iJRASET
International Journal For Research in Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VIII **Month of publication:** August 2021

DOI: https://doi.org/10.22214/ijraset.2021.37081

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VIII Aug 2021- Available at www.ijraset.com

Role of Building Information Modelling (BIM) in Sub-Contractor Management

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Abstract: ***Construction industry being an excellent example of supply chain has various key components which are interlinked and interdependent on each other. The whole chain is glued on communication among each other. Any lack in the flawlessness of this communication breaks the chain and the whole system gets affected. The work breakdown structure of this industry is structured in a hierarchical manner and works on decentralization of the authority. The most common lack of communication has been observed between the Contractor and Sub-contractors which causes multiple issues during delivery. Thus, this study has established a workflow through which BIM (Building Information Modelling) can be employed to improve communication between the Contractor and Sub-contractor of a project. This document gives formatting instructions for authors preparing papers for publication in the Proceedings of an IEEE conference. The authors must follow the instructions given in the document for the papers to be published. You can use this document as both an instruction set and as a template into which you can type your own text.***

Keywords: BIM; Sub-contractor management; Communication; Scheduling; Revit Architecture.

I. INTRODUCTION

Communication leads to coordination and without coordination there cannot be a seamless collaboration. The lack of communication between the contractor and the subcontractor has opened the door op application of BIM in this sector to erase this flaw. The BIM handbook (2008) defined BIM as CAM technology for the purposes of managing the information of a construction projects.

Building information modelling (BIM) can be defined as a reliable, 3-d digital estimation and maintenance of the projects (through words & images). Graphisoft in 1986 introduced its new software as solution for virtual building. The terms BIM was wide spread when Autodesk released the “Building Information Modelling” (Autodesk,2003). Most of the time people misunderstands BIM. [1]

Building information modelling (BIM) – based coordination is a valuable step that precedes construction because building have become heavily equipped with mechanical, electrical and plumbing system. BIM based coordination has been very effective for detecting and solving the problems during the design stage, reducing reworks and change orders, and helping construction projects reduce cost and avoid delay.

Although there have been many studies asserting that BIM based coordination generates the benefits of cost reduction, the benefits are not fully maximized because of the passive participation of subcontractors. Subcontractor should play a key role during BIM based coordination because they are responsible for both the development and realization of construction details. Komran and Tatum (2006) argued that the active involvement of subcontractor in creating design alternative during BIM- based coordination is critical for deriving feasible and cost-effective solutions. However, subcontractor is typically passive in BIM-based design coordination.

They tend to solely on eliminating spatial interference and are typically reluctant to develop a cost-effective alternative plan that could lead to the cost reduction. This result from the use of unit price-based lump sum contract method. Which pays subcontractor based on the amount of work they perform. Therefore, if the subcontractor’s work is reduced, they will be paid less. Thus, subcontractor have no motivation to explore cost effective design alternatives, which could reduce their work and income.

This paper aims to show the solution for the communication gap and provide seamless communication between the main contractor and sub-contractor in BIM project environment with the support of Revit Architecture BIM tools is used for creating 3D models, plans, section, elevation and door window scheduling. it is compulsory to having a proper knowledge of BIM and experience for the subcontractor to succeed. This paper also discusses the requirements of BIM knowledge and experience enrichment of main contractor and sub- contractor.

II. LITERATURE REVIEW

There are various published research works that relate to the role of Building Information Modelling in construction industry as well as subcontractor management.

In a study conducted at the Worcester Polytechnic Institute, six BIM utilization activities were targeted: visualization, 3D coordination, cost estimation, prefabrication, construction planning and monitoring, and record model. The visualization is generally the simplest use of a Building Information Model such as renderings. It was observed that BIM enhances the use of "design to build" and "build to design" concepts. The visualization, fabrication, coordination, and construction planning were carefully studied. Due to the time consideration of the project, they could not pay extra attention to use of cost estimation, construction monitoring, and record modelling. Hence, this study contributed to further research in those parameters.

A paper introduced a two-step subcontracting process for building information modelling (BIM)–based design coordination under a design-bid-build (DBB) contract. Only subcontractors who meet the target costs during BIM-based design coordination in the preconstruction phase win the right to work during the construction phase. From case studies, this study finds quantitative cost reductions from this change in the preconstruction process. These findings contribute to maximizing the efficiency of BIM-based design coordination, which will eventually contribute to more efficient delivery of construction projects [2].

The recent paper of ASCE 2021, findings enable practitioners to better understand BIM diffusion and reduce their NVA BIM implementation activities for enhanced construction productivity. but there is some limitation of this paper i.e., category, hierarchy an interrelationship among the critical cause of NVA BIM implementation activities were not explored, design model does not fit for intended downstream users (architect/engineers and designers) and design change can expensive once fabrication has commenced [3].

The research article described the information flows in a BIM enabled construction projects and I found one gap in this project is study is limited to its scope on the contractor's informational relationships to its most influential relationships with lead designer and supplier/subcontractor, which causes informational outputs as depicted by the literature and respondents.so need for future research arises on the contractor's extensive informational relationships in a BIM project environment

After analysing all the research papers in reference to the use and role of building informational modelling in construction industry, it was found that there is no seamless communication between the main contractor and subcontractor. Thus, this research focused on establishing an improved process of using BIM for managing communication between the sub-contractor and the prime contractor.

III.METHODOLOGY

After detailed analysis of the past research on this subject, a commercial-cum- residential project was taken as basis for conducting research. A model-based research approach was picked where a model of the same project was trained on the BIM atmosphere using Revit architecture and was scheduled at all parameters and few details were added that were not initially in the min project report to enhance the effectiveness of the model. Through this model, an opportunity opened for sub-contractors to convey their issues and ordeals in a more orderly manner.

Data on the project was collected by personally visiting the site and interacting with the owner and the following data was obtained that will be helpful in making prototype and formulating the process for research-

1) Land Cost- 1.5cr.
2) Land Area-3000 SQFT. Project cost- 4 crore
3) Area- Gomti Nagar Extension, Lucknow, Uttar Pradesh.
4) Locality- Near City Montessori School, NH-25, Lucknow, Uttar Pradesh. 226010.
5) Building Type- Commercial cum Residential
6) Project duration- 1.5-year
7) Starting date- November 2019.
8) Ending date- Tentative July 2021.

A. Implementation of Analysis in project using BIM Analysis Tool

After establishing the relation of BIM and sub-contractor, considering the communication gap, a project model is created in BIM Tool i.e., Revit Architecture. Using the tool 2D Plan, 3D model in all the view from East-West-North and South, Elevations, Sections and Door Window Scheduling were prepared.

Fig-1 Front elevation view

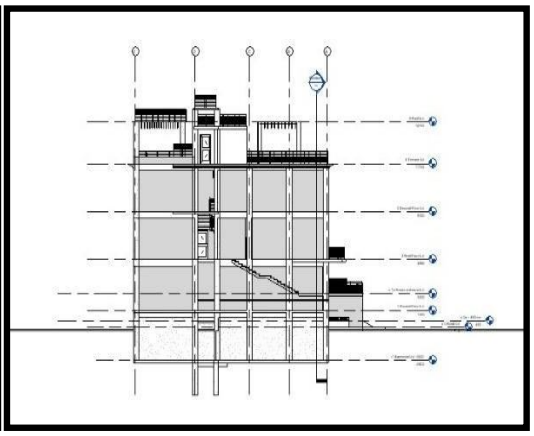


Fig-2 Left elevation view

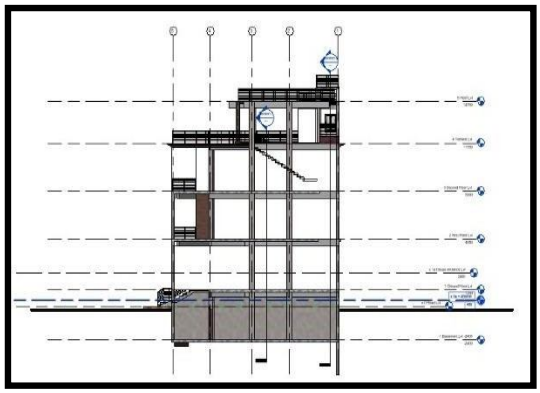


Fig-3 Rear elevation view

Fig-4 Back elevation view

Fig-5(i) 3-d view corner elevation

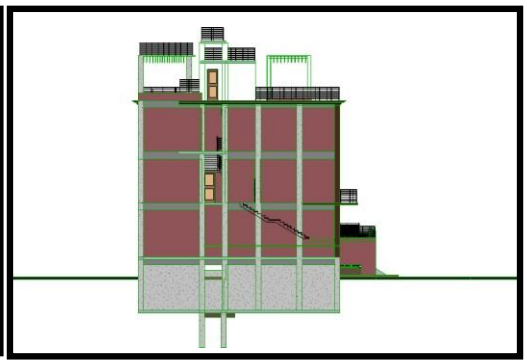


Fig-5(ii) 3-d view side elevation

Fig-5(iii) 3-d view exterior elevation

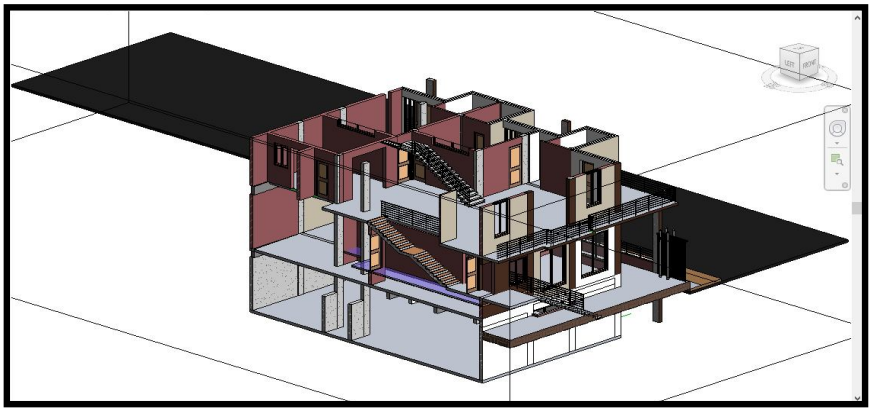


Fig-6 Section model

Using these models, it is proposed that it will reduce and remove the communication gap and show the seamless communication between the main contractor and sub-contractor. These models will help in conveying the information in a more organized way that will be aided by visualization through images.

IV. CONSIDERATION OF HYPOTHESIS

Consider the hypothesis that if subcontractor give these above all the information through Revit Architecture tool of BIM so selection of subcontractor will become easy and reduce the cost reduction. then it can be said that Building Information Modelling (BIM) plays a very important role for the sub-contractor and management for sub-contractor. It is also profitable for both Main Contractor and Sub-Contractor

V. CONCLUSION

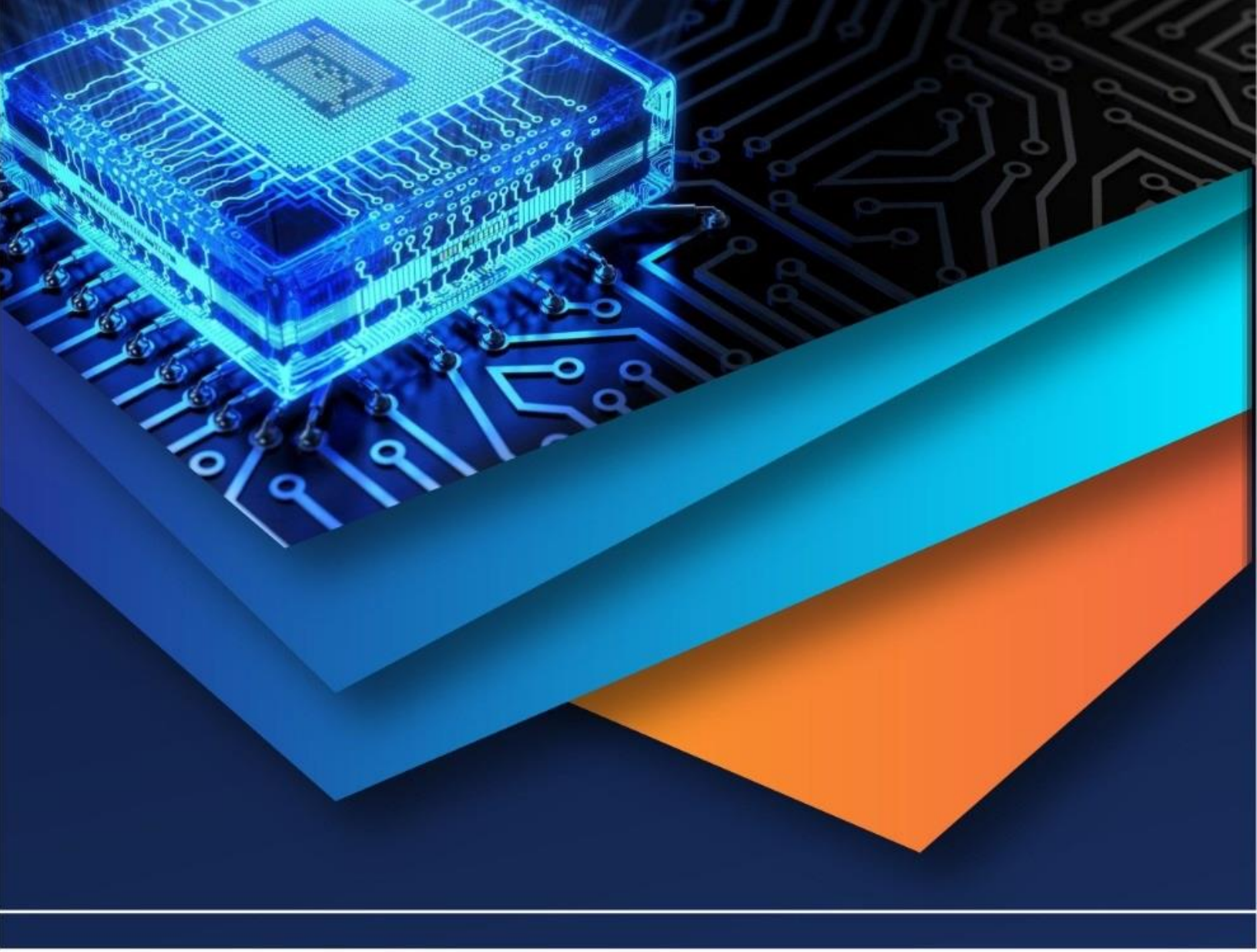
This research has been attempted to prove that the communication gap between the contractor and the sub-contractor can be removed by applying BIM tool. The information flow occurs seamlessly which complements the nature of a supply chain. The delay of work due to communication gap.

VI.LIMITATION

The anecdotal nature of this study is its main limitation. The cost-reduction impact for one-step and two-step subcontracting and subcontractors' attitude changes are based on two project cases. As mentioned previously, different companies have different ways to manage contracts and resources, which influences the impact of cost reduction from the use of the two-step subcontracting approach. This study took project case from one category project to control for the impact of different management approaches. However, this led to the anecdotal comparison. To generalize the impact of the BIM, future studies should collect more data from more project cases involving multiple companies.

REFERENCES

[1] Rokooei S. Building Information Modeling in Project Management: Necessities, Challenges and Outcomes. Procedia - Soc Behav Sci. 2015; 210:87-95. doi: 10.1016/j.sbspro.2015.11.332
[2] Jang S, Jeong Y, Lee G, Kang Y. Enhancing Subcontractors' Participation in BIM- Based Design Coordination under a DBB Contract. J Manag Eng. 2019;35(6):04019022. doi:10.1061/(asce)me.1943-5479.0000714
[3] Liao L, Teo EAL, Li L, Zhao X, Wu G. Reducing Non-Value-Adding BIM Implementation Activities for Building Projects in Singapore: Leading Causes. J ManagEng. 2021;37(3):05021003. doi:10.1061/(asce)me.1943-5479.0000900
[4] Azhar S. Building Information Modeling (BIM): Trends, Benefits, Risks, and Challenges for the AEC Industry. 2011;11(3):241-252.
[5] Fazli A, Fathi S, Enferadi MH, Fazli M, Fathi B. Appraising Effectiveness of Building Information Management (BIM) in Project Management. Procedia Technol. 2014; 16:1116-1125. doi: 10.1016/j.protcy.2014.10.126
[6] Papadonikolaki E, Koutamanis A, Wamelink JWF. The utilisation of BIM as a project management tool. In: EWork and EBusiness in Architecture, Engineering and Construction - Proceedings of the 10th European Conference on Product and Process Modelling, ECPPM 2014. CRC Press/Balkema; 2015:561-568. doi:10.1201/b17396-92
[7] Jrade A, Lessard J. An Integrated BIM System to Track the Time and Cost of Construction Projects: A Case Study. J Constr Eng. 2015; 2015:1-10. doi:10.1155/2015/579486
[8] Hergunsel MF. BENEFITS OF BUILDING INFORMATION MODELING FOR CONSTRUCTION MANAGERS AND BIM BASED SCHEDULING.
[9] qian ay. benefits and role of bim for multi-disciplinary project management.; 2012.
[10] Lee G, Borrmann A. BIM policy and management. Constr Manag Econ. 2020;38(5):413-419. doi:10.1080/01446193.2020.1726979
[11] Sebastian R. Changing roles of the clients, architects and contractors through BIM. Eng Constr Archit Manag. 2011;18(2):176-187. doi:10.1108/09699981111111148



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