

A CASE STUDY ON TIME AND COST DRIVEN FACTORS OF COMMERCIAL COMPLEX BY USING EARNED VALUE ANALYSIS (EVA) TOOL

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Abstract— Now a day's several business complexes are being created. People with busy time schedule show a ton of interest in visiting these malls, so that lots of our time is optimally utilized and each item is formed offered within the business complicated.

There exist many reasons that are accountable for this cost and time overruns. This paper attempts to determine the foremost factors of cost and time overrun in construction production sector and potency function manner, forward future add addressing these overruns.

Keywords— Cost overrun, Time overrun, EVA (Earned Value Analysis), Construction.

I. INTRODUCTION

In the housing industry, the purpose of project controller is to guarantee that comes end on time, contained by budget and come through not the same project objectives. A efficacious (success full) project is the solely project that has consummate its technical performance, sustained its schedule, and carry on within monetary fund prices. Management (Project) tools and techniques play a vital role within the operational management of a project. Construction time and cost they are basic issues in project management and considered most vital parameters for mensuration success of any project. Poor performance of your time and price can result in a major quantity of time and price overrun that is world development.

Overrun Time can be outlined as late completion of works as compared to the planned schedule or contract schedule. It occurs once the growth of a contract falls behind its regular program. It might be instigated by any party to the contract and will be right away results of one or additional conditions.

Cost overrun is thought-about because the distinction concerning real cost (price) of a project and its cost (price) limit. It occurs once the resultant price target of a project overdo its price(cost) limits wherever price(cost) limit of a project mentions the most expenditure that the consumer is ready to sustain on a completed building project whereas price(cost) target refers to the counseled expenditure for every component of a project. Construction cost that is out of management enhances to investment pressure, increases construction price, and affects investment decision-making.

1.1. Problem identification: is the heart of a pursuit because it helps us to see the factors that are chargeable for the time and price overruns.

Once implementation begins, a project's costs seldom stay static. As more data becomes offered the prices is also further outlined. Yet, even when a price has become firmly mounted, there are various factors that will result in the value increasing. Delays are a major issue. Whatever the reason, delays almost invariably increase budget prices.

1.1.2 Cost Overrun: The factors that result in projects being delayed or costing more than originally planned are:

- I. Poor Project Management
- II. Design Changes
- III. Inflation
- IV. Shortages of Material and Plant
- V. Inappropriate Contractors
- VI. Funding Problems
- VII. Lack of proper training

1.1.3 Time Overrun: The factors that result in projects being delayed due to the time overrun are as follows:

- I. Low Skilled Manpower
- II. Inexperience of Project Manager
- III. Inaccurate evaluation of projects time/duration
- IV. Inaccuracy of Material Estimate
- V. Lack of appropriate software
- VI. Complexity of Works
- VII. Lack of Experience in Similar Project

II. METHODOLOGY

2.1 EVA (EARNED VALUE ANALYSIS): Earned value analysis is the project management tools that will objectively standing schedule and price performance in real time. EVA creates money in time paradigm pursuit costs associated schedule in associate degree objective, reliable and easy to use model replacement the sophisticated and confusing

project deliverables. EVA creates project at a glance with readily understood visual show of quantitative information.

EVA is primarily a schedule tracking tool, determining schedule from price and earned value of individual WBS tasks performed in time. EVA is very common in style, engineering, construction and contract administration corporations as well as big design-manufacturers like half firms. On some of these projects invoicing is driven by EVA calculation: that takes a real commitment.

EVA is a lightweight, flexible, easy to learn tool pliable to comes of any size, able to management all of them, requires negligible effort to track and report in real, time from task to activity levels up to entire project progress.

Step1: Performance is assessed mathematically and expressed in “Key Performance Indicators” They are:

- So far how much work **SHOULD** be done?
BCWS (Budgeted Cost of Work Scheduled)
- So far how much money **ACTUALLY** has been spent to progress of the project?
ACWP (Actual Cost of Work Performed)
- So far what is the **VALUE** of the work that has been accomplished?
BCWP (Budgeted Cost of Work Performed)

Step 2: Cost and Schedule Variance are the two primary measures of project progress.

This can be determined by:

CV (Cost Variance) = BCWP(Budgeted Cost of Work Performed) – ACWP (Actual Cost of Work Performed)

SV (Schedule Variance) = BCWP (Budgeted Cost of Work Performed) -BCWS (Budgeted Cost of Work Scheduled)

If CV/SV = 0; then project is on the track.

If CV/SV = +; then project is under budget and ahead of schedule.

If CV/SV = -; then project is over budget and behind schedule.

Step 3: Cost and Schedule Performance Indices: Two indices that are useful for communicating progress status are the CPI (Cost Performance Index) and SPI (Schedule Performance Index).

They are determined by:

CPI (Cost Performance Index)

The competence factor express the relationship between the actual costs expended and value of the physical work performed.

CPI = BCWP/ACWP

SPI (Schedule Performance Index): The planned schedule efficiency factor representing the relationship between the value of initial planned schedule and the value of physical work performed.

SPI (Schedule Performance Index) =

BCWS (Budgeted Cost of Work Scheduled) /

BCWP (Budgeted Cost of Work Performed).

If, CPI and SPI=1, then the project is on budget and on schedule

CPI and SPI <1, then the project is over budget and behind the schedule

CPI and SPI >1, then the project is under budget and ahead of schedule

BAC (Budget at Completion) is an original Estimate of Completed Project Costs.

EAC (Estimate at Completion) is a projection of the final costs of work at project completion.

EAC (Estimate at Completion) =BAC (Budget at Completion) / CPI (Cost Performance Index).

Refer:-Table 1: Earned Value Analysis Values

IV. RESULTS&CALCULATIONS

Budgeted cost for work scheduled =**BCWS**

Budgeted cost of work performed =**BCWP**

Actual cost of work performed =**ACWP**

BAC (Budget at Completion) = Budgeted cost = 16731lakhs = 167.31 cores

1. Scheduled variance (SV)

= Σ BCWP - Σ BCWS

= 8428.63 – 9167.32

= -738.69 lakhs

→Project is **behind scheduled.**

2. Cost variance (SV)

= Σ BCWP - Σ ACWP

= 8428.63 – 9968 = -1539.37 lakhs

→Project is into **cost overrun**

3. Schedule Performance Index (SPI) =

SPI = Σ BCWP ÷ Σ BCWS

= 8428.63 ÷ 9167.32

= 0.919 < 1

→The Project is on behind **scheduled**

4. Cost performance index (CPI) =

CPI = Σ BCWP ÷ Σ ACWP

= 8428.63 ÷ 9968

= 0.845 < 1

→Project is on into **cost overrun**

5. Critical ratio (CR) =

SPI (Schedule performance index) * CPI (Cost Performance Index)

= 0.919 * 0.845

= 0.7765 < 1

→Overall project **performance is poor.**

6. Estimate at completion (EAC)

= BAC ÷ CPI

= 16731 ÷ 0.845

= 198 crores

7. Cost escalation = EAC – Budgeted Cost

= 198 – 167.37

→**Cost escalation =30.69 crores**

8. Construction started on Sept-2013 and the expected completion of project is on April-2016.

But due to the time overrun the project is expected to be completed by April-2018→**Time escalation = 2 years.**

V. RECOMMENDATIONS

Recommended Mitigation Processes

5.1 ABC (Always Better Control) Technique:

- Materials should be managed by using ABC (Always Better Control) technique in which class-A items which cost 70% cost of materials should be stored very less, class-B items which cost 20% cost should be stored in minimum quantity and class-c items which cost 10% cost should be stored maximum.
- By this they can save maximum cost as class-A items are frequently purchased from 3-4 sources so max negotiations can be done.

5.2 Proper project planning and scheduling:

The planning and Scheduling plays a key role in cost reduction as the plan which is prepared by the competent person i.e. project manager will be in such a way that there won't be ambiguous nature of activities which has to be executed. As there is no confusion there will be minimum chances to waste resources and materials. Planning and Scheduling can be done with the help of software packages such as Microsoft Project, Primavera, Asta Power Project.

5.3 Frequent Progress Meetings:

To avoid confusions at site what are the activities to concentrate and to avoid confusion in the mind of the labor. To ensure whether the labor have good knowledge on the activity that they are executing so that no material and resources are over used. By this we can control cost.

5.4 Inventory Control:

Inventory control also plays a crucial role in minimizing the cost. If we maintain good inventory control 10% of the cost can be reduced.

5.5 Use of experienced subcontractors:

It is the responsibility of the contractor to appoint a experienced subcontractor who have the experience in similar type of works. This subcontractors credentials should be checked by contractor and client. After client gives permission then only the subcontractor should be appointed.

5.6 Use of experienced suppliers:

The reliability of the supplier is very important. We have to check whether the supplier can meet the materials demand which is needed at site. If he cannot meet the demand then we have to choose other supplier. This can save the cost as we can negotiate with the supplier and reduce the cost.

CONCLUSION

As the project is facing cost and time overrun we have used EVA (Earned Value Analysis). The main cause for the cost and time overrun in this case are frequent design changes, poor project management, inappropriate contractors, unskilled manpower, inaccuracy of material estimate, lack of appropriate software, complexity of works. To overcome these problems the firm have to focus on better inventory control, use of adequate software and focus on activity based control. So that project is transparent enough to rectify or overcome their mistakes at the time of work progress itself.

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Table 1:- Earned Value Analysis Values

S.NO	Work item	Budgeted cost (in lakhs)	% Scheduled completion	% Actual completion	Scheduled cost (in lakhs)	Actual cost (in lakhs)	BCWS	BCWP
1	Earth work- Excavation Filling Pile breaking	179	100	100	179	204	179	179
2	Total cost of concreting including formwork	4193	98	91	4193	4329	4109.14	3815.63
3	Total cost of post tension work	220	94	89	197	205	206.8	195.8
4	Masonry work	519	90	85	487	450	467.1	441.15
5	Internal plaster	481	82	80	407	420	394.42	384.8
6	Water proofing	297	63	20	69	75	187.11	59.4
7	Doors	1897	46	55	956	1010	872.62	1043.35
8	Windows	815	43	50	367	450	350.45	407.5
9	Vitrified tiles	6056	38	30	2120	2725	2301.28	1816.8
10	Toilet finishing	284	35	30	128	100	99.4	85.2
11	Terrace and paving	465	-	-	-	-	-	-
12	Staircase finishing	45	-	-	-	-	-	-
13	Grills and railing	261	-	-	-	-	-	-
14	Painting	812	-	-	-	-	-	-
15	M.S.shutter	62	-	-	-	-	-	-
16	Miscellaneous	145	-	-	-	-	-	-
	Total	16731			9103	9968	9167.32	8428.63

★★★