

A Review on Earned Value Management Analysis in Construction Industry

Mr. Pavan D. Ippakayal¹ & Dr. M. B. Kumthekar²

¹Mr. Pavan D. Ippakayal (M. Tech – Construction Management), Civil Engineering Department, Government College of Engineering Karad, Maharashtra, India

²Dr. M. B. Kumthekar Professor and HOD, Civil Engineering Department, Government College of Engineering Karad, Maharashtra, India

Abstract - Project cost is the one of the governing aspects in project success. Construction projects, both private and public, have a long history of escalation in cost and schedule. A large number of studies and research projects have established individual factors that contribute to increased project cost and schedule. Project management is used to increase human and material resource productivity. Earned value management is a technique for assessing project performance that has been adapted for use in project management. The technique helps in comparison of budgeted cost and actual cost of work. This study deals with the review of the project management involving earned value analysis.

EVM is a forecasting technique that provides an early warning of cost and schedule. It not only assesses the project's performance, but also measures the progress of the schedule. It is a useful tool for assessing a project's cost, schedule, and performance. The evolution, basic terminologies, and effective use of earned Value analysis in the construction industry by Microsoft Project software are summarized in this study. There are a variety of ways to incorporate EVA into a construction project. Primavera is a programme that can be used to calculate the EV and its parameters quickly and accurately.

Key Words: Earned Value Management, Project Planning, Scheduling, Project Control, Earned Value Management Analysis...

1. EARNED VALUE MANAGEMENT

1.1 Introduction

The building industry is widely recognized as one of the most ductile industries on the market. The construction process is repeatedly described as a method of problem solving, and the problem is to create a facility for low budget, on short amount of time and far too regularly with minimal amount of information [Winch, 2002]. Change is inherent in the construction work and the industry has in many ways adapted its organizational grouping in order to solve those changes more efficiently than most other industries and corporations. In spite of that the construction industry has had a poor prominence for years for its impotence to cope with the long term negative effects of change as many

projects fail to reconcile their deadlines as well as cost and quality targets. One of the things that should be considered is that it is achievable that the project managers and engineers focus too much effort on the short term problem solving whilst the long term effects on the project duration, cost and quality remain unknown. This is not surprising given that there are no known perfect engineers, just as there are no known perfect project designs.[Smith, Merna & Jobling, 2006].

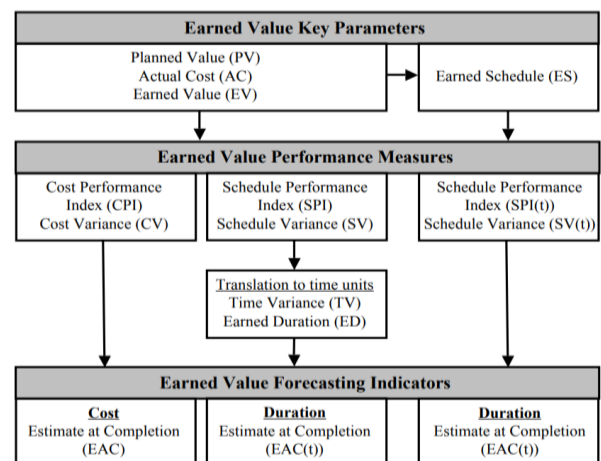


Fig.1 Earned Value key parameters

2 LITERATURE REVIEW

Chang [1] Engineering design projects frequently experience cost and schedule increases. Although some research has looked into the factors that lead to better design performance, the causes of cost and schedule increases have not been formally investigated. This paper uses four case project documents to identify and quantify the reasons for cost and schedule increases from the ground up. These reasons are comprehensive and can be used to investigate the cause-and-effect relationship, assign blame, and improve engineering design project performance.

Czarnigowska [2] Author used Earned Value method as a tool for project control Earned Value could be a well-known project management tool that uses information on cost, schedule and work performance to found the present status

of the project. By means of some simple rates, it allows the manager to extrapolate present trends to predict their likely final effect. The strategy relies on a simplified model of a project, but proved to be useful in practice of cost control. It's being developed to account better for schedule and time conditions. The paper outlines the essential principles of the strategy and its recent extension, the Earned Schedule method, and, with help of some examples, investigates into assumptions that affect their diagnostic and predictive accuracy.

Gupta [3] defines significance of Earned Value Management in the construction sector. How Earned value management can act as early warning tool is explained with the help of case study. The "to-complete" performance indicator for evaluation of final forecasted cost is explained in this literature paper. Drawbacks of traditional methods are explained. Objectives of Earned Value Management are given. This paper also gives the Key Parameters of EVM system. Various relationships between EVM parameters are given. Example is given for clear understanding of parameters. At last Benefits of EVM system and why to use EVM system is explained. Firstly, History of EVM system is mentioned.

Iyer and Jha [4] In this paper author worked on the most two objectives i.e. analyze the relative significance of success and failure attributes in Indian housing industry and to know the latent properties of those success and failure attributes by studying the critical success and failure factors for further suggestions to enhance the performance. For the study, an enormous amount of documented data on completed projects is required. Due to no availability of documented data of completed projects for study in India, a questionnaire survey approach is considered to find out impacts of various attributes on project performance. A questionnaire was then prepared to gauge the impact of the above attributes on the four performance evaluation criteria: schedule; cost; quality; and no-dispute. However, only the "schedule" as project success evaluation criteria is discussed in this paper. Over 40% of Indian construction projects are facing time overrun ranging from 1 to 252 months; the explanations that are being studied by researchers to suggest possible remedial measures. This paper identifies 55 attributes liable for impacting performance of the projects. These attributes were then presented to Indian construction professionals within the sort of a questionnaire. Statistical analysis of responses on the attributes isolated them into distinct sets of success attributes and failure attributes. Factor analysis of sets of success attributes and failure attributes distinctly grouped them into six critical success factors and 7 critical failure factors. In order to know the extent of contribution these factors wear the result of a construction project, a second stage questionnaire survey was also undertaken. The analyses of responses of the second stage questionnaire force us to conclude that two success factors and one failure factor: commitment of project participants; owner's

competence; and conflict among project participants accord significantly in enhancement of current performance level of the project. The extent of their addition has, however, been observed to vary for a given level of project performance. The analyses results are expected to assist project professionals to specialise in a couple of factors and obtain the optimum results instead of giving attention to all or any the factors and not getting the proportionate results.

Khan and Reza, [5] stated that earn value analysis with cost monitoring, schedule monitoring using tool Microsoft project. As the study for apply the earn value management on construction project which was completed in 2018. Also discuss the main parameters involved in the calculation and analysis of Earn value analysis in construction project by using software MS projects. They conclude that earn value management helps to do the particular project within the stipulated time and cost so they are able to complete the project within the time.

Lanke and Venkateswarlu [6] focus on the design, cost and time analysis of precast and RCC building. Design of same building is done by traditional method and precast method and comparison is done for execution cost and duration. It was found that precast building requires less cost than cast in place concrete and duration of construction was much lesser than traditional method. But some condition affects the economy of precast method like distance of site from manufacturing unit, type of building, size and shape building. An advantage of precast method over the traditional method is elaborated.

The work done by More and Patil [7] the difference between the precast and conventional cast in place concrete using parameters like construction speed, quality control, Environmental condition, labour requirement, durability, size and shape, connections, time and cost. It is concluded that precast concrete is economical than cast in place method except in some condition. This study identified that for standard and repeated work precast method is best option. Effectiveness of precast method in terms of time units is explained. Only drawback of precast method is it requires the skilled labour and qualified contractor.

Prakash Rao and Cherian [8] the author of this paper explains all of the parameters of earn value analysis and defines the project's importance. The author of this paper conducted a study on Earn Value Management and used the software MSP to do so. Using MSP, they plan, schedule, and budget the project, and then track it to determine the project's performance. Finally, it predicts the project's complication time, as well as the additional profit or loss the contractor will make from what was originally planned on the whole EVM manager will monitor the project's progress work in terms of cost and time, and it will be much more effective.

Wells et al. [9] for better function of Earned Value Management (EVM) methodology in different types of organizations and projects, a model was developed based on a research effort over a 2- year period. The findings combine: (1) EVM is gaining higher acceptance due to more favorable views related to both diminishing EVM problems and elaborating utilities; and (2) a broader approach considering four-factor groups (i.e. EVM users, EVM methodology, project environment, application process) together can significantly improve the acceptance and performance of EVM in different types of organizations and projects. In this chapter research paper on the different factors responsible for over time and over cost of project and earn value management are reviewed. Also the research paper on software used for project management is reviewed but sufficient work is not carried out on how the EVM is effectively used for different project with the help of software. In next chapter a residential building is taken for case study for EV analysis and planning and scheduling is done with primavera. Reports generated by primavera are used for EV analysis.

3. EV Analysis

- 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): $VC = EV - AC$.

4. CONCLUSION

From the above literature it is concluded that there are wide scope for Earned Value Analysis in construction Industry. The Earned Value analysis widely used as project monitoring tool. This proved very helpful in controlling cost and schedule of the construction project. By using different parameters of EVM we get an early warning of variations in both the project duration and cost.

REFERENCES

- [1] Chang, A. S. "Reasons for cost and schedule increases for engineering design projects." *J. Manage. Eng.*, 18(1), (2002) 29-36.
- [2] Czarnigowska, A., Jaskowski, P., Biruk, S., (2011), "Project Performance Reporting and Prediction: extensions of earned value management", *international journal of business and management studies*,3(1), ISSN: 1309-8047.

- [3] Gupta, R. (2014), "Earned Value Management System" *International Journal of Emerging Engineering Research and Technology*, 2(4), 160- 165.
- [4] Iyer, K.C., and Jha, K.N., "Critical Factors Affecting Schedule Performance: Evidence from Indian Construction Projects.", *Journal of Construction Engineering and Management*, Vol. 132 No. 8, (2006), 871-881.
- [5] Khan, K. M., Reza, M., (2018), "Earn Value Management Design and Construction Project", *International Research Journal of Engineering and Technology (IRJET)*, 2(5), ISSN: 2456-6470.
- [6] Kim, E., Wells, W. G., & Duffey, M. R. "A model for effective implementation of earned value management methodology". *International Journal of Project Management*, 21(5), (2003), 375-382.
- [7] Lanke, A., Venkateswaralu, D. (2016), "Design, cost and time analysis of precast & RCC building" *International Research Journal of Engineering and Technology (IRJET)*, (3)06.
- [8] More, S. A., Patil, A., (2017), "Time, cost, productivity and quality analysis of precast buildings" *International Research Journal of Engineering and Technology (IRJET)* 4(11).
- [9] Prakash, R. B., Cherian, J., (2015), "Earned Value Analysis on an ongoing residential building project in Bangalore, India" *International Research Journal of Engineering and Technology (IRJET)*, 02(03), e-ISSN: 2395-0056.

[10] www.pmi.org

BIOGRAPHIES



Mr. Pavan D. Ippakayal,
PG Scholer (M. Tech – Construction Management), Civil Engineering Department, Government College of Engineering Karad, Maharashtra, India



Dr. Madhav B. Kumthekar,
Professor and HOD, Civil Engineering Department, Government College of Engineering Karad, Maharashtra, India. Ph. D., M. tech, B.E., H.S.C.