

An Investigation into Factors Causing Time and Cost Overrun in Marine Construction Projects in India

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Abstract: -- The construction industry is of great significance to the economy of India. The Construction sector in India is the sixth largest economic activity in India and provides employment to a large group of people. However, it is infamous for projects overrunning time and cost. A large number of researches have been conducted to define causes of time and cost overrun in completing construction projects. A study on time and cost overrun of different types of Marine construction projects in India was conducted to determine the causes of overrun and their importance according to each of the project participant's experience level, i.e., below 5 years, 5-10 years and above 10 years. The field survey conducted included 37 respondents of less than 5 years' experience, 44 respondents of 5-10 years' experience and 39 respondents of more than 10 years' experience. The researcher identified 3 groups of factors causing overrun and in each group 6 factors were placed according to their nature, totaling to 18 factors of time and cost overrun. Data were gathered through a survey, analyzed by using Relative importance index, taking in view different experience levels.

Keywords: - Marine, Overrun, Relative importance index

I. INTRODUCTION:

In construction, overruns are of two type time overrun and cost overrun. Time overrun is project slippage over its planned schedule while cost overrun is escalation of cost from its budgeted amount. Also according to MOSPI it can be shown as Time overrun= Anticipated Data of Commissioning minus Original Data of Commissioning and Cost overrun= Anticipated Cost of project minus Original Cost of project Marine projects are considered as few of the very fascinating projects in form of oil and gas, ports and underwater projects. As economy of any country grows its export and import also grows leading to more marine construction projects. A marine project becomes symbol of nations status and economic power. The problem of time and cost overrun in the

construction of marine construction projects is a worldwide phenomenon and India is not an exception. There are many major contributors to the failure of a real time construction project all over the world. Considering the Indian condition, not much research and case studies are reported on the factors associated for time and cost overrun in the construction of marine projects.

II. OBJECTIVES OF RESEARCH:

Research Aim: The aim of the research is to assess the causes leading to time and cost overruns in marine construction projects.

Research Objectives:

- To identify the causes that lead to time and cost overrun and to evaluate their relative importance.

- To get opinion on these causes from people of different experience level in the construction industry.
- To rank the causes of time and cost overrun on the basis of importance.
- To assess which causes need the most attention by stakeholders.

III. LITERATURE REVIEW:

Sadi A. Assaf et al (2006) stated that to the owner, delay means loss of revenue through lack of production facilities and rent-able space or a dependence on present facilities. In some cases, to the contractor, delay means higher overhead costs because of longer work period, higher material costs through inflation, and due to labor cost increases. All this happens because of some definite causes in the projects. Msafiri Atibu Seboru, (2015) stated that Project delays are a common problem internationally in the construction industry in modern times. Investigating the reasons for delay has become an important contribution to improved construction industry performance.

Dr Abdussalam Shibani et al., (2015) in his article in research gate identified the factors causing time overrun through quantitative approach and found out most important factors of delay. Ram Singh, special article Economic and political Weekly (2010) discussed on, "Delays and Cost Overruns in Infrastructure Projects: Extent, Causes and Remedies". He found that delays leads to cost overrun

and bigger the project more is the cost overrun compared to smaller projects. Projects in roads, railways, urban development, civil aviation, shipping and ports experiences more severe delays.

Cost is the budgeted expenditure, which the client has agreed to commit for creating/acquiring the desired construction facility (Chitkara, 2011). Cost overrun can be understood as the difference between the actual and anticipated costs as a percentage of the anticipated cost. Actual costs are defined as the costs which have been actually incurred during the time of project. Anticipated costs are defined as the forecasted costs at the time of project sanction. (Lee, 2008). It is an established fact that most of the projects in construction industry face time and cost overruns (Apolot et al., 2012) It is evident that problem of cost overrun is more prominent than time overrun (Kasimu, 2012). It is a matter of further research to analyse the problem of cost overrun (Kasimu, 2012). The finding of the factors influencing cost overrun for effective mitigation of the problem must be done by keeping in view three main stakeholders i.e. client, consultants and contractor (Doloi, 2012). Construction industry being very much resource oriented and fragmented always susceptible to time and cost overrun (Memon et al., 2011). So, it is imperative to find the factors that contribute to cost overrun to avoid and reduce the problems (Ali & Kamaruzzaman, 2010). To find out the reasons is generally the primary step when dealing a problem and then solutions can be found

out (Chang, 2002). S.K. Patil, A.K.Gupta, D. B. Desai, A.S.Sajane studied “Causes of delay in Indian transportation Infrastructure projects” and based on 64 delay factors he found the relative importance of delay factors based on Relative Importance Index (RII). Msafiri Atibu Seboru, (2015) used Relative Importance Index and Spearman’s rank correlation to analyse the factors of delay.

IV METHODOLOGY:

Methodology adopted for this study is questionnaire survey for data collection and relative importance index for ranking of factors according to importance. A study on time and cost overrun of different types of Marine construction projects in India was conducted to determine the causes of overrun and their importance according to each of the project participant’s experience level, i.e., below 5 years, 5-10 years and above 10 years. The questionnaire survey conducted included 37 respondents of less than 5 years’ experience, 44 respondents of 5-10 years’ experience and 39 respondents of more than

10 years’ experience. The researcher identified 3 groups of factors causing overrun and in each group 6 factors were placed according to their nature, totaling to 18 factors of time and cost overrun. Data were gathered through a survey, analyzed by using Relative importance index, taking in view different experience levels. Questionnaire consists of total of 18 factors that are responsible for the delay in construction of marine structures. Among those, 6 for each three parts named as planning section, execution stage and general factors in questionnaire survey. For each category (Experience less than 5yr, Experience 5-10yr, and Experience above 10yr), their point of view regarding the topic is different. Total of 150 questionnaires were distributed to client, contractor and consultant. The response of these peoples categorized to three groups according to their experience (Experience less than 5yr, Experience 5-10yr, Experience above 10yr). There were 120 responses from distributed 150 questionnaires and which denotes 80% responsive rate. Table I shows questionnaire response detail.

Table I Questionnaire response detail

Particulars	Experience < 5 years	Experience 5-10 years	Experience >10 years
No. of respondents	37	44	39
No. of Questionnaire distributed	50	50	50
Responsive rate in percentage	74 %	88 %	78 %

Relative importance index is used as a statistical tool for the analysis of data. Most of the research related with delay in construction industry makes use of this RII method due to its simplicity and easiness to understand. The RII will vary only from 0 to 1. Higher RII value represents the most significant contributor of delay and lesser value indicates the least contributor factor.

The analysis is carry out by the equation 1,

$$\text{RII} = \frac{W}{(A \times N)} \quad (1)$$

Where:

W – The weight given to each factor by the respondents and ranges from 1 to 5.

A – The highest weightage (i.e. 5 in this case) and;

N – The total number of respondents.

V. RESULTS AND DISCUSSIONS:-

For the category Less than 5 year experience candidates, among the eighteen factors responsible

for time and cost overrun in construction of marine projects, Lack of contractual clarity (5.90%), Problems due to tidal and seasonal variations in sea (5.90%), Lack of defined project management plan (5.83%), Poor project monitoring (5.83%), Delay in design and drawing approval process (5.83%), Erroneous quantity survey and estimations (5.76%), Shortage of competent workmen and proper equipment (5.69%), Delay/ Shortage of funds and payments (5.69%) and Delay in material Indenting/ lack of considerations on long lead materials (5.69%), were the most severe six factors. All this together contributes 52.12% of total delay. Similarly the ranking of most critical factor which contributes in time and cost overrun according to candidates having experience between 5-10 years and experience greater than 10 years is shown in Table II.

Table II Details of all delay factors in different category of experience

FACTORS OF DELAY	Experience < 5 years			Experience 5-10 years			Experience >10 years		
	RII	% of delay	Rank	RII	% of delay	Rank	RII	% of delay	Rank
PLANNING STAGE									
Lack of defined project management plan	0.7364	5.83	3	0.7543	5.74	4	0.7913	5.96	3
Lack of proper contracting strategy	0.6636	5.26	16	0.7771	5.91	2	0.7391	5.56	7
Lack of proper construction methodology and sequencing	0.6818	5.40	14	0.7829	5.96	1	0.7652	5.76	5

Inter dependencies and evaluation of the contractor not considered in advance	0.6818	5.40	14	0.7543	5.74	4	0.7217	5.43	11
Overlook of Design review timelines	0.6909	5.47	11	0.7371	5.61	8	0.7217	5.43	11
Erroneous quantity survey and estimations	0.7273	5.76	6	0.7543	5.74	4	0.7652	5.76	5
EXECUTION STAGE									
Poor project monitoring	0.7364	5.83	3	0.7657	5.83	3	0.8348	6.28	1
Lack of contractual clarity	0.7455	5.90	1	0.7143	5.43	16	0.7913	5.96	3
Problems due to tidal and seasonal variations in sea	0.7455	5.90	1	0.7314	5.57	9	0.7217	5.43	11
Shortage of competent workmen and proper equipment	0.7182	5.69	7	0.7200	5.48	13	0.7391	5.56	7
Rework due to non-compliance in quality or poor workmanship	0.6909	5.47	11	0.7200	5.48	13	0.7304	5.50	9
Delay in design and drawing approval process	0.7364	5.83	3	0.7314	5.57	9	0.7304	5.50	9
GENERAL SECTION									
Delay due to environmental issues	0.7091	5.62	10	0.7200	5.48	13	0.6609	4.97	17
Delay/ Shortage of funds and payments	0.7182	5.69	7	0.7086	5.39	17	0.7043	5.30	15
Lack of clarity in specifications	0.6455	5.11	17	0.7543	5.74	4	0.7130	5.37	14
Delay in permissions, approvals and statutory compliance from authorities	0.6909	5.47	11	0.7257	5.52	12	0.6261	4.71	18
Delay in material Indenting/ lack of considerations on long lead materials	0.7182	5.69	7	0.6914	5.26	18	0.8261	6.22	2

Violation of safety rules causes delay	0.5909	4.68	18	0.6000	4.57	9	0.7043	5.30	15
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Table III shows the details of delay factors in combined three categories. While considering all the factors together for all three categories combined, Poor project monitoring contributes major part of delay with 5.98% and RII 0.7790. Lack of defined project management plan (5.84%), Lack of contractual clarity (5.76%), Erroneous quantity survey and estimations (5.75%), Delay in material

Indenting/ lack of considerations on long lead materials (5.72%) and Lack of proper construction methodology and sequencing (5.71%) were the very next most severe factors to the first. Whereas, Violation of safety rules causes delay only contributes 4.85% and RII 0.6318 and is ranked as last. All these first six ranked factors together contributes (34.76%) of total delay.

Table III Details of all delay factors in combined three categories.

Factors of delay	RII	% of delay	Rank
PLANNING STAGE			
Lack of defined project management plan	0.7607	5.84	2
Lack of proper contracting strategy	0.7266	5.58	9
Lack of proper construction methodology and sequencing	0.7433	5.71	6
Inter dependencies and evaluation of the contractor not considered in advance	0.7193	5.52	11
Overlook of Design review timelines	0.7166	5.50	12
Erroneous quantity survey and estimations	0.7489	5.75	4
EXECUTION STAGE			
Poor project monitoring	0.7790	5.98	1
Lack of contractual clarity	0.7503	5.76	3
Problems due to tidal and seasonal variations in sea	0.7329	5.63	7
Shortage of competent workmen and proper equipment	0.7258	5.57	10
Rework due to non-compliance in quality or poor workmanship	0.7138	5.48	13

Delay in design and drawing approval process	0.7327	5.63	7
GENERAL SECTION			
Delay due to environmental issues	0.6967	5.35	16
Delay/ Shortage of funds and payments	0.7104	5.46	14
Lack of clarity in specifications	0.7043	5.41	15
Delay in permissions, approvals and statutory compliance from authorities	0.6809	5.23	17
Delay in material Indenting/ lack of considerations on long lead materials	0.7452	5.72	5
Violation of safety rules causes delay	0.6318	4.85	18

CONCLUSION:

This study was aimed at finding the causes of time and cost overrun of marine construction projects in India. There were 45 factors of time and cost overrun identified from the literature study and then amongst these factors 18 factors of overruns were categorized into three groups according to expert opinion. The top six causes of time and cost overrun identified are

Poor project monitoring, Lack of defined project management plan, Lack of contractual clarity, Erroneous quantity survey and estimations, Delay in material Indenting/ lack of considerations on long lead materials and Lack of proper construction methodology and sequencing. The ranges of causes of Overrun in completing marine construction projects in India were identified. The most important causes of overruns in marine construction projects in India were also identified. Therefore, the objectives of this study were substantially accomplished.

REFERENCES:

- [1] Sadi A. Assaf , Sadiq Al-Hejji. "Causes of delay in large construction projects" *International Journal of Project Management* 24 (2006) 349–357
- [2] Msafiri Atibu Seboru. "An Investigation into Factors Causing Delays in Road Construction Projects in Kenya". *American Journal of Civil Engineering*. Vol. 3, No. 3, 2015, pp. 51-63. doi: 10.11648/j.ajce.20150303.11
- [3] Ram Singh, "Delays and Cost Overruns in Infrastructure Projects: Extent, Causes and Remedies", *Economic and Political Weekly*, Vol.21. May 22, 2010, PP 43-54.
- [4] Chitkara, K.K. (2011), "Construction Project Management - Planning, Scheduling and Controlling", 2nd Edition, Tata McGraw Hills.
- [5] Lee, Jin-Kyung. (2008), "Cost Overrun and Cause in Korean Social Overhead Capital Projects: Roads, Rails, Airports, and Ports", *Journal of Urban Planning and Development*, Vol. 134, No. 2, 59-62.

[6] Apolot, Ruth. Alinaitwe, Henry. & Tindiwensi, Dan. (2012) , “An Investigation into the Causes of Delay and Cost Overrun in Uganda’s Public Sector Construction Projects”, *Second International Conference on Advances in Engineering and Technology*.

[7] Kasimu, M. A. (2012), “Significant Factors that Causes Cost Overruns in Building Construction Project in Nigeria”, *Interdisciplinary Journal of Contemporary Research in Business*, Vol. 3, No. 11, 775-700.

[8] Doloi, Hemanta. (2012), “Cost overruns and failure in project management - understanding the roles of key stakeholders in construction projects”, *Journal of Construction Engineering and Management*, www.ascelibrary.org, doi:10.1061/(ASCE)CO.1943-7862.0000621.

[9] Memon, Aftab Hameed., Rahman, Ismail Abdul., Abdullah, Mohd Razaki. & Azis, Ade Asmi Abdu. (2010), “Factors Affecting Construction Cost in Mara Large Construction Project: Perspective of Project Management Consultant”, *International Journal of Sustainable Construction Engineering & Technology*, Vol. 1, No. 2, 41 -54.

[10] Ali, A.S., Kamaruzzaman, S.N. (2010), “Cost Performance for Building Construction Projects in Klang Valley”, *Journal of Building Performance*, Vol. 1, No. 1, 110-110.

[11] Chang, Andrew Shing-Tao. (2002), “Reasons for Cost and Schedule Increase for Engineering Design Projects”, *Journal of Management in Engineering*, Vol. 10, No.1, 29-36.

[12] S.K. Patil, A.K.Gupta, D. B. Desai, A.S.Sajane (2013) “Causes of delay in Indian Transportation Infrastructure Projects”. IJRET eISSN: 2319-1163 pISSN: 2321-7308.