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A STUDY OF RESEARCH METHODOLOGY ON ANALYSIS OF OVERRUN FACTORS WITH SPECIFIC REFERENCE TO MARINE CONSTRUCTION PROJECTS

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ABSTRACT

Success of a construction project is measured by means of certain familiar factors like Client satisfaction, technical performance, delay in schedule and cost overrun from estimated budget etc. and marine construction is not an exception. Most of the industries in construction field have failed to maintain the client satisfaction throughout the project period because of delay. A lot of studies are being made on the topic of delay by collecting the views of stakeholders. Since it is a real time one, the experience of peoples involved in the construction field have more importance than their position in the project. Their ideas should be implemented for completing a project on time and within the budget. So the study of factors that causes overruns in construction of marine projects by collecting the views of experienced stakeholders is of utmost importance. The study thereby help the project management practices to curb the causes and effects of schedule delays in various marine construction projects and encourages the investors to invest in such huge projects.

Keywords: Construction Industry, Delay causes and factors, Project Management, Relative Importance Index, Spearman Rank Correlation

I. INTRODUCTION

In construction projects, delay is the main reason for the completion of the projects on time over several decades. It has been main research topic to know the main reason for the delay in construction projects. By identifying factors and attributes that causes delay, the research can be done for finding the major factors responsible for delay.

From development perspective of the country, marine projects have fascinated the minds of people in the form of ports, oil and gas and other under-water structures. But in the modern era, construction of such project began in the nineteenth century. But nowadays it became a factor of country's status and economic power.

The problem of time and cost overrun in the construction of marine construction projects is a global 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 delay in the construction of marine projects.

Shehzad Khan (2015) studied "An analysis on critical causes of delays in oil & gas construction projects" and found relative importance of delay factors by using various tools like Relative Importance Index (RII), Frequency Index – FI (%), Severity Index – SI (%) and Importance Index – IMP.I (%). Shehzad studied various delay factors- Project ManagementAdministrative Related, Design Related, Contract Action Related, Construction Related, Financial / Economical Related, Statutory Laws & Regulations Related and Act of God.

Asish Ram, Dr. Pratheeba Paul (2015) studied the "Study on Construction Sequence Delay for Road Infrastructure Projects" and concluded his research with various delay factors like Delay due to land acquisition, Environmental issues, Delay in progress payment, Ineffective project planning and scheduling, Poor site management and supervision, rework due to errors, Delay in approving design documents, Poor coordination between owner and other parties, Financial closure, Change order by clients.

Ms. Yogita, Honrao (2015) worked on "Study of Delay in Execution of Infrastructure Projects –Highway Construction" and studied many factors like Causes related to Contractor, Causes related to Owner, Cases related to Consultant Cases related to Services and Utilities, Causes related to Government Regulations.

Ghazi Saad A Elawi, Mohammed Algahtany, Dean Kashiwagi and Kenneth Sullivan (2015) studied "Major Factors Causing Construction Delays in Mecca" and based on delay factors like Land acquisition, Contractor' lack of expertise, Re-designing, Line services, they found the priority of the factors based on their frequencies.

Prof Siddesh K Pai, Mr. J.RajBharath (2013) studied on "Analysis Of Critical Causes Of Delays In Indian Infrastructure Projects" and using Frequency Index – FI (%), Severity Index – SI (%), Importance Index – IMP.I (%) prioritized many delay factors as per their percentages. Various delay factors studied by them were Delay at Project level, Delay due to Owner, Delay due to Contractor, Delay due to consultant, Delay due to Designer. , Delay due to Material, Delay due to Equipment, Delay due to labors, and Delay due to External factors.

Vivian W. Y. Tam and L.Y. Shen (2012) studied the "Risk Management for Contractors in Marine Projects". The study sought the relative importance of the factors that cause delays in marine construction projects. The paper emphasized on various delay factors like Acts of God, Poor inclement weather conditions, High tides Physical Damages to equipment, Labour injuries, Financial and economical Fluctuations greater than the estimated values, Unavailability of materials, plant or labour Political and environmental Changes in legislations, regulations and code of practices, Public disorders, Design Variations of design, Late information or site instructions by engineers, Construction related Possession of sites Inaccessibility to sites, Third parties' delays, Poor site controls, Poor workmanships, Lack of technical experiences Poor communications and management skills, Underwater conditions different from tender assumptions.

Mohamed Salama, MoustafaAbd El Hamid and Bill Keogh (2008) studied the "Investigating the causes of delay within oil and gas projects in the U.A.E." and worked on various delay factors like Delay in start of purchasing long-lead items, Wrong choice of contractor or project management consultant, Delay in material and equipment delivery, Insufficient data collection and surveys before design, Lack of experience and knowledge of contractor technical staff, Shortage of material in Market, Poor project management by contractor, Poor contract management, Shortage of experienced and qualified engineers, Ambiguous or incomplete definition of Client requirements, Poor project management by PMC, Wrong choice of contract type, Shortage of skilled labor, Ineffective 'delay penalties' or 'incentives for early delivery', Shortage of experienced and competent contractors and suppliers, Rework due to errors bycontractor or sub-contractor, Increased cost due to high inflation during project, Poor inspection and testing of equipment and material at supplier site, Long time for

approval and decision making by shareholder and Client representatives, Errors in design, Improper selection of subcontractor or supplier, Governmental and political related issues, Inadequate coordination among designers from different disciplines, Shortage in specialized construction equipment, Lack of involvement of operations and maintenance staff in the design phase, Major disputes and negotiations, Slow response and decision making; Inadequate study of market requirements, Lack of staff involvement in decision making and problem solving, Delay in contractor payment to sub-contractors and suppliers, Change orders during EPC by Client, Lack of IT use in communication and information management, Lack of communication among different parties involved Inadequate application of safety rules and regulations by contractor, Long time for tendering and award.

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).

NaikwadiSumaiyya R., KharePranay R. studied on "Causes of Delays in any Construction Project" and classified all delay factors into Inexcusable, Excusable and Concurrent delays and applied Relative Importance Index (RII) method to classify them as per their relative importance.

Hassan Emam, Peter Farrell and Mohamed Abdelaal studied "Causes of delay on infrastructure projects in Qatar" and studied many delay factors like Long response from utilities agencies, Major change of design during construction, Ineffective planning and scheduling, Ineffective control of progress, Changes in the scope of the project, Slow decision making, Delay in issuing the drawings, Delay in solving design problems, Delay in approving shop drawings and sample materials, Difficulties in obtaining work permits, Delay in issuance of change orders, Discrepancies between specifications and drawings prepared, Unreasonable project time frame, Shortage of manpower, Delay in the settlement of

contractor claims, Poor coordination with the stakeholders, Poor site management, Slow preparation of change orders requests, Low productivity of laborers, Delay in reviewing and approving contract documents.

From the above literature review, it is apparent that in most studies, the main importance is given for identifying the critical causes of delays based on different parties involved in construction projects.

However, quantification of the dependencies of one factor over others has not found widespread coverage. For instance, steps taken to control a critical reason might trigger a situation where other factors become critical and cause even more delay than earlier anticipated. Due to this reason, it is important to find out the Relative Importance Index (RII) and Spearman Rank Correlation of each delay factor in marine projects.

This Relative Importance Index and Spearman Rank Correlation gives us the information about main causes for delay which are affecting total completion time of project.

II. METHODOLOGY

Marine construction is an activity oriented process and because of its repeatability one can make a study of what the formers did. Researchers are using the method of collecting information from the industry experts, personal interviews and literature review. A prudently designed questionnaire helps to find the most possible causes of overrun based on judgement of key experienced stakeholders. A use of both online and offline questionnaires for data collection will be made. Relative importance index and Spearman's rank correlation coefficient method will be used for analysis of collected data to finally reach to conclusion.

Time overrun**:** For non-hustle completion of any project, the planners involved in the project make a baseline schedule known as baseline plan. Deviation from this baseline plan i.e. schedule time for completing the project is called as time overrun. Usually it will occur when activities or tasks within a project are not completed by the time assigned by project planning department. Cost overrun and time overrun inter-related to each other.

Cost overrun**:** The imprecise estimation of project budget is the root cause of many factors leading to project failure. The poor calculation of budget leads to inaccurate estimation. Cost overrun means an upside falling of any project expenditure from the budgeted cost. There are many methods to find out these type of alarming situations and management is very keen to find out any cost overrun in advance.

Methodology adopted for this study consists of well-established methods like questionnaire survey, relative importance index and spearman's correlation equation shown in Fig 1.The questionnaire survey will help the researcher to collect data while relative importance index and spearman's correlation will be used for analysis of data and finding the degree of association among respondent group.

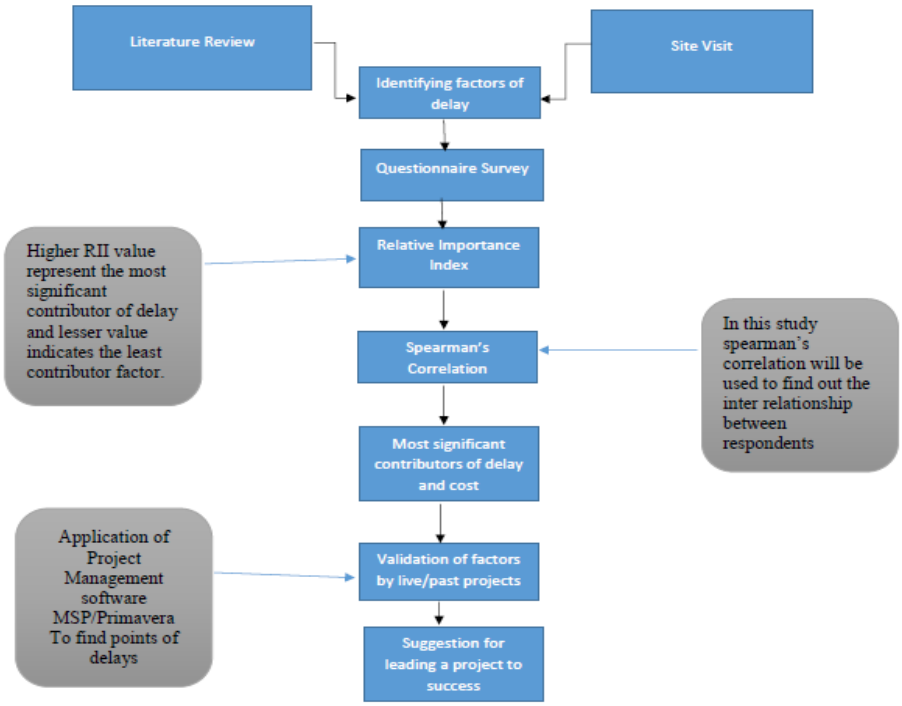

Figure 1: Proposed Research Framework

Data Collection and Analysis are the prominent features of this study because this will lead us to objective and conclusion of research study. Interview and questionnaire survey are the most commonly adopted methods for collecting the data. Questionnaire survey will be used to collect data which will in turn leads to measure the degree of association between the response of the respondents as per there experience.

There are several factors that contribute delay in marine projects. Among which some have more importance, some have less importance and some may be the root causes of both the overruns. Critical factors responsible for the delay in construction of marine projects will be first identified through a thorough study of literatures and also from opinion of industrial experts. From that, most critical repeated factors will be finalized to be the

part of questionnaire survey. Questionnaire will be consist of two to three parts of 8 questions each, which are planning section, execution section and general section. Respondents will be asked to tick the appropriate rating for each of the factors according to their experience. To facilitate the analysis of response, following numerical values will be assigned to the four option of each question in the survey.

1 = Strongly disagree

2 = Disagree

3 = Agree and

4 = Strongly agree

Since there is a higher probability for giving the option of "Neither disagree nor agree" for all the questions in the survey by the respondents, that option is removed from survey.

Relative Importance Index: Multiple regression analysis was the most frequently used statistical tool for the analysis of data in the organizational sciences until the development of relative importance index. Most of the research related with delay in construction industry make 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 represent the most significant contributor of delay and lesser value indicates the least contributor factor.

The analysis will be carried out by the following equation,

$$\mathbf{RII} = \boldsymbol{W/(A*N)}$$

Where:

W – The weight given to each factor by the respondents and ranges from 1 to 4.

A – The highest weightage (i.e. 4 in this case) and;

N – The total number of respondents.

Spearman Rank Correlation: There are actually three method for finding the strength of association between two variables. Pearson correlation method, Spearman rank correlation method and Chi square test of independent method.

Spearman rank correlation is a non-parametric test which is developed by Spearman and is used to measure the degree of association between two categories. It is usually denoted by "ρ" and it will vary from -1 to 1. The positive value of correlation shows that there is good positive relation in between that two categories and the other shows negative inter relationship of two categories. In this study spearman's correlation will be used to find out the inter relationship between respondents because the surveyor categorized the respondents into three, according to their experience (Experience less than 5 yr., Experience between 5-10 and Experience above 10 yr.).

$$\rho = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)}$$

Where d = difference in the ranking of a two set of causes; and n = number of data in one set of causes. Relationship between two categories are classified according to the value of "ρ".

±0.1 to ±0.3 → Low degree of correlation

±0.3 to ±0.5 → Moderate degree of correlation

±0.5 to ±1.0 → High degree of correlation

± 1.0 → Ideal correlation (perfect)

± 0.0 → No correlation

The above mentioned classification will give the idea of association between two categories. The most correlated categories can be combined to make a single result for this research.

III. CONLCUSION

The researchers are confident to achieve following prime objectives with the help of this study as they are on the finishing stage of the methodology:

- To find the critical problems that are responsible for schedule delay in the construction of marine projects in India.
- To find the degree of association between each two category among all the three categories of respondents.
- To suggest some remedies to curb the causes and effects of delay after analyzing the collected data.

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