

## Abstract

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In the present times, construction sector is termed as an industry. The real estate sector acts as an essential participant in making the construction industry successful. Housing accounts for a major share of the real estate sector. Majority of the housing projects being constructed in India are beset with time and schedule overruns. Schedule overruns are caused due to a wide range of factors, e.g., site-related issues, land litigations, issues related to payment, market demand. Although the principal reasons for construction delays are comparable across different locations within a country, several factors pertaining to local industry, socio-economic issues, cultural effects and project characteristics also contribute to construction delays. Various research and literatures have indicated the relationship between construction delay and its possible causes. Estimating the schedule is an important aspect in deciding the viability of a construction project, especially if the project invests huge amount of money. Utilizing the experience from past construction projects can be helpful in predicting the delay in construction projects. Case-based reasoning (CBR), a technique that uses knowledge from past experiences, can be viewed as an effective method in estimating the construction delay. Even though CBR has been frequently used to predict the construction project costs in previous studies, studies performed for determining construction schedule and delay are rare.

Research literature stops short of developing a methodology for predicting construction delay. The prediction of construction delay is one of the prime areas of modern construction management research. Forecasting the amount and nature of delay in any construction is a complex process and varies with various situations and locations. Moreover, a prediction model that can predict construction delay in the construction activities of individual buildings of a construction project would be beneficial to project stakeholders in the long run. With emphasis on residential high-rise construction and using information from past projects, this research focuses on developing a methodology for predicting construction delay using CBR with the attribute weights determined from certain analysis methods. The attribute weights were input from multiple regression analysis (MRA) and artificial neural network (ANN).

Against the previously mentioned background, the present study is an attempt to develop a systematic model for predicting the delay in specific construction activities, pertaining to the execution of high-rise buildings, using the learnings from previous projects. Initially, a primary survey was carried out in four metro cities of India (Bengaluru, Kolkata, Mumbai and National Capital Region) to identify the various causes of construction delay and its relative impact. In the

second part of the research, the prediction of schedule overrun is forecasted on the basis of (i) primary level building data and (ii) repetitive construction activities. The study considers the data from several projects that are nearing completion in the city of Kolkata as the basis for developing such a model. The prediction of delay is computed using case-based reasoning (CBR). The attribute weights for the analysis were input from multiple regression analysis (MRA) and artificial neural network (ANN).

The results indicate that as compared to conventional multiple regression methods, CBR performed better in forecasting the construction delay. Though this study focusses on residential high-rise construction, the construction industry may be benefitted using the learnings from this study. A project database consisting of the details related to previous projects can prove to be useful for the construction professionals not familiar with the challenges existing in new locations. Consequently, this study can provide means of predicting the construction schedule in construction projects using preliminary project information. Techniques like case-based reasoning (CBR) can be beneficial for construction project stakeholders as an excellent tool for systematically utilizing past experiences for future projects.

**Key words:** construction delay; delay prediction; repetitive activities; high-rise construction; case-based reasoning; residential buildings.