Feasibility study and implementation of BIM in small scale projects

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Abstract. Quality, cost and time are the 3 most crucial factors in any construction project. In fact, the success of a construction project is determined by how well these three elements are managed throughout the project. Even though, there are many traditional methods and software’s to provide assistance in this process but more often than not, they are proven to be expensive and error prone. In the last few years, the construction industry has witnessed a spur in the use of more advanced software’s and tools, thanks to the rapid technological advancements, and one of them is the emergence of Building Information Model (BIM). At present BIM is mainly used in managing large scale projects and has become the most important factor for the success of many such projects all over the world. While this paper tries to explore the feasibility and the practical problems arising in the process of adapting BIM even for small scale projects, it also proposes few methods on how to overcome these issues. It also highlights that following these methods will help to reduce the overall project cost by 20-30% and project completion time by a significant 80%.

1. Introduction
In the world construction industries are one of the most important industries. But construction industry is suffering from poor communication, time, cost overruns and low productivity[1]. The construction project clients mostly concern on completion of project without any conflicts or defects, delivery on time, reasonable costs based on the market and with satisfactory durability. In any construction project the information generated is high and sometimes inconsistent. By using the BIM technology, the productivity of the construction increases[2]. In BIM collaboration of data is easy and convenient. An accurate effective model of the building is constructed by using BIM technology. It can be used for construction, planning, design and operation facilitate[3]. Everyone is thinking about initial cost of the construction, but the cost of the construction is increases due to some delays or some unknown errors. To overcome the increased project cost and time delays the BIM technology is useful. The REVIT useful for better 3D model visualization and REVIT structure is for detailing of the project. The main purpose of the paper is BIM is suitable for small scale projects.

In India, the adoption of BIM is the major problem due to the lack of knowledge about software’s and high operation cost. But people are not seeing about the running cost of the project they are seeing...
about initial cost of the project, due to lack of knowledge in India most of the people are going with traditional methods. Traditional methods are not a big problem in India but delay of the project budget and time affects the cost of the project.

The architectural, engineering and construction industry makes use of Building information model for 3D visualization, feasibility analysis, constructability, clash detection overview, cost estimate, 4D scheduling and quantity take off. BIM use has ability to enhance production performance, enhance collaboration and understanding sharing most of the group contributors, and guide construction-associated duties[4]. The use of BIM in the course of a task reduces risks through promoting performance, via minimizing errors or misinterpretations between designers, engineers and contractors with the aid of requiring collaboration and understanding sharing among all parties involved to make sure validity and reliability[5].

For example, BIM can be used for 3D dimensional visual conversation, that’s a good deal and extra user pleasant with in the case example standard college students compared to virtual communication, throughout using 3D walkthrough of a college.

2. Feasibility study
BIM creates green and effective development method that’s intensively required by using any industry to improve the progress overall performance by using lowering the cost and budget troubles, time issues, loss of facts issues and problems related to behind schedule offerings of task work[6]. By means of the usage of 4d and 5D BIM approach, quantity of issues in production enterprise can be solved without difficulty of issues in production enterprises can be solved without difficulty. 4D BIM creates notable impact on creation challenge against conventional technique. In united states like India wherein visibility of construction progress paintings isn’t always so clean it affords a lot of better visualization and communiqué of challenge work which give terrific performance. It removes rework and clashes took place at construction site via detecting the issues of labour at earlier stage which helps India production agencies to eliminate finances regarding issues and boom within your budget aspect. BIM software program is commonly priced one user-based subscription model. A famous answer like REVIT starts at $173.19/month for three-year subscription NAVISWORK also cost same as the REVIT. Most BIM software answers additionally require some shape of training they could value up to $2000 on pinnacle of what we are already paying. But, the lack of understanding about BIM creates troubles to the society even through creating 4D and 5D models with small elements is also very highly priced.

Several countries are using BIM for developing construction industries. Consistent with survey about BIM adoption rate in North America founded that 70% of artists, about 74% of contractors and 67% of engineers are using BIM. In Australia, approximately 40% of architect and 70% each of contractors and engineers used BIM. In UK in keeping with national BIM survey observed that 39% of respondents which can be used to assist scheduling analysis, constructability, price estimating and sequencing. Constructing facts modelling as a new paradigm has an amazing capability for integration into the existence cycle of production tasks. The countries using BIM are the United Kingdom, France, the United States, Germany, Switzerland, Australia and India. The companies using BIM in India are BIM labs, BIM arc, Tesla, Jupiter technologies, ASC techno, ASC technology solutions private limited, BIM services India are some of the BIM usage companies.

3. Literature review
Ogwuueleka, amakachinweude the paper suggests the need for the federal government of Nigeria, production and building associations/organizations and researches to put into effect guidelines and standards to promote BIM implementation in the construction sector. The government companies, institutions and researches must also enforce the practice through standards and regulations. This paper investigates the part of upgrading from 2D CAD to BIM technologies within the Nigerian creation industry. The maximum critical challenges confronting the improve are identified as lack of clarity on criminal and contractual troubles, wrong framework for adopting BIM and insufficient information or training. The method gives the opportunity to contrail the countrywide constructing
requirements into BIM models and the legal responsibilities of all crew members are stipulated in a settlement file[7]. ShivaDattayadav, gajanankanade this paper explores about key problems regarding compensation, contractual relationships, chance allocation, and so on may be triumph over. for integration project delivery they used Revit applications for building construction project. Here, observe till now become accomplished on utility of BIM. They discussed about usage of BIM in integrated project delivery by project case study and questionnaire survey of building construction project. They explain about the differences between the traditional project delivery and integrated project delivery by the use of building information model (BIM) and they show that IPD is better than trainable methods.

The paper of Patan.md.rafi,k.j.brahmachari has explained about the applications regarding visualizing of progress in construction projects. 4D Revit software has regarding relationships and space for visualization across the time period. This mainly discuss about the software’s of 5D application in civil sector and the management primavera and construction technique and also information modelling on building[8]. Peter smith has discussed the topics regarding management and cost of project with 5D BIM software it mainly focus on the problems faced in the civil sector like factors in cost management of the project and also it would implement in needed utilizing of various software techniques available in the sector information modelling sphere. It would discuss strategies to address these issues. The key role players are clients, contractors and developers, modelling standards are also needed to develop[9]. Amjed N.Hasan , Sawsan M.Rasheed had discussed about the AEC which is prominent on the contribution of countries like Iraq etc, They concentrate on quality, communication, delay in projects etc. Time management and the estimation of cost are the major in the management sector. BIM would help in estimating the accurate values in a short period of time. The main motto of this paper is to study the 5D BIM in Iraq construction. This paper would set some benchmarks in the usage of 5D software for estimation of cost and the changes obtained in 3D and 5D building information software[10].

3. Research Area
The data is taken from the residential building in Hyderabad Telangana. This residential building consists of c+s+9 area of 750 m2. The build-up area is 8500 construction building started in year 2017 august completed in year 2020.

4. Building Information Technique
In market different type of software’s are available. BIM is effective of simulation and analysis of energy, quantity and cost. in construction project quality time and cost are three important elements. BIM improves the quality of information sharing, comparison and project integration. This is a practical application of the BIM in small scale project. The methodology is followed by different stages. Problems of the research, the aim of the research, preparing objectives of research plan. After research select the area data collection and literature review that related to the topic. REVIT is one of the widely used software in BIM. The main purpose of the REVIT is modelling. For detailing REVIT structure is used. Here, in BIM I am using software’s like AutoCAD, REVIT, ETABS, NAVISWORKS[11].

BIM will reduce clashes not 100% but at least 80% of clashes will be reduced. BIM will provide exact time to complete. Each material of the project can assign in BIM[12]. The benefits from this section are apparent not only within the layout section but also at some point of construction planning and facilities control. Moreover, modelling this small venture confirmed that if the exceptional stakeholders are aligned with in the use of BIM technology and behaviours, there are obvious blessing to small tasks that are frequently left out of the BIM dialogue, given their simplicity[3]. Time and cost overruns postpone are very not unusual aspects in the production enterprise due to unexpected cost fluctuations, modifications in design, bankruptcy from the customer which can’t be avoids entirely but to reduce these effects we want to adopt new generation like BIM. BIM offers specific consequences with improved accuracy that saves money and time[13]. We can work with 4-Dimentional at any stage
of initiatives and indeed it can add a variety of price in implements on the front end whilst assessing the feasibility of schemes.

5. Methodology
The basic methodology of this paper is to preparation of BIM by 5D applications in construction scheduling, management and cost estimation of the project. This methodology contains different stages. 2D drawings are collected in first stage. All AutoCAD structural drawings and 2-Dimensional plans of the residential building are collected. For getting better results, accurate cost and benefits of BIM for small scale projects.

5.1 3D modelling of building
3D structural design of residential building is created by using REVIT architecture for better visualization and better understanding of building. The data which is required for building we can share data to stake holders by on convenient model. The data like building construction, design and maintenance can show in single 3d model. REVIT is used to design a building, structure and its components in 3-dimention, annotate the model with 2-dimentional drafting factors, and access building information from the building models statistics base.

NAVIS concluded that after modeling the task in REVIT and performing exclusive analysis and duties, there may be an obvious distinction from conventional CAD drawings, representing a leap forward for any layout or creation agency inclined to put money into training and software. The observe case showed that modeling in BIM REVIT maybe very truthful, reflecting the fabric nature of building elements that turned into no longer present in 2D CAD. Autocad is almost two decades older than REVIT, it need to come as no surprise that its market share is bigger as properly, and it has end up the default drafting tool for many engineering firms. Fig.2, 3 and 4 deals with the model and structure of residential building.

5.2 4D cost estimation
By using the NAVISWORKS the main advantage is REVIT file is easily import. Design with primary understanding about REVIT software can understand the language of NAVISWORKS software. It can import or export different models by different softwares. NAVISWORKS incorporates 3 application packages in which NAVISWORKS freedom. NAVISWORKS simulate and NAVISWORKS manage are used to simulate are used for 4D ANALYSIS. The NAVISWORK imports the 3d model which is design in AUTOCAD REVIT. The NAVISWORK include assignment, hobby, call, planned begin, status, deliberate quit, real begin, actual quit and activities contains regular Gantt chart. For time analysis process the software NAVISWORKS is used. By using NAVISWORKS freedom, simulate and manage the 3D model MSP file data of project into the NAVISWORKS simulate for 4D analysis of REVIT to create Gantt chart of overall construction project with time factor.

5.3 Analysis and design
In every structure can be subjected to both one or the corporations of masses, the diverse forms of loads usually consider are dead load, live load, earthquake load, and wind load. Structural evaluation is a branch which entails in the determination of behaviour of systems as a way to expect the responses of different structural additives due to impact of masses. ETABS is a software program that included with all of the main analysis engines this is dynamic, nonlinear, linear and static and so forth. And serially this software is used to analyse and design the buildings. Our challenge is analysis and design of residential building using ETABS. A c+s+9 storey building is taken into consideration for this have a look at evaluation is accomplished via static technique and design is executed as in keeping with IS 456:2000 guidelines.
The fresh and revolutionary new ETABS is the last integrated software program package deal for the structural design and analysis of building. This modern ETABS gives unequalled 3D object primarily based on modelling and visualization equipment, fast linear and nonlinear analytical strength, state-of-the-art and complete layout abilities for a wedge- variety of substances, and insightful image shows, reviews, and schematic drawings, CAD drawings may be directly transformed into ETABS fashions. Design of steel, concrete frames, composite beams, composite columns, metallic joists and concrete and shear walls, as is the capacity take a look at for base plates and steel connections. Complete and customizable reviews are available for all design and analysis output, and construction drawings of details, framing plans and move sections are generated for concrete and steel systems[14].

6. Results and discussion
Combination of REVIT and NAVISWORKS has been carried out to provide better visualization of the construction development of the tasks. The linkage among scheduled activities and respective drawings in REVIT enables in identifying creation sequences and additionally in detecting logical errors that occur in task schedules in REVIT tool has numerous blessings which have been
increasingly more used to no longer only include spatial relationships but additionally examine and visualize area throughout time. By using NAVISWORKS cost and error in construction is reduced. Accurate streamlined construction productivity. In NAVISWORKS planning sequence and execution easier to understand and execute. In construction management to give better results BIM applications are more accurate. 2D plan in REVIT software program, scheduling of the assignment work, breakdown structure to expand the structure, layout of structural constructing development and floors of the building and creation of scheduling and track of building. By using the revit time saving up to 25%.

In the 4-Dimensional simulation, the objects can be visible that shows from start date to finish date. At the top left of the simulation, date, ongoing task collection and its completed present are proven. This is convenient for the contractor to expose the virtual view of the project progress and additionally very ease for the contractor to provide alternative for designing in the construction sector. The actual cost of the building is 17cr by using BIM technology the cost reduced up to 1cr.

Figure1. AUTOCAD drawings.  
Figure2. 2D in drawing in REVIT Architecture.

Figure3. Model in REVIT structure.  
Figure4. Detailing in REVIT ARCHITECTURE
7. Conclusion

Usually, scheduling is carried out by way of the use of controlling software’s like MS software and primavera even though, production schedules do not have accurate prominence inside the construction industry because of its complexity and uncertainties. BIM in production enterprise supports to attain incorporated assignment shipping which includes all of the customers and stakeholders from planning stage to finishing stage of the assignment to get optimized results and that will increase the cost of the proprietor.

Even constructing facts modelling has many advantages which cannot be performed with the aid of traditional strategies they are a few tasks for the adoption of BIM like price of the software program are very excessive give up structures to run the ones software’s the cost of the training for the personnel is excessive, ownership of BIM statics and copyright problems.

These papers mainly focus on BIM software in small scale projects. To reduce the time and cost management in a better way in the design process, BIM software is far better than when compared to the traditional software’s. A famous answer like REVIT starts $173.19/month for three year subscription NAVISWORK also cost same as the REVIT. Most BIM software answers additionally require some shape of training that could value up to 2000 on pinnacle of what we are already paying. But, the lack of understanding about BIM creates troubles to the society even through creating 4D and 5D models with small elements is also very highly-priced. A famous answer like REVIT starts at $173.19/month for three year subscription NAVISWORK also cost same as the REVIT. Most BIM software answers additionally require some shape of training the cloud value up to $2000 on pinnacle of what we are already paying. But, the lack of understanding about BIM creates troubles to the society even through creating 4D and 5D models with small elements is also very highly-priced. Compared to the traditional method 25% of time is reduced and 1crore cost is reduced by using BIM technology.

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