

BIM based Project Scheduling and Progress Monitoring in AEC Industry

Saini, Vijay Kumar¹, Mhaske, Sumedh²

¹Veermata Jijabai Technological Institute, H.R. Mahajani Marg, Matunga, Mumbai MH 400019, India

²Veermata Jijabai Technological Institute, H.R. Mahajani Marg, Matunga, Mumbai MH 400019, India

Abstract: *Traditional scheduling and monitoring technique fail to provide a clear view of the ongoing actual work at the project site. Building Information Modeling (BIM) is Single file concept collaborating various database of the project at one platform. Various databases are simulated virtually and forth coming impediments can be known beforehand. In this paper, traditional and BIM methods of scheduling are explained taking 4th dimension as time. This paper explains the Software used & methodology used by which 4D model of a building can be created. This paper describes the model from the perspective of a construction manager and therefore database in model is restricted to civil work.*

Keywords: Building Information Modeling, Methodology, Digital Interface, Simulation

1. Introduction

The Architecture, Engineering and Construction (AEC) industries have long sought techniques to decrease project cost, increase productivity and quality, and reduce project delivery time. Effective planning is one of the most important aspects of a construction project and influences the success of a project. Recently, a quiet revolution has been taking place which will fundamentally change the very fabric of the audiovisual design and integration business. This revolution is the increased utilization of Building Information Modeling (BIM). 4D modeling is the integration of a 3D model with a construction schedule in order to visualize the sequence of construction. 4D models can be created to various levels of detail, from high-level zone analysis during the design phase, to detailed subcontractor coordination during construction. The same model can be updated and maintained throughout the project based on the updated schedule and 3D model. This paper gives the information about the various software used, methodology adopted for the making a 4D model.

2. Literature Review

2.1 Two Dimensional Computer aided design (2D CAD)

Initial drafting tools in architecture are pencil; paper etc. with these tools Architects create different supporting drawings for a project in multiple sheets. 2D applications are nothing more than “electronic drafting boards” capable of providing only two-dimensional drawings, without the capability for 3D models.

2.2 Three Dimensional Computer aided design (3D CAD)

3D CAD programs allow users to create a spatial model of the building together with the necessary 2D documentation. Some drawings (e.g. sections or elevations) can be partially derived from the 3D model but in most cases the documentation is kept in a separate file (or set of files) from the model. Most 3D applications offer built-in visualization

tools and basic quantity calculation features (e.g. floor areas, roof areas).

2.3 Current Design Methods

The technology development from 2D CAD to 4D simulation greatly improved the design process. 2D CAD developed into 3D modeling. This innovation changed the process of building design and the relationship between the structural engineer and the architectural designer. It did not only change the way building designs are visualized, but also signaled a paradigm shift in design thinking from pure visualization to simulation.

2.4 Building Information Modeling (BIM)

Building information modeling is a building design and documentation process. It enables you to create and manage information about a building project, using the information about the building project which is stored in a 3D model. More importantly, the intelligent data inherent in the building model allows you to experience your design before it is real, simulate and visualize design alternatives, analyze performance, and make better informed design decisions earlier in the process.

3. Need of BIM in Project Scheduling and Progress Monitoring:

Due to the difficulty observed in using the traditional scheduling and monitoring methods, the construction industry has acknowledged that its current scheduling and progress reporting practices are in need of substantial improvements in quality and efficiency. Research efforts to incorporate visualization into scheduling and monitoring have been motivated by the failure of traditional methods.

Building Information Modeling (BIM) allows project managers and different people involved in the project with different backgrounds to get the accurate information of the project and monitoring of activities. The project manager and client can use the visualization aspects at any stage of

the project to monitor the activities and cost flow. BIM improves the construction planning and design efficiency by integrating the 3D model and schedule of the project at one platform.

4 Methodology

Various software used for making a 4D model are AutoCAD 2013, Autodesk Revit 2013, Microsoft Project 2007, Autodesk Navisworks Manage 2013. Following are the steps for creating a 4D model.

- 4.1 Creating Architectural Design by using AutoCAD 2013.
- 4.2 Creating 3D model by using Autodesk Revit 2013 by starting using a new template file or importing 2D CAD file and then raising model on it.

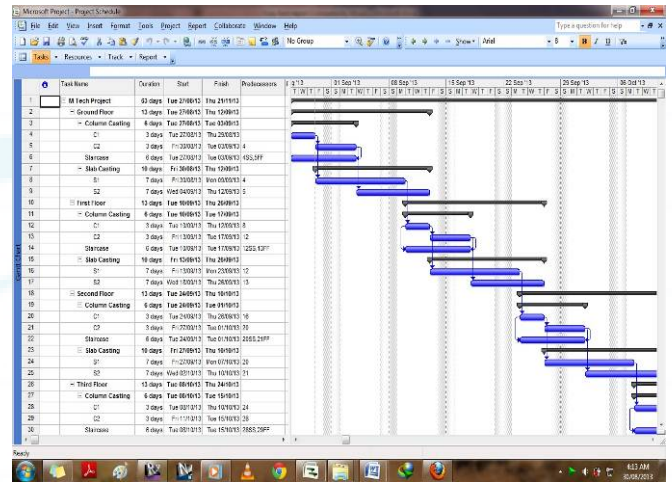


Figure 3: Creation of MSP schedule

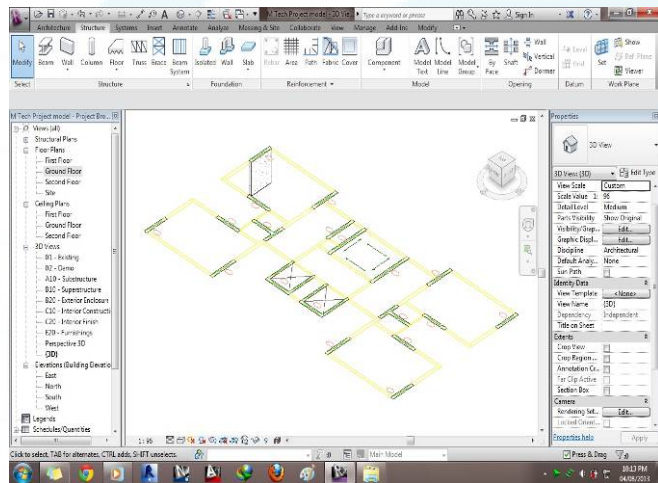


Figure 1: Creation of model in Autodesk Revit 2013

- 4.3 Creation of an orthographic 3D view by pressing a home shape button in the view tab. Different 3D views can be viewed by rotating the cube.
- 4.4 Export the model from Autodesk Revit 2013 while it is opened in 3D view.

- 4.6 Import 3D model file and construction schedule in Autodesk Navisworks.

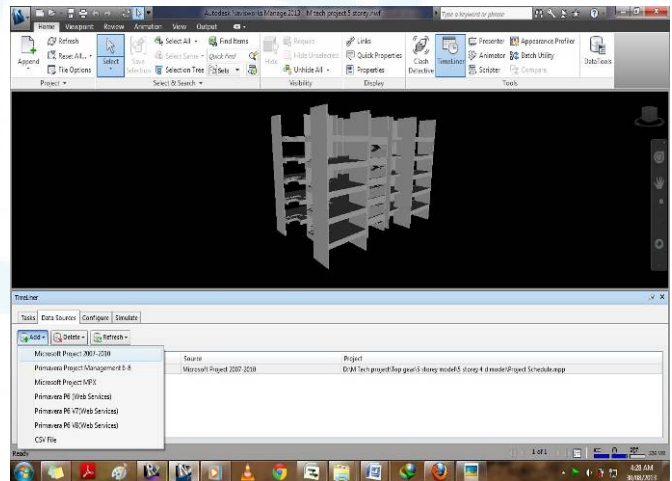


Figure 4: Importing 3D model and MSP schedule

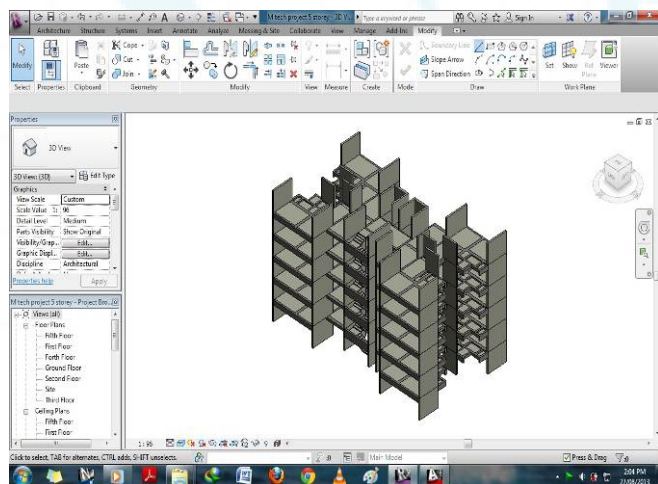


Figure 2: Creation of 3D model.

- 4.5 Create Work Breakdown Structure for the model and accordingly prepare schedule in Microsoft Project 2007.

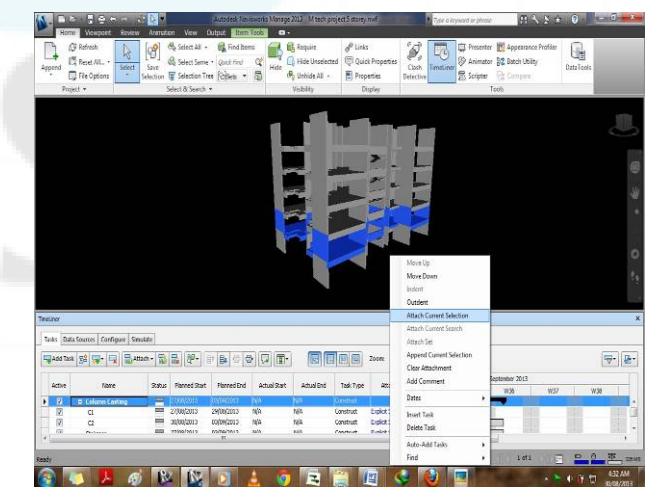


Figure 5: Linking activities with 3D model

4.8 Configure settings for the project in the simulation tab.

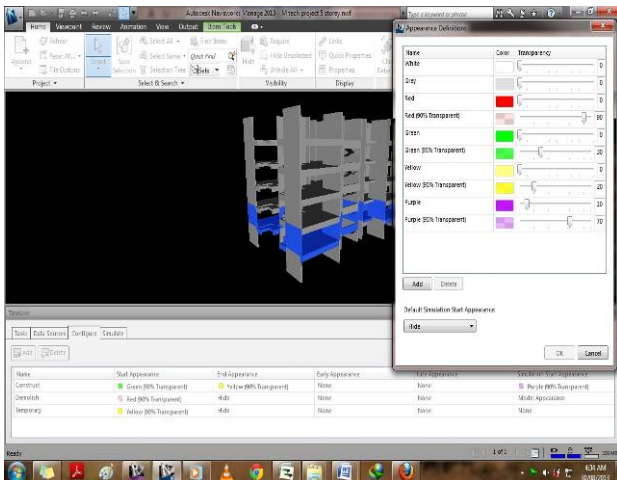


Figure 6: Configuring the settings for simulating the model

4.9 Start simulation for viewing the 4D model.

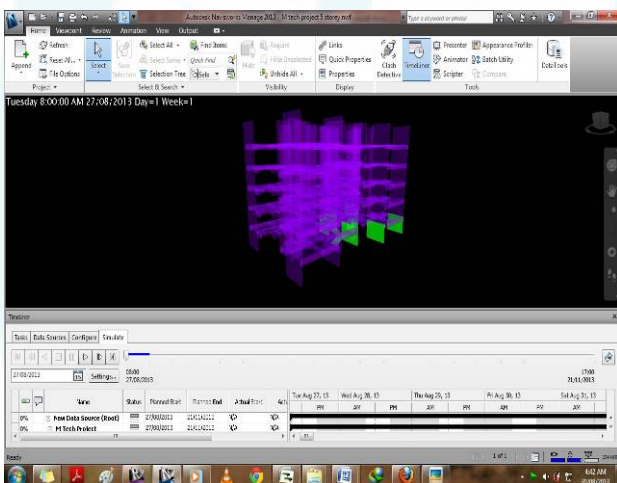


Figure 7: Simulation of the project.

5. Conclusion

The proposed methodology utilizes the dynamic linkage between the activities in the schedule and corresponding 3D components and help to detect the incompleteness and logical errors in the schedule sequence. This is because, BIM provides the user with a real time representation of the project which may improve and speed up the construction planning as well as ensure data integrity and accuracy. BIM, thus is not only a visualization tool but can be utilized as a project scheduling and monitoring tool at any stage of the project in which the schedule and the 3D components can be manipulated in a single BIM environment. The schedule in BIM allows easier understanding of the project as well as helps to detect possible problems in it. Therefore, by integrating and displaying specification/recommendation and construction resource information, the schedule in BIM promotes interaction and collaboration among the project team members from different fields.

6. Future Scope

Building Information Modeling is a team based work; however in this dissertation study is restricted to civil engineering construction planning & scheduling. Current model can be further enhanced by adding various databases from other fields also like electrical, mechanical, plumbing etc. In this paper 4th dimension is considered as time, further other dimensions like cost, resources, materials etc. can be taken as nth dimensions and thus creating a 5D model.

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Author Profile

Vijay Kumar Saini received the B.E degree civil Engineering from D.Y Patil College of engineering, Akurdi, Pune in 2011. Presently 2011-2013, he is pursuing his M Tech in Civil Engineering with specialization in construction management from VJTI, Matunga, Mumbai, India.