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Cost Overrun & Time Delay study of Government Project in JNNURM-Case Study of Jabalpur City Using Fuzzy Model

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Abstract— *One of the most important success parameters of any project is its cost. The cost overrun factors are determined using a questionnaire survey and expert opinion ranked on a Relative Important Index (RII) scale. Graphs of cost overrun variation for various combinations of cost overrun factors are obtained. Using the Fuzzy toolbox of the MATLAB Program Software, this project work presents an application of fuzzy logic for developing a cost overrun evaluation model. The main factors affecting construction cost overrun in the Indore bridge construction industries are identified using these methodologies. By considering the delay factors characterized in bridge construction projects, a delay evaluation model based on fuzzy set theory was planned. The evaluation model was created with the MATLAB Software's Fuzzy toolbox. A two-case study was used to test the proposed methodology. The main factors affecting construction time delays in the Indore bridge construction industries are identified using these methodologies. The results of the evaluation model were found to be acceptable. Finally, some recommendations were made to reduce and control construction project delays. This paper presents an application of fuzzy logic for developing cost overrun and time delay evaluation model using Fuzzy toolbox of MATLAB Program Software. The top eight factors have been used for this purpose. Graphs showing the variation of cost overrun and time delay for different combination of cost overrun and time delay factors are obtained. Finally, the model has been calibrating, validated and testing using three case studies (Abstract)*

Keywords*—component, formatting, style, styling, insert (key words)*

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I. INTRODUCTION

The construction industry in India contributes more than 5% to the country's Gross Domestic Product (GDP) (GDP). Highways, railways, ports, bridges, power plants, tunnels, and municipal facilities are all part of the construction industry (Maheshwari and Latha 2015). Construction projects that are completed on time demonstrate effective planning, management, and construction.. If a project is completed on time and on budget, it is considered successful. When projects are overdue, they are usually either extended or accelerated, resulting in additional costs. Many projects, much to the chagrin of owners, contractors, and consultants, experience significant time delays and thus exceed initial time and cost estimates. The industry of bridge construction is one of the most dynamic and risky in the world. Many bridge construction projects fail to meet all of their objectives due to inherent risks and uncertainties in the project. These factors contribute to project failure in terms of schedule delays, cost overruns, and poor quality. In order to assign responsibility for the duration of the delay among the project participants (owner, contractor, and/or third party), time delays and cost overruns must be investigated. There are a variety of delay analysis methods available, such as the Delphi survey method, the additive delay analysis method, and fuzzy theory, among others. However, depending on the time and resources available for the analysis, as well as the accessibility of project control documentation, different analysis techniques produce different results for the same circumstances. When different parties' points of view are taken into account, the same technique may produce inconsistent results (Hegazy and Zhang, 2005).

II. OBJECTIVE

In any industry, the primary goal is to complete the project on time and within the allocated budget. One of the most dynamic, complex, fragmented, schedule-driven, and resource-driven industries is construction. It is constantly confronted with serious issues such as low productivity, poor quality, time delays, cost overruns, and so on (Memon et al., 2011). As the construction industry expands, so do the challenges of planning and budgeting.

The main goal of this research is to use fuzzy logic to analyse cost overruns and time delays in the execution of government projects under Jnnurm in Jablpur city.
The objectives of the study are:
1. To identify the factors affecting of cost overruns and time delay for governed construction project through questionnaire survey.
2. To develop cost overrun and time delay analysis model using fuzzy set theory.

Time delay and Cost overrun

Every infrastructure project must go through several stages, from project planning to approval, contract awarding to actual construction/procurement, and so on. The lifecycle of a project is divided into three stages: development, construction, and operation and maintenance. The project sponsoring department prepares estimates of time and cost (funds) required to complete the project at the start of the development phase. A projected completion date is also provided. The actual completion date is almost always different from the expected date. The time difference between the actual and planned (i.e. expected) completion dates is referred to as "time overrun." The difference in time is expressed in months. The term "implementation phase" or "implementation period" is also used. It is defined as the time it takes for a project to be completed, i.e. the time between when the project was approved and when it is expected to be completed. As a result, we can define percentage time overrun for each project as the ratio of time overrun to the project's implementation phase (multiplied by 100). The time overrun, and thus the percentage time overrun, could obviously be positive, zero, or even negative. Similarly, we define "cost overrun" as the difference between the project's actual cost and the projected (i.e. expected) cost.

III. METHODOLOGY

The essence of probability analysis is uncertainty and imprecision (Shull 2006). Any analysis that ignores this uncertainty and imprecision could result in seriously misleading information, which could lead to critical errors (Shull 2006). The fuzzy logic is based on uncertainties, which are inherently unreliable. It provides mathematical tools for dealing with data that is imprecise, uncertain, or ambiguous (Shull 2006).
The MATLAB programmed software's fuzzy logic toolbox was used to create the constructed fuzzy assessment model. The steps below were followed to construct the proposed fuzzy assessment model to be used in estimating the cost overrun and time delay.
1. The main input variable of this assessment model was the delay factors and groups identified in the previous sections.
2. The fuzzy membership functions and linguistic variables were determined.
3. To construct the fuzzy assessment model to estimate cost overrun and time delay, the relative importance indices of the factors and groups of factors given in the previous section were selected as the weights of the fuzzy rules, and the aggregation and defuzzification methods were determined.
4. The government projects were used to calibrate the constructed fuzzy assessment model.

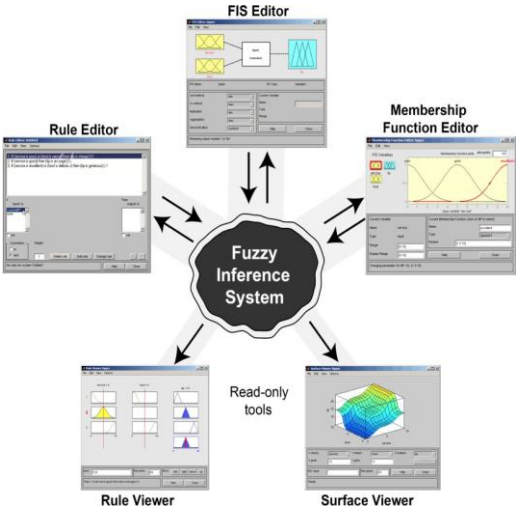

Fig.1 Graphical user interface tools to construct the fuzzy assessment model in the fuzzy logic tool

In this chapter, we present a systematic methodology for analyzing government construction projects, in which we identified the factors affecting the project's cost and time delay, and then ranked these factors using the RII. We created a fuzzy model and chose a triangular membership function as the basis for calibrating, validating, and testing the three models.

Fuzzy logic model for predicting time delay

A fuzzy logic model was developed to predict time delay. For the model, a Mamdani inference engine with a triangular membership functions were used Five fuzzy subsets namely, very low (VL), low (L), medium (M), high (H) and very high (VH) were used. Sensitivity analysis was used to select the topmost factors affecting time delay. The fuzzy model was calibrated Construction of Houses with Basic Infrastructure Facilities in Jabalpur, (Lal Kuan); the model was validated for Rehabilitation and Resettlement of Chuni Khada Madia And Area Behind Burn Company Shyma Prashad, Jabalpur City. and the model was tested for Slum Rehabilitation of Basor Mohalla, Choudhary Mohalla, etc In Jabalpur City.

IV. RESULT

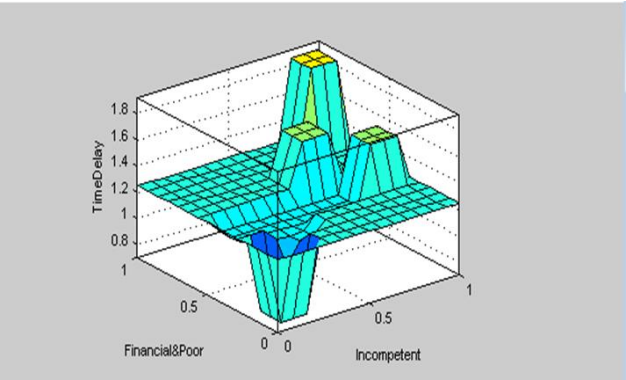

Fig.2 Variation of Incompetent project team and financial problems & poor quality of construction material with respect to time delay for Lal kua Project

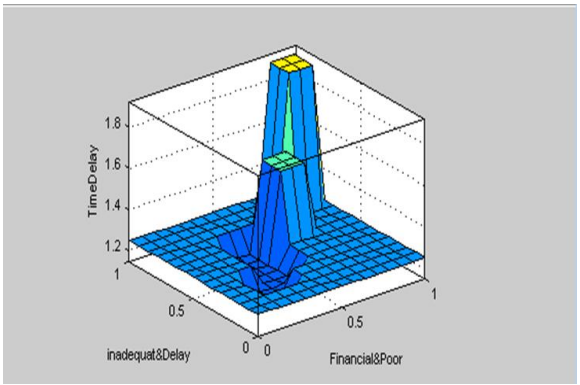

Fig.3 Figures and TablesVariation of financial problems & poor quality of construction material and inadequate project planning/scheduling & delay in approving design document with respect to time delay for Lal Kua Project

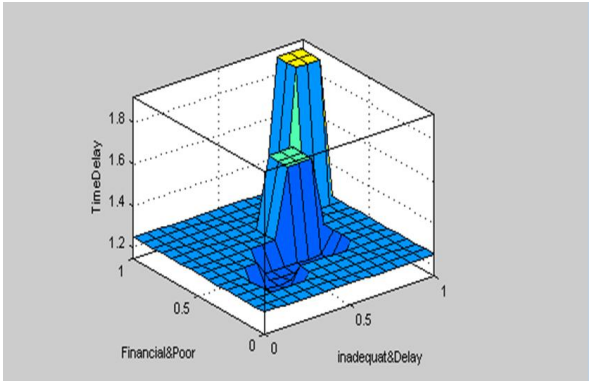

Fig.4 Variation of Inadequate Project Planning/scheduling & Delay in approving design document and financial problems & Poor quality of construction material with respect to time delay Lal Kua Project.

V. CONCLUSION

To validate the survey findings on the most eight significant factors contributing to cost overrun and time delay, a detailed case study analysis of three government construction projects (BSUP unit at lal kua, bagra dafai porject, choudhary mohalla basor mohalla porject) was conducted. For cost overrun Lal kuaa Project, the average percentage error is less than 2.5 percent for five factors (2.23 percent) and less than 5% for eight factors (0.69 percent). For five factors (20.75 percent) and eight factors (8.75 percent), the average percentage error for the time delay lal kua project is less than 2.5%. (7.25 percent).

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