Comparative Study of Residential Building With Conventional & BIM Method

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Abstract- *The potential of Building Information Modeling (BIM) to support a transformation of the processes of design and construction has been evident in the construction industry. Although BIM is considered helpful in improving design quality by eliminating conflicts and reducing rework, there has been little research into using BIM throughout the project for construction quality control and efficient information utilization. Due to the consistency of design data with quality data and construction process with quality control process, the potential of BIM implementation in quality management lies in its ability to present multi-dimensional data including design data and time sequence. This paper explores and discusses the advantages of 4D BIM for a quality application based on construction codes*

Keywords- Building information modeling (BIM)

I. INTRODUCTION

Building data displaying (BIM) and related issues has been a subject of extraordinary innovative work, as announced in the ongoing academic writing. Improvements in the efficiency of the planning and design processes, construction planning and control, design-construction integration, and facilities management have been analysed. Furthermore, benefits got from BIM usage have been characterized in light of enhancements accomplished all through building-related procedures. It is widely accepted by experts and evidenced by prior research that BIM and 4D approaches are able to provide faster and more effective communication of information between interested project parties and yield improved and innovative solutions stemming from better design, along with many other benefits. BIM is a process involving the generation and management of digital representations of physical and functional characteristics of places. BIMs are files (often but not always in proprietary formats and containing proprietary data) which can be extracted, exchanged or networked to support decision-making regarding a building or other built asset. Ebb and flow BIM programming is utilized by people, organizations and government offices that arrangement, plan, build, work and keep up different physical frameworks, for example, water, can't, power, gas, correspondence utilities, roads, bridges, ports, tunnels, etc

The aim of the paper are i) To understand BIM flow process for effective coordination with Builders, contractors, structural consultant and architects, ii) To prepare 5D model for G+6 commercial building model which include cost, quantity, schedule, iii) To check BIM process for quality management of construction industry and its verification with questionnaires survey.

This project describes the results of research focused on quality management in construction industry using BIM during the construction phase of the project as well as after completion of the project. To get effective outcome checklist for quality management as per IS standards will be prepared and survey will be taken out. Also comparison with conventional method will be done. Commercial project is selected for study.

II. LITERATURE REVIEW

Several case studies, international journals are studied to understand BIM technology. Through literature survey it can be concluded that BIM technology should be implemented in construction industry

1) Mehmet F. Hergunsel has studied visualization, 3D coordination, cost estimation, prefabrication, construction planning and monitoring, and record model. The 3D coordination used to detect and eliminate trade clashes and conflicts. BIM based 4D scheduling helps understanding of the construction components and schedule progress that in turn results better construction planning. The record model can be created as the last advance of the development as the as-assembled are totally refreshed in the Building Information Model. Prototype 4D Building Information Model was created and studied. The BIM-based schedule was integrated to the 4D model. The undertaking finished up with an investigation on the utilization, preferences and mishaps of BIM and its instruments.

2) In research paper of P.M Diaz done analysis is intended to show the correspondence of BIM and project manager‘s roles on construction projects. It insists on the significance of proper knowledge and experience of project managers to get succeeded in BIM, 3D, 4D BIM and BIM based scheduling techniques are examined. The use of the term 4D to refer to the fourth dimension time is also discussed. The paper likewise surveys the issues in regards to the BIM usage, static plan and natural issues related with an endeavor to evaluate the points of interest in an absolutely quantitative manner, The studies show both the BIM advantages and disadvantages. And BIM can be regarded as a decision-making tool despite it being technical equipment also BIM should be included in the construction curriculum

3) Su-Ling Fan, Miroslaw J. Skibniewski, and Tsung Wei Hung, has written in paper , that BIM and 4D demonstrating have both as of late gotten broad consideration from the structural, designing and development (AEC) enterprises. Research efforts to date have demonstrated that BIM and 4D technologies are able to provide faster and more effective communication of information between interested project parties and yield improved and innovative solutions stemming from better design along with other benefits. This paper describes the results of research focused on capturing the effects of BIM during the construction phase of the project. Four factors including requests for information, rework, change orders, and schedule compliance are discussed based on personal interviews with contractor employees experienced in the use of BIM. Eight case studies were conducted to explore the effect of BIM during the construction phase with respect of these four factors.

4) With the utilization of BIM for vertical building ventures, the utilization of BIM in framework extends consistently increments. Construction companies of infrastructure facilities are expecting the adoption of BIM since they have observed high return on investment (ROI) resulting from BIM for vertical building projects. In this paper, the attention is set on the use of BIM for quality administration in parkway and scaffold development. A review of the literature on quality information model and quality control process is presented. The application of BIM for quality management is described. The consequences of concentrate by the creators on the model-driven way to deal with quality affirmation (QA) and quality control (QC) is explored. Finally the issues and obstacles to BIM implementation in the infrastructure sector are discussed. Discourses in this paper are the basic parts of the usage of BIM for quality administration in framework development venture. Based on the results of this study, great potential of using BIM for quality management in infrastructure projects has been identified. Nonetheless, only limited amount of literature on this topic is currently available. It is believed that this study will set a stepping stone to future research and practice for promoting BIM technology in horizontal construction projects. By Namhun Lee, Talat Salama and George Wang

5) By View of Nam Buiab, Christoph Merschbrockb , Bjørn Erik Munkvolda,BIM is widely seen as a catalyst for innovation and productivity in the construction industry. BIM can assist a more sustainable construction process that in turn may contribute to eradicating poverty in developing countries (United Nation Millennium Goals). While BIM is progressively being received in created nations, executions in the creating nation setting are uncommon. The article highlights shortcomings of existing research on BIM implementation in developing countries, and may serve as a starting point for researchers interested in how BIM technology can be adopted in a developing country context and overview of BIM research in developing countries. Almost no research on BIM in developing countries exists prior to 2013, and the focus of the present work is limited to the three countries of China, India, and Malaysia. In general, more studies are required to cover the gaps identified in this paper. Technological and managerial aspects in enhancing BIM implementation should be focused in further work. Moreover, further studies on how professional communities and industry clusters promoting BIM practice can be cultivated in developing countries are recommended and the managerial view, development of an effective strategy for BIM implementation in developing countries should be targeted also in-depth comparison between developed and developing contexts is required.

A. Theory Content

There are various tools and techniques are available for the quality management of construction work. Yet there are many difficulties to implement quality management system in construction firms. Conventional methods of quality management are quite tedious and somehow troublesome to implement. To achieve the satisfaction of customer and quality objectives of construction firm need to use modern technologies and tools for the quality management. In this study How Revit , MSP and Naviswork like modern tool is effective for quality management is evaluating by comparative study is doing on traditional methods of quality management with the Naviswork modelling. For quality management and scheduling technique following case study from data collected is analyzed and compared in Naviswork.

III. METHODOLOGY

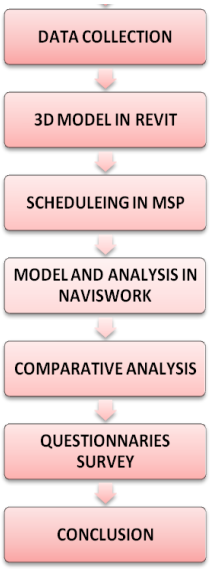


Fig 1: Flow chart of methodology

The objective of this research was to develop a comprehensive, informative and practical 4D BIM-based application for the purpose of construction quality management and to investigate how it can fit into the current construction practice. Also, the research identified potential problems with using Naviswork technology with current quality management methods, and proposes solutions. Amid the examination, quality models that contained procedure, association, and item (POP) data were assembled utilizing national, modern and nearby quality norms and codes. Then, a scheduling model and the quality model were integrated into a virtualized 4D BIM-based application to identify quality control criteria and responsibility assignments in the construction process.

This application includes inspection and testing, analysis during the construction phase, and feedback of inspection results.

A case study approach was adopted to explain the dynamic quality control model that was developed from a comprehensive review of the site investigation. In the case study, the inspection data was acquired from the project general contractor and CAD drawings and the construction schedule were obtained from the project owner and from contractors.

A. Steps For Design Of Building Model:

Step1: Collection of AutoCAD 2D drawings of the project from site and project manager.

Step 2: Creation of 3D model by importing 2D drawings in REVIT software.

Step3: Conversion of the REVIT 3D model into Naviswork readable (.nwf) format by using an extension tool in REVIT.

Step 4: Preparation of work breakdown structure for the project and creation of task schedule using the quantity data from REVIT in Microsoft project.

Step 5: Creation of 5D model by importing and attaching 3D model and the MSP schedules (time and cost) in Naviswork software.

Step 6: Simulation and visualization of 5D model in Naviswork software.

B. Development Of Model In 3d Using Revit:

Autodesk Revit Architecture is a documentation software application created by Autodesk for architects and building professionals. The tools and features that make up Revit Architecture are specifically designed to support building information modeling (BIM) workflows. By using BIM rather than PC supported drafting (CAD), Revit Architecture can give dynamic data in savvy models likewise permits complex building structures to be precisely planned and documented in a short amount of time. Each intelligent model created with Revit Architecture represents an entire project and is stored in a single database file. This allows changes made in one part of the model to be automatically propagated to other parts of the model.

C. Scheduling Using Microsoft Project (Msp):

Microsoft Project is offered in standard and professional editions, depending upon the project requirements and management level. The format of a Microsoft Project file is .mpp. It is one of the most commonly used PC-based project management tools, and is designed to assist managers in tasks such as: Devising plans, Setting realistic goals, Defining resources, Assigning tasks, Recording progress and finances, Monitoring workloads, Scheduling meetings.

The product incorporates a simple to-utilize help wizard that aides the client over the span of the venture from creation to asset ID, appointing assignments and getting last outcomes.

C. Development Of Model In 4d Using Naviswork:

Autodesk Naviswork Manage software is a comprehensive review solution for analysis, simulation, and coordination of project information. Multidisciplinary plan information can be joined into a solitary incorporated undertaking model for impedance administration and conflict

location. Naviswork Manage helps design and construction professionals anticipate and avoid potential problems before construction.

4D Scheduling Simulate development plans and break down venture exercises, and lessens delays and sequencing issues. In project we used the scheduling for developing construction sequences that link model geometry to times and dates import times, dates, and other task data from project management software to progressively interface plans with venture models; and set up arranged and real circumstances to envision deviations from the undertaking plan.

With the use of Collaboration Toolkit we communicated design intent and encourage teamwork with the ability to add mark-ups to viewpoints with advanced redlining tools. The software's object animation features help you create animations of objects for clash and interference analysis. You can make communication contents those connection activitys to particular occasions, triggers, or key remarks, and connection movements to errands in a 4D plan or enhanced development arranging.

D. Clash Detection with Naviswork Software:

Naviswork provides a platform for integrating all of the trades, even those with different 3D programs, into one system in order to build a comprehensive and interactive, three dimensional model of each project we perform.

Naviswork predicts conflicts by consolidating the greater part of the exchanges the virtual world, enabling us to overhaul designs and calendars to determine clashes before development starts. This saves thousands of man hours that would be spent working through these issues in the field. Doing it right the first time, with a comprehensive 3D representation of the project, preserves valuable resources of time and money.

With Naviswork, a 3D model of the entire project is given a virtual walk through.

E. Questionnaire Survey:

To find out a conclusion that BIM is beneficial for quality management in construction industry , questionnaire are made and survey is taken out from expertise in construction industry as well as consultants , contractors engineers and builders .

F. Quality Management System:

The quality of a product is reflected in its ability to satisfy stated or implied needs and internal characteristics of a finished product in addition to its external design. Therefore, construction product quality can be defined as: the degree to which the stated or implied needs and the internal characteristics are guaranteed during the process of construction. This research defines quality as compliance with construction codes and specifications.

During the last decades construction industry has been heavily criticized for its performance and productivity in relation to other industries. With the turn of the new thousand years, it gives the idea that the development business is experiencing an extraordinary time of thoughtfulness, which is exacerbated by expanded mechanical and social change. These changes are altering the tempo of the environment within which construction operates. Moreover, such changes extensively affect the way business is carried. No association working in the development business, regardless of whether huge or little, private or open, can bear to disregard its changing surroundings in the event that it is to survive.

Many of the management practices used to support construction organizations are being challenged. The industry's clients are moving forward. Clients demand improved service quality, faster buildings and innovations in technology. It is no mischance that the development business has swung to the assembling area as a perspective and wellspring of advancement. Successful concepts derived from manufacturing, such as Total Quality Management (TQM), Reengineering and Lean (or Just-in-Time) Production, are being adopted and integrated into the construction industry. Certainly, the effective usage of these ideas is intensely subject to a culture of collaboration and participation at both intra-and between authoritative levels in development.

Quality Management has increasingly been adopted by construction companies as an initiative to solve quality problems and to meet the needs of the final customer, if ever an industry needed to take up the concept of QMS (Quality Management System) in the construction industry. However, implementing QMS principles in construction industry is particularly difficult because of the many parties involved.

IV. CASE STUDY

A. Data Collection:

Site Details

- Name of site : 18 latitude
- Location of site : Punawale, Mulshi, Pune

- Site Engg: Manoj Gawade
- A proposed Residential building having 7 floor is taken for case study location is in Punawale.
- Design Team: Sanskrit construction
- Owner and Developer :G. D. Square and akshaychordiya
- Architect: Rajas Designers
- Cost of project : 16 Cr
- Structural Engineer : Structus Consultantss
- Builder :G. D. Square and akshay chordiya
- Area: 92000 sq.ft.
- Commercial building having No. of Towers: 1, No. of Floors: 7 Floors, No. of showroom:6.
- Present condition of the project : under construction
- No. of Towers: 1,No. of Floors: 7 Floors

Fig 2: 3rd eye view of actual site

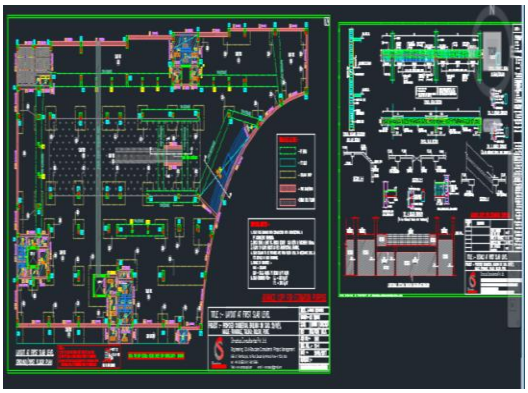


Fig 3: First floor slab

Fig .4: layout plan

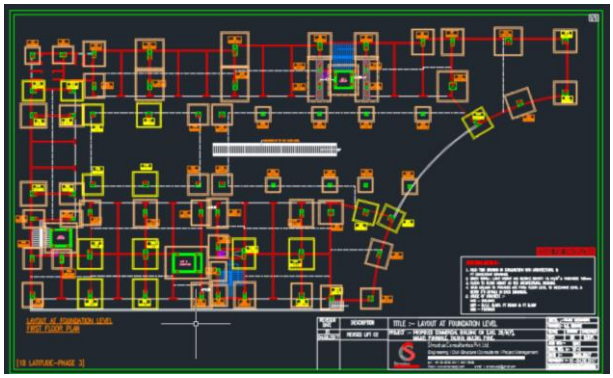


Fig 5: center line plan

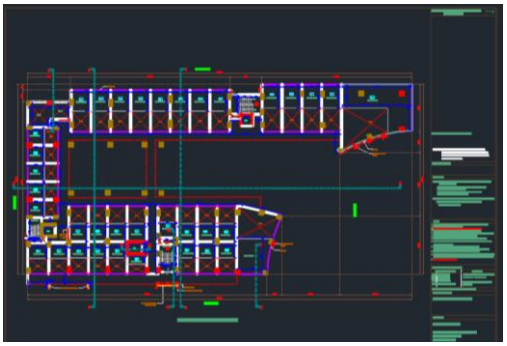


Fig 6: 2nd floor plan

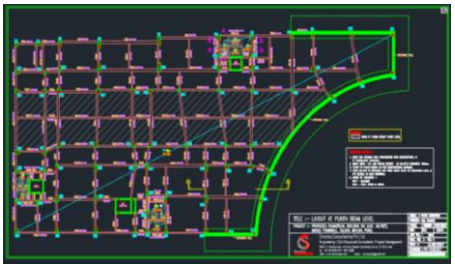


Fig 7: plinth beam layout

B. 18 latitude by G. D. Square and Akshay Chordiya

18 latitude is spread across beautiful 92000 sq.ft., of which nearly 50% is reserved for greenery and open spaces. The landscape is designed in a contemporary resort style, with the lush tropical planting to cool the environment and provide beauty.

Fig 8: Site Condition

V. RESULTS AND DISCUSSION

A. Lod 300 Revit Model:

LOD 300 MODEL PREPARED IN REVIT SOFTWARE:

Using Autodesk Revit software 3D model of building is prepared in LOD 300.

Following are image of model, framing of model, development of model and final LOD 300 model.

After 3D modelling proceed to scheduling in Microsoft Project software. And then 4D model in Autodesk Navisworks will work out.

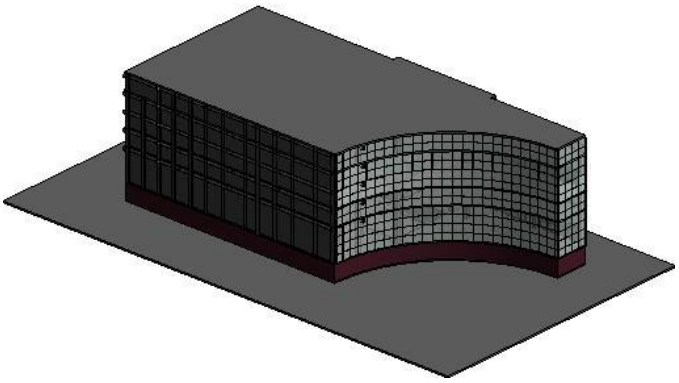


Fig 9: 3D Model

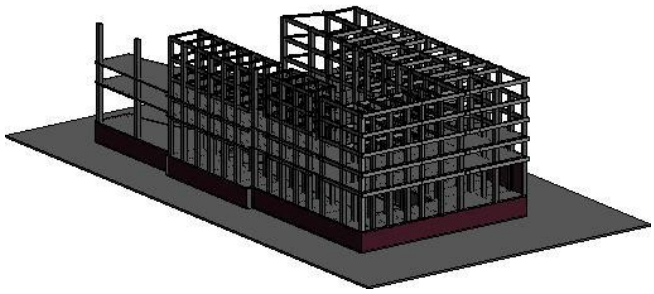


Fig 10 : 3D Model LOD 300

B. Naviswork modeling: Lod 400 Model

3D model from Revit software and Schedule from MSP is imported to the Naviswork and 4D model is done in Naviswoks. In this software simulation is workout

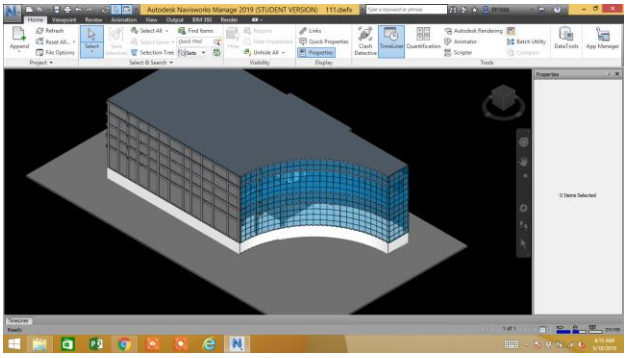
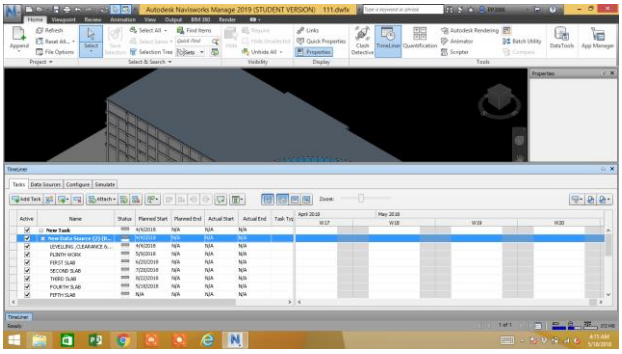


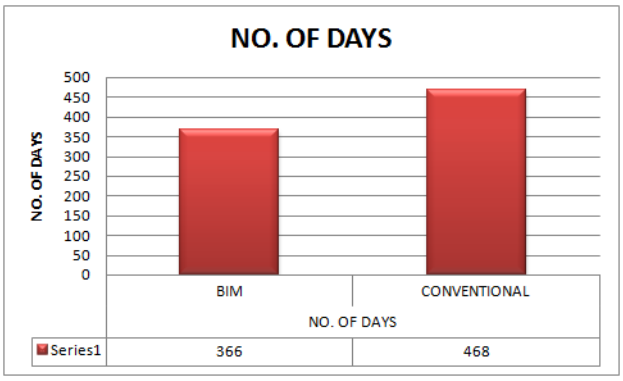
Fig 11: Lod 400 Models

C. Lod 400 Model+ Scheduling



D. Graphical represenatation:

It is observed that by using BIM technoogy we can save total 102 days of construction of building.



VI. CONCLUSION

In this paper the BIM method is used for effective construction management, the quality management improvement is studied and it is observed that using clash detection effective coordination of various parties can be maintained. Furthermore the number of schedule days can be reduced to 25-30% by reduction in planning, analysis and design days

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