Construction Project Monitoring For Multi Story Building With 4D and 5D BIM

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Abstract -In today's growing housing industry , time cost and quality work are the foremost important elements. Traditional building design was majorly hooked in to two-dimensional (2D) drawings. BIM is one among the primary software emerged within the 1970s for building modelling and designing. BIM give us three- dimensional (3D) model of the building (Length, breadth, and height), fourth dimensional (4D) model including time and also the fifth dimensional model (5D) with cost estimation. This features enables the visualization ,scheduling ,planning, monitoring and clash detection of all pre-construction and post-construction processes of a building. This paper gives a transparent view on used the knowledge of all a live project of traditionally built residential building processes of a building, which was remolded using 4D and 5D BIM technique. the aim of this study was to match and analyze the impact of 4D and 5D BIM on time and price parameter of live project .This paper also explain uses of varied software like REVIT, Microsoft Project,Naviswork Manage to make 5D model.

Key Words:4D, 5D, Monitoring, REVIT, Naviswork manage

1.INTRODUCTION

BIM is instrumental in shifting the event industry from two dimensional (2D) based drawing system to a 3-dimensional (3D) object informational system .This transformation changes the documentation method utilized in building design and construction ,from manual conducts which are human readable ,and integrates digital description of building elements with other information including time as (4D) and will be accustomed track the expansion of the project during construction from getting down to completion [1] and price as (5D) this beneficial to the owner or project head recognize how the cash is being spent over the project .BIM is additionally viewed as a tool to boost architectural practice moving from a computer aided design (CAD) . There are research that has been conducted exploring the blending of assorted dimensions of information into 5 dimension (5D) BIM for better project outcome.

The attitude of a software Revit ,MSP, Naviswork manage is also a BIM project simulation which is comprised of the 3D model of the project component containing links to all or any or any the desired information of the project planning , design ,construction while BIM could even be seen as a virtual process that merge all aspects. also the growing complexity of construction projects and lack or availability of resources there is a requirement for better, more sophisticated tools for construction planning and management. there is a requirement for system which run more efficiently (save time and money, requires less resources and without compromising the quality), BIM is also a brand new promising tool to Architecture, Engineering, and Construction (AEC) industry, allows constructing building virtually before actual construction on field. BIM aims collaboration between various stakeholders of construction industry for better and faster design and execution.

1.1. PROBLEM STATEMENT

Construction project becoming complicated in nature due to lack of co-ordination. Poor communication, cost overrun, time overrun, over budget, rework, delay these are problems faced by construction industry. These problems can be reduced by increasing the use of Building information modelling effectively.

1.2. OBJECTIVE

- To study building information modelling and its framework.

- To prepare 3D model in Revit Autodesk for construction project.

- To prepare scheduling and cost estimation in Microsoft Project.

- To design 5D model in Autodesk Naviswork manage.

- To optimise the time duration and cost of construction.

2. LITERATURE REVIEW -

Dr. Peter smith et. al (2014) **,** This paper examines the global issues related to the role of project cost management professionals in the implementation and evolution of Building Information Modeling (BIM) in the construction industry. The paper is based on a review of current industry trends and issues with BIM implementation and detailed interviews with quantity surveying firms in Australia. BIM involves more than just 3D modelling and is also commonly defined in further dimensions such as 4D (time), 5D (cost) and even 6D (as-built operation). 4D links information and data in the 3D object model with project programming and scheduling data and facilitates the simulation analysis of construction activities. 5D integrates all of this information with cost data such as quantities, schedules and prices.

J. Vinoth et.al (Dec 2009),Said that the design communication is gradually being changed from 2D based to integrated 3D digital interface. Building Information Modeling (BIM) is a model-based design concept, in which buildings will be built virtually before they get built out in the field, where data models organized for complete integration of all relevant factors in the building lifecycle which also manages the information exchange between the AEC (Architects, Engineers, Contractors) professionals, to strengthen the interaction between the design team .

Niraj Thurairajah et.al (2013), The findings indicate a need for detailed understanding of cost consultants' challenges during the implementation of 5D BIM in construction projects. Currently, the authors have undertaken a further empirical research using expert opinion survey and case study approach to collect detailed qualitative information regarding cost consultants' routine challenges in adopting BIM.

Qiqi Lu, et.al(2016),They found that Analysing cash flows of a project accurately and choosing a better financing plan are important issues for contractors. The traditional methods of cash flow analysis required manual integration of schedule and cost information. This process is time-consuming. A system based on 3D modelling technology linked to schedule and cost information, which is called 5D BIM, can automate and simplify this process.. This paper describes a5D BIM framework to help contractors analyse cash flows of single project and make financial decisions properly.

Jiang Xu et.al(2017), In this study, through detailed analysis of BIM technology in the Central Grand project specific application, showing the BIM technology in the construction phase of the specific implementation process, at the same time to improve the construction quality, reduce construction costs and achieve the green construction of fine management requirements for BIM Technology in the construction process management of the study to provide reference. Building the construction management of integrated information management system with BIM technology achieves the construction project information management.

Pravin B. Patil et.al (2015),examined in the study the implementation of BIM and its impact on traditional conventional building design method. BIM a technical tool in which a virtual project is built that creates consistent, coordinated construction project with computable information which can thus be used to produce quality construction documents, decision making for design, cost estimation, planning, and for managing and operating the facilities. Further, they mentioned the extension of BIM

methodology to create 4D and 5D models taking time and cost in consideration.

Daegu Cho1 et,al (July 2012), Author said that Cost, schedule, and performance control are three major functions in the project execution phase. Along with their individual importance, cost-schedule integration has been a major challenge over the past five decades in the construction industry. This paper concentrates on project execution data related to project control functions including quantity takeoffs, cost estimation, cost control, schedule control, periodic monthly payment, and performance measurement

BIM Model –

BIM or Building information modelling is an intelligent digital representation or a model based process for planning ,designing ,construction and carrying out the process of operational and maintenance. The National Building Information Modelling Standards (NBIMS) committee of USA defines BIM as a digital representation of physical and functional characteristics of a facility.
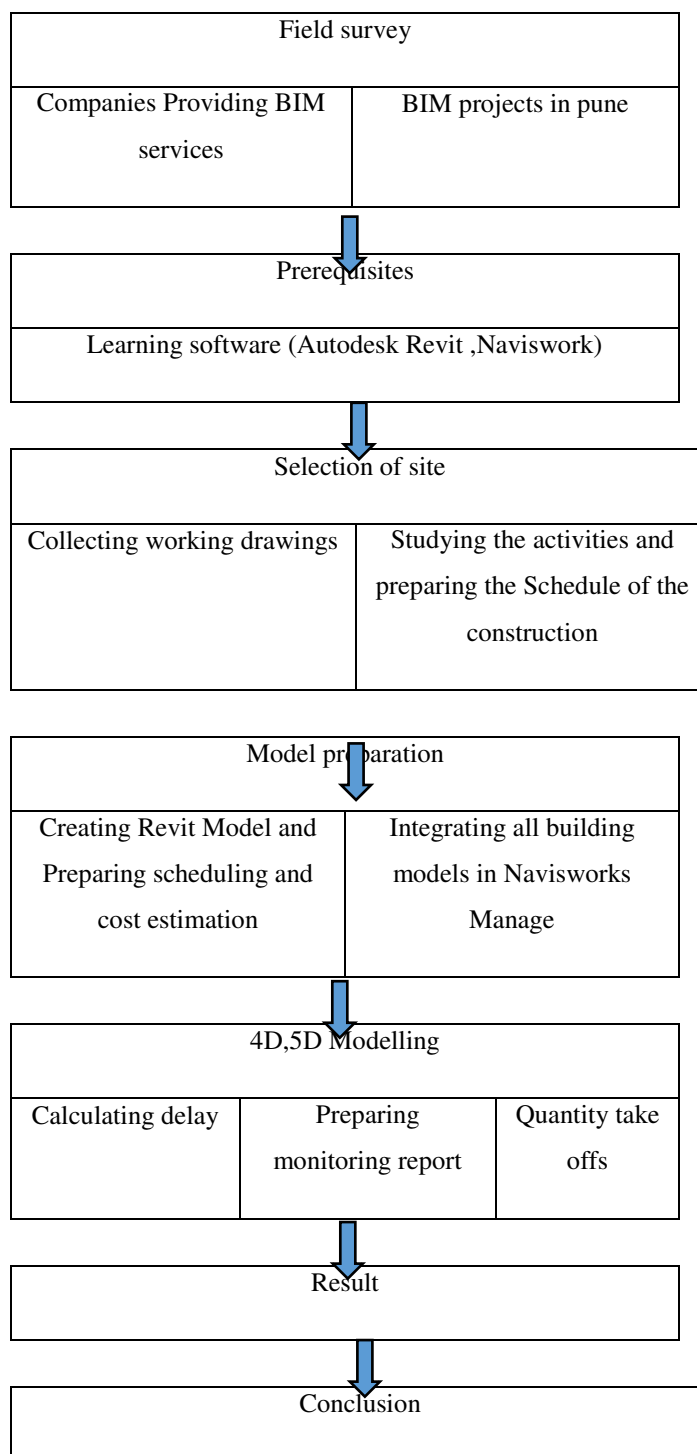
4D BIM –

4D BIM is to feature time to the project 3D model its helpful to simulate the development method of the project so as to spot problem as a vital path activity . logistical delivery and processing the development method .It may also be accustomed examine ways that to create up time , Time as a extra information and analyse totally different quite project sequence comes within the kind of 4D .By linking BIM with the development work schedule the method information and time information square measure integrated into a visible 4D (3D +Time) model which may directly and accurately mirror the development activity . The BIM 4D is one effective visualisation management approach for the location assembly demands of within the construction process.

5DBIM-   -

The importance of accuracy in cost estimation during the first stages of construction projects has been widely known. within the past, cost estimation for construction

materials supported user's experience was essential because the value estimation is that the prediction of cost for a process or project using experience or methodology. Cost estimation is extremely significant for deciding as inaccurate estimation may result in disastrous cost and project delay . the 2 main elements of a price estimate are quantity take-off and pricing. Quantities from a Building Information Model may be extracted to a price database.

3.METHODOLOGY –

Field survey	
Companies Providing BIM services	BIM projects in pune

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Prerequisites
Learning software (Autodesk Revit ,Naviswork)

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Selection of site	
Collecting working drawings	Studying the activities and preparing the Schedule of the construction

Model preparation	
Creating Revit Model and Preparing scheduling and cost estimation	Integrating all building models in Navisworks Manage

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4D,5D Modelling		
Calculating delay	Preparing monitoring report	Quantity take offs

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Result

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Conclusion

CASE STUDY-

Project details –

Name of Project: - Godrej 24 .

Client –Pearlite Real properties Pvt. Ltd.

Consultant – Rambll India Pvt.   Ltd.

Architecture- Kapadia Associate design LLP

Site- Godrej 24 Hinjewadi phase 1 ,Pune.

Address- Next to Wipro, Phase 1 , Hinjewadi Rajiv Gandhi InfoTech Park

Type- 2 BHK , 3 BHK

No. of flats on every floor – 4(2- 2BHK , 2- 4 BHK)

No of floors- 17 , Parking floors -2

Size – 920-1167 sqft

Land area – 8 Acres

No. of buildings – 12

Total units – 800

Building taken into consideration for case study – E3 tower.

1.Collection of 2D drawing
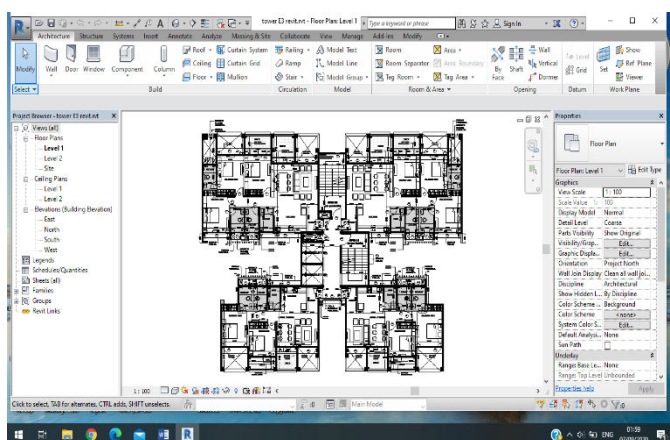
Fig No.-1: 2D drawing

2.Creation of 3D model by importing 2D drawing in REVIT Software. For construction of Architectural building information model detailed AutoCAD drawings are referred .

With the help of Revit architecture 2017 software, and other available details such as ,material used and cost respective material etc. the model is competed.

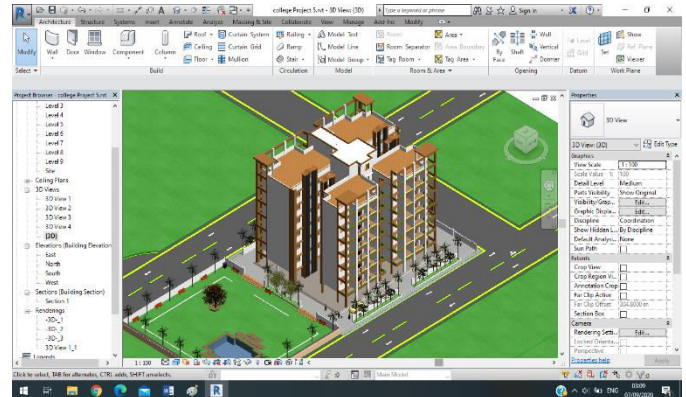

Fig No-2:3D Model Created in Revit Software

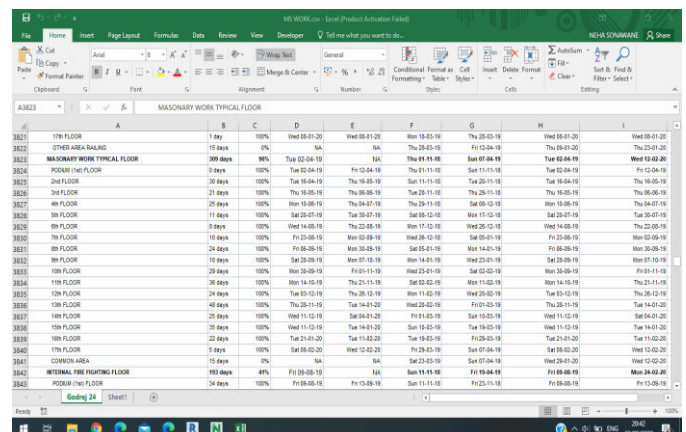3.Task scheduled using data from revit in Microsft excel

Fig No. 3: Task Scheduled sheet in MS Excel

4. Creation of 5D model by importing and attaching 3D mode and the MS excel schedule in naviswork software
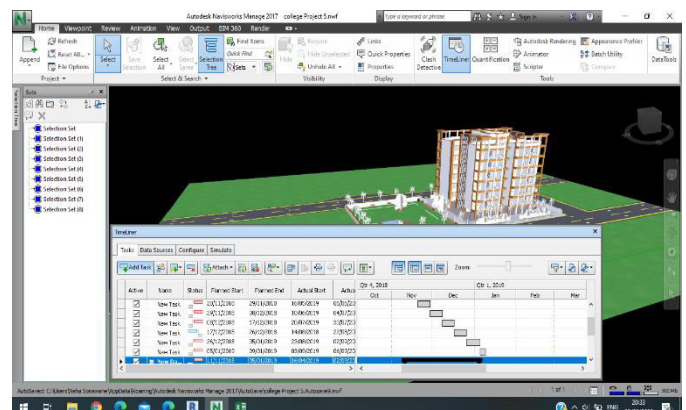

Fig No. 4: Attached Scheduled in 3D Model in Naviswork Software

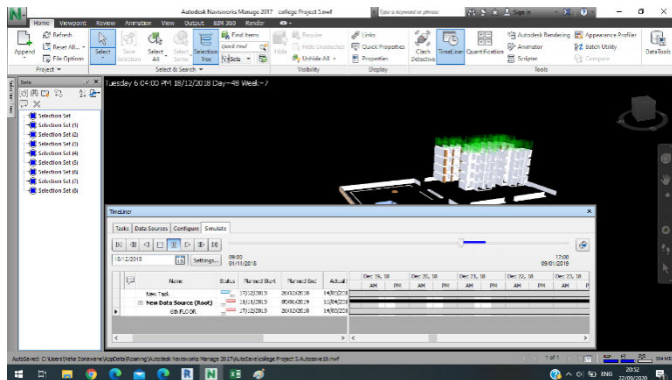5.Simulation and Visualization of Model in Naviswork software

Fig No.5: Simulation Of 5D Model

4.RESULT- The result of the study show that the masonary work of the project schedule by traditional method and BIM model method were the time required for 4BIM is less than the traditional method . and also the cost is reduced by 20% using 5D BIM model . Quantity take-offs from the 3D model . 4D simulation for monitoring and control of construction.

5.CONCLUSION–BIM is a perfect tool for monitor the project progress on day to day basis on computer monitor. Using BIM technique time, cost and labour management become smooth and feasible. In order to reduced the cost, time, rework 4D and 5D technique is used in project.

Some of the methods that are used to study time overruns within a 4D model required full automation, For the 5D BIM ,engineers and planners should synchronize methods to regulate building modules and the features related building modules for cost estimation.

The technology allow the different software's like Autodesk Revit, Microsoft project, Naviswork manage which are very appreciate in generating outputs for a particular type of task., the 5D BIM software able to the users to easily define the time ,cash flow forecast monthly, weekly ,daily or even in hourly in the simulation ,which is not possible in traditional method .The use of BIM has made the project easier to handle and better understanding .As per project study ,we mainly took up the major two parameter of project management i.e. time scheduling and cost analysis.

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