Respondent *

Your answer

Figure 5: Snapshots of Questionnaire
Source: (Authors)



Years of experience

Your answer

Age *

Your answer

Region

East

West

North

South

Central

Education

Below Under graduate

Under graduate

Post Graduate

Company name

Your answer

Role in project

Contractor

Subcontractor

Consultant

other

Type of project. *

- Residential Building
- Commercial Building
- Both
- Other

A number of projects executed. *

- Less than or equals to 10
- 11-50
- 51-100
- More than 100

Survey about the identification of key factors responsible for time and cost overrun in construction projects.

Factors for the project overrun.

The Questionnaire is mainly based on the five ordinal measures from one (1) to five (5) according to the level of contributing. 1=Strongly disagree, 2= Disagree, 3=Neutral, 4=Agree, 5=Strongly agree.

We have mentioned some factors responsible for the time and cost overrun below. You just have to select your view regarding time and cost overrun for a particular factor.

Please fill this quick survey. You just have to click the most relevant option.

Note:- For a complete view of options (Strongly disagree, Disagree, Neutral, Agree, Strongly agree) slightly scroll left on the options panel.

1. Site clearance issues

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

2. Improper drawings (Design error)

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

3. Mistakes in planning and scheduling

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

4. Inefficient cost and monitoring

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

5. Shortage of the material

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

6. Quality of material

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

7. Material price fluctuation

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

8. Labour supply

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

9. Low productivity level of labors

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

10. Increase in labor price

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

11. Equipment availability and failure

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				

12. Inadequate modern equipment

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

13. Site safety

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

14. Mistakes in the construction phase

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

15. Bad weather

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

16. Obstacles from the government

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

17. Problems with neighbors and site conditions

	Strongly disagr...	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

18. Slowness in decision making.

	Strongly disagr...	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

19. Poor site management

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

20. Lack of communication between parties

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Time	<input type="radio"/>				
Cost	<input type="radio"/>				

21. Problems with

	Owner	Contractor	Subcontractor	Consultant
Time	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cost	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Figure 6: Snapshots of Questionnaire

V. DATA ANALYSIS AND FINDINGS:

5.1 Type of Projects

As shown in the pie chart, the majority of respondents (34.2 percent) have work experience in a field other than residential or commercial 29.1 percent working officials have responded from both residential and commercial building projects. 19% of those polled have worked on commercial construction projects. The minimum no of respondents were from the residential building projects i.e. 17.7 percent.

5.2 Number of Projects Executed

A number of projects executed.
79 responses

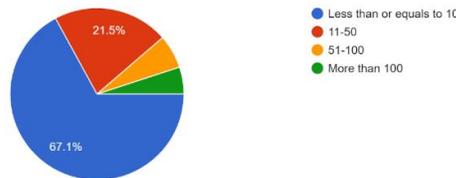


Figure 7: Pie chart representing number of projects executed by the respondents

The pie chart above depicts the number of projects completed by working officials during their careers in the construction industry. The majority of respondents, 67.1 percent, have worked on projects with fewer than or equal to ten projects. The second highest number of respondents who have completed the projects ranges from 11 to 50. And 21.5 percent of respondents.

6.3 percent of respondents have worked on projects ranges from 51 to 100 numbers. And 5.1 percent of respondents have worked on more than 100 projects. According to the responses received, 37.97% of respondents believe that site clearance issues can cause project time overruns. Site clearance, according to 46.83 percent of working professionals, can also result in cost overruns.

5.3 Improper Drawings

2. Improper drawings (Design error)

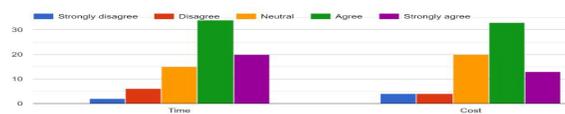


Figure 8: Bar chart representing overruns caused by Improper drawings

43.03% of working officials agrees that design error can affect the scheduled time in the project and hence can cause delay in completing project.

5.4 Inefficient Cost and Monitoring

4. Inefficient cost and monitoring

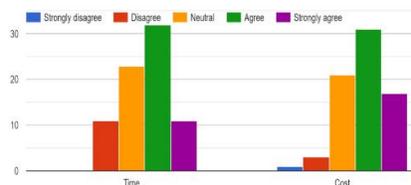


Figure 8: Bar chart representing overruns caused by Inefficient cost and monitoring

43.03% of respondents believe that due to improper drawings or any design error project can cause cost overrun.

5.5 Mistakes in Planning and Scheduling

3. Mistakes in planning and scheduling

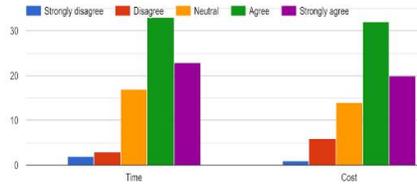


Figure 8: Bar chart representing overruns caused by Mistakes in planning and scheduling

Mistakes in planning and design can also have a significant impact on project time overruns, as agreed by 41.77 percent of respondents.

41.77 percent of working professionals agree that mistakes in planning and scheduling can lead to cost overruns on projects. According to the graph, 40.50 percent of working professionals agree that inefficient cost and monitoring can lead to project time overruns.

Inefficient cost and monitoring, according to 40.50 percent of respondents, can also lead to cost overruns.

5.6 Shortage of the Material

5. Shortage of the material

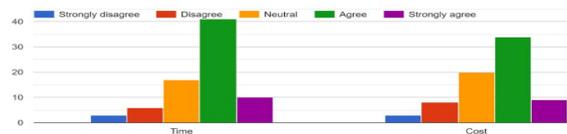


Figure 9: Bar chart representing overruns caused by Shortage of the material

A shortage of materials, according to 53.16 percent of respondents, can cause project time overruns.

Furthermore, 43.03 percent of working professionals believe that a lack of materials leads to cost overruns..

5.7 Quality Of Material

6. Quality of material

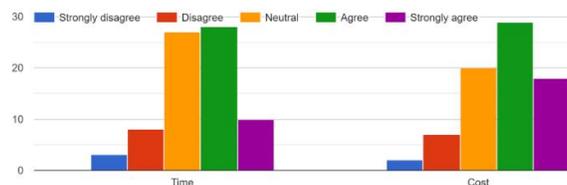


Figure 10: Bar chart representing overruns caused by Quality of Materials

According to the responses received, 35.44 percent of people believe that poor material quality causes project delays.

And 39.24 percent of respondents agree that it causes project cost overruns.

5.8 Material Price Fluctuations

7. Material price fluctuation

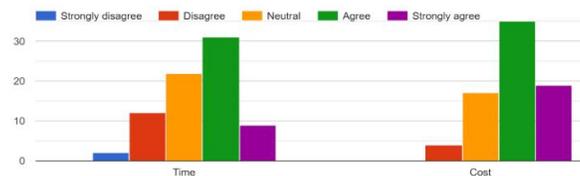


Figure 11: Bar chart representing overruns caused by Material price fluctuations



According to a survey, 41.77 percent of working professionals believe that material price fluctuations are also a factor in project completion delays. 44.30 percent of respondents agree that fluctuating material prices are the cause of the project's budgeted cost increase.

5.9 Labour Supply

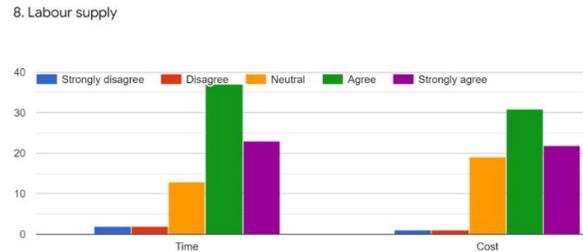


Figure 12: Bar chart representing overruns caused by Labour Supply

According to the survey, 46.83 percent of professionals believe that any change in labour supply has an effect on time. 41.77percent believe it will have an impact on the project's cost.

5.10 Low Productivity Level Of Labors

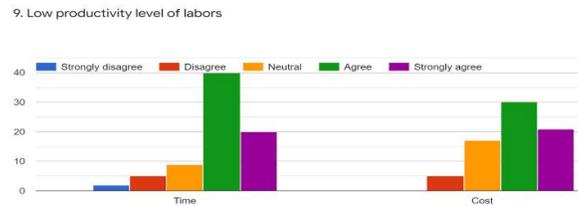


Figure 13: Bar chart representing overruns caused by Low productivity of Labors

54.43 percent of industry professionals agree that low labour productivity can cause delays. 40.50 percent believe it will result in project cost overruns.

5.14 Increase in Labour Price

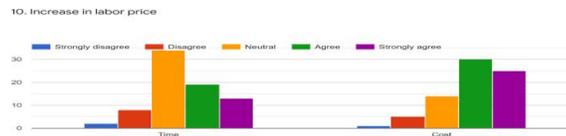


Figure 14: Bar chart representing overruns caused by Increase in Labour Price

The graph shows that, 44.30 percent people think increase in labour price has a neutral effect on time. Whereas 40.50 percent believe it will have an impact on project costs

VI. CONCLUSION

Based on the survey, the main goal of this paper is to identify the key factors of time and cost overruns in construction projects. According to the findings of the paper, the following factors contribute to cost overruns: Increase in labour price Labor supply Mistakes during the construction phase

The main factors which contribute to the time overrun are:

- Increase in labour supply,
- Low productivity of labour
- Mistakes in planning and scheduling.

Overall, 20 factors were examined; according to the survey, the three factors mentioned above are the most critical factors responsible for cost and time overruns in a construction project. Other factors are also responsible for schedule delays and cost overruns to the project.

The last question from the survey stated that owner is responsible for cost overrun of the project, as the owner is responsible for defining the scope of the project, and if the scope changes the cost is affected at a large scale. While the contractor is responsible for project time overruns, as the contractor is responsible for project execution, if proper monitoring is not performed, the schedule may be delayed.

However, it has been observed that time and cost are highly dependent on each other and reciprocate each other; for example, if we need to complete a project before the scheduled date, more resources are required, and thus the cost increases. The result shows that maximum of the problems in construction projects mainly comes from the labour related issue; it is required that proper monitoring and controlling is done to avoid costs and time overruns. It is required that the scope is understood at the beginning of the project and the planning is done accordingly to achieve 100 percent scope. Overruns can be avoided by properly monitoring and controlling the project if the scheduling is done correctly from the start.

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