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TO STUDY COMPONENTS OF COST & SCHEDULE OVERRUN ON CONSTRUCTION SITE

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Abstract - *As we are aware that construction industry of India is facing severe problem with time & cost overrun on site. A project can be successful if it is completed in schedule time & budgeted cost. The purpose of this research paper is to look on to major critical factor which causes the delay on site and also to know the view points from engineers, contractors and Project Managers about what are the best practices we can apply to complete the project on time with proper safety and at minimum risk. The result of this paper is conducted through Relative importantance index method and mean method.*

Key Words: Cost Overrun, Delay, Construction projects, Time Overrun.

1. INTRODUCTION

As we are aware that Indian construction industry is one of the vast sectors for development and growth in India. This issue of overrun is one of the serious problems that have a great impact on the success of the construction project. We can say a project is successful if it is finish within a planned schedule and as per estimated cost. If the project doesn't run as per planning, proper monitoring, controlling then it can skid of the track and can cause a project delay due to that it cannot complete on actual time limit.

Due to delay it can cause unpredicted failures which can led to late completion of project, increasing rent of machineries, disputes between the parties. As we know that there are many construction project which look complex & difficult to do it and & the location of working and environment is also challenging. So there is a greater risk for construction team to complete it within the contract time limit and planned cost.

It is therefore to find some of the root causes that affect budget & schedule overrun on construction sites & how to minimize it for the success of project.

1.1 OBJECTIVE

- To identify various factors that significantly influences cost and time overrun.
- To find out some of the root causes that affect budget & schedule overrun on construction sites & how to minimize it.
- To find how frequently these root causes generate.
- To identify how overrun affect owner and contractor.

2. LITERATURE REVIEW

- Anant Narayan Shete, Vaibhav Durwas Kothawade (Nov 2016):

  This paper states various causes of cost & schedule overrun on construction projects. A questionnaire survey is prepared & is circulated to various constructing firm for knowing the view from personnel regarding cost & schedule overrun on construction projects. The aim of this research is to find the causes that affect overrun in any construction projects. Also the older literature paper & article is been studied to know the critical success factor that help in avoiding the overrun. Also for this research case study has been done on building project and from the responses it has been seen that most of responders think that cost overrun is a major problem. Some of the causes are identified like external factor, inflation & escalation of material prices, more competition.

- Shubham S. Deshmukh, Shubham D. Menkudle (April 2019):

  The purpose of this research paper is to find some of the reason that affect budget & schedule overrun on construction sites & how to minimize it. The existing literature paper & other research have been done and it has been found that two main components are time & cost overrun. Various factors has been identified like improper material procurement, political issues, material handling, manpower productivity, lack of detail in drawing, Increase in scope of work from client are significant causes that lead to time & cost overrun in construction industry.

- Chhavi Gupta, Chitranjan Kumar (Oct 2020):

  As we are aware that construction industry is the bigger sector for economic growth in India. A project is said to be successful if it completed within a time and as per budget. The main purpose of this study is to identify root causes of time and cost overrun and also to take essential measures to mitigate it. A literature paper has been studied to find the causes of budget & schedule overrun. By keeping in mind the causes a question survey form has been created & floated to various construction personnel. The responses that have been gathered are check by using RII method to rank the causes. By ranking the factors various factors have been noticed i.e. financial problem from contractor side, less labour available, less available of material on site, increasing rate of material, error in execution of work, higher charges on arrival of material. These causes should be kept in mind while planning, designing and execution phase.

- Shabbab Al Hammadi, M. Sadique Nawab (April 2016):

  In this paper it is stated that there is an unpredicted issue during planning, designing & execution stages which tends to lead to overrun of project. For this research work a survey was done in Saudi Arabia for knowing the factors that often led to time & cost overrun. This was possible by doing a research on existing literature paper and also making a question survey form and circulates among contractor, owner and engineer and knowing their views as per their experiences. The important factor has been identified from the survey. Also the past study was done of Asia & Africa related to comparison on time & budget overrun factor and the factors which we have found is financial issues of contractor, political issues, labour productivity, Inappropriate design.

- Oza Apeksha Pradipbhai, Patel Khyati Bharatbhai (June 2020):

  The purpose of this paper is as we all know that cost & schedule overrun has been a serious issue of any construction projects. This kind of unexpected problem is devastating & effect for upcoming development and growth of India. There type of unpredicted failures can led to not proper coordination & relationship between client & contractor, quality standards, maintaining of proper health and safety during construction work. There is a need for study related to budget & schedule overruns causes and to take necessary decisions to mitigate it. From existing literature paper some of the causes are noticed and question survey is prepared with thirty five factors based on it. The survey forms is distributed among construction personnel and were asked to give a rating of this causes as per their work experience on site and received response is accessed using different methods. The factor which we have found is improper planning, manpower productivity.

- S. Shanmugapriya, Dr. K. Subramanian (Oct 2013):

  As we are known that budget & schedule overrun has been a bigger problem in construction industry. A project is said to be successful if it completed within a time and as per budget. A study has been done for knowing the causes that affect budget & schedule overrun. From existing literature paper some of the causes are found and question survey form is been prepared based on it and has been floated to various construction personnel. The responses that have been gathered are accessed by using RII (relative importance index) method to rank the causes. By ranking the factors various factors of cost and schedule overrun have been noticed i.e. higher price of material, higher rate for delivery of goods, quality standards.

- A M Faten Albtoush, R A Bahamid (2019):

  In this paper it is stated that there is a serious problem that has a great impact on the success of the construction project. A necessary step to be taken from the working team to keep the project on track so as to complete the project within a time and as per estimated budget. As we all know that many of the construction projects are complex & tedious and it require proper planning and execution for maintaining the performance of project. From existing literature paper and from various researches some of the factors of cost & schedule overrun have been reviewed. Some of the factor that are noticed from the studies are poor planning & design, political issue, poor communication & coordination, poor maintenance of equipment & machineries, less availability of labour.

3. DATA COLLECTION

3.1 QUESTIONNAIRE SURVEY FORM

This is a questionnaire survey form which I have prepared to know about cost & time overrun occurring on different sites and I have floated to different construction personnel for knowing their view based on their experience.

Questionnaire Survey Form						
Name of Respondent:						
Designation:						
Email ID:						
Time & Cost Overrun on Different Sites		**Scale of Importance**				
		Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Sr No.	**Time Overrun**					
1	Shortage of construction material					
2	Poor maintenance of equipment					
3	Shortage of labour					
4	Lack of skilled labour					
5	Availability of equipment					
6	Financing between the owner & the contractor					
7	Slow delivery of materials					
8	Cash flow					
9	Poor quality of materials					
10	Insufficient time for preparation of contract documents					
11	Ineffective planning & scheduling					

12	Stoppages because of work being rejected by consultant					
13	Delay in preparation & approval of drawings					
14	Errors & omission in design, incomplete drawings					
15	Materials selection & change in types & specifications during execution of construction work					
16	Delay in decision making					
17	Labour productivity					
Sr No.	**Cost Overrun**					
1	Inflation & Escalation of material price					
2	High transportation cost					
3	Frequent breakdown of the construction plant & equipment					
4	Rework due to errors during construction					
5	Additional works, extra work, increase in scope of work from client					
6	High maintenance cost of machinery					
7	Ineffective planning & scheduling of project by contractor					
8	Lack of financial management & planning					
9	Difficulties on importing equipment's & materials					
10	Wastage on site					
11	Mistakes during construction					
12	High cost of machinery					
13	Inappropriate construction method					
14	Poor communication & coordination with other parties					
15	Shortage of subcontractors & specialist firms					
16	Inaccurate BOQ					
17	Inaccurate or poor estimating of original cost					

Table-1: Questionnaire Survey Form

3.2 SAMPLE SIZE

Sample Size = (Z^2 *P *(1-P)) / C^2

Where, Z = Z Score Which Is Determined Based on Confidence Level.
P = Population proportion
C = Margin of error

Sample Size (SS) = ((1.96) ^2 * 0.5* (1-0.5)) / (0.05) ^2
= 384.16

New Sample Size = SS / (1 + [(SS-1) / Population])
= 384.16 / (1 + [(384.16-1) / 60)]
= 52

3.3 INTERVIEW SURVEY RESPONSES

During interview survey, the interviewer were asked three questions about time & cost overrun, these include:

3.3.1 WHY TIME & COST OVERRUN OCCUR ON CONSTRUCTION SITES?

SR.NO.	NAME	DESIGNATION	RESPONSE
1	Dhruv Shah	Site Engineer	Time overrun occurs many times as many works are time consuming and some works are also dependable on each other which cause a huge delay sometimes. And consideration of cost may overrun due to huge timeline of project which causes increasing of material amount as well as many miscellaneous costs for the running site.
2	Mohammed Hasam	Project Coordinator	There are many reasons for time overrun and cost overrun on construction sites. Few important reasons have been listed below: Delay in progress payment by owner Effect of weather Accidents on site Frequent design changes Delays in decisions making Lack of coordination between parties Delay in Preparation and approval of drawings Incomplete design at the time of tender Owner interference Modification in material specifications Financial difficulties of owner
3	Shabbir	Planning Engineer	Due to lack of coordination between construction stakeholders Due to less productivity of manpower and equipment Due to lack of site management

			Due to lack of poor pre planning of activities Due to material shortage or delay
4	Shyam Vithlani	Civil Engineer	During recent trends at construction sites, the problem of time overrun & cost overrun is the major drawback which can't be ignored. Sometimes, time overrun occurs due to less knowledge of worker about particular work or by other reasons such as lack of skill of engineer-contractor. Such process leads to result in cost overrun in terms of indirect loss.
5	Ali Shakir	Site Engineer	There are 3 factors which affect these criteria: Work efficiency of Manpower, Material & labour availability, Natural or artificial disaster.

Table-2: Response data on why time & cost overrun occur on construction sites

3.3.2 HOW CAN WE MINIMIZE THE PROBLEM OF TIME & COST OVERRUN ON CONSTRUCTION PROJECTS?

SR.NO.	NAME	DESIGNATION	RESPONSE
1	Dhruv Shah	Site Engineer	There are many ways to overcome the time and cost overrun problems such as making activities parallel and doing work with more efficiency with proper skilled persons which can Ultimately give some freedom to time as well as cost of the project. Although of problems we can find some solutions to overcome anyhow and make things work with some alternatives too.
2	Mohammed Hasam	Project Coordinator	By thoroughly planning the project ahead of time. By knowing the vendors and their scope of work. By maintaining planned scope and avoiding scope creep. By the use of project management software such as MSP, Primavera etc. By keeping the Stakeholders updated. By monitoring the progress on day-to-day basis and to stay on track. By reassigning the resources and to carry out the maximum efficiency from it.
3	Shabbir	Planning Engineer	By controlling time schedule By coordination between site management and client By setting daily targets Motivation to construction people By budget analysis and cost controlling
4	Shyam Vithlani	Civil Engineer	Such process can be done on various phases of firm hierarchy, but recent updating shows major update at lower ground may leads to huge reason why can be done by optimistic use of labour for particular work & by examining from various past

			approach.
5	Ali Shakir	Site Engineer	Try to resolve ans. 1 for minimizing the cost & Time overrun.

Table-3: Response data on how can we minimize the problem of time & cost overrun on construction projects

3.3.3 WHAT ARE THE OBSTACLES THAT STOP US FOR REDUCING TIME & COST OVERRUN ON DIFFERENT CONSTRUCTION PROJECTS?

SR.NO.	NAME	DESIGNATION	RESPONSE
1	Dhruv Shah	Site Engineer	Obstacles such as sudden price rise of material not getting proper skilled persons, sometimes it's about getting permission to go ahead from the client or department, regarding the changes client or department makes frequently which cause huge time and cost overrun. Also, sometimes seasons plays a role where rain causes the stoppage of work and festivals causes insufficiency of labours.
2	Mohammed Hasam	Project Coordinator	Financial problems Unrealistic contract durations imposed by clients Poorly defined project scope Client-initiated variations Delays in the issuance of permits by government agencies Variations in designs Lack of communications plans Poor feasibility and project analysis Poor financial management on site and material price fluctuations
3	Shabbir	Planning Engineer	Poor approach from client or contractor to complete project Choosing less productive workforce Bad decision making No pre planning of materials requirements No budget allocations Delay of approvals from client
4	Shyam Vithlani	Civil Engineer	Factors/obstacles include 3M of the project. Man- Money- Machine which are eye catching whose updating will improve the speed of work in optimistic way leads to reduction in cost & time overrun.
5	Ali Shakir	Site Engineer	Shortage of material, manpower & equipment's. Weather conditions, Corona lockdown.

Table-4: Response on what are the obstacles that stop us for reducing time & cost overrun on construction projects

4. DATA ANALYSIS

The data which have been collected for different factors are analyzing using Relative Importance index Method & Mean Method.

4.1 RELATIVE IMPORTANCE INDEX METHOD

Time Overrun											
Sr No.	**Questions**	**Strongly agree (x5)**	**Agree (x4)**	**Neutral (x3)**	**Disagree (x2)**	**Strongly Disagree (x1)**	**Total**	**Total Number (N)**	**A*N**	**RII**	**Rank**
1	Shortage of construction material	90	64	21	12	5	192	52	260	0.73846	11
2	Poor maintenance of equipment	45	108	21	14	2	190	52	260	0.73077	13
3	Shortage of labour	95	72	24	10	2	203	52	260	0.78077	3
4	Lack of skilled labour	70	84	39	4	2	199	52	260	0.76538	6
5	Availability of equipment	80	84	24	12	1	201	52	260	0.77308	4
6	Financing between the owner and the contractor	70	76	42	8	1	197	52	260	0.75769	9
7	Slow delivery of materials	50	108	27	10	1	196	52	260	0.75385	10
8	Cash flow	55	100	42	4	0	201	52	260	0.77308	4
9	Poor quality of materials	60	72	33	14	4	183	52	260	0.70385	17
10	Insufficient time for preparation of contract documents	50	72	45	18	0	185	52	260	0.71154	16
11	Ineffective planning and scheduling	85	72	27	12	2	198	52	260	0.76154	8
12	Stoppages because of work being rejected by consultant	60	72	36	18	1	187	52	260	0.71923	14

13	Delay in preparation and approval of drawings	105	72	24	10	0	211	52	260	0.81154	1
14	Errors and omission in design, incomplete drawings	100	60	30	14	0	204	52	260	0.78462	2
15	Materials selection and change in types and specifications during execution of construction work	55	104	33	6	1	199	52	260	0.76538	6
16	Delay in decision making	85	60	27	18	2	192	52	260	0.73846	11
17	Labour productivity	40	84	51	12	0	187	52	260	0.71923	14

Table-5: Relative Importance Index Method for time overrun

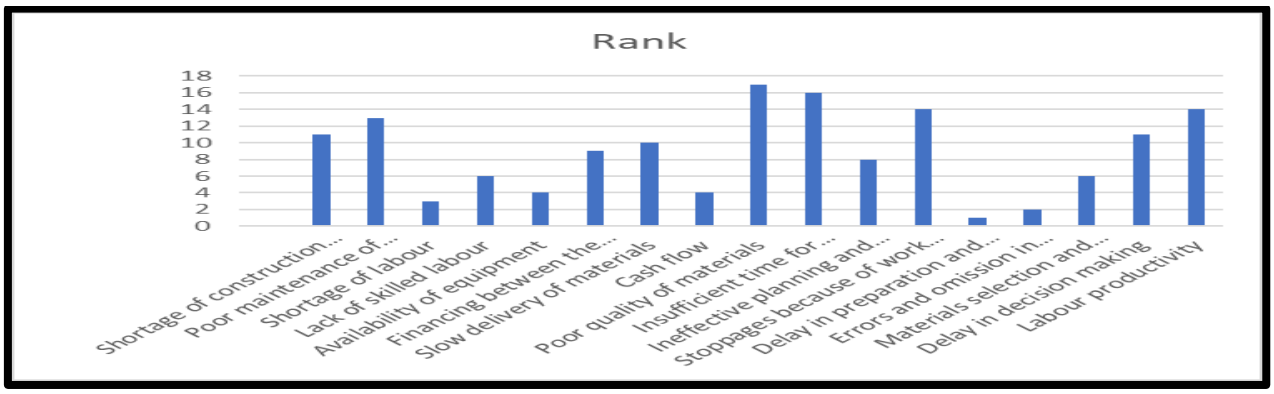

Chart-1: Rank of factors affecting time overrun

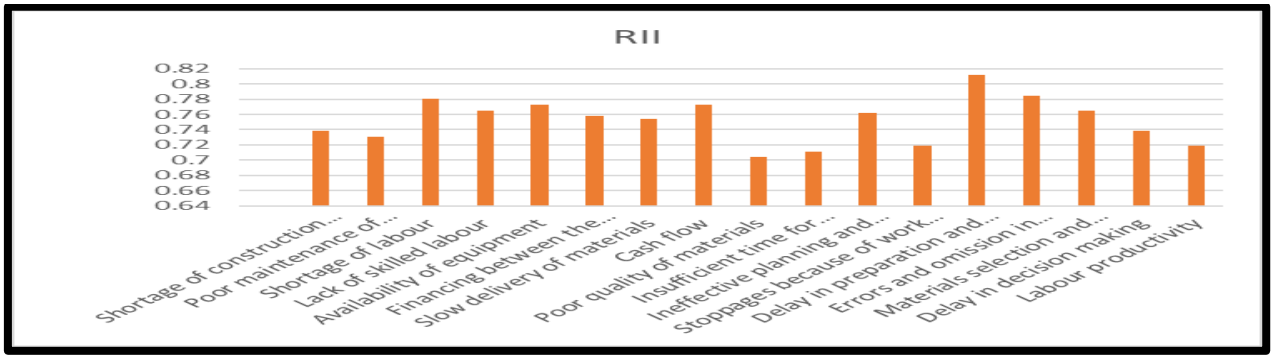

Chart-2: RII of factors affecting time overrun

Cost Overrun											
Sr No.	**Questions**	**Strongly agree (x5)**	**Agree (x4)**	**Neutral (x3)**	**Disagree (x2)**	**Strongly Disagree (x1)**	**Total**	**Total Number (N)**	**A*N**	**RII**	**Rank**
1	Inflation and Escalation of material price	60	96	33	8	1	198	52	260	0.76154	7
2	High transportation cost	55	108	27	10	0	200	52	260	0.76923	2
3	Frequent breakdown of the construction plant and equipment	45	104	30	12	1	192	52	260	0.73846	9
4	Rework due to errors during construction	70	84	36	10	0	200	52	260	0.76923	2
5	Additional works, extra work, increase in scope of work from client	55	108	27	8	1	199	52	260	0.76538	4
6	High maintenance cost of machinery	65	92	42	2	1	202	52	260	0.77692	1
7	Ineffective planning & scheduling of project by contractor	85	76	24	12	2	199	52	260	0.76538	4
8	Lack of financial management and planning	55	104	24	14	0	197	52	260	0.75769	8
9	Difficulties on importing equipment's and materials	45	72	48	18	0	183	52	260	0.70385	14
10	Wastage on site	75	80	33	10	1	199	52	260	0.76538	4
11	Mistakes during construction	50	88	48	2	3	191	52	260	0.73462	11
12	High cost of	60	76	48	6	2	192	52	260	0.73846	9

	machinery										
13	Inappropriate construction method	60	64	51	8	3	186	52	260	0.71538	13
14	Poor communication and coordination with other parties	45	100	24	16	2	187	52	260	0.71923	12
15	Shortage of subcontractors and specialist firms	45	68	36	26	1	176	52	260	0.67692	17
16	Inaccurate BOQ	60	60	42	20	1	183	52	260	0.70385	14
17	Inaccurate or poor estimating of original cost	50	80	24	22	3	179	52	260	0.68846	16

Table-6: Relative Importance Index Method for cost overrun

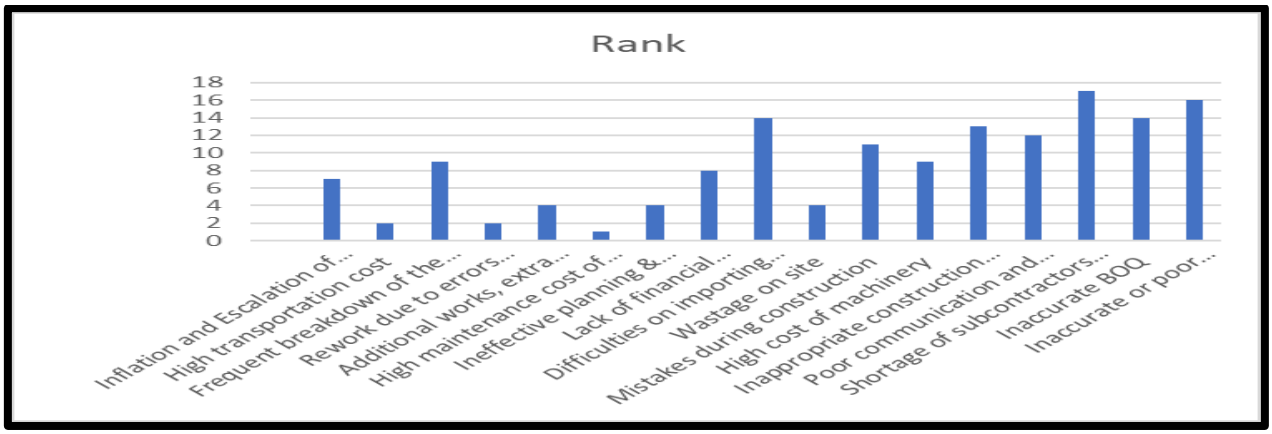

Chart-3: Rank of factors affecting cost overrun

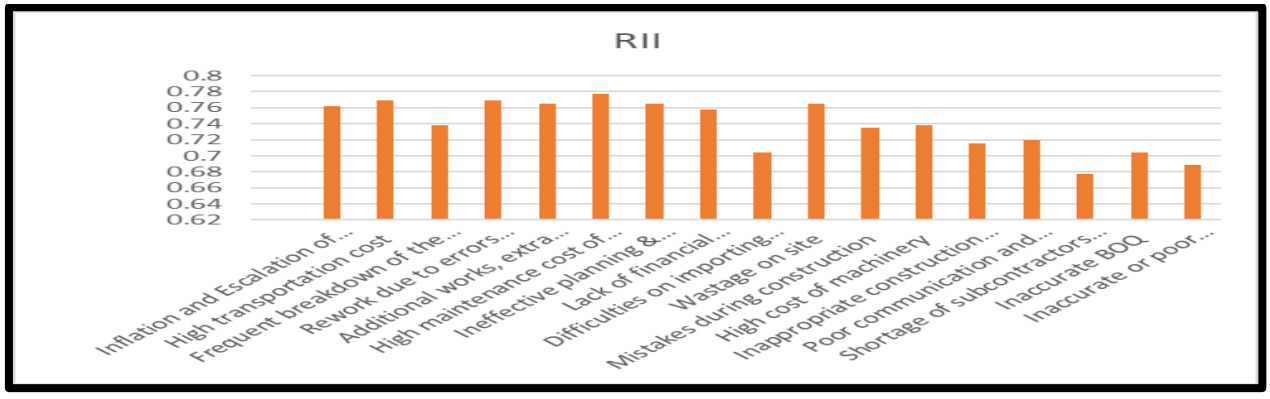

Chart-4: RII of factors affecting cost overrun

4.2 MEAN METHOD

Time Overrun									
Sr No.	**Questions**	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Total**	**Average**	**Rank**
1	Shortage of construction material	90	64	21	12	5	192	0.7384615	11
2	Poor maintenance of equipment	45	108	21	14	2	190	0.7307692	13
3	Shortage of labour	95	72	24	10	2	203	0.7807692	3
4	Lack of skilled labour	70	84	39	4	2	199	0.7653846	6
5	Availability of equipment	80	84	24	12	1	201	0.7730769	4
6	Financing between the owner and the contractor	70	76	42	8	1	197	0.7576923	9
7	Slow delivery of materials	50	108	27	10	1	196	0.7538462	10
8	Cash flow	55	100	42	4	0	201	0.7730769	4
9	Poor quality of materials	60	72	33	14	4	183	0.7038462	17
10	Insufficient time for preparation of contract documents	50	72	45	18	0	185	0.7115385	16
11	Ineffective planning and scheduling	85	72	27	12	2	198	0.7615385	8
12	Stoppages because of work being rejected by consultant	60	72	36	18	1	187	0.7192308	14
13	Delay in preparation and approval of drawings	105	72	24	10	0	211	0.8115385	1

14	Errors and omission in design, incomplete drawings	100	60	30	14	0	204	0.7846154	2
15	Materials selection and change in types and specifications during execution of construction work	55	104	33	6	1	199	0.7653846	6
16	Delay in decision making	85	60	27	18	2	192	0.7384615	11
17	Labour productivity	40	84	51	12	0	187	0.7192308	14

Table-7: Mean Method for time overrun

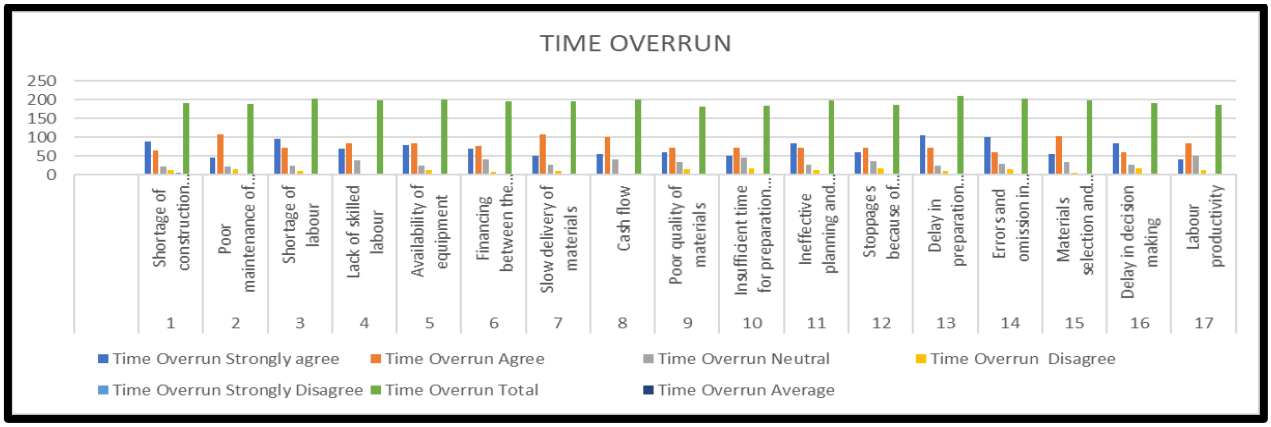

Chart-5: Response of each factors affecting time overrun

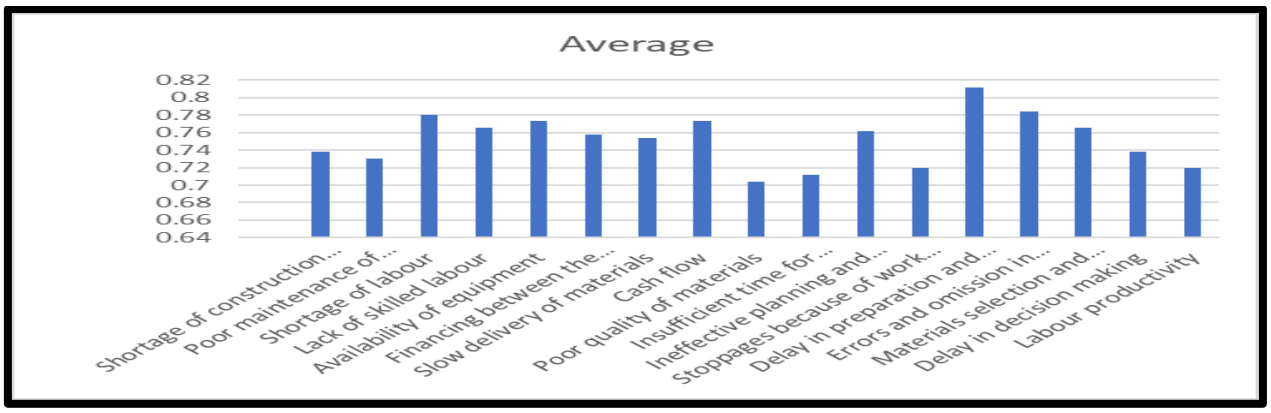

Chart-6: Average of each factors affecting time overrun

Cost Overrun									
Sr No.	**Questions**	**Strongly agree**	**Agree**	**Neutral**	**Disagree**	**Strongly Disagree**	**Total**	**Average**	**Rank**
1	Inflation and Escalation of material price	60	96	33	8	1	198	0.7615385	7
2	High transportation cost	55	108	27	10	0	200	0.7692308	2
3	Frequent breakdown of the construction plant and equipment	45	104	30	12	1	192	0.7384615	9
4	Rework due to errors during construction	70	84	36	10	0	200	0.7692308	2
5	Additional works, extra work, increase in scope of work from client	55	108	27	8	1	199	0.7653846	4
6	High maintenance cost of machinery	65	92	42	2	1	202	0.7769231	1
7	Ineffective planning & scheduling of project by contractor	85	76	24	12	2	199	0.7653846	4
8	Lack of financial management and planning	55	104	24	14	0	197	0.7576923	8
9	Difficulties on importing equipment's and materials	45	72	48	18	0	183	0.7038462	14
10	Wastage on site	75	80	33	10	1	199	0.7653846	4
11	Mistakes during construction	50	88	48	2	3	191	0.7346154	11
12	High cost of	60	76	48	6	2	192	0.7384615	9

	machinery								
13	Inappropriate construction method	60	64	51	8	3	186	0.7153846	13
14	Poor communication and coordination with other parties	45	100	24	16	2	187	0.7192308	12
15	Shortage of subcontractors and specialist firms	45	68	36	26	1	176	0.6769231	17
16	Inaccurate BOQ	60	60	42	20	1	183	0.7038462	14
17	Inaccurate or poor estimating of original cost	50	80	24	22	3	179	0.6884615	16

Table-8: Mean Method for cost overrun

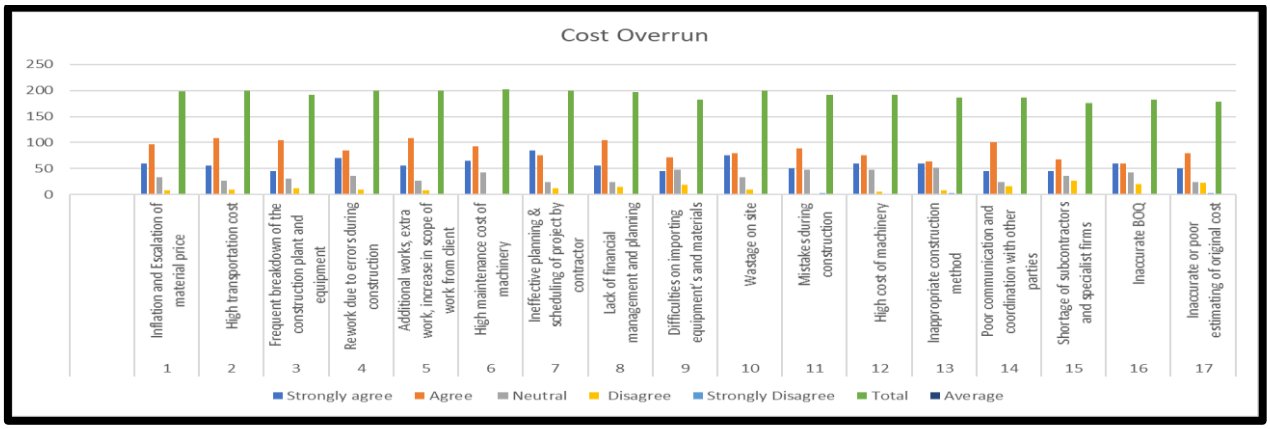

Chart-7: Response of each factors affecting cost overrun

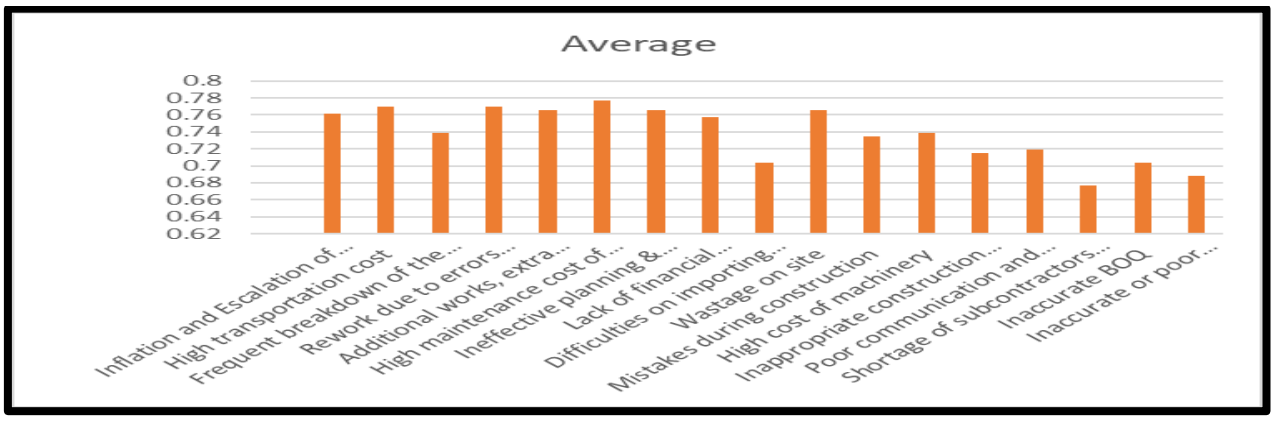

Chart-8: Average of each factors affecting cost overrun

5. CONCLUSION

The research was done to find the factors which affect schedule & budget overruns in any construction project. I have found out 34 factors which affect schedule & budget, they are various causes that affect the schedule & budget were noticed by using Relative Importance Index (RII) Method & Mean Method.

The most important causes of schedule delay are Delay in preparation and approval of drawings, Errors and omission in design & incomplete drawings, Shortage of labour, Availability of equipment and Cash flow.

The most common factors of cost overrun are High maintenance cost of machinery, Rework due to errors during construction, High transportation cost, Wastage on site and Additional works, extra work & increase in scope of work from client.

So the factors which are identified should be taken in mind to finish a project within a planned schedule and as per estimated cost. If we are aware of this factors well before the starting of the project then the planning team can prepare the schedule effectively and also proper tracking of the project will progress smoothly.

6. FUTURE SCOPE

For this thesis I could find and list the major factor that detoriate the construction time & cost overrun for any type of structure. In questionnaire survey I had put up the question as per my experience on site and based on current industry scenario. Also, I have some of the expert view and suggestion what are their facing and what are step to mitigate it. The future scope of this thesis is to study and to calculate the percentage and the possible reason for the cause which give us the deep insight of the factors. Also finding some the latest research paper and recent case studies to find the most crucial factor which the construction sites should take initiative and find possible solution of these major factors.

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