

Comparative Analysis of 5D BIM Using MSP And Navisworks For Construction Project Management

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Abstract- This paper investigates the integration of 5D Building Information Modeling (BIM) with Microsoft Project (MSP) and Autodesk Navisworks for quality management and project lifecycle optimization. A case study of the Pride Purple Square commercial building in Pune, India, forms the basis of this comparative analysis. 3D models were created in Revit, integrated with 4D scheduling and 5D cost estimation in both MSP and Navisworks environments. The study highlights how BIM-based workflows improve visualization, cost control, and clash detection compared to conventional approaches. Results show that Navisworks offers superior clash detection and 4D/5D simulation capabilities, while MSP provides robust scheduling features. Recommendations for improved BIM adoption in India are also discussed.

Keywords- Building Information Modeling (BIM), Quality Management, 5D BIM, MSP, Navisworks, Construction Project Management

I. INTRODUCTION

Building Information Modeling (BIM) is a transformative technology in the Architecture, Engineering, and Construction (AEC) industry, providing an integrated digital environment for project visualization, planning, and control. In India, where rapid urbanization and infrastructure demands are significant, BIM's application in quality management remains nascent. This study focuses on using 5D BIM to assess the comparative effectiveness of MSP and Navisworks in project management, with the Pride Purple Square commercial building serving as a case study.

II. METHODOLOGY

The methodology adopted involved a systematic workflow:

- A. **Data Collection:** 2D AutoCAD drawings, project brochures, and site data were collected for model development.
- B. **3D Modeling:** Autodesk Revit was used to create accurate architectural and structural models.

- C. **4D Scheduling:** MSP was used for activity-based scheduling, while Navisworks employed its TimeLiner tool for 4D simulation.
- D. **5D Cost Analysis:** Quantity takeoffs and cost data were integrated into both platforms to create 5D models.
- E. **Clash Detection:** Navisworks provided advanced clash detection, facilitating proactive design coordination.
- F. **Comparative Evaluation:** The platforms were compared on visualization quality, time accuracy, cost estimation, and clash detection.

III. CASE STUDY: G+6 COMMERCIAL BUILDING

A generic G+6 commercial building was chosen for this comparative study. The Revit model (Fig. 1) represents the building's architecture, integrating project data for subsequent 4D and 5D analyses.



Fig. 1 3D Visualization of G+6 Building

IV. RESULT AND DISCUSSION

This study was conducted to comparatively evaluate the impact of two distinct project management platforms—Microsoft Project (MSP) and Autodesk Navisworks—on the construction planning and cost analysis of a G+6 commercial building project. The overarching goal was to assess which software provides better efficiency in terms of time and cost management when integrated with Building Information Modeling (BIM). Through the systematic development of a 5D BIM model using Autodesk Revit as the core modeling

tool, and subsequent linkage with MSP and Navisworks for time and cost integration, the project offered measurable insights into the effectiveness of each tool. The comparative analysis focused on key aspects: time duration, total project cost, model coordination, scheduling accuracy, and simulation clarity.

A. Time Duration Comparison

- Using Microsoft Project (MSP), the total project duration was 1313 days (~3.59 years), following a conventional, non-integrated scheduling approach.
- With Navisworks TimeLiner, the project duration reduced to 1123 days (~3 years), reflecting a reduction of 190 days (~15%).
- This improvement was due to model-based scheduling, which enabled better visualization, clash detection, and activity sequencing.
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B. Cost Estimation and Control

- The 5D BIM integration in MSP provided cost estimates based on manual linkage with the Revit model, resulting in an approximate project cost of ₹11.76 Crore
- In Navisworks, automated quantity takeoff and real-time updates allowed for a more accurate and dynamic cost estimate of ₹11.25
- Navisworks' better alignment of schedule with model geometry contributed to reducing potential cost Voverruns.

C. Model Coordination and Clash Detection

- MSP lacked direct model clash detection features, requiring separate review processes and increasing the risk of overlooked design conflicts.
- Navisworks' advanced clash detection identified **several significant conflicts in MEP and structural coordination**, which were resolved during the pre-construction phase.
- This proactive approach minimized potential rework and improved overall project quality.

D. Scheduling Accuracy and Simulation Clarity

- MSP provided traditional Gantt charts that, while detailed, lacked integrated 3D/4D visualizations.
- Navisworks' 4D and 5D simulation tools offered clear, time-sequenced visualizations of construction activities, enhancing communication and decision-making among stakeholder

TABLE I
Comparing The Cost & Time

Parameter	MSP (Conventional Method)	Navisworks (BIM Method)	Difference
Duration (Days)	1313 days	1123 days	190 days less
Total cost (INR)	₹11.76 Crore	₹11.25 Crore	0.51 Crore saved
Time Efficiency	Slower execution	Faster execution	Aprox.15% faster
Cost Efficiency	Lower	Higher	Improved by R51 lakh

V. CONCLUSION

The comparative study reveals that while both MSP and Navisworks effectively manage scheduling and cost estimation, Navisworks' visualization and clash detection capabilities offer significant advantages. This suggests that Navisworks is better suited for complex projects requiring advanced coordination.

The study also emphasizes the potential of BIM-based workflows in improving quality management and project outcomes in the Indian construction industry.

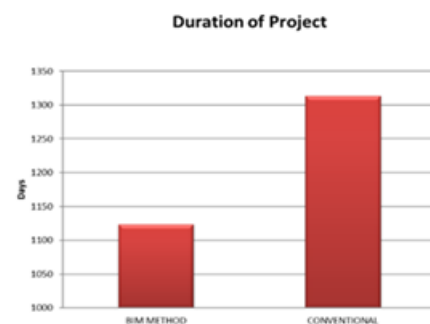


Fig. 2 Graphical Representation of Comparison of Duration of Project

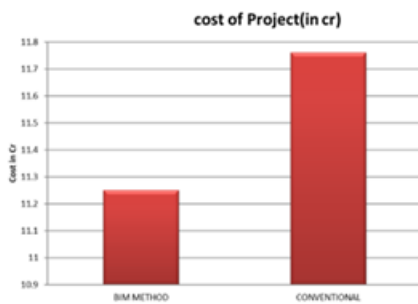


Fig. 3 Graphical Representation of Comparison of Cost of Project

VI. ACKNOWLEDGMENT

The authors express their sincere gratitude to Mr. Rohan Vilas Ambekar, Assistant Professor, Department of Civil Engineering, for his valuable guidance and constant encouragement throughout this study. We also thank Dr. Nitin P. Sherje, Principal, and Dr. Ghanasham C. Sarode, Head of the Department of Civil Engineering, along with the faculty members for their unwavering support and insightful feedback. Finally, we acknowledge the contributions of everyone who provided cooperation and motivation during the course of this research.

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