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A Simple Method for Cost Estimating and Controlling

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***Abstract*—Based on software project survey from Standish Group's "CHAOS Report", 29% of software projects in large enterprises can be delivered on time and not over budget, 53% of software project was over budget or had some problem with the schedule, and 18% of software project was failed. This means that cost management is very important to prevent the possibility of project's failure. Therefore, in this paper, we provide and recommend some methods and technique to do cost estimation and cost controlling as the crucial part of project cost management. We recommend Activity-Base Costing method for cost estimation and Earned Value Analysis for cost control. As the result of this paper, these two methods can be applied properly to the real project and ease the project manager to estimate and control the cost of the project**

***Index Terms*—Activity-Based Costing, cost controlling, cost estimating, cost management, Earned Value Analysis**

I. INTRODUCTION

One major component of project management is cost management. Since the total cost of a project is not known in advance, it must be estimated. The cost has to be broken down and assigned to work packages and controlled in the course of the project. When variances from the budget are detected, corrective actions must be taken. Cost management has become a critical problem in project management [1].

One of widely respected survey of software projects in industry and government, the Standish Group's "CHAOS Report" estimated only 29% of software projects in large enterprises succeeded (project delivered on time and on budget), 53% were challenged (project over budget or had some problem with the schedule), and 18% were failed (cannot deliver any usable result) [2]. This paper was written to propose a simple method to manage the cost of a project.

Most of the challenged projects in the Standish Group's "CHAOS Report" had an average over budget around 56% [2]. That number is quite large and represents a serious and crucial problem in enterprise's financial.

Effective project cost management of construction enterprises is an important guarantee for profits [3]. Effective cost management has six steps as the process, including [4]:

- Understand how we get the cost and revenue from the business
- Understand and decrease the complexity of the function related to each other.
- Provide the tools to manage costs
- Involve employees in decisions
- Increase the costs and the effectiveness
- Measure the decision of the strategic business plan

The objective of this paper is to provide a simple method as a way to help the project manager to manage the project costs. The process to manage this project cost involves cost estimating and cost control. This paper recommends Activity-Based Costing method for estimating the cost and Earned Value Analysis method for controlling the cost of cost management.

II. LITERATURE REVIEW

Project management is the way how we can achieve specific goals and targets with specified budget and cost using the power of knowledge, tools, skills, and techniques [5]. Project management has seven major components. They are integration management, scope management, time management, cost management, quality management, human resource management, communications management, risk management, and procurement management [6]. In this paper, we will discuss one of the components, namely project cost management.

A. Project Cost Management

Project cost management is a method that uses technology to measure cost and productivity through the full lifecycle of enterprise level projects [6].

According to the Project Management Institute (PMI), cost management can be divided into three stages [7]–[9], as follows:

- Cost Estimating, the stage during which the cost of the resources exploited for the project is forecasted, to estimate the overall cost of the project.
- Cost Budgeting, the process of establishing a budget by summarizing the estimated costs of the work packages, optimizing this budget in relation to the available amount of money and finally defining the baseline.
- Cost Control: once the project has started, the progress of expenditure is monitored, for analyzing the variances from the budget in real time.

B. *Cost Estimating*

The objective of cost estimating is to develop estimates and measurement of costs needed to complete project tasks and activities [10], [11]. Brinke et al. (2007) stated that to be effective, cost management requires information that covers the whole process [12]. To produce an effective estimate, the project manager needs to master techniques in multiple facets of the estimation process [10], as follows:

- Communication
- Being Realistic
- Uncertainty
- Big picture
- Technique in tandem

The innovative approach of cost estimating in project management which in turn are based on Activity-Based Costing (ABC) techniques.

C. *Activity-Based Costing (ABC)*

ABC was created in response to the traditional technique used for calculating the full cost of a product (or project or work contract) and based on the division of indirect cost on a single base or multiple bases [7].

Cost Estimating in Project Management adopts the ABC approach to calculate the full cost of a project, but in this case the technique is used to estimate the costs of a project or a work order, and not of a product [7].

D. *Cost Controlling*

Cost controlling includes the process of managing and controlling factors that change or affect the budget [10]. Cost control deals with the cost performance of a project. Cost control includes the measurement of the project performance and forecasting future project developments, their cost implications [6]. It is important to provide team members with all the information they require to recognize what happened historically, what is happening currently and to accurately forecast the future [10].

E. *Earned Value Analysis (EVA)*

Earned value analysis has been used for more than forty years by Department of Defense [13]. Earned value analysis is a project controlling method as well as a forecasting approach. It can be used to:

1. Measure work accomplished
2. Quantify the impact of known issues
3. Use this data to forecast estimates at completion

The Earned Value (EV) of these completed work packages can be compared to actual costs and planned costs to determine project performance and predict future performance trends [14].

There were some reasons that make earned value analysis is worth to use. First, Earned value analysis combines the analysis of actual cost and schedule performance, so that plan will be complete. Second, earned value analysis is an early warning system that alerts on future issues. Therefore, a project manager will be able to predict the negative kind of risk before that risk happened because. And the last, earned value analysis provides a standardized unit of measure [10].

III. RESEARCH METHODOLOGY

Methodology that used in this project consist of two processes. First, estimate cost using Activity Based Costing (ABC). Second, controlling cost using Earned Value Analysis (EVA).

A. *Cost Estimating using Activity-Based Costing*

There are therefore two stages in Activity-Based Costing techniques [7]. First, assign the cost of resource to the activities (First stage: Resource drivers). And second, the activities are linked to the products or projects (Second stage: Activity drivers)

The resource drivers of this method is the resources for entire duration of the activity, they can be proportion to its duration such as work hours require, but it must be compatible when allocation. When estimating the human resources, it's better to include cost of calling or exploiting. The activity driver of this method is duration of activity in project (use Work Breakdown Structure). Activity-Based Costing architecture is shown in Figure 1 [7].

B. *Cost Estimating using Earned Value Analysis*

The method that this paper used to controlling the cost in cost management process is Earned Value Analysis (EVA) concept. To use EVA, ensure that few fundamental project management activities must happen with every project [6].

There are, ensure that we had divide the project into package or manageable parts of authorized work. One kind of technique that can be use is establishing the Work Breakdown Structure (WBS).

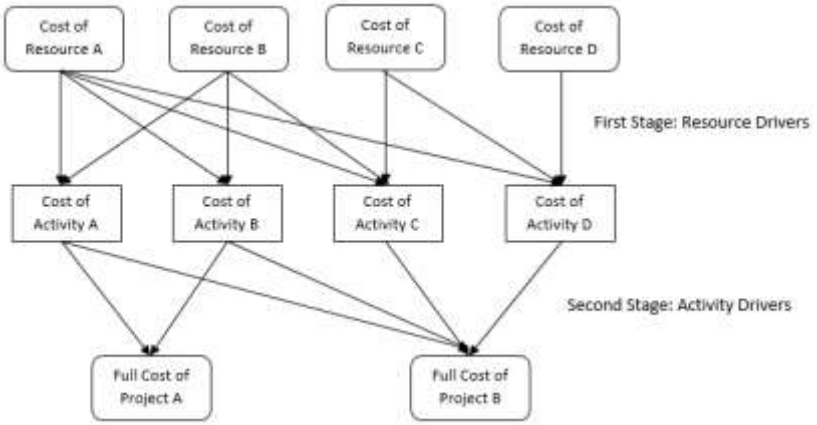

Figure 1. Activity-Based Costing Architecture

Then, ensure that all the packages are defined in order, so each activity can be allocated with duration of time and cost completely. And the last, make sure that we have set cost and effort to all parts across the entire project.

After we make sure that the project management activities work properly with that role, the process steps can be executing [10], as follows:

- Update the declination based on the current progress.
- Update the actual costs related to the current progress.
- Calculate and graph key values, variance, and ratios.
- Anatomize the results and improve the actions.

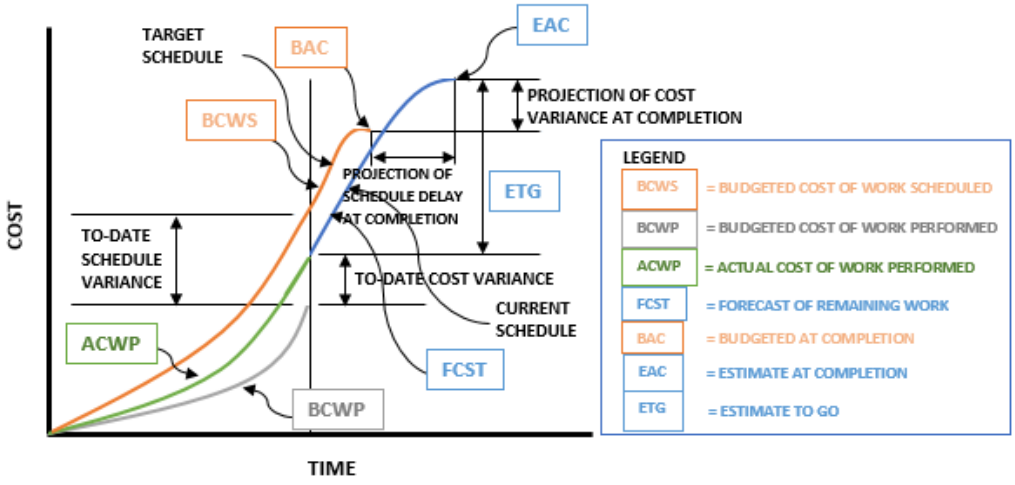

Figure 2. Earned Value Analysis Example

A graphical representation of key value, variance, and ratios is shown in Figure 2 [10]. The formula is:

- Budgeted Cost of Work Scheduled (BCWS)

$$BCWS = baseline\ cost \quad (1)$$

- Budgeted Cost of Work Performed (BCWP)

$$BCWP = work\ completed(\%) \times budgeted\ cost \quad (2)$$

- Actual Cost of Work Performed (ACWP).

$$ACWP = actual\ cost \quad (3)$$

- Schedule Variance (SV).

$$SV = BCWP - BCWS \quad (4)$$

- Cost Variance (CV).

$$CV = BCWP - ACWP \quad (5)$$

IV. RESULTS AND ANALYSIS

The evaluation of the methods that this paper provide has been is shown in Figure 3 and Figure 4. We see that for estimate the cost, we use Activity-Based Costing that separate the cost of resource and activity. This method will ease the project manager to maintain cost.

Task Name	TBC	1	2	3	4	5	6
Resource A	12500000	5000000	7500000				
Resource B	10000000		4000000	6000000			
Activity A	7500000			3500000	4000000		
Activity B	14000000			2000000	3000000	4000000	5000000
Activity C	6000000					2000000	4000000
Total Budgeted Cost	50000000	5000000	11500000	11500000	7000000	6000000	9000000
Budgeted Cost of Work Scheduled (BCWS)		5000000	16500000	28000000	35000000	41000000	50000000
Actual Cost of Work Performance (ACWP)		4920000	15570000	26010000	28210000		
Budgeted Cost of Work Performance (BCWP)		3750000	11875000	17375000	39750000		

Figure 3. Cost Estimating

According to Figure 3 and Figure 4 we can see that the earned value before the activity and after the process has finished. We can predict the possibility of over budget there in 4th month by looking at the current progress of work and the remaining budget.

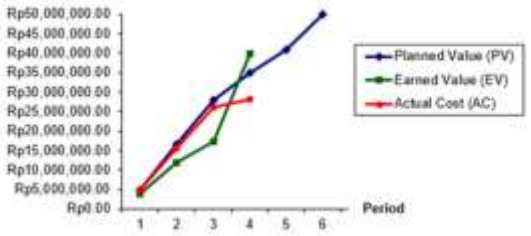

Figure 4. Earned Value Analysis Graph

Therefore, by looking at that possibility, a project manager can allocate other remaining budget to be allocated to the other progress or activity that has a possibility to over budget. So, this graph will help project manager to avoid the over budget of the project.

V. CONCLUSION

The conclusion of this paper is that Activity-Based Costing and Earned Value Analysis can be applied to real project. And these two recommended methods can be useful for project manager and ease the project manager to do cost management.

Even though these two methods can be used to manage the cost of the project, the cost management still not complete. Therefore, in the future work, we will provide method for cost budgeting as the part of cost management process. So, the cost management as the part of project management will be more effective and efficient because all process of cost management already covered.

REFERENCES

[1] Y. Linlin and W. Chao, "The Whole Process Cost Management of Construction Project Based on Business Process Reengineering," pp. 412–415, 2010.

[2] J. Johnson, My Life is Failure: 100 Things You Should Know to be a Successful Project Leader. West Yarmouth, MA: Standish Group International, 2006.

[3] B. Xu, "Research on target cost management of construction project with VBQ based on EVM," 2009 Int. Conf. Inf. Manag. Innov. Manag. Ind. Eng. ICIII 2009, vol. 3, pp. 427–430, 2009.

[4] A. A. A. Azis, A. H. Memon, I. A. Rahman, Q. B. A. I. Latif, and S. Nagapan, "Cost management of large construction projects in South Malaysia," ISBEIA 2012 - IEEE Symp. Business, Eng. Ind. Appl., pp. 625–629, 2012.

[5] G. Gautier, G. Kapogiannis, C. Piddington, T. Fernando, and Y. Polychronakis, "Pro-active project management," Proc. - 2009 Int. Conf. Interoperability Enterp. Softw. Appl. IESA 2009, pp. 320–326, 2009.

[6] [6] K. E. Kurbel, Software Project Management. Verlag Berlin Heidelberg: Springer.com, 2008.

[7] S. Tonchia, "Project Cost Management," in Industrial Project Management: Planning, Design, and Construction, Springer.com, 2008, pp. 121–136.

[8] S. P. Masticola, "A simple estimate of the cost of software project failures and the breakeven effectiveness of project risk management," First Int. Work. Econ. Softw. Comput. ESC'07, pp. 4–7, 2007.

[9] M. Jorgensen and K. Molokken, "A preliminary checklist for software cost management," … Software, 2003. Proceedings. Third …, pp. 134–140, 2003.

[10] J. Owens, S. Burke, M. Krynovich, and D. Mance, "Project Cost Control Tools & Techniques," 2007.

[11] Y. F. Li, M. Xie, and T. N. Goh, "A study of analogy based sampling for interval based cost estimation for software project management," Proc. 4th IEEE Int. Conf. Manag. Innov. Technol. ICMIT, pp. 281–286, 2008.

[12] E. Ten Brinke, E. Lutters, T. Streppel, and H. Kals, "Cost estimation architecture for integrated cost control based on information management," vol. 17, no. 6, pp. 534–545, 2007.

[13] H. B. Hayes and J. Miller, "Using earned-value analysis for better project management," vol. 15, no. 3, pp. 58–61, 2002.

[14] C. Ebert and R. Dumke, Software Measurement: Establish - Extract - Evaluate - Execute. Springer.com, 2007.