Earned Value Analysis of Residential And Commercial Building For Project Tracking

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Abstract- Earned Value Management helps to analyze the project's performance and predict the forecast. It shows the current status of the project, tracks actual progress with the planned progress, answers various performance related queries such as whether projects are over budget or under budget and whether you are behind schedule or ahead of schedule, etc. This technique is used to compare actual cost to budgeted cost of work in civil construction projects. The present study deals with the project monitoring process and rescheduling and also to discuss the main parameter's that are involved in the calculation of Earned Value Analysis in cost management of construction projects. For EVM calculations MSP 2016software is generally used. The main objective of project to track the existing project and perform analysis for effective scheduling and cost benefit analysis. Site data sampling is done for industrial sites as well as residential sites.

Keywords- Earned Value Analysis, Rescheduling, Project Tracking.

I. INTRODUCTION

Earned Value analysis is a method of performance measurement. Earned Value is a program management technique that uses "work in progress" to forecast the future possibilities of work. Earned Value is an up gradation of the traditional accounting methods used by the project managers. In the traditional methods the main focus was on planned accomplishment i.e. expenditure and actual costs. Whereas Earned Value goes one step further and examines actual accomplishment of the project. This gives managers a greater understanding of upcoming potential risk. It is an "early warning" program/project management tool that enables managers to identify and control problems before they become insurmountable.

It allows projects to be managed better – on time, on budget. Earned Value Management is a set of guidelines that guide a company's management control system and it is not a system or a technique. When the project gets over budget, the project management team may implement a value engineering program for cost reduction by either reducing the quality work of project in some parts and by reducing the scope or providing extra budget to cover overrun cost. Similarly, for time overrun case, the may plan some program such as fast tracking or time crashing for time reduction. Therefore, the role of EVM as well as correct and on time forecasting is very important to achieve project goals. This research includes implementation and improvement on EV to achieve a forecasting EAC based on statistical and econometrics techniques and traditional EV indexes as well. The Earned Value Analysis (EVA) is a valuable technique to determine real gains and losses. EVA provides means to balance gains/losses, optimize the balance and maximize the gains. EVA is a powerful tool to control simultaneously physical and cost performance.

The solution is an appropriate WBS – Work Breakdown Structure, and a suitable account plan. The solution requires distinguishing the financial control and cost control
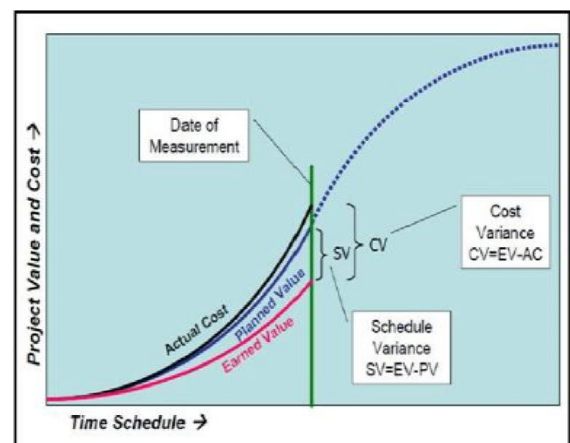

Fig 1: standard Earned Value analysis graph

1.2 Earned Value Analysis – EVA – Basics and Concepts:
The main EVA variables (indicators) are:

- BCWS (Budgeted Cost of Work Scheduled) - PV (Planned Value)

- BCWP (Budgeted Cost of Work Performed) - EV (Earned Value)
- ACWP (Actual Cost of Work Performed) - AC (Actual Cost)
- SV (Schedule Variance) : VP = EV – PV; CV (Cost Variance): VC = EV - AC
- SPI (Schedule Performed Index): SPI = EV / PV; SPI = 1 (project on time)
- SPI <1 (performing less than planned); SPI > 1 (performing more than planned)
- CPI (Cost Performed Index): CPI = EV / AC; CPI = 1 (project on budget)
- CPI < 1 (spending more than planned); CPI > 1 (spending less than planned)

1.3 COST REDUCTION METHOD FOR CONSTRUCTION:

Time and cost are two main concerns which increase importance of cost reduction techniques. Reduction of cost of construction is a constant goal for construction industry. One way of reducing construction costs to develop innovative technologies as well as methodologies to increase productivity.

For any construction project the most difficult thing is to keep the project under the budget. Construction costs including excavation, labour and equipment hire seem to have a habit of costing more than you are quoted for. Here are 5 simple things you can do to help reduce construction costs for your residential projects.

1. Firstly applying the 80/20 rule
2. Control your variable costs
3. Be wary of excavation costs
4. Consider alternative products
5. Create a project plan

1.4 Aim Of Study

To perform earned value analysis for residential, and commercial building for better project tracking

1.5 Objective Of Study

- To study earned value analysis and its implementation in construction industry.
- To identify cases for cost overrun in all construction activities.
- To reschedule activities to lower cost performance index and schedule performance index of project to avoid cost overrun

- To perform S curve analysis in given case studies

II. LITERATURE REVIEW

Many construction projects gets delayed due to various factors resulting time and cost overrun. Earned value analysis was firstly introduce in industrial engineering, it was later adopted in the civil construction work.(1)

Construction industry has a great importance at international level, it provides employment and plays an important role in economy of country. EVM a tool use to overcome the different problem is generally used in construction work.(2)

A proper budget planning is very important in any construction work at any level. At the start of the project the cost on paper is very different that in the actual construction. EVM offers a great help in managing the budget of project.(4) In the construction industries there are various indicators used to measure the performance of the project one of them is procurement These indicators represent financial and non-financial efficiency of project activities. EVA provides a report of the actual work performed.(3)

For any project to be successful the cost of the project is the basic and most important factor. EVA is a tool to evaluate the performance of the project, basically it compares the budgeted coast and actual cost of work and offers solutions.(5)

III. CASE STUDY

Fig 2: 3rd eye view of actual site

3.1 Site Details

- Name of site : Cool homes
- Location of site : cool homes, ring road, behind gajananmaharajmandir, bhusawal, jalgaon.

- A G+4 proposed building of 24 flats and of 4 shops is taken for case study location is in Bhusawal.
- Design Team : Apex consultant
- Owner and Developer :Shivaji Patil
- Architect :Sneha Nichat
- Cost of project : 2.4 cr.
- Structural Engineer :Navneet Patil and Prashant Patil
- Builder :Praj Infra Solutions pvt.ltd.
- Area : 6400 sq.feet
- Residential building having 24 flats and 4 commercial road front shops.
- Total 24 flats and 4 shops.

    i.   16 flats – 2bhk
    ii.   8 flats – 1 bhk
    iii.   4 shops – commercial road front shops.

3.2 Data Collection

1. Centre Line Plan
2. Footing & Column plan
3. Site Photos
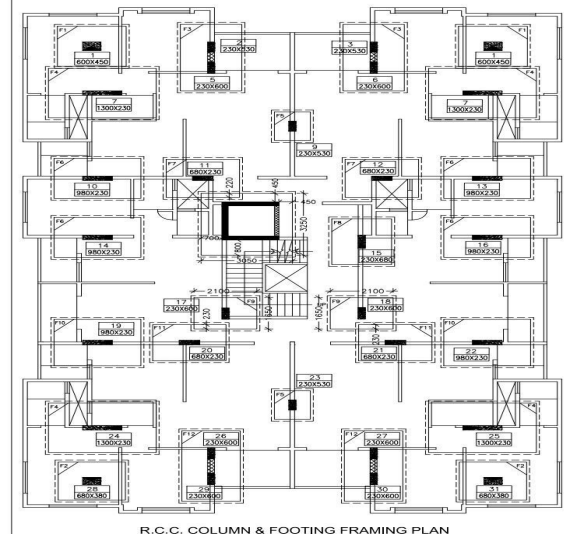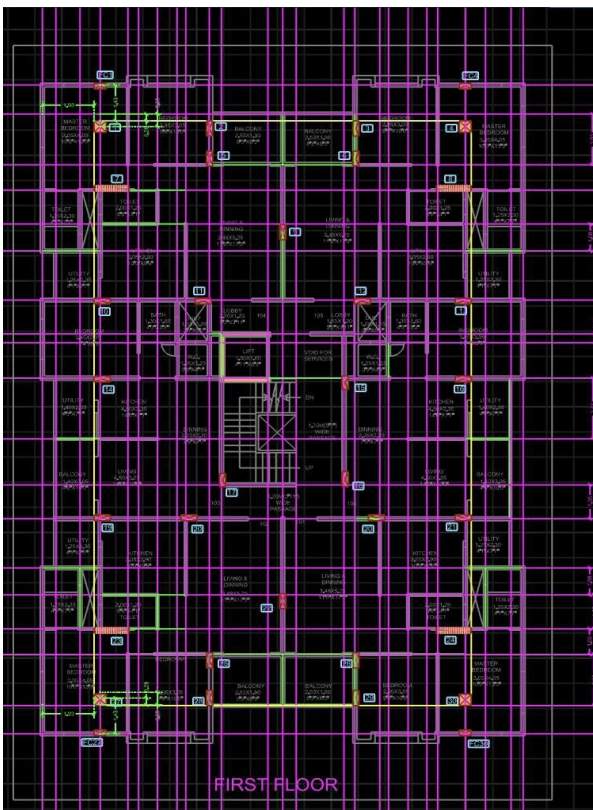
Fig 3. Centre Line Plan

Fig 4. Footing @ Column Plan

Fig 5. Plinth Beam

IV. METHODOLOGY

- LITERATURE SURVEY
- COLLECTION OF SITE DATA
- COST ESTIMATION OF MATERIAL
- COST ESTIMATION OF ACTIVITIS
- COST VARIANCE AND SCHEDULE VARIANCE
- RESULT AND DISCUSSION
- CONCLUSION

V. PART ANALYSIS
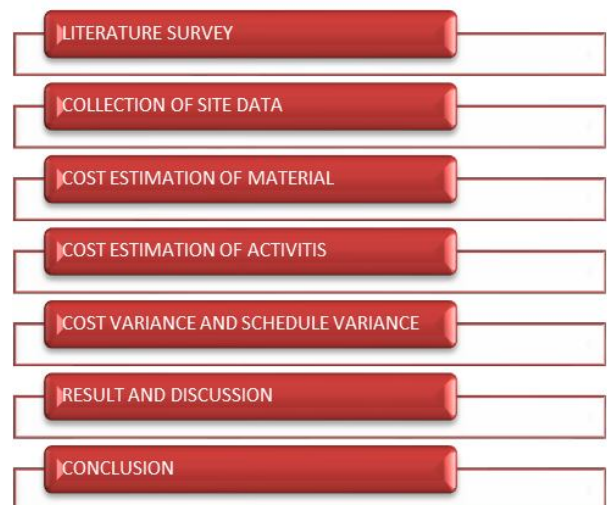
Cost estimation of materials and the cost estimation of the activities was carried out. Later the same data was used in MSP software find the earned value analysis. After that the cost variance and schedule variance was found out.

5.1 STEEL QUANTITIES

MATERIAL SUMMARY STEEL FOR PROPOSED RESIDENTIAL BUILDING, AT COOL HOMES										
SR NO.	DESCRIPTION	UNIT	6 mm	8mm	10mm	12mm	16mm	20mm	25mm	TOTAL QTY.
I	FOOTING	KG	-	-	2899.259	853.08	-	-	-	3752.34
II	COLUMN QTY									
1	FOOTING TO PLINTH LEVEL	KG	-	-	-	191.89	1554.40	-	-	1746.29
2	PLINTH TO FIRST COLUMN	KG	-	-	-	191.89	1554.40	-	-	1746.29
3	FIRST TO SECOND COLUMN	KG	-	-	-	183.96	1051.33	-	-	1235.29
4	SECOND TO THIRD COLUMN	KG	-	-	-	202.71	897.52	-	-	1100.23
5	THIRD TO FOURTH COLUMN	KG	-	-	-	263.77	783.93	-	-	1047.69
6	FOURTH TO TERRACE	KG	-	-	-	360.96	431.42	-	-	792.39
7	TERRACE TO O.H.W.T	KG	-	-	-	92.58	65.91	-	-	158.49
III	PLINTH BEAM	KG	-	554.97				-	-	
IV	SLAB BEAM QTY									
1	FIRST FLOOR	KG	-	554.97				-	-	
2	SECOUND FLOOR	KG	-					-	-	
3	THIRD FLOOR	KG	-					-	-	
4	FOURTH FLOOR	KG	-					-	-	
5	TERRACE FLOOR	KG	-					-	-	

6	O.H.W.T	KG	-					-	-	
V	SLAB QTY									
1	FIRST FLOOR	KG	797.15	1503.07	40.15	-	-	-	-	
2	SECOUND FLOOR	KG				-	-	-	-	
3	THIRD FLOOR	KG				-	-	-	-	
4	FOURTH FLOOR	KG				-	-	-	-	
5	TERRACE FLOOR	KG				-	-	-	-	
VI	STAIRCASE QTY	KG		838.31						838.31
VII	LIFT WALL									
1	UPTO PLINTH LEVEL	KG		244.02	113.09	121.86				478.86
2	PLINTH LEVEL TO FOURTH LEVEL	KG		1478.34	499.97	538.27				2516.58

VI. RESULTS AND DISCUSSION

TASK	Qty	Unit	Rate/Unit	Total Amount (Rs)	Planned Duration(Days)	Cost per Day
Excavation	1450	Cum	150	217500	15	14500
PCC	25	Cum	2255	56375	2	28187.5
Footing	32	Cum	4535	145120	10	14512
Backfilling	1425	Cum	426	607050	5	121410
RCC(Ground floor)	100.35	Cum	7033	705762	15	47050.8
2nd slab (first floor slab)	74.35	Cum	7033	522904	15	34860.266
3rd slab (second floor slab)	74.35	Cum	7033	522904	15	34860.266
4th slab (terrace floor slab)	74.35	Cum	7033	522904	15	34860.266
Block Work	106	Cum	4614	489084	19	25741.263
Electrical wall conducting switch board fixing	125	Sqm	1230	153750	16	9609.375

Internal plaster	1169	Sqm	149	174181	33	5278.212121
Doors	73	Nos	15000	1095000	12	91250
Internal plumbing work	17	Nos	8000	136000	16	8500
Waterproofing	95.2	Sqm	325	30750	15	2050
Tiling	760	Sqm	1000	760000	63	12063.492
Aluminum Window Fixing	72	Sqm	725	52200	6	8700
External Plaster	591	Sqm	340	200940	15	13396
External paint	591	Sqm	145	85695	10	8569.5
Compound wall	750	Sqm	800	600000	15	40000

CPI	SPI
1	1
1	1
0.99	0.99
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0

VII. CONCLUSION

The main conclusion is that EVA provides a relevant contribution to the cost management in construction projects, namely in the case COOL HOMES Project. EVA contributed to cost management in Monica Park Project and the use of EVA in Monica Park Project contributed also to the application of EVA in construction projects, in general, and in the future, through the data, perceptions and concerns developed in this paper.

Some considerations were added to the ones found in the main EVA book references. For changing the scope of a project it gets very complex by using EVM. This was very clear in the use of EVA in Monica Park. One insight that reduced problems was that the reports allow easy and fast fixing of mistakes. Not only mistakes on digitizing numbers,

but mistakes in the expectations related to the measuring criteria. The record and reporting method offer easy regularity analysis of data. Wrong data was easily identified and fixed. Error recognition allowed improved practices and provided support for the decision making process, as well as discussions with suppliers and 3rd parties.

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