

AN OVERVIEW OF SCHEDULE ESTIMATION IN CONSTRUCTION OF A RESEDENTIAL BUILDING

¹Abhishek Asthana, ²Sarthak Singh Rajput,
¹M.Tech student, ²Corresponding Author and Assistant Professor,
¹Civil Department,
Integral University, Kursi Road, Lucknow, India

Abstract : The main aim of project management is to complete the project within specified time and along with assured quality. Adopting conventional execution practices, it is difficult to constantly measure the progress of work, evaluate plans, and track the cost and time as well as adopt corrective measures wherever required. Planning effectively by systematic application of project management skills and techniques has become the need of the hour in order to overcome the problems faced by adopting conventional construction execution practices.

There are various tools and techniques available for optimizing the construction procedure to prevent time overruns. The monitoring tools adopted during construction plays a significant role for thriving completion of project on time and within estimated budget.

In this study, I have made an effort to estimate the overall time required to execute a residential building by use of conventional construction execution practices and by adopting project management techniques to compare the results for justification.

Index Terms - Project Management, Project Management Software, conventional construction execution, time optimization and primavera.

I. INTRODUCTION

A *schedule* is a work program, set date-wise in a logical sequence; it is a time table for action. Time scheduling is the process of developing a work program. It implies programming of the chosen work plan on a calendar basis and provides the base against which all progress is measured. In order to accomplish this, the project must be broken down into well-defined work tasks. The details as well as relationship between these individual tasks must be determined.

A construction schedule is a communication tool with different levels of accuracy for different phases of the project. At a minimum, the Preliminary Construction Schedule should include milestones demonstrating the start and completion of major tasks or activities. Estimating a construction schedule is not limited to just the time when building is ongoing; there are tasks to be carried out both before and after the physical construction of the project to consider, and gives various parties involved responsibility over different functions.

Theme that underline scheduling

Set Goals \longrightarrow Plan

There are various techniques used for scheduling a project depending upon :-

- size
- Complexity
- Personnel
- Owner requirement

There are some of the general methods and techniques that are commonly used are :-

- Bar chart or gannt chart
- Critical path method (CPM)
- Work breakdown structure
- Concept of network and precedence (signify the order inwhich they would be completed)
- PERT (program evaluation and review technique)

The schedule estimation tells the project manager how long it will take to complete the project. It also helps the basis for planning cost and resource plans.

For example,

Whether you are constructing a house extension or building a large commercial unit, the duration of the project needs to be accurately estimated in order to correctly assess such items as resources and budget.

Estimating a construction schedule is not limited to just the time when building is ongoing, there are tasks to be carried out before and after the physical construction of the project to consider.

“A good schedule also establishes the relationship between task and time”.

II. BASIS OF STUDY

I. Project Management in construction

A project generally starts at the right pace but as it proceed, activities gets off the schedule due to various tribulations like; improper planning, uncertainties, non delivery of resources on time, execution delays, environmental factors and so on, which directly impacts on cost.

Thus, application of project management in construction aims to accomplish the precise goals by virtue of perfect planning, scheduling, executing, monitoring as well as controlling time, finances and utilizing all resources effectively. It is an interconnected group of processes which directs the project team to accomplish a successful project within specified cost as well as time.

II. Project Management Software

Project management can be implemented to projects achieved via software like Microsoft Project and Primavera, which are applications developed to help manage projects and other works effectively. The applications are able to perform the following:

- a) Develop and schedule a plan
- b) Create an appropriate standard base calendar or based upon usage working calendar
- c) Assigning relationships between scheduled activities
- d) Define resources required for the project
- e) Helps to level and smooth out the resources between activities
- f) Helps to update and track work progress regularly
- g) Performs earned value analysis
- h) Allows to incorporate revisions and reanalyzes the data

III. Primavera P6 PROFESSIONAL R8.3

Primavera Systems Inc. provides project and program management software for the Architecture, Engineering and Construction industry. Focused on project portfolio management, or PPM, Primavera's solutions let users' measure progress, assure governance, improve team collaboration and prioritize project investments and resources.

Primavera's software packages include P6, ProSight, Contract Manager, Cost Manager, Pertmaster, SureTrak, Evolve and Inspire. The newest addition to the suite of project management solutions is Primavera P6, which is an integrated PPM (project portfolio management) solution that provides a real-time view of portfolio performance. P6 also offers what-if scenario modeling, tabular scorecards and capacity analysis.

Application of Primavera

- Balance resource capacity.
- Monitor and visualize project performance versus plan.
- Plan, schedule and control complex projects.
- Conduct what-if analysis and analyze alternative project plan.
- Allocate best resource and track progress.

Advantages of Primavera

Primavera P6 Reduces Risk When your schedule has inconsistencies, errors, or overrun issues, project expenses will grow. This could mean cutting more vital aspects of the project to compensate for the excess costs. Using Primavera P6 helps identify and mitigate risks in the course of planning, managing, and completing a project

Easy to Use Software Primavera P6 offers many complex analyses and processes; however, accessing and managing the schedule remains simple. Simply input your information, and wait for the software to determine if any problems exist. For example, worker shifts may be uncovered, have too many employees, or additional raw materials may be needed. P6 may be used throughout an entire project, even large, multi-tier projects.

Optimized Resources Primavera P6 allows all involved in a project to carefully monitor resource availability and adjust such resources to meet project demands. Furthermore, the software can help identify areas where resource costs may be reduced by analyzing resource trends and costs. 20

Enhanced Visibility Visibility and compliance with political and environmental regulations are among the top priorities for project managers and business executives. Since Oracle Primavera P6 allows all data to be entered, tracked, and analyzed in one location, you can ensure your project does not pose any possible violations.

Forecasting of Project Activities As a project evolves, the project may require additional resources, activities, and tasks to meet stakeholder demands. Within Oracle Primavera P6, project managers can create forecasts for resources, activities, and other project needs.

IV. Review Paper

Anuj Dubey, Tajammul sayed, Jan–2015¹

In his paper they emphasize on the use of software's for scheduling purposes in Project Management. They selected Hadapsar-Saswad bridge in Pune for construction scheduling as a case study. In this project the activities were first listed out, quantities were estimated, resources were allocated and hence a final schedule was created. Some suggestions were made on the site so as to overcome the obstacles on the site without affecting the project's duration and also not hampering too much with the cost. Smoothing and Tracking were done using the software's and the results were analyzed to find the optimum time of Construction. The variation of time and cost can hence be analyzed along with the constraints to finalize a given project Schedule.

After scheduling on Microsoft Project and Oracle Primavera, the results are analyzed to give suitability of the given software's for specific circumstances.

Aaquib Rasul Mazumdar,Mayak JindalA, Oct.-Dec 2012²

This study includes the layout of G+4 residential building using AutoCAD, Analysis and Design using STAAD Pro, Planning using Primavera P6 and concludes with the cost estimate for the entire project.

The layout of the proposed G+4 residential building is based on a plot of size 150' x 90' located at Jangpura, Delhi.

Previously the plot was being used as a commercial complex, but according to the new plan it will be used as a multi-storied residential building. The ground floor of the building will be used as parking while the remaining 4 floors will be divided into 8 apartments each having an area of 246sq m. Each apartment is of 3BHK configuration. All the drafting was done using AutoCAD. Also these drawings made on AutoCAD also served as a base for transfer of the structure for analysis and design into STAAD Pro.

Rashmi J V, Amey A Kelkar, Vishwanath K G, July -2017³

It highlights management techniques in a proper way reduces the cost and time of construction, without affecting the quality and performance. Use of Microsoft Project software gives a proper scheduled path which helps in setting a track for all the activities, to check if there is deviation from planned cost and schedule. Application of proper management helps project manager to achieve efficient project performance by waste minimization and resource optimization along with proper planning, scheduling and controlling activities during construction processes. Time management and resources management are considered as leading factors which highly affect the competent and timely completion of project within schedule

Igor_Peško, Vladimir_Mučenski, Miloš_Šešlija, 2017⁴

This paper includes research of precision that can be achieved while using artificial intelligence for estimation of cost and duration in construction projects. Both artificial neural networks (ANNs) and support vector machines (SVM) are analysed and compared. The best SVM has shown higher precision, when estimating costs, with mean absolute percentage error (MAPE) of 7.06% compared to the most precise ANNs which has achieved precision of 25.38%. Estimation of works duration has proved to be more difficult. The best MAPEs were 22.77% and 26.26% for SVM and ANN, respectively.

Pedro Alexandre Amaral Lopes ,October, 2013⁵

It suggest the very simple and effective model to apply in project management and monitoring, and presents the current project status as well the forecasts of its status through explanatory reports and other able performance indicators. One of the most innovative aspects of this model is the interconnection of the activities from the planning program with the items from the bill of quantities as well with the budget in one software package. This process reduces the workload required in making compatible data produced of the two different cost and time control software package so that it can be analyzed.

XU Zhe, WU Jin-jin, WANG Yang-qing, June 2016⁶

In this paper they both studies independent estimating techniques, the high confidence percentile estimating values for cost and schedule can't be gained simultaneously, and the cost risk and the schedule risk are increasing in the actual projects. The integration method combines Monte Carlo multiple simulation analysis technique, regression analysis and statistical analysis. First, the project with stochastic cost and duration in activities was simulated m times using n runs per simulation. Then, the simulation outputs of cost and schedule were analyzed.

K. Bansal, Nov 2016⁷

His paper presents a geographic information systems (GIS) based methodology for scheduling as an alternative to the existing 4D computer aided design tools. A methodology to build a 3D model and link it with the construction schedule using several in-house scripts written in GIS environment is discussed. It allows the planner to understand the construction schedule quickly by linking the activities of the schedule with the corresponding 3D components as well as to visualize a buildable schedule on a computer screen. The proposed methodology utilizes the dynamic linkage between the activities in the schedule and corresponding 3D components, thus, making it possible to detect the incompleteness and logical errors in the schedule sequence.

Chung-Ying Yu, 2013⁸

His paper outlines the development of artificial neural networks ensemble and support vector machines classification models to predict project cost and schedule success, using status of early planning as the model inputs. Through industry survey, early planning and project performance information from a total of 92 building projects is collected.

The results show that early planning status can be effectively used to predict project success and the proposed artificial intelligence models produce satisfactory prediction results.

Highlights

- ▶ Project success is predicted using AI techniques (ANNs-ensemble and SVMs).
- ▶ Status of early planning is model input and project success is model output.
- ▶ Data from 92 building construction projects are used to develop and test models.
- ▶ Better early planning leads to project cost and schedule success.
- ▶ AI techniques are applicable for non-linear data in this case.

Yuan Fang, March 2015⁹

This paper presents a scheduling system that applies Multi-Dimensional (MD) CAD model, Object Sequencing Matrix (OSM), and genetic algorithms (GAs) to generate the time-cost integrated schedule for the construction project. A computer implementation called MD CAD model-based Project Scheduling System (MD_PSS) is also developed to verify the feasibility of the proposed approach.

Swee Lean Chan Corresponding author & Moonseo Park, Dec 2001¹⁰

His study aimed to develop a schedule estimation model considering both labor and equipment resources. In this study core wall construction was selected because it is a very important construction activity in terms of schedule estimation for high-rise building construction. To develop a schedule estimation model for core wall construction, an in-depth case study was conducted. On the basis of the results of the case study, a simulation model was developed using the CYCLONE method. Finally, by using the results of the simulation, a schedule estimation model for core wall construction was developed by conducting multiple-regression analysis. By using the developed model, a project manager can easily, quickly, and accurately perform schedule estimation when there are problems that may cause construction schedule delays during the construction phase.

V. CONCLUSION

With reference to the above mentioned papers I would like to conclude the following points:

- 1- The use of project management techniques in a proper way reduces the cost and time of construction, without affecting the quality and performance.
- 2- Application of proper management helps project manager to achieve efficient project performance by waste minimization and resource optimization along with proper planning, scheduling and controlling activities during construction processes.
- 3- Moreover with respect to tool (Primavera), The software is very easy to apply which enables to include almost all of the details of a project can have, It's very efficient for big projects with many branched activities. we can add all types of files we need in any section of the project so that it makes your project as inclusive as ever.
- 4- Though there are various tools available for schedule estimation as per this study is concern, I have opted for primavera p6 software for my analysis work.
- 5- This study will bring an entire schedule estimation of a residential building.

VI. REFERENCES

1. AnujDubey, Tajammulsayed Jan–2015,“Bridge Construction Scheduling”, ISSN - 2249-555X, Department of Civil, MIT PUNE .
2. Aaquib Rasul Mazumdar,Mayak JindalA Oct.-Dec 2012, “Project Report On design, planning and cost estimation of a G+4 residential building” E-ISSN 0976-3945, Amity university, Uttar pradesh.
3. Rashmi J V, Amey A Kelkar, Vishwanath K G July -2017, “Planning and scheduling of a multi-storeyed residential building with conventional execution approach as compared with application of project management techniques”, ISSN: 2395-0056,Dept. of Civil Engineering, Jain College of Engineering, Belagavi, Karnataka, India
4. Igor Peško, Vladimir Mučenski, Miloš Šešlija 2017, “Estimation of Costs and Durations of Construction of Urban Roads Using ANN and SVM”, ID 2450370, University of Novi Sad, Faculty of Technical Sciences, Trg Dositeja Obradovica 6, Novi Sad, Serbia.
5. Pedro Alexandre Amaral Lopes October, 2013, “Integration of the Construction Estimate in Construction Programe”, Técnico Lisboa ,Av. Rovisco Pais 1,1049-001 Lisboa, Portugal.
6. XU Zhe, WU Jin-jin, WANG Yang-qing june 2016,“Confidence Percentile Estimation to Cost and Schedule Integration Based on Monte Carlo Multiple Simulation Analysis Technique” School of Economics and Management,Beijing University of Aeronautics and Astronautics, Beijing 100083, China
7. V. K. Bansal nov 2016, “Generating, Evaluating, and Visualizing Construction Schedule with Geographic Information Systems”, Lecturer, Dept. of Civil Engineering, National Institute of Technology, Kurukshetra, Haryana, 136119 India (corresponding author).
8. Chung-Ying Yu 2013,“Predicting construction cost and schedule success using artificial neural networks ensemble and support vector machines classification models”, Dept. of Civil Engineering, National Kaohsiung University of Applied Sciences, 415 Chien-Kung Road, Kaohsiung, 807, TAIWAN
9. Yuan Fang march 2015, “Analysing the construction logistics” Guangdong University of Technology China, Guangdong, Guangzhou, Panyu, china.
10. Swee Lean Chan Corresponding author & Moonseo Park dec 2001,“Project cost estimation using principal componen”,Department of Building , National University of Singapore , 4 Architecture Drive, Singapore 117566