# Assessment of Project by Inclusion of BIM (Building Information Modelling) Techniques and PMBOK Project Process

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***Abstract.*** **Starting with BIM, which despite of being a reliable, three dimensional and documented representation of the project built for the use in design decisions is not being implemented properly into the local projects in Pakistan. BIM is beneficial tool in a lot of ways to the concerned bodies included into the project I-e: stakeholders, managers, engineers and architects to read out accurate and improved data of the project. since BIM implementation requires changes within the systems (I-e: firms working on construction project) and adopting BIM techniques into their projects needs to have different project life cycle so it's becoming difficult for Pakistani firms to adopt it. Although we have BIM training courses offered and BIM councils are working for corrective measures to be taken in construction field but still there is research gap in adopting BIM. This study is designed to how can BIM implementation improve the overall quality of the project by following BIM supporting software's in contrast of adopting PMBOK project lifecycle.**

***Keywords:*** **BIM techniques, project management life cycle, cost and scheduling.**

## I. INTRODUCTION

Project management carries a huge history of how it evolved and survived with the managing of projects. For any project it is important to have management that would lead to project success but unfortunately it took a lot of efforts and researches to make project management successful. In 1983 project management was defined that focused on six knowledge areas scope, time, quality, human resources, and communications in the BOK (body of knowledge). By time it kept on updating, adding contracts/ procurement and in 2013 project stakeholder was added into PMBOK (project management body of knowledge) published by PMI. Project management has adopted lots of techniques in AEC industry, including LEEDS, BIM, by focusing on different software's and that is called modern project management [1].

AEC industry worldwide is moving to technological advancements and there is requirement of modern management with the change in technology, featuring new methods and procedures. considering PMBOK, since it focuses on project planning, cost management, scheduling, quality, safety management and risk, which shows that characteristics and procedures of general project management can be applied in construction project management [2]

The concept was initialized at institute of Georgia. The term BIM was first used by in 2002 to describe design virtually, construction and facility management. [3]. BIM (building information modeling) is a repellant tool for costing, scheduling, corrective measures, error reduction for construction project. it gives a visualization at every stage life cycle of the project progress. Proper circulation of the project information with the clients, stakeholders, contractors, engineers and architects.

There are different case studies who have focused on applying BIM tools for existing building. by applying it offered a range of alternative potential benefits for the built environment focusing on following areas: i-e: facility management activities, heritage and historical documentation, quality control, monitoring and assessment, energy management.

BIM (building information modelling) is a technical technique which is run through various software's, but its adoption is low due to several reasons [4]. BIM (building information modeling) provides different models i-e: 3d, 4d, 5d, 6d models with supporting of project life cycle.

## II. MATERIALS & METHODS

This research aims to provide the knowledge diving into newer technologies adopted by AEC industry by inclusion of BIM (building information modeling) and PMBOK (project management body of knowledge) life cycle into construction project. The research method adopted for this article is by focusing on research papers, conference papers, lectures, which are sourced from journals. The main key words used for data collection are: BIM strategies, successful framework for BIM adoption, BIM on implemented project, BIM and project management, cost benefit analysis through BIM. From the data collected, most of the author focus on 5D (costing) and 4D (time) model for the betterment of project quality. Tools used for each of the model are mentioned in the below description and implementation into projects.

Following are the models incorporated in BIM (building information modeling), alongside managing project management life cycle.


Fig. 1

*A. Application of BIM 3D model*

For any construction project the very first step in project life cycle it follows is the visualization of building in three dimensions. although 3d modeling does not includes in BIM implementation, it has been a misconception that BIM and 3d modeling only is BIM, but it is not. though it is the very first step for the implementation of BIM successfully. To take out step for 3d modeling ,3D modeling software's are available in huge variety for which architects and all other participants involved in project must have knowledge of software's. it gives clear vision of the designing and all perspectives included, and one can easily choose materials, positioning of plants and tress as per by laws, and other designing concerns [5] , with all such concerns it helps contractors, stakeholders to communicate easily over site conditions and by discussions better solutions can come up which would be helpful for preventing future errors. In such a scenario as the project moves forward , when it comes to costing scheduling and overall management of the project , it becomes difficult for architect /designers to communicate which each team member of the project [6] .Or on the other hand MEP , construction drawings leading that design may cause error due to gap of having less communication between team members and between the designs made by different co workers I-e : architectural design may vary from the construction drawings made or can have clash with the designs in MEP . there are lot of software's for 3d modeling. I-e: **AutoCAD**, **SketchUp**, **3ds max**, **Lumion**, **Revit** and so many others, while some of them support BIM as well Government of UK in their report described BIM as follows [7]:

Providing 3d model is an effective management in terms of information and communications throughout its project life cycle. now since the scenario of the construction industries and changing and innovations are coming up, companies ought to invest for increasing capability.

*B. Application of BIM 4d model:*

With the increasing innovation, managing project in a way of cost reducing and scheduling project in such a way that it encompasses time to overcome delay has become emerging trend. Since in so many projects the major issue is faced in context of project scheduling [8]. The acceptance trend of adopting newer technologies to manage project scheduling has become very important because if organization is adopting the BIM so we need to have BIM manager as well, who have knowledge BIM implemented software's. the tools to manage project scheduling, ultimately which are for construction project management. I-e: **primavera, vivo office software, schedule planner, Navisworks manager, synchro etc.**, among which synchro and Navisworks supports for BIM scheduling. For managing project scheduling Gantt charts had been widely used tool, but due to the fact of the information it provides is lower and the bar it indicates does not show the amount of work, also it needs to be updated every single time. For any project planning and monitoring of the project affects overall project quality. It provides a facility for already designed model. 4d BIM model incorporates to show start and end dates, highlighting important dates. The building "mixed use tower", taken as an example tower for implementation by [9]. this building consists of seventy-five stories having height of 327m. this project is an ongoing project located in Worli, Mumbai. this was made in tool, "Revit software "and construction schedule was made in primavera software and it was then transferred to Navisworks. As the project was being constructed, such as column completion, it showed building model till that step, which is very help in removing communication gap between other team members to communicate clearly the work progress.

*C. Application of BIM 5d model*

BIM 5d model is concerned with the costing of the project. since so many tradional ways have been following
in calculating project costing, which has ultimately caused error into estimations and that would lead to project over run, and project over run happens in more that 80% of the projects. To avoid this error, we need to adopt new technological enhancement, which would carry costing with the BIM live model, and it would be easy for the clients as well to understand the costing of the project [10]. Tools used for the 5d modeling are: **Revit**, **cost X**, which provides is linked with the BIM model and as we put materials into the model it would give us calculations. this technology can also let clients to do changes on the spot as per their budget and ultimately that would save time span foe the project. In one of the case studies conducted by [11], surveyed over KSA housing trends and people willing to live in housing qualities. From their survey they depicted that most of the

commode don't want to love in flat systems. for which they decided to take out solution of providing terraced housing and adopted BIM 5d model technology to provide low costing and save from waste of material and a chance to choose corrective measure while choosing building materials. KSA kingdom wanted to provide 500,000 properties for especially low paid occupants. From their research and surveys, it was concluded that 5d BIM is very beneficial to use If it used correctly, and it ultimately reduced the overall cost of the project by saving materials which are wasted, clash detention and ultimately having accurate planning and scheduling. This 5d model is useful for architects in terms of choosing right materials, and other key players as well, such as, government, BIM managers, contractors. In contrast to this case study, named as RICS provided with some of the flaws while applying BIM 5d model, which includes:

- While adopting 5d model we need to have proper standardization of materials.
- 5d model should be test of existing building, to check benefit acquired.
- The model before take-off for 5d model should be checked for information richened and data it is providing.
- Classification systems, I-e: RICS, NRM, omni class construction classification systems, and many other should be adopted and should be concerned for future work.

### *D. Application of 6d model:*

This phase of project management is concerned with the feasibility management, which includes repairing, maintenance of the project after when it is completed. All the documents, data are handed over to the owner and then owner own team, which is hired by the owner to look after building life and its time to time maintenance. There are different standards set for the application of BIM and FM in different countries. In one of the case studies presented by [12], he applied 6d BIM model in one of the business storage building, located in Slovenia. He applied this technique by following some steps:

- Collected information of the whole building I-e: ways of structure, carpentry done, fixtures etc.
- Made out list of maintenance.
- After that elements that carried out for the maintenance, taken out life time measures of that element.
- Carried out cost analysis by the help of 5D model and connecting it to 3d model.
- Cost estimations for over all replacement of the elements.
- Cost estimates were done in **VO project management software** compiling 3d, 4d, and 5d BIM models.
- Time analysis was done with the help of cost planner software.

By this study it was concluded that , it is good opportunity to apply this technique which leads to benefit in terms of clear costing and controlling schedules in tabular formats by using software's as a tool .the research gap is that it was used at low level , due to fact of low knowledge provided of practical projects in literature reviews and proving frameworks for implementation.

## III. CONCLUSIONS

The construction industry in present scenario need to adopt newer techniques to incorporate the saving of time, material, and so many other benefits. the adopting of BIM needs to have pre- investment cost, but it would benefit in providing benefit in future. BIM adoption is being difficult for many countries but in contrast many countries are trying to adopt it and there have been so many of the projects where BIM has been successful. some of the companies or firms are adopting BIM partially and some are some are trying on pre constructed projects to test the quality of the project after implementation. Along with BIM enhancement project life cycle would also be enhanced and that would also improve project quality in terms of costing, scheduling, monitoring and evaluation, data stability, visual knowledge of project, clash detection, easy communication among team members by using different software's for different steps.

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