

An Analysis of Cost Overruns and Time Overruns for Construction Projects using AHP

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Abstract: Today India is the second quickest developing economy on the planet. The Indian development industry is a vital piece of the economy and a channel for a maintainable piece of its improvement speculation. The development business in India is balanced for development because of industrialization, urbanization, financial improvement and individuals' rising desires for better nature of living. In India, the development business is the second biggest industry next just to farming. Its commitment to GDP (Gross Domestic Product) 2011-12 is about 10%. It utilized 45 million faculty including both talented and incompetent laborers, experts, foreman, administrative staff and specialists. The development business in India expects a development rate of 7-8% per annum throughout the following 10 years. With expanding push on creating foundation and alluring concessions seeming private association in framework extends, the Indian development industry is as of now blasting and ready to see a greater development in not so distant future.

Keywords: Construction Industry, Time Over-runs, Cost Overruns, Questionnaire, Factors, Causes, Delay, Projects

Introduction

The development business assumes an indispensable job in the formation of any country's riches. For creating economies, it frames the foundation of generally ventures. There are mostly three portions in the development business like land development which incorporates private and business development; framework building which incorporates streets, railroads, control and so on; and modern development that comprises of oil and gas refineries, pipelines, materials and so on.

With the present accentuation on making physical framework, huge speculation is arranged in this part. The Planning Commission has evaluated that speculation necessity in foundation to the tune of around 14,500 billion or US\$320 billion amid the eleventh Five Year Plan period. The components support of Indian development Industry are accessibility of shoddy work, accessibility of qualified experts, vast number of development organizations (almost 28,000 sorted out organizations and 75 huge contracting organizations), intense deficiency of lodging, help from the legislature and development in mechanical area. (1)

Literature Review

Jomin P Jose et al. (2018) undergoes intensive literature review of 15 research paper of various authors on cost overruns in construction projects. They have concluded those 27 factors that affect cost overruns of projects which are unexpected inflation/Material price escalation, Inaccurate estimates, Improper planning and scheduling, Improper planning and scheduling, adverse effect of weather and others.(7)

S. Uday Kiran (2017) assessed reasons for expense and time invades in development ventures from view purpose of advisor, customer and temporary workers. As indicated by him Effects of subsurface conditions, Shortage of work, Poor coordination, and Communication between Parties, Poor site the executives and supervision by the contractual worker and Inaccurate appraisals were boss elements of the overwhelms. He reasoned that Difficulties in financing venture by the contractual worker with RII (Relative Importance Index) of 0.83 is first positioned factor from temporary workers perspective, Shortage of Labor with a RII (Relative Importance Index) of 0.85 is first positioned factor from advisor perspective and Rework because of mistakes amid development stage with a RII (Relative Importance Index) 0.82 is prime factor from customers perspective. (12)

Shripad Bhagat A et al. (2017) led their investigation venture from view purpose of time and cost invades in water system extends in Amravati area. They inferred that Land obtaining, Rehabilitation influenced individuals and Increase in CSR (Corporate Service Reliability) rate was the most basic factor that impacts venture delay. They additionally discovered different purposes behind postponements are Changes in Structural Design, ETP (Establishment apparatuses and plant) and Extra work. (15)

Anant Narayan Shete et al. (2016) conducted their meeting overview of two famous Indian development organizations with comparable qualities for examination of time and cost overwhelms in ventures. Through association they inferred that Delays in land securing and site handover is the essential explanation behind time invades additionally is essential purpose behind cost overwhelms in undertakings. Further they gave proposals for diminishing time and cost invades. (3)

Dinesh Bhatia et al. (2016) carried out their investigation for cost invades and calendar overwhelms for private structures in Pune district of Maharashtra. They discovered ineffectively performed time estimation of the venture errands, unexpected conditions, inward clashes inside the task group and poor work association and arranging are purposes behind timetable invades. They additionally discovered Material lack, Shortage of work, late conveyance of materials and gear, Unavailability of skillful staff, Delay in advancement installment, budgetary troubles by contractual worker, drawing not got from experts, Poor correspondence and coordination by proprietor and different gatherings are explanations behind cost overwhelms. (5)

Leena Mali et al. (2016) conducted a study in Pune locale of Maharashtra to distinguish reasons for postponements in development ventures. They did writing survey of past ten research work and records out different reasons for deferral and they order delays in four classes. They distinguished best 10 reasons for deferrals specifically deficiency of work (RII 0.797) , Lack of high innovation of mechanical gear (RII 0.766), Delay site activation (RII 0.750), Poor capability of the contractual worker's specialized staff (RII 0.719), Providing administrations from utilities (RII 0.703), Late acquisition of material (RII 0.672), Late in looking into and supporting plan (RII 0.672), Unqualified workforce (RII 0.656), Damage of arranged materials (RII 0.656) and Frequent difference in subcontractor (RII 0.656). They additionally examined impacts of this deferrals on undertakings. (8)

Mandar C. Borse et al. (2016) brought out writing survey and through master conclusion from industry specialists drill down different elements that influence cost and timetable execution in development ventures. These polls were circulated to different best and center administration of the private and government segment of development industry. Factor conveyances of the 54 factors distinguished are circulated into 8 gatherings. A five point size of 1 to 5 is embraced for assessing the impact of each factor. Utilizing relative significance record factors were positioned from 1 to 10 and presumed that top factor which is in charge of expense and calendar execution of task is money related issues which are trailed by postponed in contractual worker's installment, deficiency of works thus on. In request to compute relative understanding between reactions spearman rank connection technique is utilized. The estimation of Spearman's relationship coefficient among best and center administration is 0.97, among center and lower the board is 0.93, among best and lower Management is 0.93. This shows solid positive relationship between's respondents. (9)

Naveenkumar.G.V et al. (2016) led poll overview and investigates information utilizing SPSS programming and use positioning strategy. He presumed that low efficiency of work, Slowness in giving guidance, Delaying in bill settlement, Poor acquisition programming of materials, Lack of support for the gear and Strikes, riots and other outer powers are basic components influencing time overwhelms. He likewise finished up Delay in fundamental giving over of undertaking, incorrectly/improper decision of site, deficient task arrangement, addition of material costs because of nonstop terminations, assets requirement, flighty climate conditions, vacillations in the expense of building materials, hardware assignment issues, absence of cost reports arranging/checking amid pre and post contract organizes in the position and configuration changes as ten elements affecting cost overwhelms. (10)

Methodology

1. Literature Review
2. Questionnaire Preparation
3. Questionnaire Validation
4. Questionnaire Survey and Data Collection
5. Analysis
6. Conclusion
7. Suggestions

Following were the Factors Obtained from Literature Review for Cost Overruns

1. Shortage of Labours
2. Delay in land acquisition
3. Inaccurate estimate of time and cost
4. Change in scope and design
5. Slow decision making
6. Ineffective construction methods
7. Bad weather conditions
8. Delay in supply of raw materials
9. Inflation/ Material Price Escalation

Following were the Factors Obtained from Literature Review for Cost Overruns

1. Shortage of Labours
2. Delay in land acquisition
3. Inaccurate estimate of time and cost
4. Slow in decision making
5. Difficulty in getting permit
6. Design change
7. Poor communication between parties
8. Delay in supply of raw materials and equipments
9. Non performance of Subcontractor
10. Low productivity of labour

Scope of Study:

Scope of study is limited to Ahmedabad and Surat region of Gujarat and AHP (Analytic Hierarchy Process) method is utilized in this study. The stakeholders were Contractor’s organization, Client organization and Consultant organization

Stakeholder	City		Total
	Ahmedabad	Surat	
Contractor	28	30	58
Client	20	20	40
Consultant	12	10	22
Total	60	60	

Details of data Collection

Data Analysis

1. Pairwise Comparison

	CONTRACTOR	CLIENT	OTHERS
CONTRACTOR	1	3	4
CLIENT	0.33	1	2
OTHERS	0.25	0.5	1
TOTAL	1.58	4.5	7

2. Normalized Matrices

	CONTRACTOR	CLIENT	OTHERS	CRITERIA WEIGHT	RANK
CONTRACTOR	0.632911392	0.6666667	0.571429	0.623668877	1
CLIENT	0.208860759	0.2222222	0.285714	0.238932422	2
OTHERS	0.158227848	0.1111111	0.142857	0.137398701	3

3. Check For Consistency

	CONTRACTOR	CLIENT	OTHERS	WEIGHTED SUM	
CONTRACTOR	0.623668877	0.7167973	0.549595	1.890060947	3.030552
CLIENT	0.205810729	0.2389324	0.274797	0.719540553	3.011481
OTHERS	0.155917219	0.1194662	0.137399	0.412782131	3.004265
				LEMMA MAX	3.015433

Consistency Index	Consistency Ratio
Consistency Index = $(\text{Lemda Max} - n) / (n-1)$ Consistency Index = $(3.01543 - 3) / (3-1)$ Consistency Index = 0.00771	Consistency Ratio = Consistency Index / Random Index Consistency Ratio = $0.00771 / 0.58.....$ (for n=3) Consistency Ratio = 0.0133 < 0.1 O.K. (According to founder of AHP - Satty)

Finally all the criteria weight of each factor is averaged and the factor which gets the highest criteria weight is the most critical factor amongst.

Conclusion and Results:

After the analysis the most critical factor is highlighted in Red color, followed factor is highlighted in Blue color and Third most critical factor is highlighted in Green color.

Critical Factors for cost Overruns in Ahmedabad city

Overrun	Criteria	Sub-Criteria	Criteria Weight	Rank
Cost Overrun	Contractor (0.5154)	Shortage of Labours	0.1769	2
		Delay in Land Acquisition	0.1538	3
		Inaccurate Estimates	0.2028	1
		Decision Making	0.0785	7
		Ineffective Methods	0.1418	5
		Equipment Cost	0.1441	4
		Wastage of Materials	0.0875	6
	Client (0.2888)	Change in Scope	0.2873	1
		Delay in Supply	0.2035	4
		Extra Items	0.2148	3
		Decision Making	0.2846	2
	Others (0.1957)	Inflation	0.2184	3
		Material Non Availability	0.2812	2
Poor Communication		0.1800	4	
Natural Forces		0.3144	1	

Critical Factors for Time Overruns in Ahmedabad city

Overrun	Criteria	Sub-Criteria	Criteria Weight	Rank
Time Overrun	Contractor (0.5186)	Shortage of Labours	0.1336109	5
		Delay in Land Acquisition	0.1952863	2
		Inaccurate Estimates	0.1313108	6
		Non Performance of Subcontractor	0.1517423	4
		Construction Techniques	0.1973424	1
		Inferior Quality	0.1768181	3
	Client (0.2854)	Decision Making	0.1541736	5
		Design Change	0.2344990	1
		Delay in Supply	0.2239611	2
		Extra Items	0.1923716	4
		Delay in Payments	0.1949945	3
	Others (0.1958)	Poor Communication	0.1235010	3
		Natural Forces	0.1024226	4
		Inflation	0.2653368	2
Material Non Availability		0.5029217	1	

Critical Factors for cost Overruns in Surat city

Overrun	Criteria	Sub-Criteria	Criteria Weight	Rank
Cost Overrun	Contractor (0.3925)	Shortage of Labours	0.157334109	4
		Delay in Land Acquisition	0.105336096	6
		Inaccurate Estimates	0.072432296	7
		Decision Making	0.21760574	1
		Ineffective Methods	0.177615763	2
		Equipment Cost	0.163227943	3
		Wastage of Materials	0.106448053	5
	Client (0.36748)	Change in Scope	0.257925659	2
		Delay in Supply	0.130725755	4
		Extra Items	0.230493479	3
		Decision Making	0.380855107	1
	Others (0.2399)	Inflation	0.275365954	3
		Material Non Availability	0.294461877	2
Poor Communication		0.312222158	1	
Natural Forces		0.117950011	4	

Critical Factors for Time Overruns in Surat city

Overrun	Criteria	Sub-Criteria	Criteria Weight	Rank
Time Overrun	Contractor (0.3914)	Shortage of Labours	0.20693644	1
		Delay in Land Acquisition	0.132666097	6
		Inaccurate Estimates	0.154966199	4
		Non Performance of Subcontractor	0.139985631	5
		Construction Techniques	0.163475302	3
		Inferior Quality	0.201970331	2
	Client (0.3708)	Decision Making	0.204748241	3
		Design Change	0.263685386	1
		Delay in Supply	0.203980988	4
		Extra Items	0.112113714	5
		Delay in Payments	0.21547167	2
	Others (0.2375)	Poor Communication	0.314047299	1
		Natural Forces	0.117395425	4
		Inflation	0.273484418	3
Material Non Availability		0.295072858	2	

Suggestions and Preventive Measures

1. For Inaccurate Estimates

Following are some of major mistakes in preparing estimates which should be avoided

- Lack of transparency
- Last-minute changes
- Focusing on strengths only, ignoring weaknesses.
- Underestimating Labor/ workers Costs.
- Lack of margin calculation algorithm.
- Allocating resources incorrectly.
- Limited views of the project.

2. For Shortage of labours

Following are the ways for avoiding shortage of labours

- Use Innovative/modern Technology to Get People Excited
- Make Workers Lives Easier with Construction Software
- Increase Connectivity for Better Retention
- Prioritize worker/ labours safety
- Review and manage hours

3. Material Non-availability

- There should be adequate stock of material in the store houses.
- As per golden rule 2/3 of material should be under usage at site and 1/3 of material should be store as inventories.
- Wastage of material should be minimized.
- There should be constant monitoring on handling of materials especially costly materials.

4. Improper Construction Technique

Following are the easy steps which one should keep in mind during Construction of Projects.

- Improve your planning
- Find good construction management software
For e.g. MS Project and Primavera
- Start using Building Information Modeling (BIM)
- Listen to your staff and other stakeholders
- Invest in training
- Improve your communication skills
- Establish performance measurements, and hold your crew accountable
- Implement prefabrication and modular construction into your projects

5. Slow Decision Making

Following steps should be applied to improve decision making.

1. Identify the problem
 2. Search for alternatives
 3. Weigh the alternatives
 4. Make a choice
 5. Implement the choice
 6. Evaluate the results and, if necessary, start the process again

6. Poor Communication

Following are the ways to improve communication

1. Poor Communication
2. Choose the right communication method for the message
3. Be an active listener.
4. Avoid confusion, be clear and concise
5. Keep written communication professional at all times.
6. Stick to the facts.

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Dr. Jayeshkumar Pitroda received his Bachelor of Engineering Degree in Civil Engineering from Birla Vishwakarma Mahavidyalaya Engineering College, Sardar Patel University (Vallabh Vidyanagar, Gujarat-India) in 2000. In 2009 he received his master's degree in Construction Engineering and Management form Birla Vishwakarma Mahavidyalaya Sardar Patel University (Vallabh Vidyanagar, Gujarat-India). In 2015 he received his Doctor of Philosophy (Ph.D.) Degree in Civil Engineering from Sardar Patel University (Vallabh Vidyanagar, Gujarat-India). He has joined Birla Vishwakarma Mahavidyalaya Engineering College as a faculty in 2009, where he is lecturer of Civil Engineering Department and at present working as Associate Professor from February 2018 having total experience of 19 years in the field of Research, Designing and Education. At present holding charge of PG Coordinator Construction Engineering and Management. He is guiding M.E. / M. Tech (Construction Engineering and Management/ Construction Project Management/ Environmental Engineering) thesis work in the field of Civil / Construction Engineering/ Environmental Engineering. He is also guiding Ph.D. students (Civil Engineering). He has published many papers in National / International Conferences and Journals. He has published nine Research Books in the field of Civil Engineering, Rural Road Construction, National Highways Construction, Utilization of Industrial Waste, Fly Ash Bricks, Construction Engineering and Management, Eco-friendly Construction.



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