



A Critical Literature Review on Implementation of Earn Value Management

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Abstract: Earned Value is a well-known project management tool. It is an industry standard method of measuring a project's progress at any given point of time, forecasting its completion date and final cost, analyzing variances in the schedule and budget as the project proceeds. It is a method for measuring project performance; it indicates how much of the budget should have been spent, in view of the amount of work done and the baseline cost for the task, assignment and resources. In order to organize these all information, there should be efficient use of the construction software available in the market. This literature review paper emphasizes on the use of this techniques in modern software such as Microsoft Project in order to exercise better management over the project.

Keywords: Earn Value Management, Project Performance Tracking, Project Monitoring &Controlling, Microsoft Project

1. INTRODUCTION

Feedback is critical to the success of any project. Timely and targeted feedback can enable project managers to identify problems early and make adjustments that can keep a project on time and on budget.

Earned Value Management (EVM) has proven itself to be one of the most effective performance measurement and feedback tools for managing projects. It enables managers to close the loop in the Plan-Do-Check-Act (PDCA) management cycle.

EVM has been called “management with the lights on” because it can help clearly and objectively illuminate where a project is and where it is going—as compared to where it was supposed to be and where it was supposed to be going. EVM uses the fundamental principle that patterns and trends in the past can be good predictors of the future.

EVM integrates the project Scope, Schedule and Cost. EVM can play a crucial role in answering management questions that are critical to the success of every project, such as:

- Are we ahead of or behind schedule?
- How efficiently are we using our time?
- When is the project likely to be completed?
- Are we currently under or over our budget?

If the application of EVM to a project reveals that the project is behind schedule or over budget, the project manager can use the EVM methodology to help identify:

- Where problems are occurring?
- Whether the problems are critical or not?

- What it will take to get the project back on track?

2. CRITICAL LITERATURE REVIEW

The following are the previous research reviews based on Earn Value Management in various civil engineering projects.

McConnell et al. (1985) concluded that 1st and 2nd level of Earned Value Management should be most accurate. 1st level defines key milestones and 2nd level defines detail description of each milestone. Effective control over project may be defined by dividing the project in shorter time intervals.[9]

Cabri et al. (1997) compared EVM and agile project managements and concluded that EVM can be applied for initial task baseline for measuring progress, well defined scope and linear fashion projects. Agile cane was applied for iterative, nonlinear and not well-defined scope of any project.[6]

Angelo at al. (2006) concluded from his case study that EVM is very effective in cost management. But ii is very sensitive for scope changes. Another perception is that Schedule Performance Index (SPI) is not, “Time”. The EVA process provided clear information about scope issues because the scope was better modeled through the WBS.[21]

Henderson et al. (2007) stated that ES method requires only the PV and EV data which is readily available form projects utilizing EVM. ES method is very much easier than doing detailed, bottom-up critical path updates, estimation and analysis.[12]

Czarnigowska at al. (2008) found from model that the final cost variance will be greater than cost variance at 20% of project development. After the project completes about 20%, CPI stabilizes; usually it does not change by more than 10%.[7]

Kim et al. (2011) suggested that cost BAF (Bayesian Adaptive Forecasting) method is the most appropriate method for forecasting cost estimation in Earned Value Management. This estimation gives effective project control within the project at company level.[5]

Czarnigowsk et al. (2011) stated that Earned Value has unfading popularity just because of its simplicity and manipulation of data requires some basic operations only. And performance indicators produced in the analysis are easy to interpret.[8]

Ming al at. (2011) indicates that traditional EVM approach is mainly intended for ideal scheduling scenarios without considering practical resource constraints on time delays. He has done in depth discussion about how to simulates resource constrained schedules by Microsoft Project and the steps for implementing the new approach under delayed scenarios are included, the proposed framework of EVM can be further enhance in terms of scope change, work done and actual expenses on a continuous basis.[14]

Bhosekar at al. (2012) stated that EVA has significant value and presents unique features that can benefit clients’ consultants and contractors involved in construction sector. In this paper Projects were analyzed using Microsoft Project 2007 and Primavera P6. The final result gives almost 99.5% accuracy by using MS Project 2007 and Primavera P6 software.[4]

Mohd et al. (2013) identified that it is beneficial to use monitoring system that could avoid delays as well as cost overrun. The system which was utilized using the CPIs & SPIs are in fact the analysis using earned value approach. In addition to normal usage of Gantt chart, earn value analysis is a reliable tool to monitor & control construction projects which are done by ‘sub-contractor’.[16]

Tsui et al. (2013) focuses on two levels, macro level and micro level. Estimate at completion of cost (EACc) and CPI are the micro level variables and other than that, all are micro level variables. Project managers must be mindful of the actual start & completion dates of project. [20]

Luis et al. (2014) observedthatEVM has certain limitations like very high forecasting variability and doubtful information which leads to poor decision making.[13]

Mohammad et al. (2014) found thatMicrosoft Project 2013 is the active and useful program for following up the project performance especially in infrastructure project using Earn Value Management. EVM is the best indicator of future performance and forecast cost and schedule overrun at quiet and earlier stage in construction projects.[15]

Subramani et al. (2014) indicated that EVA has significant value and presents unique features that can benefit clients, consultants and industries. If two projects were analyzed using software like MS Projects, Primavera P6, based on earn value analysis method, and if schedule variances respect to time (SV) is incorporated in MSP & Primavera P6, final results gives almost 100% accuracy.[18]

Dubey et al. (2015) informed that in case of cost overrun and time overrun suitable action should be taken by project manager. An optimal solution can be between full crash solution and smoothen solution. The full crash duration is the most expensive, but has least duration while the smoothened duration has the least cost but increased duration. Hence the earned value analysis could be used to analyze what action needs to be taken by project manager to get an optimal solution.[10]

Suresh et al. (2015) conclude that EVM is sensitive to scope change. Scheduling is easy in MS Project for any project. It acts as a warning system to project manager and reports can be used in other projects also for comparison. And hence EVM provides more perceptions about the costs and other elements of scope risk performance etc.[19]

Gedi et al. (2015) concluded from his example that sublevel EVM is more accurate and effective in application of the same project. He added that sometimes project is delayed according to EVM evaluation because non-critical activities are proposed too early, therefore, when they make the completion measurement baseline; it does not influence the project schedule. He also added its limitations that EVM does not involve quality management. Thus, project manager has to ensure about time and quality.[11]

Batselier et al. (2015) confirms that for time forecasting, a relation of increasing forecasting accuracy with growing degree of seriality was discovered but for cost forecasting, no apparent indications of the existence of such a relation could be observed for considered project.[2]

Bhave et al. (2016) case studies have shown that EVA is an effective application in project management. EVA can be used for part-progress payments of contractors based on the earned value of definite outsourced work. Different approaches given for the application of the EVA. Hence it is essential to work on EVA to enhance application of it in current ongoing projects.[3]

Badgular et al. (2016) informed that utilization of earnedvalue technique for project control will result in better assessment of activity time and budget requirements. Productivity can be improved by taking constant feedback from cost and schedule performance. [1]

Picornell et al. (2016) informs that current formulation of EVM does not allow controlling production. For that an additional baseline is needed. For unit price projects variables should be like Planned production, Planned profitability, Actual production, Actual profitability, Actual cost & Production Performance Indicator (PPI). These are the effective tools for the contractor in unit price contract.[17]

3. MAJOR FINDINGS FROM THE LITERATURE REVIEW

Followings are the major findings from these much of literature reviews.

1. EVM is one of the most popular and beneficial monitoring system for any project.
2. Reason behind its popularity is its simplicity, because manipulation of its variables requires some basic operations only.
3. Planned value(PV), Earned Value(EV), Actual Cost(AC), Cost Variance(CV), Schedule Variance(SV), Cost Performance Index(CPI), Schedule performance index(SPI)are the key components of the Earned Value Management.
4. In any case of cost overrun or time overrun, its optimal solution may be varied within full crash solution and smoothen solution. This decision can be made by EVM technique.
5. Work Breakdown Structure is the most critical part of any project. Effective control over project can be achieved by accurate WBS and shorter time interval milestone.
6. Microsoft project is the active and useful program for following up the project performance especially in large construction projects using EVM.
7. EVM is very sensitive to scope change.
8. EVM has certain limitations like very high forecasting variability and doubtful information which may leads to the poor decision making.

4. CONCLUSION

Earn Value management (EVM) is the most popular and beneficial monitoring system for any kind of projects. EVM can be used in construction as well as IT sector also for software development program. EVM has basic variables which show the progress of project. Various case studies show that EVA is an effective application in project management. Different approaches given for the application of the EVA. Hence it is essential to work on EVA to enhance application of it in current ongoing projects.

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