

# Earned Value Management in Advertising Projects

Muhammad Asim Mumtaz, Amela Peric

*Abstract: This paper provides an overview of literature survey of EVM and its application in a real advertisement project. It explains integration of project control using EVM. The paper focuses on three objectives. First idea of EVM is done using peer reviews and journals. Second, best procedure is selected for advertising projects using literature survey and feasibility of method. Third, it implements EVM on a real-time advertising project based on schedule and financial risk. EVM is most reliable tool for integrating cost, time, work and budget. EVM helps in calculating physical project progress at any time, determining its completion date and final cost. It is a simple model that helps manager in cost control. The paper describes EVM method and investigates future cost of a practical project. The paper compares the actual work with the planned work and helps in forecasting future costs. This cost can be calculated in hours or in term of dollar. EVM helps manager to extrapolate the current trends to predict the final effect and thus acts as a "early warning system" to look insight into project status. Based on literature review various EVM benefits have been monitored and linked them to project control. The paper also focuses on sustainability and quality of EVM in project management.*

*Index Terms: EVM, Earn Value Management, Cost Control, Engineering Management, Project Performance improvement, Schedule Management.*

## I. IDEA OF EARN VALUE MANAGEMENT

Project Management magazine defines it as "a system used to measure and impart the actual physical work of a project considering the work finish, the time taken and the costs acquired to finish that work"

NASA defines it as "an integration system use to evaluate and understand how a field activity is progressing with dollar"

Englert and associates Inc defines it "a procedure for measuring project execution. It analyses the measure of work that was arranged with what was really proficient to figure out whether cost and schedule execution is as arranged."

Field operative defines it as "the physical work finished in addition to the approved spending plan for this work."

Microsoft Project defines it as "Performance measuring tool which describes the amount of the financial backing ought to have been spent, in perspective of the measure of work done as such far and the pattern cost for the errand, task, or assets"[8]

## 1.1. Process of Earn Value Management.

EVM helps in project control by determining whether the project is following or ahead as planned. EVM is a simple model which has become standard in project management and is recognized by many public and private agencies. [11]

The calculation requires gathering of weekly project data and information which is processed to forecast the future results. Any deviations from the pre-planned project can be identified and corrective actions can be taken to switch the project into original track. [9]

Before applying EVM on any project you must define the scope of the project and the work done. EVM focuses on the work that has already been done and compares it with the budget. Manager should figure out who will complete the defined work, actual cost of work done and identification of all major basic acquirements. You must identify remaining resources and schedule the defined work. EVM cannot be used for continuous business operations. [4]

For scope, you need to identify the work done and work needs to be done. You must know the outset when the project finishes. Manager needs to know how much of the entire job has been done at a particular time. Project controlling is keystone in project success. [2]. Initially EVM was developed as a financial tool but later on it becomes project management tool as it provides a true picture of cost analysis. [7] In USA, all projects greater than \$20 million requires a EVMS certification. In Australia, AS 4817-2006 (EVM) is new Australian standard in projects implemented by Department of Defence. [11] Chou developed a web based automated model for project performance and project control using EVM. [13] Chen combines time-series and regression analysis to develop PV into an EV response model for predicting PC and forecasting EVM. [14].

Before initiation WBS must be created. Overlapping activities must be clearly broken down. WBS can be phase based or product base depending on the project. For advertising project, phase based WBS is preferred. After organizing WBS, project network must be organized. Project network can be formed, connecting the work phases by method for priority relations. Project activities are directly linked with project control. [3]

In advertising projects, Project network is divided in parallel rather than series. The next step is the development of Baseline for the project. Base line of the project includes indirect costs and profits as well. Mostly measurements are done on weekly basis. EVM is actually the measurement of the physical work performed against baseline.

Revised Version Manuscript Received on September 29, 2017.

Muhammad Asim Mumtaz, SML (Engineering & IT), University of Technology Sydney (UTS SYD), Sydney, Australia, E-mail: [asim\\_mumtaz@live.co.uk](mailto:asim_mumtaz@live.co.uk)

Dr. Ameila Peric, School of Built Environment, University of Technology, Sydney, Australia, E-mail: [Amela.Peric@uts.edu.au](mailto:Amela.Peric@uts.edu.au)

## Earned Value Management in Advertising Projects

The actual cost must be aligned with the budget. Base line acts as a bench mark for the project. After the baseline, data is collected in order to review the current project of the project. [6] Using the current project data different terms are calculated which are described below.

BCWS = for Budget cost of work schedule.

BCWP = Budget cost of work performed

ACWP= Actual cost of work performed.

T= time of project.

Project Completion (PC)

$$PC = \frac{BCWP}{BAC} \quad (1)$$

### 1.2. Cost Variance (CV)

CV is the difference between planned and actual cost of work performed. Negative value of CV shows that budget is overhead.

$$CV = BCWP - ACWP \quad (2)$$

$$\%CV = \frac{CV}{BCWP} .100 \quad (3)$$

### 1.3. Schedule Variance SV

SV is the measure of deviation between the genuine progress and the arranged progress.

$$SV = BCWP - BCWS$$

SPI indicates the schedule of project progression.

### 1.4. Cost Performance Index CPI

CPI tells about the planned and genuine estimation of works. If CPI is less than 100% it means that the project has consumed more budget than planned.

$$CPI = \frac{BCWP}{ACWP} \quad (4)$$

CPI helps in predicting the final cost of the project. If  $CPI > 1$  it means project is over budget,  $CPI=0$  means project is on budget but  $CPI < 1$  means project is under budget.

### 1.5. Schedule Performance Index SPI

SPI tells us about the arranged cost of works finished with arranged cost of works planned.

$$SPI = \frac{BCWP}{BCWS} \quad (5)$$

If  $SPI > 1$  it means project is ahead in schedule,  $SPI=0$  means project is on schedule but  $SPI < 1$  means project is behind schedule.

CPI and SPI together can be used to compare the performance of one phase of project to another phase. SPI and CPI forecast the final budget needed to complete the project.

### 1.6. Estimate at Completion EAC

EAC is the linear extrapolation of results at fix value of CPI. It tells us how much the project is going to be in the end.

$$EAC = \frac{BAC}{CPI} \quad (6)$$

EAC doesn't include future errors and risks so it is not the exact forecast of project. As project progresses CPI goes less than present value, which means that the future cost will not follow the same pattern. [1].

## II. FORECASTING USING EVM.

One of the main task of project manage is to make future decisions. EVM is designed to forecast time and cost. Using forecasting you can forecast Estimate to completion, Variance in completion, approximation in Project finishing point and CPI. There are the following methods to forecast EVM.

### 2.1. The Plan Value Method

The plan value method was explained by Anbari. According to this method time variance can be calculated by dividing Schedule Variance to Planned value.

$$TV = \frac{SV}{PV}$$

$$TV = \frac{SV * T}{BAC}$$

$$TV = \frac{(BCWP - BCWS) * T}{BAC} \quad (7)$$

Time required to finish the project with the current SPI trend is;

$$T' = \frac{T}{SPI}$$

Duration of remaining work following the current SCI:

$$EAC = \frac{T}{SCI} \quad (8)$$

Where  $SCI=CPI*SPI$

### 2.2. Earned Duration Method

EDM was described by Jacob and Kane.

$$EAC = ACWP + \frac{BAC - BCWP}{PF} \quad (9)$$

Pf is the relation between past costs and future expenses. Let's suppose cost in future will follow according to planned budget. So we can take  $Pf=1$ . Future performances can be corrected to the current trends of SCI.

TCPI (To complete performance Index) It tells us the value of CPI that should be needed to maintain in order to complete the project in given budget. It is proportion between remaining work and budget left.

$$TCPI = \frac{BAC - BCWP}{BAC - ACWP} \quad (10)$$

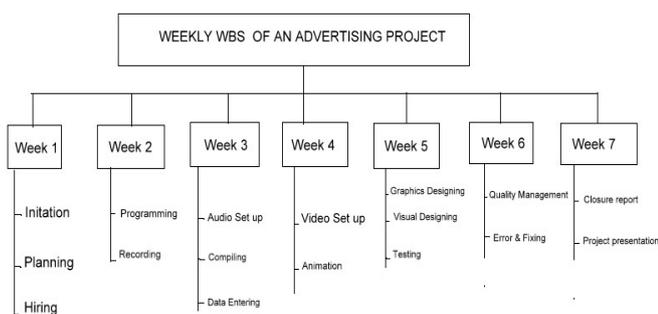
TCPI indicates the scale of effort needed for completing project under given resources. [1].

### III. RESEARCH PROBLEM

The main target of the project management is to complete project within budget and deadline. EVM was developed to integrate cost, time and progress. Many advertising projects suffer from poor cost and time management. This scenario led to think how to improve industry performance. Multiple issues like lack of market analysis, wrong media selection, poor design and programming. Budget and Time overrun in most advertising projects. The problem for which this paper will provide an over view is advertising project of Hunter Motive Group. We consider an advertising project of H.M group (Australia) worth \$550k with project duration 50 days (7 weeks). Project start date is 01 Jan 2017. It is a commercial project with a baseline of \$10k. The project was carried by ADD shell advertising company. For calculations, we make initial data assumptions of each work phase for the preparation of EVM. The project was evaluated after 50% work has done in order to see its performance parameters.

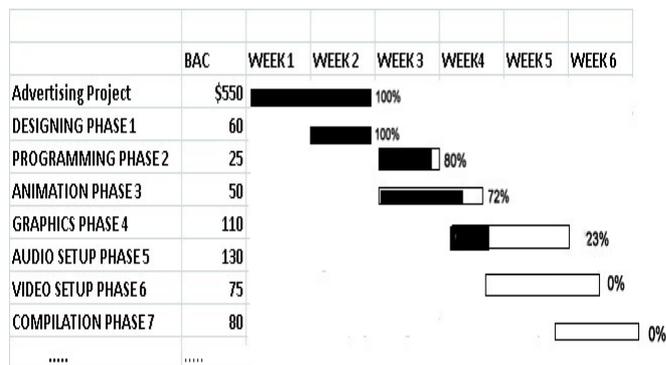
PROJECT	CATEGORY	ESTIMATED BUDGET	TIME DURATION	PROJECT START DATE	COMPANY
Advertising Animation ADD	Commercial	\$550k	50 days (7.1 weeks)	01 January 2017	ADD Shell Entertainment Australia.

The project's Work breakdown structure is shown below.



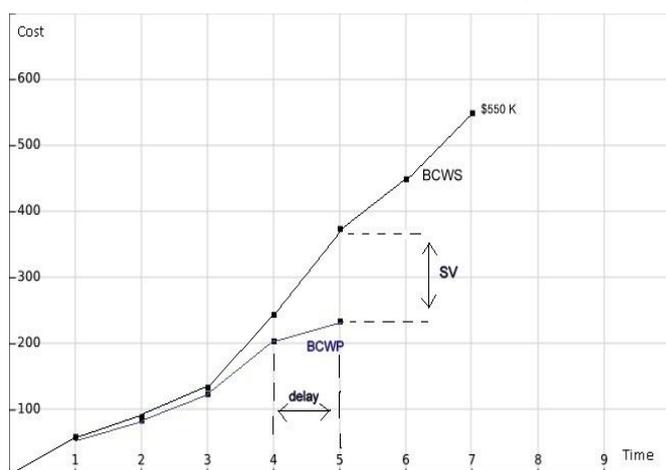
Work is uniformly divided on 7 weeks. Project was supposed to deliver at 19 Feb (7 weeks). EVM is performed by management in 5<sup>th</sup> week.

	BAC	PC	BCWS	BCWP	ACWP	SV
Advertising Project	\$550	72%	400	235	245	165
DESIGNING PHASE 1	60	100%	60	60	60	0
PROG PHASE 2	25	100%	25	25	30	0
ANIMATION PHASE 3	50	80%	50	40	35	-10
GRAPHICS PHASE 4	110	72%	110	80	80	-30
AUDIO SETUP PHASE 5	130	23%	105	30	40	-75
VIDEO SETUP PHASE 6	75	0%	50	0	0	-50
COMPILATION PHASE 7	80	0%	0	0	0	0
....	....	0%	0	0	0	0



The budget expenditure shows that the project is 72% complete but EVM shows that 46% of the work is done. The figure also shows those design and animation phases are progressing slow as projected. Phase 2 and Phase 3 are projected to be finish before week 5 but the work is still going on.

The S curve shows the utilization of resources over proposed time. It is the basic tracking tool in which we compare base S line with actual S line. There are many types of S curves e.g. (Cost vs. Time), (Man hour vs. Time) and (Value vs. Percentage) S curve. Man hour vs time is mostly used for labour demanding projects. In the given project data, we use Cost vs. Time to track the schedule completion.



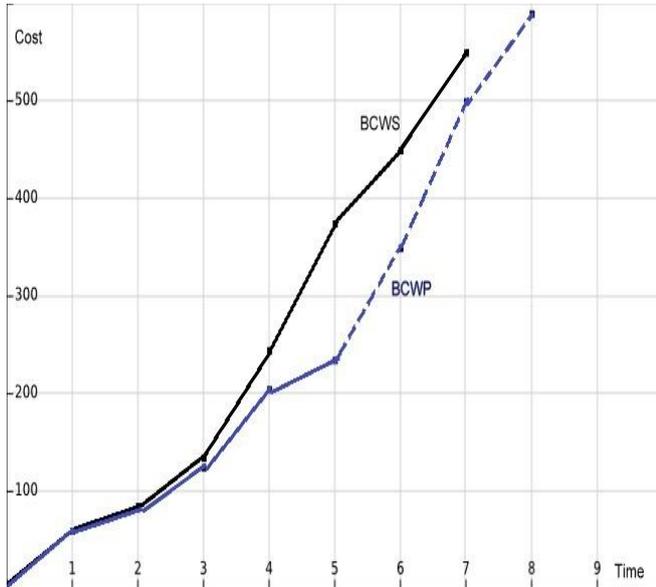
Putting the value on a graph shows that there is a delay in project performance. The deviation with respect to x axis will show the "time variance" while deviation with respect to y axis will show the "cost variance". The actual duration "T" of the project was 7 weeks and budget was \$550k. The project was planned to follow the BCWS curve. By performing EVM in 5<sup>th</sup> week, the curve shows that the project is running behind the work it set out and going over budget.

	CPI	SPI	EAC	TCPI
Advertising Project	95%	59%	578.94	103.27%
DESIGNING PHASE 1	100%	100%	60	-
PROGRAMMING PHASE 2	84%	100%	29.76	-
ANIMATION PHASE 3	114%	80%	43.85	66.70%
GRAPHICS PHASE 4	100%	72%	110	100%
AUDIO SETUP PHASE 5	75%	285%	173	111.10%
VIDEO SETUP PHASE 6	0%	-	-	100%
COMPILATION PHASE 7	0	-	-	100%
....	0	-	-	-

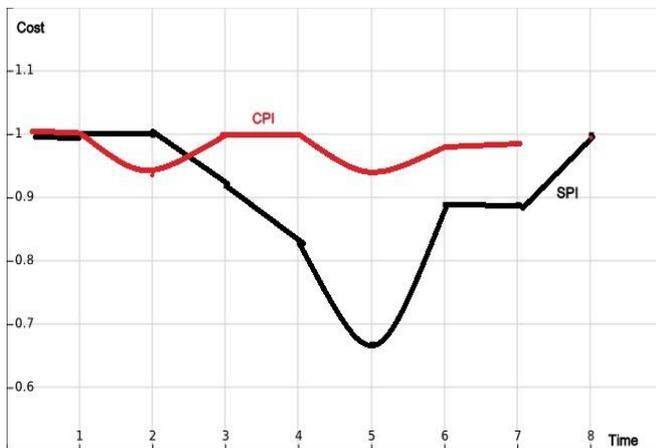


## Earned Value Management in Advertising Projects

Using Earned value, we can quickly forecast the final budget by dividing total budget to CPI factor. Thus dividing 550 to 0.95 gives us a forecast of \$574k. Another technique of forecasting is to multiply CPI (0.95) times SPI (0.59) and then using the result to statistically forecast the maximum funds likely required to complete the project. This is high end and more severe method which gives maximum budget forecast at highest level. In this case using this method gives us an estimate near \$790k which is way too far (as compare to first method). Extrapolating the current S curve will gives us an idea of project completion with given CPI.



The expected project completion with the current CPI and SPI is Week 8. By extrapolating the current trends of project progress, we can clearly see that project is running late.

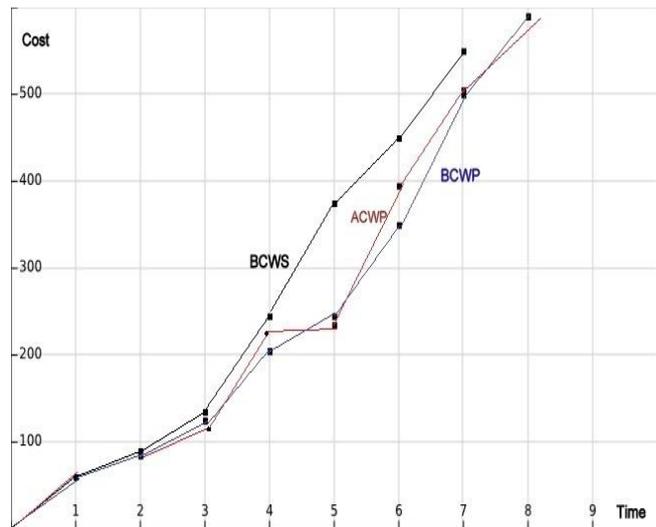


CPI and SPI ratio is less than one which shows that project is progressing poorly. It is shown in graph that project schedule is further behind as compare to the budget.

### IV. IMPROVING PROJECT PERFORMANCE USING EVM

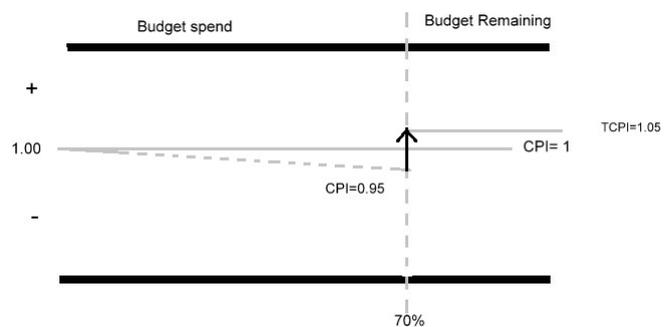
Using the current calculations the project performance can be measured and compare it with the baseline. Although EVM forecast the cost and schedule but it doesn't give us an idea either the deviations are within the project baseline or not.[5]  
 Planned Time of the project =  $T = 7$  weeks  
 Planned BAC= \$550k  
 Actual time of the project =  $T = 8$  weeks

Actual Total cost= EAC= \$590k



It shows that after the creation of baseline, the cost of project increases or the daily work schedule was low. The CPI is relatively constant and EAC is constant as well. Weekly output was low and cost of project rises. Cost changes in the mid of the project are directly affecting CPI.

In the current project the CPI of the project is 0.95. This shows that 0.95 can be offset by completing the remaining work at inverse value of at 1.05.



t	BCWS	BCWP	ACWP	CPI	SPI	EAC	T'
0	0	0	0	-	-	-	-
1	60	60	60	1	1	590	7
2	85	85	90	0.94	1	590	7
3	135	125	125	1	0.92	590	7.6
4	245	205	203	0.99	0.83	590	8.4
5	350	235	245	0.95	0.67	590	10.44
6	430	385	395	0.92	0.89	590	7.8
7	550	490	505	0.97	0.89	590	7.8
8	550	550	590	1	1	590	7

In the current project initial cost variances have particular effect on project budget. After the project becomes 30 % complete SPI starts becoming negative and in the mid of the project its 2 weeks behind schedule. The EAC based on CPI proves to be effective in project over run estimation. The above-mentioned project was retraced using a CPI & SPI values of 1.05 and 0.85 respectively.

EVM is the integration of the scope, schedule and budget of the project. It is therefore referred as integration of triple constraint. Using S curve, we can get schedule logic.



S curve can be implemented on any level of WBS. Some activities may follow critical path while some don't follow critical path. Earn duration method gives us a bigger picture of project activities. We can implement EVM on each activity separately to get a detailed view of the project. EVM is a deterministic approach which doesn't relate risks and critical path. The EV result doesn't specify critical and non-critical activities. Critical activities must be handled separate as compare to non-critical activities. It can be contended that the evaluation of critical path may require an alternate approach than the treatment of non-critical activities exercises.

## V. APPLICATION

EVM improves the planning process by improving project visibility during project progress. It gives clear and actual measurement on all management levels. In construction industry it integrates and evaluates cost vs work effort. In other industries it helps in evaluating scope, budget and work done. According to Fleming the best application of EVM lies in small projects where people are unaware of EVM. [7]

## VI. CONCLUSION

The primary aim of the paper was to relate EVM with advertising projects. In EVM, work progress is measured as Earned Value. EVM is a broad base project management tool for all types of industries and projects. EVM can help managements to take corrective decisions to re-track the project and variance reporting. TCPI can help management in achieving the project financial goals. In advertising industry, 50% completion point best describes the EVM and TCPI scenario. The findings demonstrate insignificant utilization of EVM in the schedule control of activities. EVM is the only reliable method which shows satisfied results. SPI and CPI show the project progress in term of schedule and budget respectively.

## REFERENCES

1. Agata Czarnigowska. 2008, 'Earned value method as a tool for project' Institute of Construction, Faculty of Civil and Sanitary Engineering, Lublin University of Technology. vol 3, pp.15-32.
2. Edward Chung 2016, PMP Earned Value Management (EVM) Calculation Explained in Simple Terms, viewed 14 August 2017, <<http://edward-designer.com/web/pmp-earned-value-questions-explainin ed/>>
3. Garrett, Gregory. 2006, 'Earned Value Management', Contract Management, Vol. 46, no. 12, pp. 49-51.
4. Brewin, Jeannette Cabanis. & Dsinsmore, Paul C. 2014, The AMA Handbook of Project Management, 4<sup>th</sup> edn, AMA, Broadway, NY.
5. Pajares, J., López-Paredes, A., 2011. An extension of the EVM analysis for project monitoring: the cost control index and the schedule control index. Int. J. Proj. Manag. 29, 615–621.
6. Willems, Laura L. & Vanhoucke, Mario. 2015, 'Classification of articles and journals on project control and earned value management', International Journal of Project Management, vol. 33, no. 3, pp. 1610-1634.
7. Russell, S.H., PhD. 2011, "Earned Value Management: Uses and Misuses", Air Force Journal of Logistics, vol. 35, no. 3, pp. 98-104.
8. "Earned Value Management Institute; Earned Value Management Institute Releases the Earned Value Management Professional Credential Certification", 2009, Defense & Aerospace Week, , pp. 98.
9. Stratton, R.W., E.V.P. 2007, "Applying Earned Schedule Analysis to EVM data for Estimating Completion Date", AACE International Transactions, pp. EV41-EV44.
10. Nkiwane, N.H., Meyer, W.G. & Steyn, H. 2016, "the use of earned value management for initiating directive project control decisions: a case

- study", South African Journal of Industrial Engineering, vol. 27, no. 1, pp. 192-203.
11. Fahad Usmani n.d, Schedule Performance Index (SPI) & Cost Performance Index (CPI), viewed 15 August 2017, <<https://pmstudycircle.com/2012/05/schedule-performance-index-spi-and-cost-performance-index-cpi/>>.
12. Department of Defense 2017, Earned Value Management, History, viewed 18 August 2017, <http://www.defence.gov.au/dmo/DoingBusiness/ProcurementDefence/ContractinginCASG/EarnedValueManagementProgram/>
13. Chou, J.S., Chen, H.M., Hou, C.C. & Lin, C.W. 2010, 'Visualized EVM system for assessing project performance', Automation in Construction., vol.19, no. 5, pp. 596–607.
14. Chen, Hong Long., Chen, Wei Tong & Lin, Ying Lien. 2016, 'Earned value project management: Improving the predictive power of planned value', International Journal of Project Management, vol.34, no. 1, pp.22-29.

