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COST OPTIMIZATION OF BUILDING USING BUILDING INFORMATION MODELING

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Abstract:
Building Information Modelling (BIM), it is the graphical representation of data. BIM it is used to reduce cost of construction.BIM helps, project investors to visualise what is to be built, actually what is the stage of construction.BIM used by designers, contractors & suppliers to reduce their cost & increase quality of work and achieve such designs which would be fabricate easily. This paper aims to show, how cost will be optimized using BIM.

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1. Introduction

1-1. History

Building Information Modelling (BIM), this technology is one of the technology, which helps for effective planning, rehabilitation & infrastructure development through various BIM technologies, Infraworks, navis work etc.

This BIM process involves participants from entire project lifecycle (architect, engineer, contractor, ower) . BIM is a process of generating and managing 3D building data during its development. BIM is a complex process that gathers data from team members to model the components that will be used during the construction process to create a BIM model. It is a very powerful technology that will save money, time and simplify the construction process. BIM makes a digital representation of the building available for design, high-quality production, construction planning, performance predictions, and cost estimates.

1.2 Various software used for BIM are as follows:

1 Autodesk Revit
1 AutoCAD Architecture
2 ArchiCAD
3 Naviswork
4 TEKLA BIM SIGHT

Fig No.1-flow chart of BIM process

1.3 Problem statement

- Apparently the standard of Indian construction industry still arguable &below the expectation compared to international construction industry.
- Indian construction industry has implemented a few steps of management systems like environmental, management system ,safety & health management system etc.

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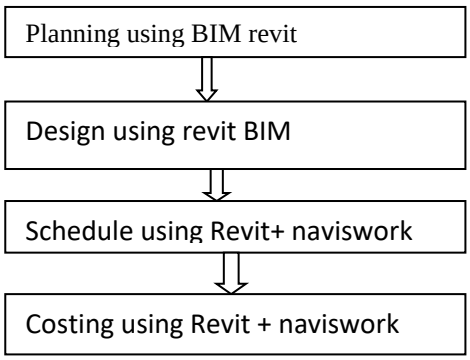
- Improves effective planning & schedule of the construction activities to achieve the success to deliver project within time& to minimize cost.

1.4 Aims & Objectives:

The objective of this research paper was to develop BIM model for construction quality management.

- To study BIM using Autodesk product Revit & Navis work
- To maintain project coordination between client contractor and consultant.
- To prepare BIM model.
- To optimize cost of construction

2 Methodology:



Steps for design of Building information model:

Step 1: In the first instance we developed the plan of different floors of the building and ground floor for the parking purpose.

Step 2: After the drawing of plan 3D model of building, the building is made energy efficient by providing solar roof panel, and reducing carbon emission material in the building.

Step 3: After detailed drawing of building the quantities of material and costing is done in Rivet.

Step 4: The building model is extracted in Naviswork software for the scheduling and time and for analysis, simulation, and project information.

Step 5: For energy analysis the geographical data is taken from the web network and various analysis is carried out.

Step 6: Cloud rendering is done through web and the rendered model is shared through collaboration.

STEEL RE-QUIRED	COST PER kg	TOTAL
19036	36	685296
CEMENT	COST PER BAG	TOTAL
1244	350	435400
SAND	COST per brass	TOTAL
33.57	4000	134280
AGGREGATE	COST per brass	TOTAL
60	3000	180000
	TOTAL	**14,34,976**

3 CASE STUDY :

A G+4 proposed building of 24 flats and of 4 shops is taken for case study location is in bhusaval for plot size 6400 sq.feet

FIG-2 General Arrangement of drawing 2D

- Case study of a G+4 proposed building of 24 flats
- Design Team : Apex consultant
- Owner and Developer :Shivaji Patil
- Architect :Ravi Varma
- Structural Engineer :Navneet Patil and Prashant Patil
- Builder : Praj Infra Solutions pvt.ltd.
- Area : 6800 sq.feet
- Cost of land : 1.98 Cr.
- Cost of construction: 2.5 Cr.
- Area of 1 BHK:464 square feet
- Area of 2 BHK:800 square feet
- Total No. of flats
- No. of skilled labours required:25
- No. of site engineer required :1
- No. of structural engineer required :1
- No. of architect required :1
- Set back distance: 14”
- Side distancs-9”

- TDR:20%
- Survey No.93/1 Hissa No.68
- Location :Bhusawal District:Jalgaon

TABLE1: COST OF MATERIAL PER FLOOR

Site clearance	2days
Compound wall	1days
Setting out Foundation and Pits	3days
Dig out(khodai)	1days
Pcc	1days
Bar bending	2days
Column erection, formwork	2days
Casting of footing	4days
Checking of plinth level	1days
Plinth level	4days
Murum filling ,compaction	4days
PCC layer	2days
Column starter	1days
Column erection centering formwork	2days
Beam bottom work	2days
Slab no 1	21days
Slab no .2	21days
Slab no .3	21days
Slab no .4	21days
Brick work	30 Days
Plastering	15Days
Electrification	15Days
Tiling ,Plumbing,water proofing	30 Days
TOTAL	266 Days

Table 2-manual scheduling

For navis work schedule, required the model in revit with all specifications. First prepare the revit model and import that in navis work, and result gets this schedule.

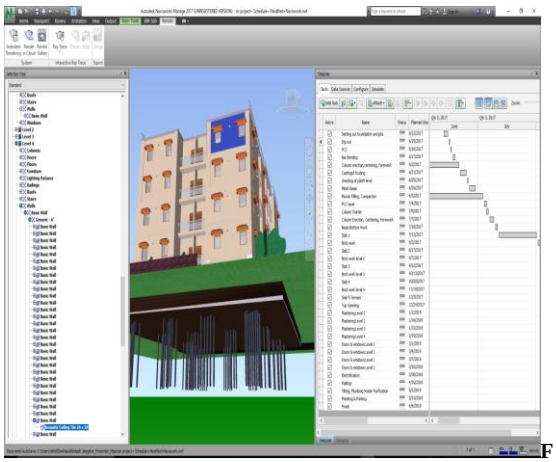


fig3- schedule generated with navis work

4 RESULT AND DISCUSSION

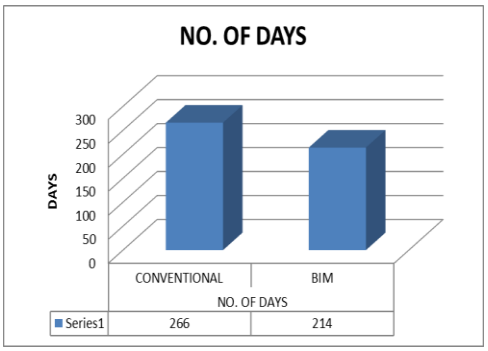


Fig4- comparison bar chart of conventional and BIM modelling

- A 5D model of G+4 building. is prepared as per methodology of BIM as mentioned which includes 3D models, scheduling ,quantity and costing
- For present case study it was observed that total 39 days can be saved in total for tasks like scheduling, planning, monitoring, cost analysis which will leads to saving in costs and 25-30% reduced due to coordination and reduction in man power. But however the cost of material will remains same.

a. Limitations:

1. This BIM is about visually sequencing project activities as the scheduler walks inside the virtual model. Scheduling of construction projects defining construction methods and tasks, sequencing of tasks, resource allocation, resource leveling, activity duration estimating, cash flow analysis, staff allocations.
2. Considerable amount of computer memory and processing power is required for BIM software's, walkthrough and scheduling.

b. Future scope:

In India the scope for BIM managers are so high. Slowly this technique is adopting everywhere.
In countries like the UK, the Netherlands and Singapore, the demand for BIM skills are rising and BIM is expected to become the standard practice in the coming years. A number of design teams are planning to adopt BIM within the next three years.
BIM not only adds value to the technology but also changes the process of designing and building.
The same analysis of BIM workflow with conventional modeling can be performed for other struc-

tures dam, communication tower etc. and check its effectiveness

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