

“Evaluating Implementation of Building Information Modelling In Construction Industry with 3D/4D Collaboration of Building Model” - A Review

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Abstract— In This Paper work is taken based upon the written work survey for the collaboration of models. In this project Various BIM tools such as Revit, MS Project, navisworks are used in the model simulation. A case study on the Private Health Center carried out. Developed 2D drawings in AutoCAD was converted to 3D using revit architecture for the development of 3D model. which has all the informations such as the size, shape, material, schedules of each components etc. A separate Timeliner was prepared in MS Project for linking navisworks with 3D model generated in revit, for model simulation. However, the rebuild hierarchy tasks using links was not satisfied. A sample structure was generated in order to satisfy the project objectives, a separate timeliner was generated by adding up all the tasks and assigning to each components. The simulation of model with respect to the time schedule was generated, which satisfies the model simulation in navisworks. The IFC format is used to exchange the information of the project. However, some of the attributes were missed while transferring through IFC file format.

Keywords: Building information modeling (BIM), 3D Visualization, cost evaluations, energy simulations, Checking building code, detailed examination of life cycle

I. INTRODUCTION

Building Information Modeling (BIM) is a relatively digital approach to design 3D and 4D model in construction industry. The BIM has changed the look of building, the way they are upbuild BIM is not a thing or type of software but a human commotion that finally connected wide progress changes in construction industry (Chuck Eastman et al. 2007). However the concepts of BIM has Exited since the 1970s. the term BIM first appeared in a 1992 paper by (G.A. Van-nederveen & F.P. Tolman). Building Information Modeling (BIM) is the hopeful evaluation in the construction industry. With BIM all section, elevation, produced automatically and they are inter related to each other. this most accurate method to develop 3D model digitally. BIM cover all geometry, spatial relationship, geographical quantities and properties of building material. BIM Concept is to create intelligent element which understand its nature. To know the present construction management techniques in the construction industry this serves as tool for the management.

II. LITERATURE REVIEW

With the rapid adoption of BIM in the construction industry, and its gradual implementation in the design industry, careful considerations have to be taken when making the change over from the traditional method of creating

construction documents towards a BIM approach. There are plenty of positives, negatives, and unknowns that have to be considered when implementing BIM. This chapter will discuss research that was done about the background of BIM, its perceived positive and negative effects, and productivity improvements for the AEC industry.

Rogier Jongeling 2008, reports in his paper the time-space analysis of construction operation can be supported by the 4D CAD models. The application of 4D models is a new approach for the introduction of construction innovation and for evaluating the various construction alternatives. The case study has been done using two 4D models of an industry test cast to illustrate how to analyze, compare, and present 4D content quantitatively. The 4D modeling combines schedule data and spatial data. The analysis made are recognizing the spatial nature of construction work and the way in which the work moves over construction site, planning of temporary structures, in which the same spatial data from the 4D CAD models are used, later the combination of crew productivity and production costs with the extracted 4D content. Hence the paper concludes with the quantitative analysis of 4D models can benefit different types of construction project, recommending the application for critical stages of a construction planning in complex projects [1].

Salman Azhar 2008, describes the techniques to decrease project cost, increase productivity and quality, and reduce project delivery time. BIM represents the development and use of computer generated n-dimensional (n-D) models to simulate the planning, design, construction and operation of a facility. BIM encourages the integration of the roles of all stakeholders on a project. The BIM was developed using Autodesk Revit, Graphisoft Constructor, and Bentley Architecture. The benefits of BIM in the AEC industry are discussed with the help of two case studies with a scope of design coordination, clash detection and work sequencing. The paper concludes that BIM as emerged as an innovative way to manage projects, the use of BIM accelerates, collaboration within project teams should increase, which lead to the improved profitability, reduced costs, better time management and improved customer/client relationships [2].

Zhaoyang Ma, et al., The author presented the Visual 4D planning and scheduling technique that combines static 3D CAD models with construction schedules has proven to be beneficial over analysis, The combination of 3D CAD models with project timeline to form 4D models. The construction schedules and site space arrangements are essential to project management. There is a strong need for more effective planning and management of site space and facilities. This paper introduces the 4D Integrated Site

Planning System (4D-ISPS) which integrates schedules, 3D models, resources and site spaces together with 4D CAD technology to provide 4D Graphical visualization capability for construction site planning. The products of 4D technology has been developed by professional software vendors, such as Schedule Simulator by Bentley and Project Navigator 2000 by Virtual STEP. This paper approaches creating an information and graphical model platform across the AutoCAD and MS Project software interfaces using Visual C++ and ObjectARX. The paper concludes by the introduction of 4D-ISPS which can deals with both 4D building models and 4D site models using the innovative technology such as ObjectARX and DLL and a series of common software packages like MS Project and AutoCAD, an integrated site layout system with management, visualization, schedule, and facility layout across the dynamic 3D site has been developed. [3].

Zhang Jianping et al., The application of 4D CAD for the operation simulation methodologies was implemented by the applications for simplified discrete-event simulation (SDESA), and 4D-GCPSU to the National Stadium of the Beijing 2008 Olympics. The installation of the steel structure was simulated and optimized by using genetic algorithm (GA) optimization methodology this results in resource allocation optimization, resource saving, and construction efficiency improvement, the simulation was done by using SDESA model and optimized using Genetic Algorithm. The paper concludes that simulation results shortened the installation duration by 39days, about 16% of the original total duration. The OpenGL graphic platform to visualize the complicated 3D models, the 4D-GCPSU system integrated 3D components with construction schedule [4].

J. Vinoth Kumar and Mahua Mukherjee, this paper reports BIM application in India, while this application is widely accepted throughout the industry in many countries for managing project information with capabilities for cost control and facilities management. 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 [5].

J. P. Zhang et al., here the author highlights the four-dimensional (4D) technology, time-dependent structural analysis, collision detection, and so on, a 4D structural information model is presented and established according to the overall solution of analysis and management for conflict and safety problems during construction. Based on this sub-BIM, the integration of dynamic safety analysis of time-dependent structures, conflict analysis and management of schedule/ resource/ cost, and dynamic collision detection of site facilities is studied, and theories and key technologies are discussed in this paper. The results of this research provided a feasible theory and methodology for integrated application of BIM, has theoretical significance and application prospects in

meeting the needs of improving the safety level during construction [6].

Boeing Laishram, author discusses the hurdles in the implementation of BIM to manage the construction projects procured through public private partnership (PPP) route, which has become one of the preferred routes for procurement of projects in developed and developing countries in view of the budgetary constraints faced by the governments. BIM promotes an integrated project delivery approach that encourages collaboration amongst the various stakeholders to the project over its lifecycle. The perceived benefits from collaboration such as improved profitability, reduced costs, better time management and improved customer/contractor relationships have been amongst the factors driving the paradigm shift towards BIM [8].

Vivek Sah, Clark Cory, This paper gives the outline for the visualization and modeling software and shows how the different building information modeling software can be used. The considerations that were made in the phased integration of building information modeling. The rapid rise has spiked interest in both the academic world and AEC industry. Several construction firms realizing the potential for growth using this technology have already started their own building information modeling divisions [7].

Manfred Breit et al., The author had discussed 3D/4D modeling, simulation and visualization of Products (buildings), Organizations and Processes (POP) can support lean construction. Initial findings suggest that Process Design Pattern may have the potential to intuitively support ICT based lean construction. First findings show that existing tools provide only limited support through the introduction of Process Design Patterns, to establish process thinking in the interdisciplinary POP design. Optimized construction processes may be synthesized with semi-automatic methods by applying Process Design Patterns on building structures. By providing process templates that integrate problem solution and expert knowledge, Process Design Patterns may have the potential to ensure high quality process models[9].

III. METHODOLOGY OF WORK

This paper utilizes an organized review of various literatures which sources are from renowned conference papers, journal articles and government reports to expose the drifts of Building information technology applications from first solving conceptual design. Like 3D Visualization, cost evaluations, power simulations, checking building code, detailed examination of life cycle, and it is arrange or put into a format to be interoperable with another program that are special to the Construction industry.

IV. CONCLUSION

Work is taken based upon the witten work survey for the collaboration of models. In this project Various BIM tools such as Revit, MS Project, navisworks are used in the model simulation. A case study on the Private Health Center carried out. Developed 2D drawings in AutoCAD was converted to 3D using revit architecture for the development of 3D model. Which has all the informations such as the

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ACKNOWLEDGMENT

Success is the manifestation of diligence, inspiration, motivation and innovation. I attribute my success in this venture to my guide, Department of Civil Engineering, G.H. Rasoni University, Amravati who showed the guiding light at every stage. I am indebted to him for sharing expertise, sincere and valuable guidance and encouragement extended to me. I am also thankful to all my friends who help me directly or indirectly to accomplish the work.

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