

# Project Planning and Management with the help of Earned Value Analysis

Darji Rujul Anilbhai<sup>1</sup>, Ankitkumar SomaBhai Patel<sup>2</sup>

<sup>1</sup>P. G. Student, Department of Civil Engineering, U. V. Patel College of Engineering, Ganpat University

<sup>2</sup>P.G. Coordinator and Assistant Professor, Department of Civil Engineering, U. V. Patel College of Engineering, Ganpat University

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**Abstract** - Earned Value Management is a training for surveying plan routine and development by acclimatizing plausibility, motivation and pace of the arrangement. EVM has been generally utilized in various ventures and various examinations have been done on EVM and its case in the business. Development enterprises are confronting difficulties step by step innovation reception, Project Complexity and so forth. In the midst of every one of these difficulties it is exceptionally vital to improve the exhibition of an undertaking regarding Schedule and Cost. EVM is a significant apparatus in investigating the exhibition of slightly development venture. Through, Literature survey it gauges the undertaking progress and aides in recognizing the basic exercises along these lines welcoming the venture on time. This paper examine the Earned Value Analysis finished on an ongoing venture in Ahmedabad, utilizing MSP. The examination assisted in recognizing the basic territories. It guaranteed that the undertaking is on schedule as well as inside the financial plan.

**Key Words:** Earned Value Management (EVM), Performance Measurement, Construction Management, S-Curve Analysis, MSP.

## 1. INTRODUCTION

Development business is one of the significant areas in India and is seen with difficulties step by step. The business adds to the development of our budget to a huge degree. One of the principle issues that the business aspects is venture delay. This can be produced because of different reasons such as deviation from the underlying arrangement, shortage of assets, lack of common sense, poor execution, regular disasters and so on. This makes the task go over the normal financial plan and neglects to finish inside the booked time.

The development itself gets costlier. Consequently, it is significant that there is a precise and logical way to deal with venture the board to guarantee that the undertaking is finished inside the limitations of time and assets. EV examination is a significant apparatus to gauge the presentation of a task. It is a database the board procedure that utilizes "work in progress" to demonstrate what will befall the work in forthcoming. It thinks about the genuine work performed against a standard arrangement. Along these lines, the investigation assist in setting a standard for

execution assessment and controls the time and cost imperatives. It additionally aids in distinguishing the basic exercises which perhaps noted down & dealt with during additional advancement of the venture.

The implication of EV is on the estates that it not just attentions on organized consumption and genuine expense yet in addition differentiates future chances and investigations real implementation. The venture chiefs can screen the potential regions that are inclined to chance. They can make plans in like manner. To put it plainly, EV investigation deals with issues through opportune remedial activity before they become too incredible to even consider overcoming.

### 1.1. TERMINOLOGIES

There are 2 relations which recognizes Earned Value Method:

- (BCWS) or (PV)
- (BCWP) or (EV)

#### A.-PLANNED VALUE

The purposeful cost is aiding of the whole value estimation affirmed which is intentional to be devoured on a movement over a proposed time.

**PV = Carnal labor + Budget accepted**

#### B.- ACTUAL COST

AC, is known as (ACWP), is aggregate of most limited just as accidental charges endured during a given period in completing work on an action.

#### C - EARNED VALUE

The picked up esteem (EV), otherwise called arranged cost for done exertion (BCWP), is gauge of the measure of right now finished real work. It additionally thinks about unique evaluated plan expenses and pace at which the group is performing plan work to time.

From the given definition, given limits are explained,

- Estimation At Accomplishment
- Reasonable Conclusion
- Agenda Presentation File
- Total Presentation Directory
- Agenda Modification

**D.-ESTIMATE AT COMPLETION**

The Calculation of (EAC) is the measure of genuine cost to time and the anticipated cost to Completion

**EAC = Actual Cost (AC) + Completion Estimation (ETC)**

**E.-SCHEDULE PERFORMANCE INDEX**

It is likely to use (SPI) to estimate the given period to accomplish the plan built on the act. It is assumed by:

SPI = 1 (SPI = EV / PV) means the schedule is set for the project.

project is overdue. = SPI < 1

project is fast. = SPI > 1

**F.-COST PERFORMANCE INDEX**

Cost Performance Index (CPI) can be utilized to figure the likely charge to achieve the plan made on act to date. It is given by:

$CPI = EV / AC$

The planned and actual costs are same. : CPI = 1

Project is under budget.: CPI < 1

Project is over budget.: CPI > 1

**G.-SCHEDULE VARIANCE**

SV is a differentiation between the amount of research done all through a concurred range of period and what was purposeful to be finished. It is resolved by the accompanying

$SV = EV - PV$

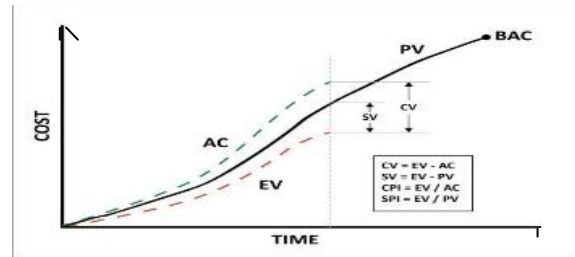
An unfriendly change in the calendar shows that the crucial late, that implies the work got lengthier than key. Likewise, a certain change displays that the job is quick which infers it took less period to perform than conscious.

**H.-COST VARIANCE**

Fluctuation (CV) is the inspection of planned aggregate of effort finished with the veritable charge. It is determined as follows

$CV = EV - AC.$

Figure shows the graphical portrayal of the expenses regarding time. It illustrations the normal spending plan & how there is a variety of genuine expense from this normal financial plan or the arranged worth. The gauge of work which is really achieved is additionally appeared as Earned worth expense



**Fig.1- Earned Value Analysis Curve**

**1.2. OBJECTIVE**

This investigation is done to satisfy the accompanying destinations: To improve the board control arrangement of a development venture by keeping the undertaking on schedule and on spending plan. To recognize and control issues in possible hazard regions.

**1.3. SCOPE OF PROJECT**

EVA as a presentation assessment instrument can be utilized for any development venture. This research paper centers around the Earned Value Analysis complete on a constant venture. The investigation assisted the undertaking perform better over the expense and timetable files.

**1.4. LITERATURE REVIEW**

Writing was gathered, considered, examination and shorted through numerous distributions. In the wake of shorting the papers and the distributions which were pertinent to the point where focused down. Besides, this papers and distribution were shorted to the importance of the present point. Numerous different sources, for example, technosocio stage (Quora and connection noise), books were alluded.

Earned Value have been a focus of contextual investigations and explore. This has assisted in considerate the idea obviously.

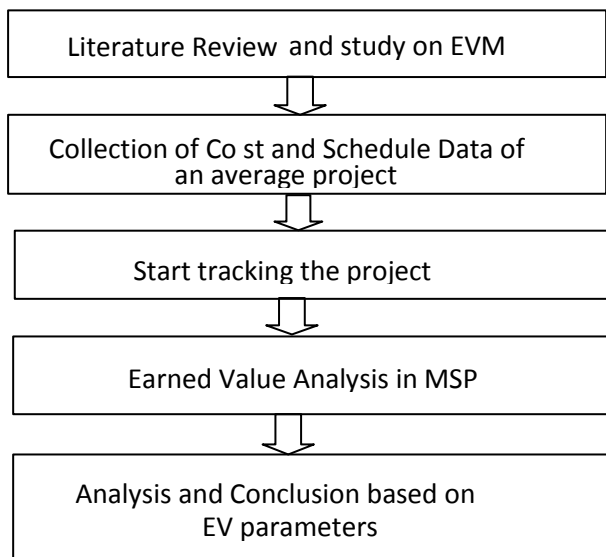
EVM offers some benefit to the venture supervisory group. It recovers the undertaking's capacity to awning rate and timetable. So the chore group can predict matters, strategy restorative events, and actualize sequence rectifications deprived of creation noteworthy antagonistic effect the venture. The inspections have seen what verves the expense of an execution to see the expectation of the guidelines. A portion of the rate chauffeurs called attention to include over the top documentation; extreme degrees of

aspect in the labor failure building, and self-possessed difference inspection rumors. The main components for achievement of the EVMS are connected with the mission squads" capacity in arranging, detecting, and monitoring the undertaking with the correct harmony amid procedure and grades.

EVM likewise encouraged a situation that was successful in regulatory in contradiction of price and timetable subjects that emerged. This degree of switch permitted the undertaking to remain inside its Contract Target Cost (Howard Hunter 2017). Earned Value is an development over conservative bookkeeping development measure. Conservative techniques center around decided attainment (use) and genuine expenditures. Earned Value goes overhead and elsewhere and airs at frank success. This gives chiefs extra notable knowledge into possible risk regions. With clearer image, administrators can make chance relief plans dependent on actual charge, timetable and specific advancement of the effort. It is an initial admonition venture the board instrument that empowers administrators to distinguish and switch issues earlier they convert outlandish. It permits activities to be overseen better – on schedule and on financial plan (Sunil Ganpat Mahadik 2007).

**2. METHODOLOGY:**

The Organization for this daily is appeared in a stream diagram as follows.



- The Initial methodology is to gather the current study and investigation that has been completed on the Earned Value Analysis.
- The Second methodology is contemplate the usage of EV in different undertakings, how they have closed dependent on the outcomes.

- The third methodology is to gather calendar and charge information of a normal undertaking which is in growth so EV examination should be possible and ends can be complete with respect to the eventual fate of task.
- The fourth methodology is to begin following the venture and retain a letter on the advancement of various exercises.
- The fifth methodology is to play out the examination on a specific date in the wake of contributing the genuine expense. The investigation is finished utilizing MSP programming.
- The sixth methodology is to harvest venture growth story on various rank days. The tale may incorporate basic exercises, exercises in progress, planned costs, cost caused and so on.
- The last methodology is to make reasonable ends dependent on the Agenda and Fee files acquired afterward Earned Value Analysis.

**2.1. APPLICATIONS:**

The venture is the development of a Commercial structure in Ahmedabad, in Gujarat situated in the Western piece of India. Investigation is made in the wake of gathering calendar and cost information.

The undertaking is required to complete in November 2020. The EV investigation is done at specific purposes of progress of the venture. In view of the outcomes appropriate ends are drawn with respect to cost toward the fruition of the task and once venture will be finished. The grouping of exercises, their span, flinch times, appearance dates and the antecedents for a piece of the venture is appeared in Figure 2.

#	REDEVELOPMENT OF CORPORATE HOUSE FOR INDIAN	270 days	Tue 03-03-20	Mon 30-11-20	
#	DIAPHRAGM WALL	20.88 days	Tue 03-03-20	Wed 25-03-20	
	Construction of Guide Wall	4 days	Tue 03-03-20	Fri 06-03-20	
	Mobilisation of Machinery	3 days	Fri 06-03-20	Sun 08-03-20	35S+3 days
	Boring	12 days	Mon 09-03-20	Wed 25-03-20	4
	Reinforcement Lowering	12 days	Thu 12-03-20	Mon 23-03-20	55S+1 day
	Concreting	12 days	Thu 12-03-20	Mon 23-03-20	65S
#	RCC FRAME	215.88 days	Sat 28-03-20	Fri 30-10-20	
#	SUB STRUCTURE	104.88 days	Sat 28-03-20	Fri 10-07-20	
#	Excavation	47.88 days	Sat 28-03-20	Thu 14-05-20	
	Excavation upto top level Anchor	3 days	Sat 28-03-20	Wed 01-04-20	7FS+4 days
	Top Level Anchoring of Diaphragm wall	3 days	Wed 01-04-20	Mon 06-04-20	11
	Grouting and stressing of anchor	7 days	Mon 06-04-20	Wed 15-04-20	12
	Excavation upto bottom level Anchor	7 days	Wed 15-04-20	Fri 24-04-20	13
	Bottom level anchoring of Diaphragm wall	3 days	Fri 24-04-20	Wed 29-04-20	14
	Grouting and stressing of anchor	7 days	Wed 29-04-20	Fri 08-05-20	15
	Excavation upto base level	4 days	Fri 08-05-20	Thu 14-05-20	16
#	Foundations	21 days	Thu 14-05-20	Thu 04-06-20	
	Levelling and PCC	5 days	Thu 14-05-20	Tue 19-05-20	17
	Reinforcement for Raft foundation	7 days	Tue 19-05-20	Tue 26-05-20	19

**Fig.2- Scheduling in MSP**

Subsequent to building up a reasonable MSP record, following of the undertaking begins. The succession of exercises as MSP is appeared in. The advancement of the venture has been broke down on various dates from March 2020 to November 2020. Tray now 9 % of the task has

remained finished. In light of the expense and timetable investigation, ends have been drawn.

Total and Agenda investigation have stood ended independently as appeared in Figure 4 and Figure 5

Fig shows the examination finished on 13th Feb. 2020. On this day exercises till, D-Wall " have been finished. In this way every one of these exercises have earned an incentive as indicated by what they have arranged. Be that as it may, it displays a Price Difference of state Rs. 1,680 for the action "RCC Structure". The CPI is 0.99 which implies for each 1 rupee that they have consumed on action „RCC Structure" they consume earn just 0.99 rupee till consummation. Similar sort of variety can be realized till „Excavation".

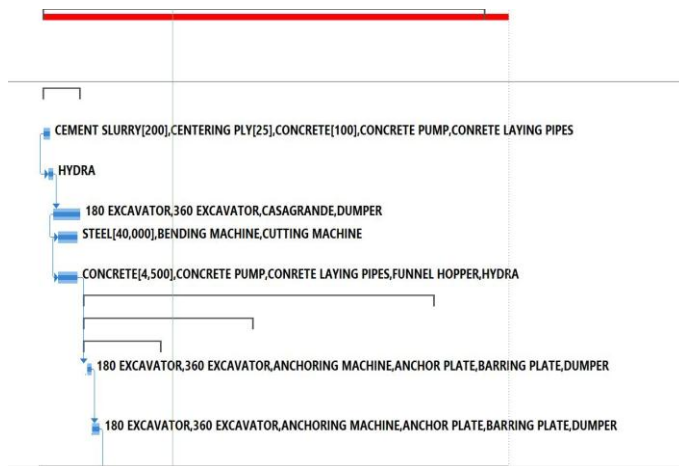


Fig 3- Sequence of Activities

Activity	Planned	Actual	SV	CPI	Planned	Actual
REDEVELOPMENT OF CORPORATE HOUSE FOR INDIAN POTASH LTD	23,292,400.00	23,059,588.00	-1%	0.99	181,817,303.29	1,817,298.78
DIAPHRAGM WALL	23,113,200.00	22,882,068.00	-1%	0.99	23,346,666.67	233,466.67
Construction of Guide Wall	556,000.00	550,440.00	-1%	0.99	561,616.16	5,616.16
Mobilisation of Machinery	0.00	0.00	0%	0	0.00	0.00
Boring	67,200.00	66,528.00	-1%	0.99	67,878.79	678.79
Reinforcement Lowering	2,240,000.00	2,217,600.00	-1%	0.99	2,262,626.26	22,626.26
Concreting	20,250,000.00	20,047,500.00	-1%	0.99	20,454,545.45	204,545.45
RCC FRAME	179,200.00	177,520.00	-1%	0.99	16,588,940.83	155,521.32
SUB STRUCTURE	179,200.00	177,520.00	-1%	0.99	7,364,859.06	69,045.55
Excavation	179,200.00	177,520.00	-1%	0.99	192,201.89	1,801.89
Excavation upto top level Anchor	16,800.00	16,632.00	-1%	0.99	16,969.70	169.70
Top Level Anchoring of Diaphragm wall	16,800.00	16,632.00	-1%	0.99	16,969.70	169.70
Grouting and stressing of anchor	39,200.00	38,808.00	-1%	0.99	39,595.96	395.96
Excavation upto bottom level Anchor	39,200.00	38,808.00	-1%	0.99	39,595.96	395.96
Bottom level anchoring of Diaphragm wall	16,800.00	16,632.00	-1%	0.99	16,969.70	169.70
Grouting and stressing of	39,200.00	38,808.00	-1%	0.99	39,595.96	395.96

Fig 4- Cost Analysis

This is the manner by which Cost examination is deciphered. The calendar investigation is appeared as beneath in Fig 5.

Activity	Planned	Actual	SV	CPI
REDEVELOPMENT OF CORPORATE HOUSE FOR INDIAN POTASH LTD	23,292,400.00	23,059,588.00	-1%	0.99
DIAPHRAGM WALL	23,113,200.00	22,882,068.00	-1%	0.99
Construction of Guide Wall	556,000.00	550,440.00	-1%	0.99
Mobilisation of Machinery	0.00	0.00	0%	0
Boring	67,200.00	66,528.00	-1%	0.99
Reinforcement Lowering	2,240,000.00	2,217,600.00	-1%	0.99
Concreting	20,250,000.00	20,047,500.00	-1%	0.99
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Bottom level anchoring of Diaphragm wall	16,800.00	16,632.00	-1%	0.99

Fig 5- Schedule Variance

Fig 5 shows the timetable examination. Take a model. The advancing movement which is „Construction of Guide Wall" is bogged down with an estimation of Rs. 5560. The SPI show 0.99 which implies it is advancing at 99 % of what was initially arranged.

## 2.2. DATA ANALYSIS

The primary target of this contextual investigation on this undertaking is to examine and break down the EVM factors and reach a resolution in regards to how the qualities were shown up at. The Table for exercises wherever variety is enormous is classified and appeared in Table 2.

Table 2- Root Cause Analysis

Activity	Start Date	SV of - Rs.	Impact
D-Wall Construction	03-03-2020	2,31,132	Delay in resources
RCC Frame	28-03-2020	1680	Change in estimated plan
Excavation	28-03-2020	1680	Due to need on „PRCC Frame" action, stay in that reasons stays in ensuing actions.

After the Cost Analysis, CV is demonstrating a bad worth which implies it is ended financial plan. CPI = 0.97, which implies the task is receiving just 0.97 of each 1 rupee that it applies. From the SV when measured for the entire task is demonstrating a optimistic worth which implies it is in front of calendar. For undertaking, introductory gauge depended

on the arrangement of individual footings for every segment. Be that as it may, there was an adjustment in plan and heap establishment was adopted. The potential explanations can be:

- o Owing to non-accessibility of illustrations throughout sure advancement of exercises bringing about postponement.
- o Change in gauge as heap establishments were received rather than segment footings arranged at first.
- o Output from the work sideways.
- o The potential things that should be possible to defeat this are:
  - o Accept 24 hours out of every daytime employed schedule. They have complete this as need to complete the task inside the cutoff time much after the plan the aforementioned was altered. Comprise increasingly gifted works

o It goes about as a notice framework to the venture directors and in this manner helps in productive task the executives.

- o The reports can be exploited in upcoming undertakings as to potential preventions that might fit arise in diverse responsibilities moreover.

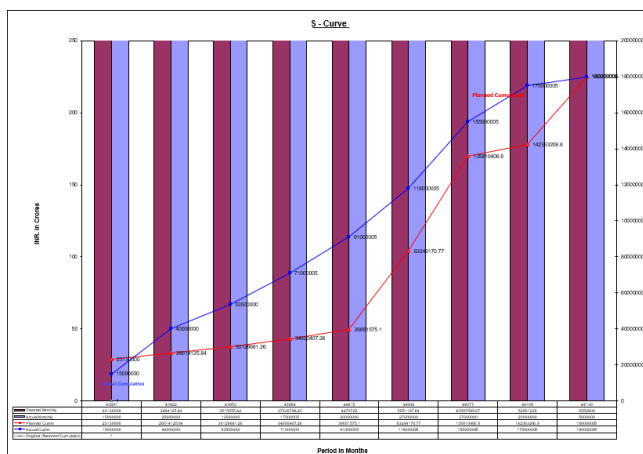
Then, EVM stretches additional recognition about the expenditures and diverse mechanisms of delay, hazards, implementation and so on. It moves the supervisory crew to give more thought to price, timetable and growth with higher power and enhances the task.

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Monthwise Plan v/s Achieve							Status as on		Remarks	
Sl No	Month	Month (Crore Rs.)		Cumulative (Crore Rs.)		Monthly % age		Cumulative % age		
		Planned	Achieved	Planned	Achieved	Planned	Achieved	Planned		Achieved
1	Mar-20	23130000.00	15000000.00	23130000.00	15000000.00	12.85%	8.33%	12.85%	8.33%	
2	Apr-20	3484125.84	25000000.00	26614125.84	40000000.00	1.94%	13.89%	14.79%	22.22%	
3	May-20	3515555.42	13500000.00	30129681.26	53500000.00	1.95%	7.50%	16.74%	29.72%	
4	Jun-20	37636798.23	17500005.00	3460047.26	71000005.00	20.91%	9.72%	37.65%	39.44%	
5	Jul-20	4470726.00	20000000.00	39651575.10	91000005.00	2.48%	11.11%	40.13%	50.56%	
6	Aug-20	5051167.84	27000000.00	83249170.77	118000005.00	2.81%	15.00%	42.94%	65.56%	
7	Sep-20	43597595.67	37000000.00	135810406.77	155000005.00	24.22%	20.56%	67.16%	86.11%	
8	Oct-20	52561236.00	20000000.00	142863206.77	175000005.00	29.20%	11.11%	96.36%	97.22%	
9	Nov-20	6552800.00	5000000.00	180000005.00	180000005.00	3.64%	2.78%	100.00%	100.00%	
<b>Total Amount</b>		<b>180000005.00</b>	<b>180000005.00</b>							

**Fig.6- Monthwise Plan V/S Achieve**



**Fig.7- S-Curve of Project Obtain from EVA**

**3. CONCLUSIONS**

The principle end is that EVM can give a significant commitment in cost the executives of a development venture.

- o It must be delicate to choose modification.
- o Arrangement in software demonstrates to facilitate the booking of tasks.

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