

FEASIBILITY STUDY OF BIM IN G+1 BUILDING CONSTRUCTION PROJECT

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Abstract— In any building construction project Quality, cost and time are the 3 most crucial factors. In fact, the success of a project is determined by how well these three elements are managed throughout the construction phase. Even though, there are many traditional methods and software's to provide assistance in this process but often than not, they are proven to be expensive and error prone. In the last few years, the construction industry has witnessed a spur in the use of more advanced software and tools, thanks to the rapid technological advancements, and one of them is emergence of BIM. At present BIM is mainly used in managing large scale projects and has become the most important factor of the success of the many such projects all over the world. While this research tries to explore the feasibility and the practical problem arising in the process of adopting BIM even for small scale residential building construction project. This research work analyzes a 3D model and a construction schedule are combined in 4D modeling to represent the order of construction. This was attempted to explain 4D BIM for better co-ordination, communication and share information among project team which is useful for projects in terms of performance and time. For this purpose, the researcher has considered case study on site of G+1 residential building with total construction area of 80 square meters.

I. INTRODUCTION

All In the Architecture, Engineering and Construction (AEC) sector, different individuals, techniques and resources are combined to create projects of increasing complexity. One of the most important elements of a construction project is effective planning, which affects the success of the project. A quiet revolution has recently taken place that will radically change the fundamentals of the audiovisual design and integration industry. This revolution (BIM) is the growing use of building information modeling. 4D modeling combines a 3D model with a construction schedule to show the sequence of construction. From high-level zoning analysis during the design phase to precise coordination of subcontractors during construction, 4D models can be created at various levels of complexity. Based on the revised schedule and 3D model, the same model can be updated and maintained throughout the project. This article provides details on the tools and processes used to create a 4D simulated model of a G+1 residential building. This project involves a new approach to building design, construction and facility management. Figure 1 : Conventional Process vs. BIM The main objective of this BIM guide is to teach construction managers the main concepts and words related to the application of BIM that may be relevant to their line of work or academic research. In particular, it focuses on providing advice and information on how to incorporate BIM into business environments and future or existing construction projects. The term "BIM" in this project refers to a process (building information model), not an item (building information model). The aim is to demonstrate that BIM is a human activity that will ultimately lead to significant process improvements in the construction industry rather than an object or a certain type of software.

II. OBJECTIVES

- To Evaluate feasibility of BIM tool and understanding its effectiveness.
- To Evaluate suitability of software like Auto CADD, Revit, sketch up, staddpro, MS project, etc.
- To visualize actual project before construction.
- Case study on implementation of 4D simulation model on G+1 residential building construction project.
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III. METHODOLOGY

Designing architectural structures, the three key pieces of software utilized by civil engineers in their workflows are AutoCAD, Revit, and STAAD Pro. These three software programs have evolved into indispensable instruments for civil engineers all around the world, enabling them to plan projects with speed and accuracy and analyze complex structures with robust toolkits. We construct a secure building with the aid of programmes like AutoCAD Revit MSP SketchUp Navisworks stadd Pro. Create a 3D model Direct design of the project model is possible with Revit 2021. Using the Import option in Revit, the 2D CAD drawing can be imported; however, if the architect created the architectural drawing using AutoCAD, During the project planning, design, construction, and operating phases, identify high value BIM usage. 2) Create process maps to design the BIM execution process. 3) Create the framework for the implementation, including the contracts, communication protocols, technology, and quality control. Manage a 4D model in Navisworks The platform utilized by Autodesk Navisworks Software to create 4D models is called Manage. MSP schedule and 3D models (structural and architectural models) are loaded. Navisworks automatically aligns the rotation and origin of models when a 3D file is imported. It also scales each file's units to correspond with the display units. We can manually change the rotation, origin, or file units for each of the opened files if they are set incorrectly for the scenario. Arrangement in MSP The

management of the projects will be carried out with the aid of Microsoft project software. It gives the entire time and cost of the project, as well as aids in tracking the project.

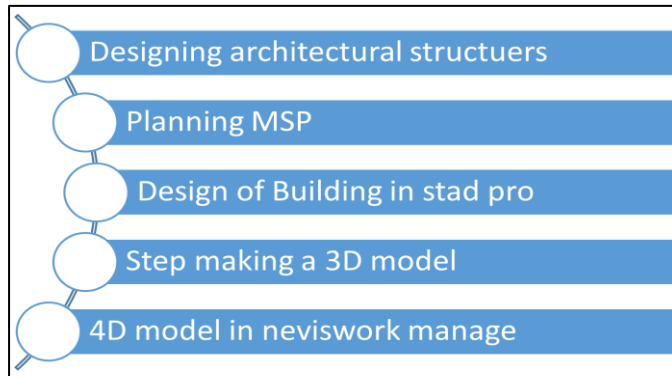


Figure 1: Methodology

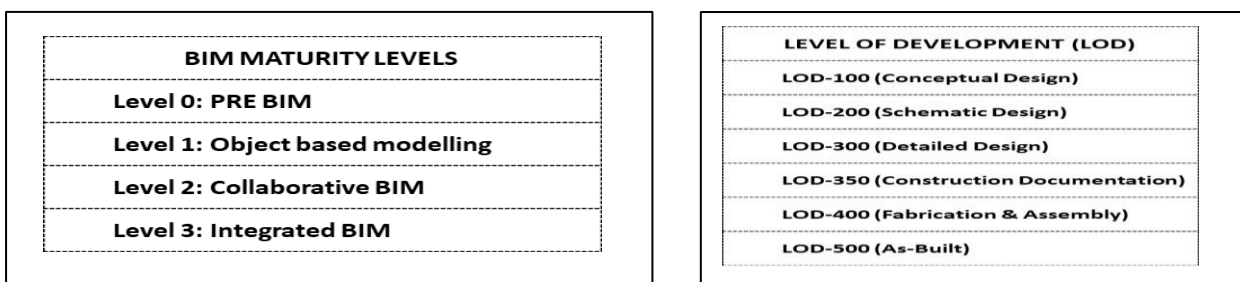


Figure 2: Levels of BIM Maturity & LOD Steps

The BIM Project Execution Planning building SMART alliance (BSA) Project is the source of the BIM Project Execution Planning Guide. The National Building Information Modelling Standard (NBIMS) is being developed in the USA by the BSA. The fundamental ideas of modelling and information exchange have been created to complement the long-term objectives of the BSA in the creation of a standard that may be put into practice. The maturity of a BIM project is described using BIM maturity levels. They are helpful because they outline the outcomes that the supply chain is anticipated to produce, allowing the client to understand exactly what the supply chain is providing.

IV. RESULTS & DISCUSSIONS

Creating Architectural Design The design of the construction project is created using AutoCAD 2016, a widely used software package in architectural design practice. BIM in the production industry promotes included assignment shipping, which involves all clients and stakeholders from the project's planning stage through to completion in order to produce the best outcomes at the owner's expense

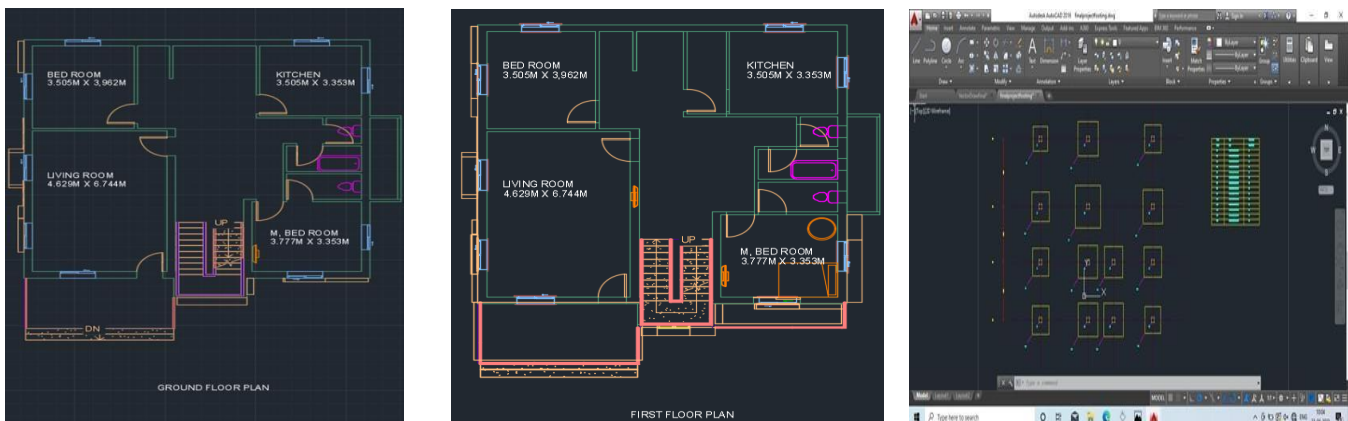


Figure 3: Result Discussion A. Ground Floor Plan B. First Floor Plan C. Foundation Plan

Defining 4D Modelling The 4D Modelling is one of the modern computer technologies that have developed into the AEC industry. A 3D model intelligently linked with time or schedule related information for a project. 4D BIM gives a graphical model that allows planners for identification of problems in early phase of projects. 4D BIM shows project schedule in visual format. It can also be used to coordinate in work with engineers, clients and subcontractors. The 4D BIM allows participants to extract and visualize the movement of their activities through the lifetime of the project. Using 4D BIM technology will be in superior control over conflict detection or over the complexity of changes occurring during the course of a construction project. The 4D BIM provides methods for managing and visualizing site condition i.e., site information, change effects as well as supporting communication in different situations such as informing site staff or warning about risks.

A. Need for 4D Modelling Scheduling It is very essential part of construction management point of view. Without proper planning and scheduling successful completion of any project of any organization will not be possible. Proper scheduling of the various activities before beginning of work and controlling the operations in systematic manner is the heart of planning. A traditional construction schedule is a complex chart or network which consists of various activities and the time desired to deliver those activities. When project starts, the construction manager collects the data and measures the progress in order to update the schedule with respect to any change especially related to the design. The consistency of the schedule mainly relies on the accuracy of construction managers in reviewing the data and drawings and in considering the availability of resources of each time period. This process is a time-consuming procedure and labour oriented would lead to a high potential of errors due to the manual data collection. Traditional scheduling methods i.e., CPM Diagram, Bar charts, Gantt chart can be difficult to understand and do not identify the spatial aspect to the construction activities nor are they directly linked to a design or building model. Due to the failure these traditional methods there should be need significant improvements in construction scheduling which having the ability to watch the elements of a design come together onscreen gives the design and construction team improved accuracy in construction sequencing so that in less time and avoiding manual errors instated of traditional scheduling. So that it is necessary to apply 4D Modelling procedure overcomes the deficits and results in better collaboration and more efficient schedule. Software's Selected for Creating 4D Model The software's selected in this case study are stated as follows.

1) Autodesk Revit 2016: Revit is database structure and object definition Modelling; it is effective Modelling software the preferable work practice is of course when all the Modelling is performed internally within Revit. In order to satisfy the specific needs of the diverse types of specialists for Revit, Autodesk distributed the product into three types – Revit Architecture, Revit Structure and Revit MEP. The 3D model of case study was created in Revit Architecture 2016.

2) Autodesk Navisworks Manage 2016: The Autodesk Navisworks product helps architecture, engineering, and construction teams to develop better control over the outcome of their projects. Navisworks enables user to interrogate and utilize this information throughout the design, build, and operation stages without the need for a design application.

For this case study exporting 3D model to Navisworks, preparing work break down structure in Navisworks and giving time to each task. Steps to Develop the 4D Model The Process of preparing the 4D model consisted of following steps

1) Creating 3D model in Autodesk Revit 2016

2) Naming 3D components as per scheduled activity

3) Import 3D Revit files into Navisworks or export files from Revit to Navisworks in NWC file format.

V. CONCLUSION

Auto CAD, Revit, and STAAD Pro are all essential pieces of software used by civil engineers in their workflows. From this research work researcher had analyzed that designing projects with accuracy and speed to analyze complex structures with powerful toolsets these software programs have become invaluable tools for civil engineers around the world. With the help of software like AutoCAD Revit MSP SKETCHUP Navisworks stadd pro we build a safe structure of building. By using the MSP software, we can plan G+1 building construction project, after planning project in MSP we have concluded that total duration of project completion is 177 days as per task, resources assigned in the project. Also, for the structural design of G+1 building we are utilizing stadd pro software which will help to carried out structural analysis of project. From this analysis we are able to know that the conventional process such as quantity orders (QTO) were carried out manually planning which was based on drawings and specification, however, QTO in BIM were generated automatically. Thus, it saves a large amount of time compared to conventional methods. The present case study was demonstrated that BIM technology brings many advanced construction management skills to project scheduling, monitoring and even project controls for project team. Developing the 4D modelling software's Autodesk Navisworks Manage 2016 found easy to learn which helps architecture, engineering, and construction teams to develop better control over the outcome of their projects. The 3D model could obtain from Autodesk Revit 2016 which is also user-friendly. The 4D modelling also useful to check the accuracy of schedule and the sequence of the activities in the work plan and their impact on each other can be simulated with utilize minimum resources and time in the construction phase with maximum benefits. The 4D BIM provides an accurate representation for construction sequence and any changing of construction plan. Additionally, all construction activities are involved in the 4D model, therefore it is useful for safety analysis and improved occupational safety of Construction project. During this case study we are came across the few shortcomings such as it needed highly skilled and adequate training staff, cost of software's, cost of software's training. Hence, implementation of BIM based 4D model in G+1 building project we had concluded that 4D modelling as a promising tool for construction planning. From this we had get to know about that with the help of BIM we build a structure virtually before being physically. The most important advantage of 4D modelling determined are better visualization of construction work better communication among project teams, increased planning efficiency , achieving detailed and accurate work plans and

improved occupational safety of Construction project. Autodesk Naviswork allows to leverage construction of G+1 buliding planning schedule with 3D models to create 4D model In this project using Navisworks reduces multi-level desing changes. With the help of Naviswork reduces error using clash-detective tool, in Neviswork model Compared to Revit, aggregated models evaluate more quickly. BIM software is far superior at managing time and costs during the design process. Using BIM technology allows for a 25% time and a 20% cost reduction over the conventional approach. At the end we got a result that BIM is useful in construction management field.

VI. Acknowledgment

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