



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 8, Issue, 7, pp. 18686-18691, July, 2017

**International Journal of
Recent Scientific
Research**

DOI: 10.24327/IJRSR

Research Article

IMPLEMENTATION OF BUILDING INFORMATION MODELLING FOR COMMERCIAL BUILDING PROJECT

Abhijit.N.Bhirud and Ganesh Nandkumar Gore*

Civil Engineering Department, Imperial College of Engineering and Research,
Wagholi, Pune-412205, India

DOI: <http://dx.doi.org/10.24327/ijrsr.2017.0807.0550>

ARTICLE INFO

Article History:

Received 16th April, 2017
Received in revised form 25th
May, 2017
Accepted 23rd June, 2017
Published online 28th July, 2017

Key Words:

Building information modeling, Comparison
of BIM, necessity of BIM.

ABSTRACT

This paper illuminates the degree of Building Information Modeling encourages us to keep up control over the ventures, upgrades composed exertion between different units, reenactment with impression of the ventures at different stages, settle many conflicts even before beginning execution work, guides the organization of risk to be taken after for better completion of the venture and can help in taking various managerial decisions. This project is highlighting the Implementation of Building Information Modeling for Commercial Building Project and furthers its necessity to different parties at various stages of construction which are pre-construction, construction, and post-construction stages and finally the comparison between BIM and conventional methods

Copyright © Abhijit.N.Bhirud and Ganesh Nandkumar Gore, 2017, this is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

The BIM idea conceives virtual development of an office before its real physical development, to decrease instability, enhance security, work out issues, and mimic and dissect potential effects. Sub-contractual workers from each exchange can include basic data into the model before starting development, with chances to pre-create or pre-gather a few frameworks off-site. Waste can be limited nearby and items conveyed on an in the nick of time premise instead of being stock-heaped nearby.

Amounts and shared properties of materials can be separated effortlessly. Extents of work can be confined and characterized. Frameworks, congregations and successions can be appeared in a relative scale with the whole office or gathering of offices. BIM additionally forestalls blunders by empowering struggle or 'conflict location' whereby the PC display outwardly highlights to the group where parts of the building (e.g.: basic edge and building administrations funnels or conduits) may wrongly converge.

Building Information Modeling (BIM) is a kind of a new advance that offers many advantages to the development business. These advantages bring about various benefits such as enhanced venture quality, lessened timetables and also decreased expense considered. This exploration also inspects

the advantage of BIM which can offer the current development ventures starting from conceptualization to devastation. Through this and related research, the development firms can figure out how to consolidate BIM into their function and also give experience of an expansion in general nature of a venture. This paper talks about the part and utilization of Building Information Modeling from the Construction Management perspective. The employments of Building Information Model, and the Building Information Model programming and integrators are additionally examined mostly from a development administrator point of view. BIM connected with 3D part to give 4D and 5D demonstrate. 4D demonstrate is implanted to time which can be utilized to reenact development procedure of building. 5D show is expansion of cost in 4D demonstrates and permits snappy cost estimation for various plan alternatives. Aside from 3D, 4D, and 5D there are likewise idea of 6D, 7D and 8D displaying. 6D demonstrating is 5D or more site information; implies 3D building model connected with a 3D site display and the coordinated model ought to likewise convey all the venture calendar and estimation data. The site information requires the coordination of Geographic Information System (GIS) and BIM. The 7D BIM idea has been raised, which is BIM forever cycle office administration. 8D demonstrating is identified with the well being and security.

*Corresponding author: **Ganesh Nandkumar Gore**

Civil Engineering Department, Imperial College of Engineering and Research, Wagholi, Pune-412205, India

Be that as it may, in this theory we can contemplate just 3D, 4D and 5D displaying.

What is BIM

BIM or Building Information Modeling is a procedure for making and overseeing data on a development extend over the venture lifecycle. One of the key yields of this procedure is the Building Information Model, the advanced portrayal of each part of the manufactured resource. This model draws on data collected cooperatively and refreshed at key phases of a venture. Making an advanced Building Information Model empowers the individuals who interface with the working to improve their activities, bringing about more noteworthy entire life esteem for the advantage.

The Benefits of BIM

When we consider BIM, we frequently consider better outline coordination and enhanced constructability. Be that as it may, the genuine esteem can come after handover, when the proprietor or office chief gets an entire and precise arrangement of data. Significantly more than that, BIM gives an arrangement of interrelated and cross-referenced data. For instance, protests in the model are connected to related data including manuals, determinations, appointing information, photographs, and guarantee points of interest. This enables the proprietor or office director to effectively and precisely deal with the benefit. Since 75% of the cost of an office is brought about after handover, unmistakably the advantages of BIM keep on occurring after outline and development have been finished.

LITERATURE REVIEW

Review of Technical papers

Benedict D. Ilozor and David J. Kelly "Building Information Modeling and Integrated Project Delivery in the Commercial Construction Industry: A conceptual Study" Journal of Engineering, Project, and Production Management, Pg 23-36, Vol 2(1), 2012

In this paper taking after focuses are talked about:

1. The main objective of this research paper is to conceptualize a newer framework in order to understand BIM and IPD (including partnering), their interactions and also the resulting impact it has on the design and construction process outcomes.
2. Firstly the literature review was done to understand the potential of BIM and IPD including Partnering which is a less formal predecessor to IPD. It was seen that positive potential was identified.
3. Further this conceptual study identifies the key benefits and deficiencies within the literature and was discussed further. This information was further synthesized with the help of comparative analysis.
4. The author concluded that future research approaches was needed to have a better understanding the relationship between BIM and IPD and also project performance measures utilizes a rigorous quantitative methods to measure and evaluate the effect of technology.

Lancine Doumbouya, Guoping Gao and Changsheng Guan "Adoption of the Building Information Modeling (BIM) for Construction Project Effectiveness: The Review of BIM Benefits" American Journal of Civil Engineering and Architecture, Pg 74-79, Vol 4, No 3, 2016.

1. The main objective of this research paper is to have a better comprehension about the BIM benefits and also to analyze BIM adoption which thus provides a better understanding of BIM and its usefulness in various stages of the construction projects.
2. Firstly the author has mentioned about the role of BIM in various stages of Construction and also mentioned how important it is to have a better understanding of BIM in all stages. Further author has also mentioned about the Benefits of BIM in the projects. Also author has mentioned that adoption of BIM can be a success if the people involved in the project have better understanding of the factors involved. Lastly the authors have mentioned about the factors which effect in the adoption of BIM.
3. The study thus concluded how BIM is beneficial to the construction projects. BIM helps to yield better quality in the projects and also increases the efficiency of the processes during all stages.

Wissam Hijazi, Dr. Sabah Alkass and Dr. Tarek Zayed "Constructability Assessment Using BIM/4D CAD Simulation Model" ACEE International Transactions, 2009.

1. The main objective of this research paper is to develop a new methodology for evaluating the level of application of constructability principles on building using BIM and 4D Models.
2. The author proposed a new methodology to evaluate the level of application of constructability principles in residential buildings. This methodology integrated the object oriented Building Information Model (BIM) and the 4D CAD simulation model. Also the various factors affecting the constructability of building designs were identified with the help of a questionnaire survey on constructability attributes. Further Multi-attribute decision analysis and Analytical Hierarchy Process (AHP) were used to assess the overall constructability value. This new methodology was been validated by using a case study of a condo project in downtown Montreal.
3. The outcome of the methodology showed that by integrating BIM and 4D CAD simulation models have many benefits to the designers in which the evaluation of different designs can be carried out in a more faster and accurate way.

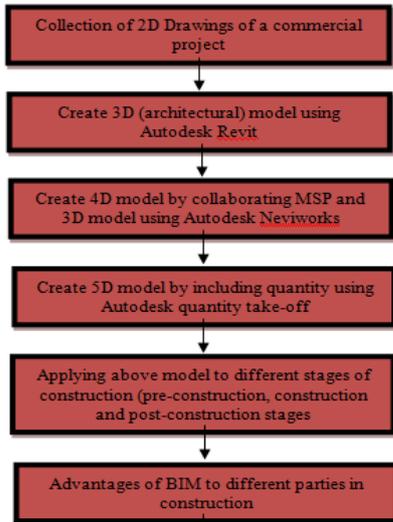
A.Z. Sampaio and Diogo Simoes "Maintenance of Buildings using BIM Methodology" The Open Construction and Building Technology Journal, Pg 337-342, 2014.

1. The main objective of this research paper is to implement the benefits provided by BIM on a software tool used as support to the maintenance of the buildings.
2. Firstly during an inspection activity for the maintenance purposes, the implemented application, containing a very rigorous database, allows the user to identify each anomaly present in the building components, directly into BIM model, which is automatically associating with probable

causes, repairing methods and with help of a photograph. By this application there are gains in productivity and decreasing error probability. Also the inspection data is to be stored in the BIM model making it useful for consultation when maintenance program is planned.

- The paper thus helped to demonstrate not only that there are problems which is still concerning the interoperability between BIM software, But also it helped to get the advantages of employing BIM for building maintenance purposes.

METHODODOLOGY



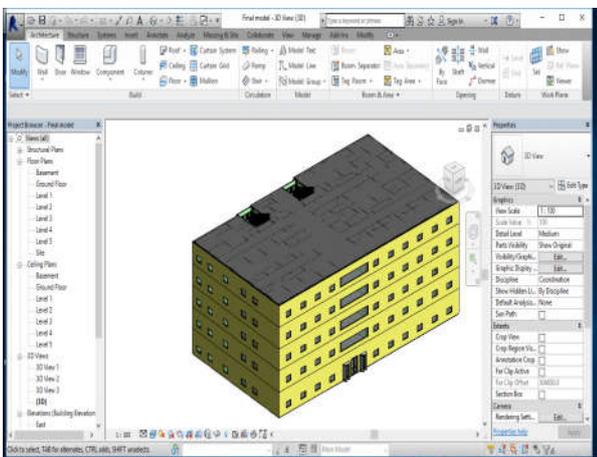
Data Collection

General Detail of case study

1. Site location : Hinganawadi road, Nagpur
2. Type of structure : RCC Framed structure
3. Floors : B + G + 4
4. Plot Area : 3150 Sqmt
5. Built up area : 10997 Sqmt

Following key data was collected for research

1. Architectural Plans
2. Structural Plans
3. Mechanical Electrical and Plumbing Plans
4. Tender Specifications
5. Microsoft Project
6. Monthly progress reports



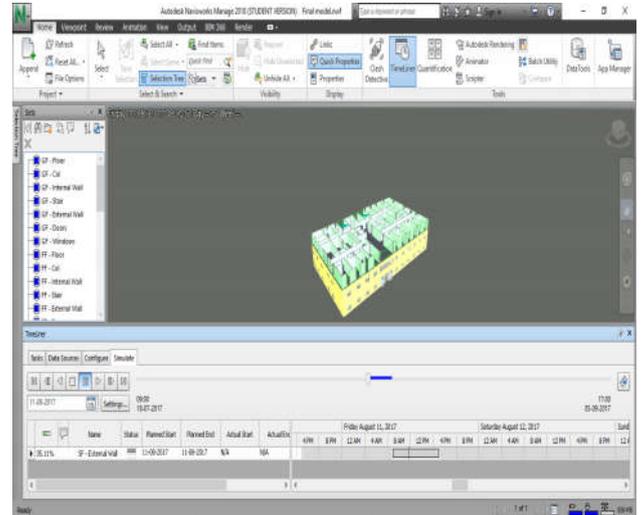
Analysis of Data

3D Model (i.e. architectural model)

The 3D model was made by using Autodesk Revit 2016, view as follows

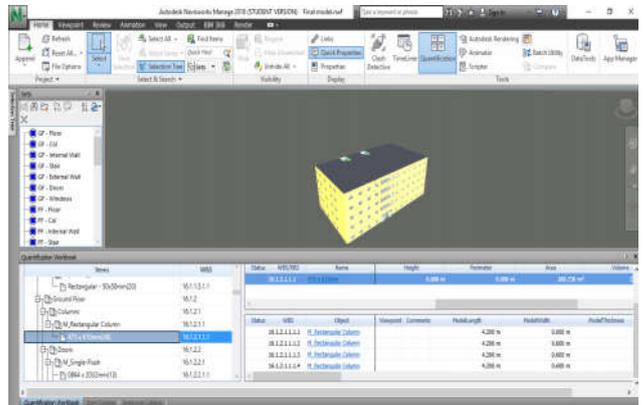
4D Model (i.e. 3D + Scheduling)

Later the 3D model was converted to 4D model by using Autodesk Neviworks, adding schedule(i.e time the 4th dimension) view as bellow



5D Model (i.e. 4D + Quantity Takeoff)

Finally the Quantily by quantity tool, as below



Observed necessity of BIM in construction project by different parties

Clash Detection: - One of the common problems of different disciplines plans for a construction project is the geometrical design inconsistencies. This issue happens when there is an overlap between the plans of different disciplines. Using BIM, it would be possible to bring the plans together and detect the clashes. Modifying the aesthetic problems is another possibility of this visual checking.

Constructability: - Using BIM, it would be possible for teammates in a project to review and handle constructability issues and (if needed) promote issues into RFIs. In addition, visual information can be provided from a vantage point to show the problems. This visual information accompanying markup allows further investigation for finding solutions and, thus, mitigates the risks.

Analysis: - Helping the project managers, designers and engineers in doing more analyses and enabling better decision making is another aspect of BIM. By linking the building information models to appropriate tools, it would be possible to analyze the energy consumption of a construction project and then find better solutions such as changing materials and orientation, mass and space, etc. Moreover, light, mechanical and acoustics analyses are also available to be performed by BIM.

Time & Cost Estimation (4D & 5D):- Time and cost estimation are other features of BIM which enable project managers to visualize the construction project at any point in time and have a clear understanding of project phases. Time and cost estimation, which are generally called 4D and 5D, can be properly utilized in the first stages of a project and facilitate the decision making process with minimum cost and time needed. Furthermore, BIM has the capability to simulate the various alternatives for a construction project and hence helps project managers and executives to reliably predict the consequences of their decisions.

Integration: - The project team can deal and interact with a unified model when a composite model is built from an amalgam of various disciplines' models. Having this capability, and through the different phases of a construction project, BIM can coordinate the design, analysis, and construction activities on a project and, therefore, results in integrity of projects.

Quantity Take-off: - Quantity takeoffs in a BIM model can be very helpful for the project teams and managers to analyze their decision and have a clear and reliable insight to various alternatives in the design phase or even throughout the project lifecycle. Since there is a possibility of integration between the BIM model and a database containing cost estimation, an accurate estimation can be obtained faster. Moreover, these takeoff items can be used easily in procurement procedure.

Element Based Models: - Since the BIM models generally are composed of objects-and not geometries, such as line, surface, etc.-the whole model can be divided into a specific number of smaller objects. This breakdown makes it possible to have a defined and clear scope of projects. The distinction between the elements will result in a better management design, estimation and construction.

Collaboration and Team Building: - Collaboration and team building is another key factor for BIM success on construction projects. All efforts made by various specialties on a project are unified and applied to one model. This results in direct correspondence and team building. All disciplines have to work on a unified model as a team and have an effective collaboration during a project using the BIM concept.

Communication :- The Nature of a unified model to input, modify and analyze the data in BIM models will improve communication and collaboration between all parties involved on the construction project including project managers, architects, engineers, and contractors. These unique building models facilitate the communication throughout the project and lessen the disputes between different parties.

To analyse the use of BIM at various stages of construction i.e pre-construction, construction and post-construction stages

The slab above the column was not been taken into consideration while planning of the false ceiling work during finishing and thus there was problem encountered of electrical and firefighting pipelines coming below as the thickness of that slab was not taken into consideration and thus finally the ceiling had to be taken down and thus expected room height was not achieved.



There was much difference in the planned quantities and the actual quantity while execution of the work. As the quantities increased there was increase in the total estimate of work. This could be reduced to a significant level by using BIM model as much accurate quantities could be gathered before the execution of work or while estimating the project.

Another problem encountered is there were clash between the electrical, firefighting and plumbing lines and due to this clash there was necessity to make changes in the initial drawings. This is one of the major benefits which we achieve by using BIM where it will inform us if at all any clash is happening and it could be resolved in the initial time itself.



There were a large number of RFI (Request for Information) by the contractor been placed while executing the work due to lack of complete data (including revised plans) available which could have been easily provided by BIM to save the time delay caused due to RFI's.

There was problem in material procurement as there was alteration and modification in the plans extra material had to be purchased and due to more lead time there was delay in the work and also extra cost for transportation of material had occurred.

To compare BIM and conventional methods

Sr.no.	Point of focus	conventional method	BIM
1	Planning and scheduling	Only schedule and bar-chart	Link your schedule to the 3D model, for better understanding of the project.
2	Baseline Vs Actual analysis	Bar-chart comparison is tedious	Visual comparisons in few minutes video
3	construction progress tracking and control	Inaccurate layout colouring and progress representation	accurate layout colouring and dynamic progress representation
4	Look ahead plan	Unclear look-ahead plan	Very clear look-ahead presentation
5	Claim analysis and dispute resolution	Very hard to prove who is responsible for the delay and required so much time and money.	Very easy to prove who is responsible for the delay and what is the expected outcomes in the future
6	General Project management approach	Huge amount of data hence mistakes, duplication, losing data and wasting time.	Just nice and easy for getting desired data.
7	Cost of operation	Low initial cost but can lead to heavy constructional cost.	High initial cost but can recover cost in first few months.

CONCLUSION

Construction projects are getting more complex day by day and it is difficult to manage them with the traditional methods, hence Building information modeling is becoming need of the hour for large numbers of projects, so as to the Commercial Building Project.

Building information modeling compile data received from various sources and gives the appropriate information at a desired level, as it improves accuracy, Increase Efficiency, Better visualization and documentation, Single and integrated information resource, saves time and energy, reduces collisions but on the other hand the cost of hardware, software and training is high, Transition from Drafting to Modeling and compatibility pushes it to the back foot.

3D Model (i.e. architectural model), 4D Model (i.e. 3D + Scheduling) and 5D Model (i.e. 4D + Quantity Takeoff) were successfully prepared and was helpful to observe the different aspects of the subject Commercial Building Project. The necessity of BIM in construction project for different parties were discussed which are Clash Detection, Constructability, Analysis, Time & Cost Estimation (4D & 5D), Integration, Quantity Take-off, Element Based Models, Collaboration and Team Building and Communication.

Later the use of BIM was analyse at various stages of construction which were pre-construction, construction and post-construction stages and received various outcomes such as improper consideration of column cap, difference in the planned quantities and the actual quantity, clash between the electrical, firefighting and plumbing lines, large number of RFI (Request for Information), material procurement as there was alteration and modification

The comparison between BIM and conventional methods were done on following aspects and BIM stands at better position, Planning and scheduling, Baseline Vs Actual analysis, construction progress tracking and control, Claim analysis and dispute resolution, General Project management approach, Cost of operation

Finally we can conclude at present stage it hold a large numbers of solution ahead and its importations spreads day by day and with more parties accepting the building information modeling as an integral part of project.

References

1. "Building Information Modeling (BIM) and Sustainability – Using Design Technology in Energy Efficient Modeling", IOSR Journal by Eng. Parisa Esmaeili Moakher and Prof. Dr. S. S. Pimplikar, Pune, Maharashtra, India. ISSN: 2278-1684 Volume 1, Issue 2, July-Aug 2012, PP 10-21.
2. "Adoption of the Building Information Modeling (BIM) for Construction Project Effectiveness: The Review of BIM Benefits" - *American Journal of Civil Engineering and Architecture* by Lancine Doumbouya, Guoping Gao, Changsheng Guan, Vol. 4, No. 3, 74-79, 2016.
3. "BIM based Project Scheduling and Progress Monitoring in AEC Industry" -*International Journal of Scientific Engineering and Research (IJSER)* by Saini, Vijay Kumar, Mhaske, Sumedh, 2347-3878 Volume 1 Issue 1, September 2013.
4. "Contractors Transformation Strategies for Adopting Building Information Modelling" - ASCE By Yong Han Ahn, Young Hoon Kwak and Sung Joon Suk, 2015
5. "Building Information Modeling in Support of Sustainable Design and construction" - ASCE , Patrick Bynum, Raja R. A. Issa and Svetlana Olbina, A.M., 2013.
6. "BIM based Project Scheduling and Progress Monitoring in AEC Industry" - *International Journal of Scientific Engineering and Research (IJSER)* by Saini, Vijay Kumar, Mhaske, Sumedh, 2347-3878 Volume 1 Issue 1, September 2013.
7. State of Practice of Building Information Modeling in the Electrical Construction Industry.- ASCE , Awad S. Hanna, Michael Yeutter and Diane G. Aoun , 2014
8. "Solutions for Scalability in Building Information Modeling and Simulation-Based Design", - by Sixuan Wang, Gabriel Wainer, Rhys Goldstein, and Azam Khan. 2014.
9. Advantages and Challenges of Using BIM: a Cost Consultant’s Perspective”, 49th ASC Annual International Conference Proceedings - by Niraj Thurairajah, Dan Goucher. 2013.
10. "Solutions for Scalability in Building Information Modeling and Simulation-Based Design”, - by Sixuan Wang, Gabriel Wainer, Rhys Goldstein, and Azam Khan. 2014.
11. Advantages and Challenges of Using BIM: a Cost Consultant’s Perspective”, 49th ASC Annual

- International Conference Proceedings - by Niraj Thurairajah, Dan Goucher. 2013.
12. An analytical study on relationship-oriented building information model - ASCE - Zhenghong Peng, Ru Wang and Hua Liu, 2012.
 13. "Building Information Modeling: Optimizing BIM Adoption and Mindset Change" - by Kelvin Mulenga & Ziqing Han, Goteborg, Sweden 2010.
 14. Building Information Modelling: How it can Benefit a Modern Construction Project in a University Setting - by William Michael Duke, Philip W. Johnson, Committee Chair Gary P. Moynihan Timothy A. Leopard, 2013.
 15. "Building Information Modeling in Commercial Construction Projects" - *International Journal of Recent and Innovation Trends in Computing and Communication* by Ganesh Gore, Prof.Abhijit.N.Bhirud, Volume 4, Issue 12, December 2016.
 16. Application of Building Information Modeling for The Residential Building Project - *International Journal of Technical Research and Applications* -by Prof. Abhijit .N. Bhirud 1, Pravin B. Patil, - Volume 4, Issue 3 (May-June, 2016), PP. 246-249.
 17. Application of Building Information Modeling for the Residential Building Project - *International Journal of Engineering Research-Online(Ijoer)* - Prof. Abhijit .N. Bhirud 1, Pravin B. Patil, - Vol.No 3, Issue No 4, (July-August)Year...2015 .PageNo:- 13-18

How to cite this article:

Abhijit.N.Bhirud and Ganesh Nandkumar Gore.2017, Implementation of Building Information Modelling for Commercial Building Project. *Int J Recent Sci Res.* 8(7), pp. 18686-18691. DOI: <http://dx.doi.org/10.24327/ijrsr.2017.0807.0550>
