Residential Project Scheduling And Costing Using BIM

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Abstract- *Construction organizations run with different departments such as planning, estimation, contracts, billing & site. Number of construction when visited and studied it was found that there is lack of communication and information flow among the departmental persons working on projects. This is due to planning, scheduling and costing departments which indirectly deals with the progress of execution leading delay and poor quality in project handover. Nowadays trends of 3D model and schedule along with costing is overcoming all the above problems. This is possible by using BIM which is nowadays replacing old conventional methods. Residential project case study is chosen for computing analysis and comparing with conventional methods.*

Keywords- Planning, Scheduling, Costing, BIM execution, Revit architecture, 5D etc.

I. INTRODUCTION

Going with the current trends it is much simple and effective to use BIM for project management. Virtual imaging and planning instead of two dimensional conventional drawing and planning is of great help to the personals working directly on the project. It enables them to build their project image and mapping in their brain in advance before hitting the ground. Number of software are available in market which combinedly does planning and scheduling together. Conventional methods are separate for scheduling, quantity surveying, drafting, costing its done in different softwares every time when a new project arrives. Thus this causes lack of information flow among professionals as it is done by different departments at different project levels.

To overcome this study was done with listing out the names of the software and there information in tabular format considering their rates, cost, benefits, customer reviews and usability from top to bottom level of construction. The result found the following information from literatures, thesis reports, online support guides and market survey from web browsing and quotations from training centres and consultants. Thus after study it was decided to go with Revit Architecture and Autodesk Naviswork for Building Information Modelling.

Project is about 5 dimensional planning in BIM with different parameters as dimensions such as X,Y, Z for 3D modelling as 1^{St} three dimensions addition to this time as 4th dimension and cost as a 5th dimension.

II. LITERATURE REVIEW

Mehmet Hergunsel studied BIM as technology to find its uses from view of construction managers, architects and engineer etc. P M Diaz studied the benefits, advantages and challenges that may occur while implementing the BIM in the actual field. Ahmed Hawary and Ayman Nassar studies the effects of BIM on construction clams. Nam Buiab, Christoph Merschbrockb, Bjorn Erik Munkvolda combinedly reviewed how BIM is used in developing countries. Yusuf Arayici, Charles Egbu, Paul Coates studied implementation of BIM in remote construction projects. Su-Ling Fan, Miroslaw J. Skibniewski and Tsung Wei Hung also combinedly studied effects of BIM during construction.

III. OBJECTIVE

1) To find sole system for scheduling and costing to achieve time and budget saving in residential project using BIM.
2) To build virtualmodel with5 dimensions with LOD 300.
3) To build 3D model for ready reference to plan and execute the project which will be also used for future maintenance and repair problems.

IV. METHODOLOGY

1) Literature review
2) Collection of input data
3) Preparing 3D model
4) Cost estimation
5) Time scheduling
6) Results & discussion
7) Conclusion

V. EXPERTIMENTALANALYSIS

5.1: Cost estimation for consultancy charges

Sr No	Consultancy	Charges/ Saleable area	% of project cost
1	Architectural Consultancy	33.199	2.40
2	RCC Consultancy	10.243	0.74
3	MEP Consultancy	12.637	0.91
4	Environment Consultancy	1.017	0.07
5	Interior Designing Consultancy	7.375	0.53
6	Hydrological Assesment& Rain water harvesitng	0.213	0.02
7	Virtual walkthrough	1.370	0.10
8	Vastu Consultancy	1.443	0.10
9	Landscape Consultancy	3.606	0.26
10	Liasoning Consultancy	-	-
11	Traffic study & Parking optimisation	0.397	0.03
	Total	**71.50**	**5.16**

Fig. 5.1Consultancy Cost distribution for project

5.2: Cost distribution for residential building from estimation

Legend:
- Work up to Plinth-excl.R.C.C
- R.C.C
- Masonry & Plaster
- Gypsum for wall
- POP False ceiling
- Duro white putty for ceiling
- Doors & Windows, Railing
- Doors with Shutters
- Aluminium Window(M+L)
- MS Window Sub frame (M+L)
- M.S Folding Door in Sitout (M+L)
- M.S.Railing (M+L)
- Fabrication work (M+L)
- M.S folding Door with frame for Meter Room (M+L)
- Waterproofing
- Flooring
- Kitchen otta
- Painting
- Plumbing & Sanitary
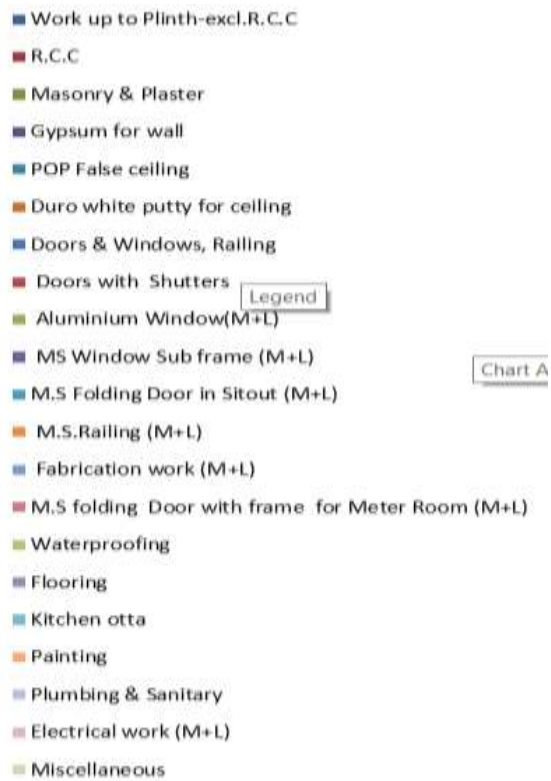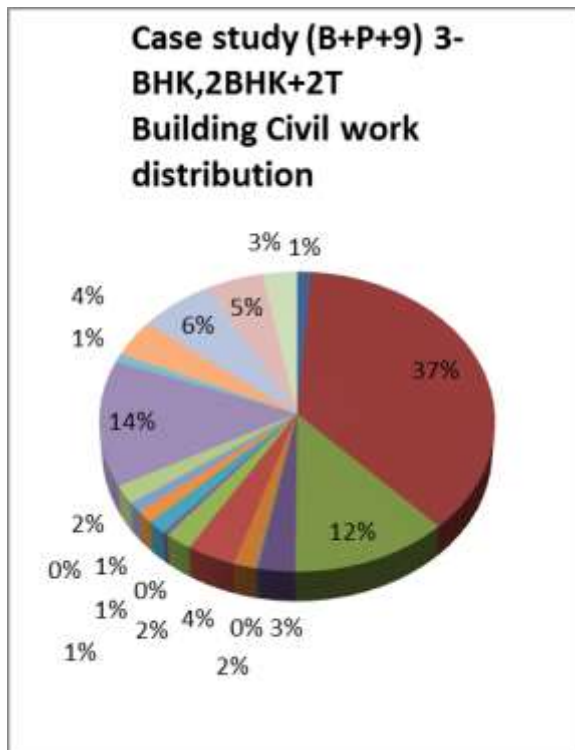- Electrical work (M+L)
- Miscellaneous

Fig. 5.2 Activity wise cost distribution for project

5.2:5D scheduling for residential building

The residential project of a well known firm in a city selected for 5D scheduling to facilitate effective management. The building consists of B+P+9 floors. Following were the steps adopted for 5D scheduling of project.

Step 1 : Collection of data
Step 2 : Input of collected data to 3D model
Step3 : 3D modelling using revit architecture
Step 4 : Scheduling
Step 5 : Costing

Following are the levels of details for developing the 3D model in BIM.

•LOD 100 – Concept from 2D drawing
•LOD 200 – Design Model
•LOD 300 – Construction Model
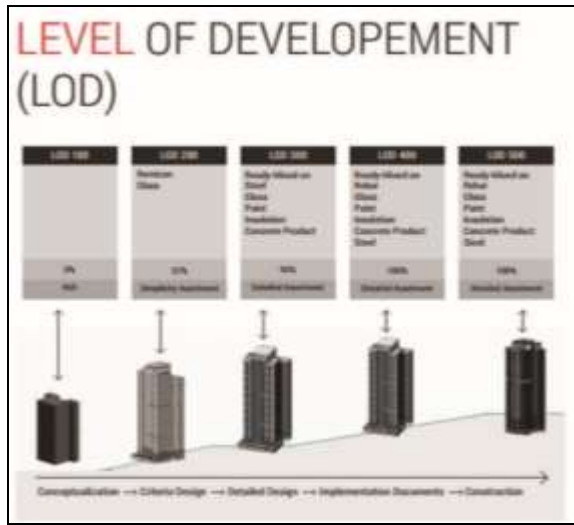•LOD 400 – Fabrication and services Model
•LOD 500 – As-Built Model
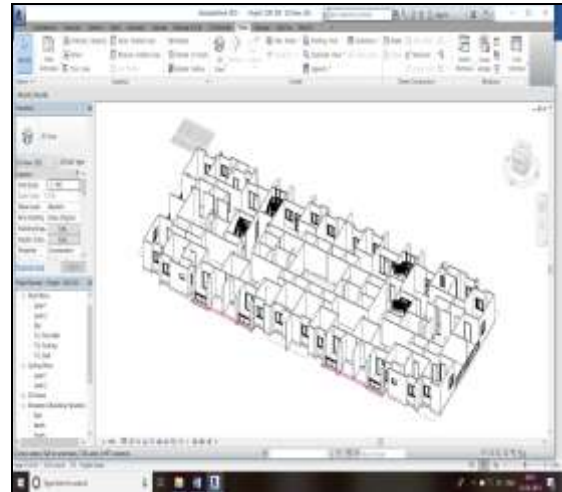
Fig.5.2.1 Level of development of project

5.3 Result:

5.3.1 Effect of 5D scheduling in terms of cost

Estimation was done in excel for whole project it was found that 5.16% of total project cost is spent over consultancy charges for this project as shown in the table no. 5.1 Thus it can be clearly seen that though the primary charges of installation of the system seems higher the future benefits are much better then the conventional methods in the numbers. The numbers given in the table are for the selected case study and estimated cost of consultancy charges from data provided by the sources. . To find the cost of the selected two buildings case study and then comparing it with cost of BIM consultancy following output observed.

- Consultancy charges: Rs. 1,23,84,000/-
- BIM designing charges : Rs. 69,32,320/-

5.3.2.1 Cost comparison between consultation done in existing method and BIM in terms of project cost

After finishing the scheduling and costing for the project, profit loss analysis done to find out effect on the budget of project which resulted into following outcomes:

Table No.5.1

Sr No	Details	Ex. method	BIM	Diff.
A	Total %	5.16%	2.85%	2.31%
B	In terms of the Project Cost	₹ 1.23 Cr	₹ 68.5 Lakhs	₹ 55.5 Lakhs

5.3.3 BIM Outputs

Fig.5.2.2: Level 1 Plan

The project level 1 plan as shown in fig.5.2.2. Similarly, all level plans built to make a complete structure as shown in fig.5.2.3.

Fig.5.2.3: LOD 300

Scheduling done in Navisworks resulted in animated walkthrough of project schedule from start to end with day, date and project status and jpeg images with all details at every stage.
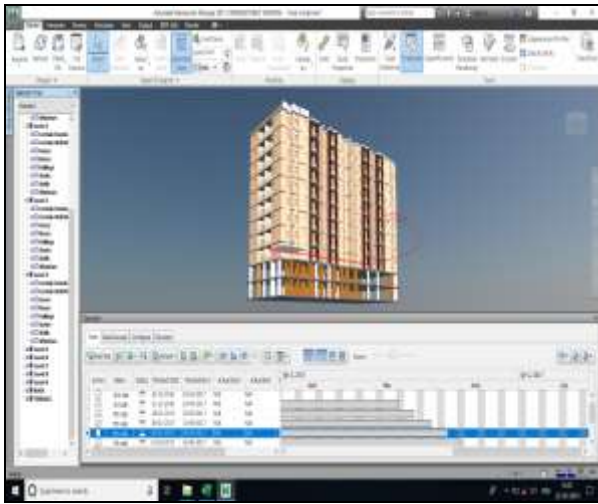
Fig.5.2.4: Final view with Navisworks, timeliner and selection tree

VI. CONCLUSION

- BIM has a significant benefits in construction industry. BIM can be used in every aspect of construction or at every phase of construction i.e at initiation, planning, execution, performance and monitoring , finally at closure.

- Also BIM can be used in maintenance phase of project. The model of case study will be used for maintenance or any other repairing work in future after handover.

- Accurate and faster design decisions can be done at early stages, accurate and faster quantity takeoff can be obtained automatically, material wastes can be minimized because with the ability of BIM technology design conflicts can be determined before construction starts on site and errors can be minimized that can reduce delays and cost overrun.

- Time Saving & easy adaptation.

- Better visualization and documentation

- Improved Efficiency

- Accuracy in Management Improved Coordination and Clash Detection

- Single and integrated information resource which can be taken as reference for future projects.

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