A Comparative Study of 6D Models with Conventional Model Using Naviswork

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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 6D BIM for a quality application based on construction codes.*

Keywords- BIM, 6D, REVIT

I. INTRODUCTION

Building information modelling (BIM) and related issues has been a subject of intense research and development, as reported in the recent scholarly literature. Improvements in the efficiency of the planning and design processes, construction planning and control, design construction integration, and facilities management have been analysed. Additionally, benefits derived from BIM implementation have been defined based on improvements achieved throughout building-related processes. It is widely accepted by experts and evidenced by prior research that BIM and 6D 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. Building information modelling (BIM) is a process involving the generation and management of digital representations of physical and functional characteristics of places. Building information models (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.

BIM in construction management Participants in the building process are constantly challenged to deliver successful projects despite tight budgets, limited manpower, accelerated schedules, and limited or conflicting information. The significant disciplines such as architectural, structural and MEP designs should be well coordinated, as two things can't take place at the same place and time. Building Information Modeling aids in collision detection at the initial stage, identifying the exact location of discrepancies.

1.1 BUILDING INFORMATION MODELLING FOR BUILDING LIFECYCLE MANAGEMENT

While there are few definitions available for BIM in the literature, in this paper the authors propose a more comprehensive and operational definition, in order to give the reader a clear understanding behind the real agenda of BIM. Consideration is also given to the natural environment, user environment and owner satisfaction throughout the lifecycle within this definition. BIM is defined as the use of ICT technologies to streamline the building lifecycle processes to provide a safer and more productive environment for its occupants, to assert the least possible environmental impact from its existence, and to be more operationally efficient for its owners throughout the building lifecycle (Arayici and Aouad, 2010). BIM in most simple terms is the utilization of a database infrastructure to encapsulate built facilities with specific viewpoints of stakeholders.

1.2 THE BENEFITS OF BUILDING INFORMATION MODELING (BIM)

1.2.1 MAXIMUM EFFICIENCY IN PLANNING & MANAGEMENT:

With limited budgets and accelerated schedules, today's facility managers, architects and construction teams often struggle to communicate their needs clearly to each other – this can lead to lost time and productivity as well as increased waste on the jobsite. BIM is the process of creating an accurately-detailed 3D model of your structure, including as much or as little detail as you like. This allows anyone on

any team to easily visualize complex concepts and how they fit into the bigger picture.

1.2.2 VIRTUAL CONSTRUCTION BIM

Software lets you construct your entire building virtually, before you ever break ground. This removes uncertainty and doubt in your plan by helping you work out any potential issues before they arise. Time-compressed simulations let you experiment with new ideas, identify any emergent problems, isolate the faulty system and make preemptive course-corrections quickly and easily during the design phase

1.2.3 FACILITY MANAGEMENT MADE EASY

When you're coordinating teams to execute a project with minimum impact on smooth facility operation, clear communication is crucial. Allowing each team to contribute their expertise to an accurate model reduces the likelihood of mistakes and misunderstandings. With a perfect model to reference, it's much easier to identify the causes of problems as they occur. For example, imagine you have an electrical short somewhere inside an interior, loadbearing wall.

1.3 OBJECTIVES AND SCOPE:

- Study of building information modelling for quality management and its documentation
- Study of 5D tool REVIT +NAVISWORK modelling for effective quality management
- Comparative analysis for Naviswork technique for quality control with Conventional
- Questionnaires survey of above output for final conclusion

1.4 BIM

Implementation for building construction: Our project has two aspects one is to rehabilitate the city for urban mobility and second is to study the effectiveness of BIM in Building construction. For the infrastructure development we have used the Infraworks 360 software and for the development of building model we have used the Revit software along with the Naviswork software for scheduling and time estimation.

1.4.1 LEVEL OF DEVELOPMENT IN BIM

There are 5 Levels of Development:

- LOD 100 - Concept
- LOD 200 – Design Model
- LOD 300 – Construction Model
- LOD 400 – Fabrication Model
- LOD 500 – As-Built Model

Level of Development is nothing but the extent to which BIM model users such asvarious contractors and fabricators within a project can use and rely on the model forscheduling of elements, pricing, fabrication and construction. LOD only applies to an individual model element.

Steps for design of Building model:

Step 1: In the first instance we developed the plan of different floors of the building and ground floor for the parking purpose.
Step 2: After the drawing of plan 3D model of building, the building is made energy efficient by providing solar roof panel, and reducing carbon emission material in the building.
Step 3: After detailed drawing of building the quantities of material and costing is done in
Rivet.
Step 4: The building model is extracted in Naviswork software for the scheduling and time and for analysis, simulation, and project information.
Step 5: For energy analysis the geographical data is taken from the web network and various analysis is carried out.
Step 6: Cloud rendering is done through web and the rendered model is shared through.

1.5 DEVELOPMENT OF MODEL IN 6D USING NAVISWORK

Autodesk Naviswork Manage software is a comprehensive review solution for analysis, simulation, and coordination of project information. Multidisciplinary design data can be combined into a single integrated project model for interference management and clash detection. Naviswork Manage helps design and construction professionals anticipate and avoid potential problems before construction.

1.6 ESTIMATION AND COSTING (5D)

Estimation and costing is done in the Revit software, in this quantities of various items of building works like, wall schedule and quantities, door schedule and quantities, windows quantities, in terms of area m^2, Volume in m^3 etc. is found out for the proposed building.

II. CASE STUDY

WARNER BROS. WORLD ABU DHABI

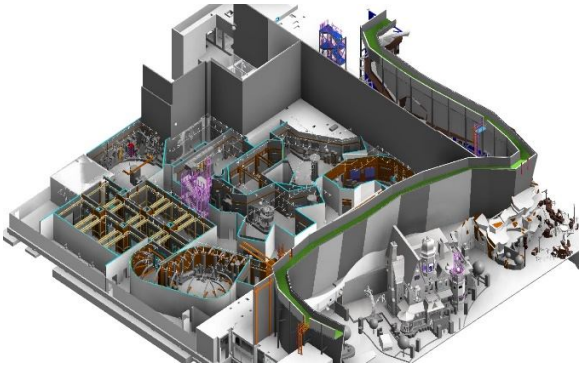


Figure 1: 3rd Eye View of Actual Site

2.1 SITE DETAILS

- Name of site : Warner Bros. World Abu Dhabi
- Location Of Site :Dubai
- A Proposed buildingis taken for case study location is inDubai.
- Design Team: AECOM
- Owner and Developer : MORAL ASSESMENT MANGEMENT
- Architect: AECOM
- Structural Engineer : AECOM
- Contractor: 6 CONSTRUCT
- Overall Area: 50 lakh square feet
- Total Cost: 1000 million dhiram

Figure 2(a): ENTRY PLAZA – Internal

Figure 2(b): WARNER BROS. PLAZA – Structure Works in Progress Theme Façade Handed Over to ASPE

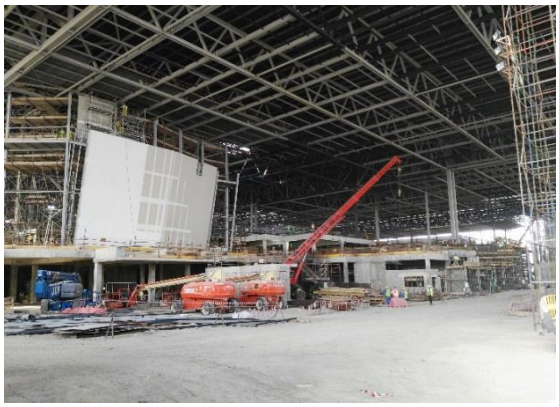
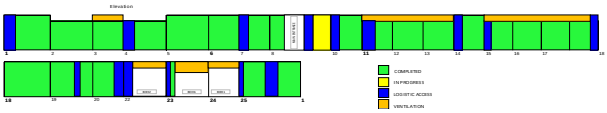


Figure 2(c): TOON JUNCTION – CYC

Figure 2(d): METROPOLIS – Attraction Box Wall works in Progress Steel and SOG in Progress

Figure 3: Structure Status & Projection (Concrete Sog)



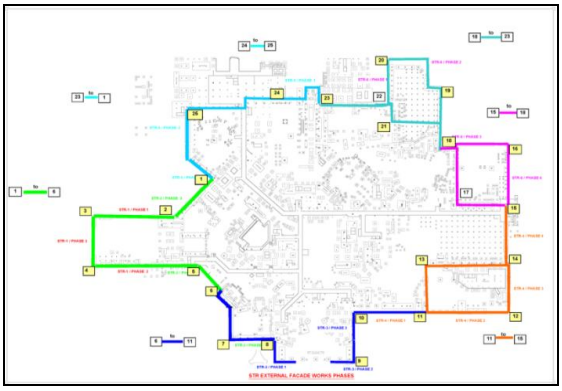


Figure 4: Façade Cladding

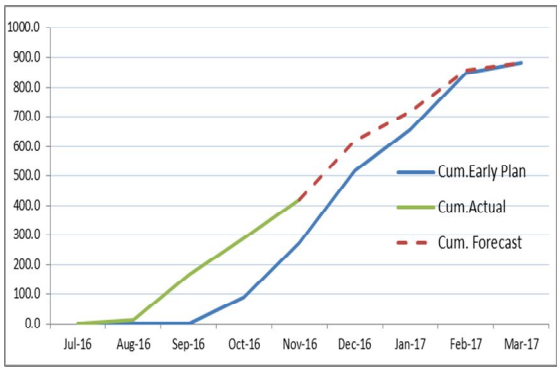


Fig 21: CATWALK STATUS

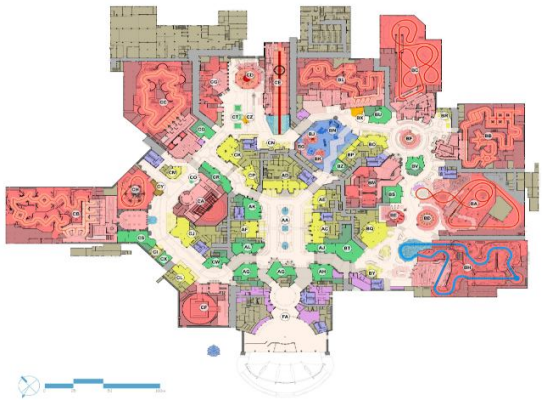
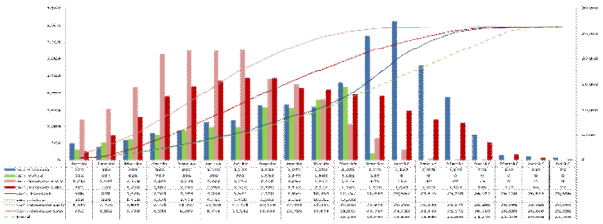
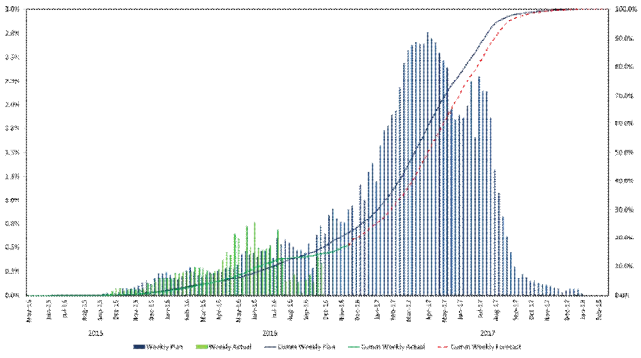


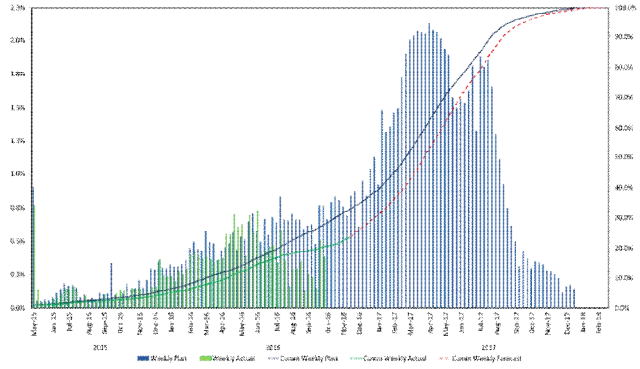
Fig 22: THEME FAÇADE HANDING OVER



(a) Overall Engineering S-Curve



(b) Overall Construction S-Curve



(c) Overall Progress S-Curve

Fig 23: OVERALL PROGRESS

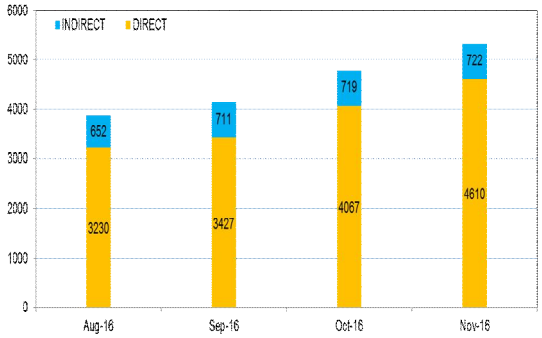


Fig 24 : MANPOWER STATUS

Status of Project Milestones (PTC)

Milestone ID	Milestone Description	Contractual Date	17-Nov-16		Remarks
			Forecast Finish	Finish Variance	
MIL-1060	Completion of bus & taxi drop off area	31-Jul-16	31-Jul-16	0	Completed
MIL-1070	Structural Steel Erection Completion	21-Jul-16	21-Jul-16	0	Completed
MIL-1090	Completion of External Envelope	22-Oct-16	22-Oct-16	0	Completed
MIL-1040	Completion of ETS Room	31-Dec-16	31-Dec-16	0	
MIL-1050	One Substation to be energized for the back of house on and wild air	31-Dec-16	31-Dec-16	0	
MIL-1140	Back of House (Maintenance)	31-Mar-17	31-Mar-17	0	
MIL-1080	Internal Horizontal / Vertical network distribution MEP (Primary Works)	04-Feb-17	04-Feb-17	0	
MIL-2220	Starting Wild air	30-Apr-17	30-Apr-17	0	
MIL-1120	Completion of External Infrastructure works (Excluding Soft landscape)	11-May-17	11-May-17	0	
MIL-2230	Completion of all wet trades including theming	30-May-17	30-May-17	0	
MIL-1110	Dust Free	30-May-17	30-May-17	0	
MIL-1150	All other substations with Final Power On	05-Aug-17	05-Aug-17	0	
MIL-1240	Riddler Revolution	24-Oct-17	24-Oct-17	0	
MIL-1190	Green Lantern	25-Oct-17	14-Dec-17	-50	Due to ride frame installation strengthening
MIL-1160	Scooby Doo	28-Oct-17	08-Nov-17	-11	STR6-Civil Works
MIL-1210	Fast & Furry -Ous	01-Nov-17	11-Dec-17	-40	Delayed delivery of ride
MIL-1220	Tom & Jerry's Swiss chees Spin	07-Nov-17	07-Nov-17	0	
MIL-1180	Ani - Maychem 3D	14-Nov-17	14-Nov-17	0	
MIL-1200	The Flintstone's River Adventure	15-Nov-17	06-Jan-18	-52	Delayed delivery of ride
MIL-1170	Justice League	17-Nov-17	17-Nov-17	0	
MIL-1320	Scarecrow's Scare ride	05-Dec-17	05-Dec-17	0	
MIL-1270	Batman Attraction	19-Dec-17	19-Dec-17	0	
MIL-1010	Completion of construction	31-Dec-17	15-Jan-18	-15	

Fig 25: MILESTONE STATUS

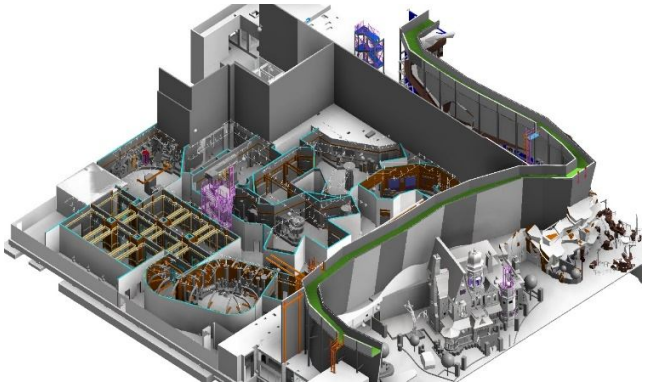


Fig 26 : KEY ATTRACTION LOOKAHEAD

III. PROBLEM STATEMENT

For quality management and scheduling technique following case study from data collected is analysed and compred in REVIT+ NAVISWORK for LOD 300

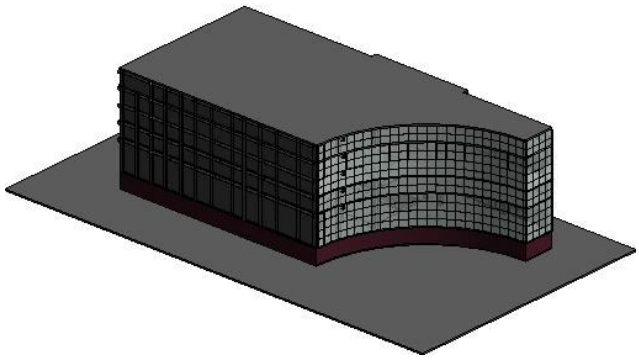
18 LATITUDE

SITE DETAILS

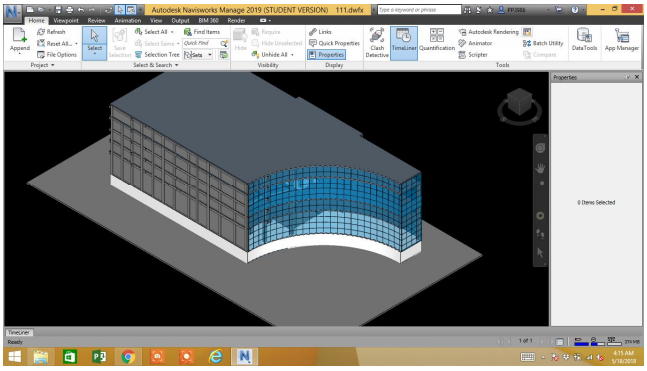
- Name of site : 18 latitude
- Location of site : Punawale, Mulshi, Pune
- Site Engg: Manoj Gawade
- A proposed commercial building having 7 floor and102shops is taken for case study location is in Punawale.
- Design Team: sanskruti construction
- Owner and Developer :G. D. Squareandakshaychordiya
- Architect: Rajas Designers
- Cost of project : 16 Cr
- Structural Engineer : Structus Consultantss
- Builder :G. D. Squareandakshaychordiya
- 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, No. of showroom: 6

IV. RESULTS AND DISCUSSION

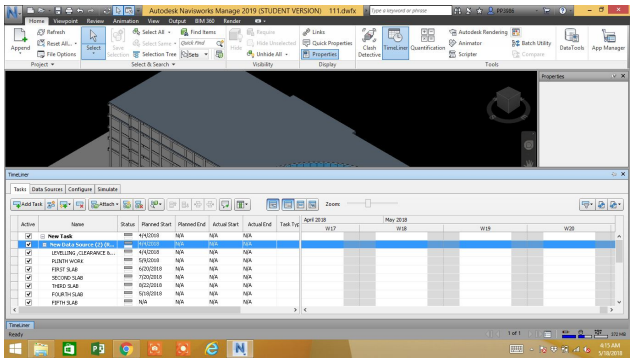
For the above problem statement lod 300 model is prepared in REVIT architecture the details of material is added as per case study



LOD 400 MODEL



LOD 400 MODEL+SCHEDULLING



V. CONCLUSION

- In this paper effectiveness of bim is studied for commercial building for 6d model cost,material and schedule is added in navisworks.
- It is observed that the bim model easy for monitoring and scheduling than conventional method

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