

EARNED VALUE MANAGEMENT AS THE BASIS PROJECT PERFORMANCE MONITORING

Ipak Nm. Bukit^{1*}, Ellida N. Lidya², Lely Masthura²

¹ *Engineering Project Management, University of Samudra, Indonesia*

² *Faculty of Engineering, University of Samudra, Indonesia*

ABSTRACT

This paper aims to know whether the Earned Value Management (EVM) is recognized and used in the local government's project control team in their projects performance monitoring. EVM has been applied as a great measure to predict the success of project in so many countries in every level of their projects. It shows that many projects in the area are changed in contract during the project implementation, few of them have failed fulfilling the project objectives and the enterprises are black listed because they cannot deliver their project well. However, a project monitoring can be a tool to avoid failure. The approach will be applied by evaluating the government projects performance in Public Work Unit (PWU), Kota Langsa, Aceh whether it fulfills the owner satisfaction perceived from budget accuracy and/or schedule accuracy or not. This research uses descriptive research about people perception of project performance control. Firstly, this research studies how effective the monitoring project is in the government project in the area by checking whether projects run as planned or there are any contract changes during the implementation phase. Data collected is secondary data from PWU Kota Langsa such as the summary of projects and their project completion status in the last three years (2013, 2014 and 2015). Secondly, we collect people perception by distributing questionnaire. The questionnaire includes the statements that represent the importance of project performance monitoring using EVM. Respondents are 20 people who work in the project monitoring and they are chosen by purposive sampling technique. The result shows that the project performance control is still formally done using the traditional way. Actually, it can be more effective if the project performance is controlled by using EVM. Furthermore, our result suggests introducing the concept to the project control team of PWU Kota Langsa, Aceh.

Keywords: Earned Value; Management; Monitoring; Performance; Project.

1. INTRODUCTION

Project is a temporary endeavor undertaken to provide a unique product, service or result (PMI, 2004). In order to obtain its objective, a project must be managed with a management system that ensures the project performance will support its progress well. The reason is because a project contains many activities that include many constraints, such as resources, time, scopes and an exact quality as a goal.

Project management helps people who work in construction industry to use their skills, tools and techniques to meet the projects requirements. In project management, project works will go through a process that consists initiating, planning, organizing, staffing, directing, and controlling. And the whole process will succeed if the active person acts

* Corresponding author's email: ipbukit@gmail.com

as a professional who is supported with right knowledge, skills, tools and technique as well (PMI, 2004).

From all steps of the process, after all the planning, organizing, and executing; controlling project is the hardest management process to accomplish. Controlling will determine the project accomplishment whether it satisfies in budget accuracy and/or schedule exactness. Controlling a project means to optimize the project management process and it plays an important role through the construction phase. People who work regularly in this phase know exactly if the project is less controlled, then it leads to failure. Failure is affirmed from the project budget or schedule whether it meets project requirement or not. Failure is the biggest risk that should be avoided by the constructor because it is related to the enterprise's credibility. There are a large number of failure objective projects in the real world (Ye, Yu and Zhang, 2012). Earned Value technique is a project management approach to manage a project performance in an objective manner (Naeni, Shadrokh and Salehipour; 2011). It uses an unprejudiced evaluation to measure the project performance; as realistic as it is. Earned Value Management (EVM) is a concept established to predict the project completion time and budget in the early days of the construction phase. EVM is an integrated and powerful method to measure the value of project performance in time and on budget (De Marco and Narbaev, 2013). Therefore, the project manager can make a right decision, according to the EVM diagram of the possibility of schedule breach and/or budget problems, at the early stage of the project.

EVM is applied during the control phase of project management process. It is obtained to answer two important questions: 1) is the project behind the schedule? 2) is the project's cost over budget? When these questions answered, the project manager can predict whether his project has a good performance or he/she should make a decision to make corrective actions. That is why government forms a monitoring team to ensure that every government project concludes their works in control and avoid more loss. Government, enterprises and practitioners usually have a group of people who are encouraged to control a project performs well. This research aims to understand whether the government project in Kota Langsa is using a project controlling method such EVM for their project performance monitoring.

The local government acquires procurement of goods and services every year in order to fulfill its people needs of infrastructures by using national or local investment. The procurement process is held by people who are qualified in the field as stated in Indonesia Presidential Decree No. 54 about Indonesian Government of goods and services procurement (Presidential Decree, 2010).

The decree also rules that the one who is responsible, i.e. the project manager (Bhs: *Pejabat Pembuat Komitmen PPK*), must ensure the project is controllable and managed as planned in the contract. This functional duty applied during implementation and controlling phases of project management process. In doing so, the *PPK* can form a supporting team to help him/her monitor the project in order to run as agreed in the contract (Presidential Decree, 2010). Such team can help the *PPK* in making a realistic report, thus describe the project as real as it is in the field. The same team can also warn the contractor if they find any possibilities of errors, therefore the involved enterprise can take a preventive action to avoid failure.

The project monitoring team works under *PPK*, and *PPK* reports the controlling process including the budget absorption and/or problems detected to the owner (Bhs: *Kuasa Pengguna Anggaran, KPA*) (Presidential Decree, 2010). Hence, the *PPK* needs a good

technique to measure the value of the project performance; therefore he/she is sure that he/she has made the right appraisal. Incorrect decision for monitoring the project works will affect the project performance as a whole. Generally, a project will include complex works and all the works are related one another. If one work is behind schedule, it will give impact to others. As well as over budget, it will raise another work's cost or increase indirect costs. Behind schedule and over budget is the risk that should be avoided by contractors because it leads to loss. Unfortunately, not all project implementers have the ability to control their project well especially in local area such as Kota Langsa. Local enterprises are usually lack of managerial skill and sometimes do not have a proper financial department. Therefore the project monitoring team of the government should be active in informing people if there is a problem designated in the progress of their project that will jeopardize the project performance.

2. METHODOLOGY/EXPERIMENTAL

In order to understand the status of project control team at PWU Kota Langsa, a set of questionnaire has been distributed. With limited population of people who are listed in project control team, hence the numbers of sample is determined using judgment sampling. This sampling method chooses numbers of sample by identifying their expertise or specialization in the field we need to study. Before it is analyzed, its reliability is tested with Cronbach Alpha coefficient (Sinulingga, 2014). Afterward, the data is analyzed to know whether the EVM is used in the field as the basis of project performance monitoring.

2.1 Size of datasets

This study is held in Public Work Unit Kota Langsa, Aceh Province. This is an area that is not too immense thus the research can be done in narrow time. From 1,045 projects in the last three years in this unit, 6.3% changed the contract because of schedule breach, and 0.1% enterprises are blacklisted. The figure is shown on the diagram below.

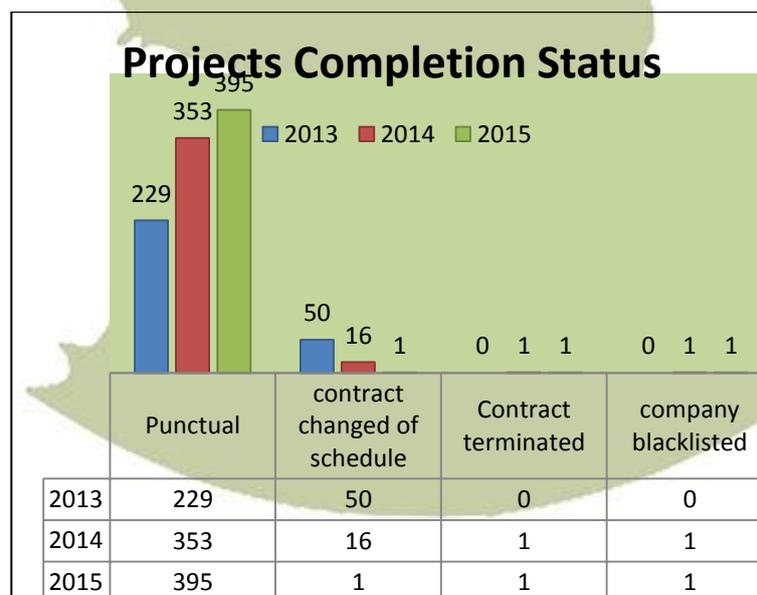


Figure 1 Secondary data: Number of Projects Completion in last 3 years

The contract amendments occur very small in numbers, but still become consideration that project can potentially fail caused by the schedule or costs factors. We are talking about zero errors, and controlling the project is the answer. Project control determines the project succeed, whether it runs as plan or not. And only people whose credential in controlling project that deserves to be involved.

In PWU Kota Langsa, the project control team is formed by PPK/PPTK every fiscal year. The team consists of 10 to 20 people. Therefore, the questionnaires are distributed to 20 people in PWU office. The questionnaire consists of 15 statements that are related with the project control method, rules, and definition, and each statement scores from 1 to 5 (1 is for very disagree to 5 is for very agree). Furthermore, analysis is based on each statement.

2.2 The Role of EVM

The main objective of cost control is to measure the actual project performance and compare it to the plan. The main goal is to predict project cost at completion and project completion time, thus project manager can take an immediate action to avoid failure. EVM was established as project control specification that was defined by Department of Defense (DoD) USA in 1960s (De Marco and Narbaev, 2013; Kwak and Anbari, 2012). It was intended to control project deviation through cost and schedule. Then it developed during 1980s and became a project management tools that can be used by industries as well. Today, it is included as the Project Management Institute professional standards and got across other countries and industries.

Jacob and Kane argued that performance measures of EVM are true indicators for project performance as long as they are used on the activity levels (Elshaer, 2012). EV means to guide the actual work and should be required during project implementation (Zhong and Wang, 2011). It ensures the project actual work on track as designated plan. The method calculates budgeted cost for work performed (BCWP or EV), actual cost for work performed (ACWP or AC) and budgeted cost for work schedule (BCWS or also called Plan Value; PV). These three parameters will obtain schedule variance (SV) and cost variance (CV) that can measure project performance budget and schedule.

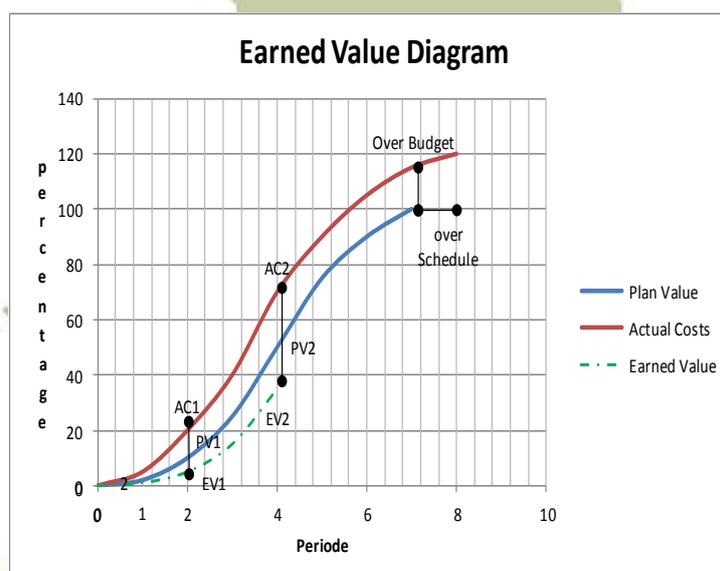


Figure 2 Earned Value Diagram

Earned Value (EV or BCWP) is calculated by multiplying the percentage complete (PC) and budget at completion (BAC). BAC is obtained in contract, while PC is the actual progress achieved in term of percentage.

$$EV = PC \times BAC \quad (1)$$

Actual Cost (AC) or ACWP is the total amount of direct and indirect costs incurred on accomplishing works on an activity during a period of time. EVM can predict estimate at completion (EAC) using this formula below:

$$EAC = (AC/EV) \times BAC \quad (2)$$

If EAC shows a number that exceeded the budget at completion (BAC), then the project manager must be alerted for potential time and cost overrun, and take an immediate action to avoid loss.

Four evaluation indexes for EV are Schedule Varians (SV), Cost Varians (CV), Cost perform Index (CPI) and Schedule Perform Index (SPI). SV is the difference between earned value and plan value (BCWP and BCWS, respectively).

$$SV = BCWP - BCWS \quad (3)$$

$SV < 0$ means that the project is ahead of schedule which is good; $SV > 0$ means that the project is behind schedule (bad); and if $SV = 0$ means the project is just on track (as plan, good).

CV is the difference between BCWP and ACWP.

$$CV = BCWP - ACWP \quad (4)$$

$CV < 0$ means that the project is over budget which is bad; $CV > 0$ means that the project cost is less than plan, under expenditure or higher efficiency (good); and if $CV = 0$ means the actual cost just as plan (which is good) (Zong and Wang, 2011).

SPI is described as the ratio between BCWP and BCWS and calculated by the formula below:

$$SPI = BCWP/BCWS \quad (5)$$

If $SPI < 1$ means the project is delayed of schedule, which is bad; $SPI > 1$ means that the project is ahead of schedule which is good; if $SPI = 1$ means the project is right on plan/good (Zong and Wang, 2011).

Furthermore, Seiler (1985) formulizes that SPI can be calculated at least with three different approaches, involving percent complete, critical path length, float, project length and time delays.

CPI is defined as the ratio between BCWP and ACWP, and the formula to calculate this index is as follow:

$$CPI = BCWP/ACWP \quad (6)$$

If $CPI < 1$ means that the project cost is higher than plan (bad); $CPI > 1$ means that the cost to complete the work is less than plan (good); but if $CPI = 1$ means the cost can be less but could be higher (sometimes good and sometimes bad) (Zong and Wang, 2011). This also can be explained that the cost performance index is equal with ratio between per cent complete and per cent spent (Seiler, 1985). We can illustrate the meaning of CPI state as follows: if per cent complete is 50% and per cent spent 40%, then CPI would be $50/40=1.25$ (Seiler, 1985) or we can say for IDR1000, there is IDR1250 worth of work concluded. It indicates the overrun to date, which shows a good project performance. It will be much easier to understand the formula by looking at the illustration below (Naderpour and Mofid, 2011).

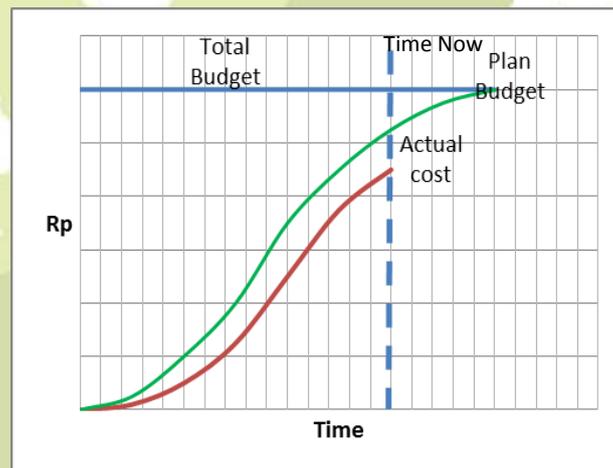


Figure 3 Traditional time and cost schedule

The diagram above shows a good position of project costs. It looks that the actual cost is below the plan costs. However, unless you can see the completed work it is hard to say whether it is a good news or not. EVM can provide what you need as figure below (Naderpour and Mofid, 2011).

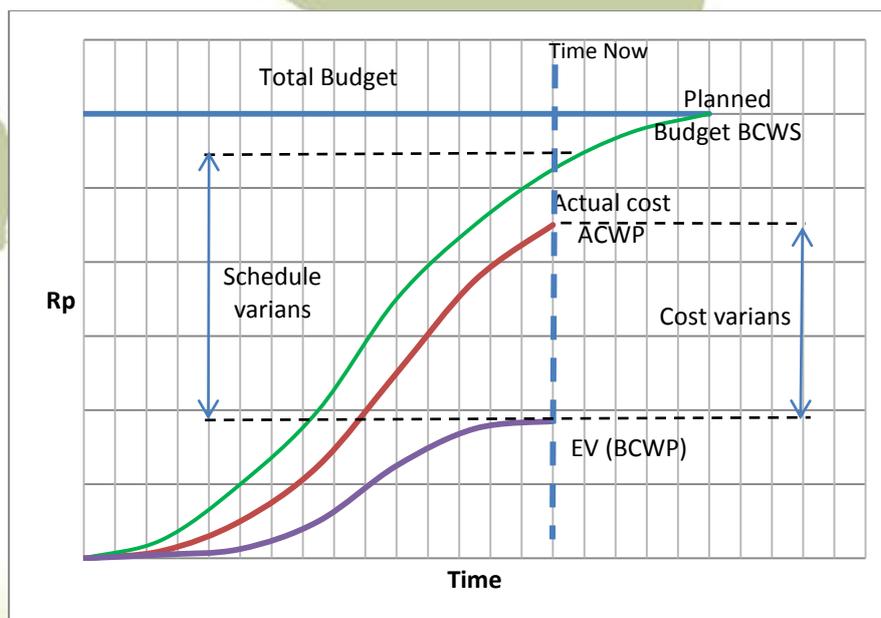


Figure 4 Earned value time and costs schedule

The third curve describes project progress by considering both time and cost factors simultaneously. This is called earned value curve (BCWP). Project manager will be able to judge the project progress confidently, and sure if the actual cost is less than plan cost and the physical progress is according to the plan schedule or not. That is because the earned value curve provides both cost and time schedule simultaneously (Naderpour and Mofid, 2011).

The BCWP curve in the example above looks like containing only one activity, that makes it look simple and easy, actually it has to include all activities schedule to be described in 'Time Now'. The administrator or people in charge must be thoroughly aware to the complexity of his/her project well. Thus the comprehensive understanding of the method is recommended.

3. RESULTS

According to the questionnaire, PWU Kota Langsa project control team seems equal in professional credibility. There are not many discrepancies in the way they answer the questions. Coefficient reliability obtained $r_{ii} = 0.580 > r_{table} = 0.444$ for 5% significance level or $r_{table} = 0.561$ for 1% significance level. That means the instrument is reliable to be used as the sample data analysis. It defines the questionnaire statements are reliable. The average score they made is presented in the graph below.

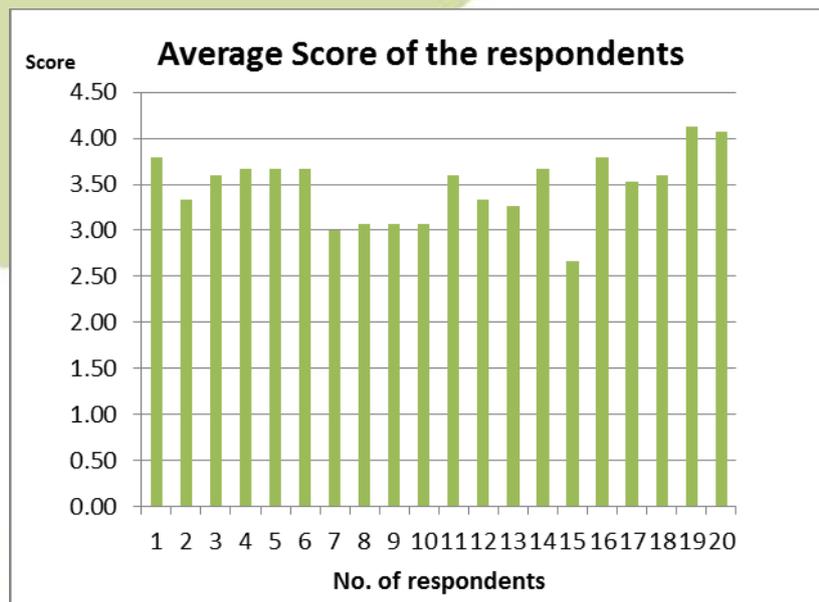


Figure 5 Average Score of respondents

From 15 statements, we divided it into three groups of implications that occur in projects control that are conducted by the PWU Kota Langsa. Those implications are:

- I. The project control team is an integrated part of a project, thus it must be established as the owner's agent to ensure the project success.
- II. The people in the team must be good in the field, who have managerial ability, and must have good understanding in using project control method such as Earned Value Management.
- III. The project control team help the project implementer to avoid failure.

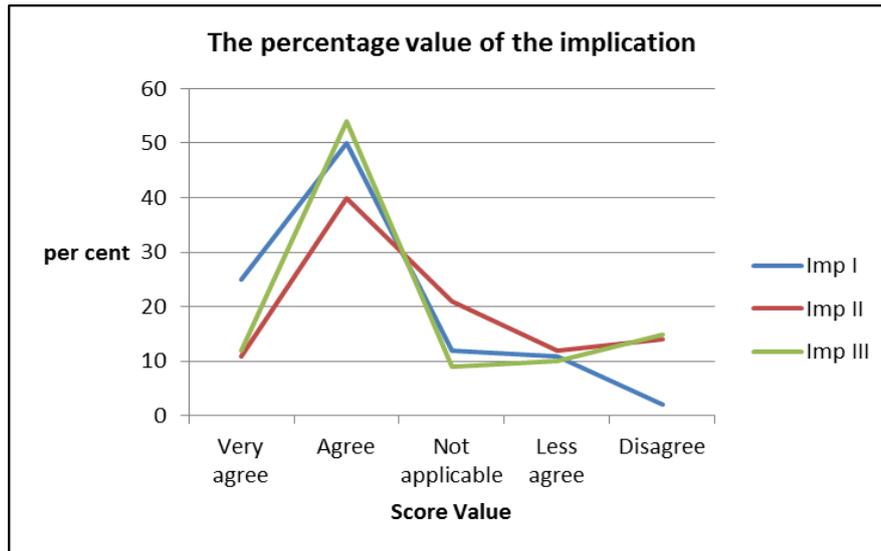


Figure 6 The tendency of the implication value

4. DISCUSSION

The result indicates that people mostly agree for implication I and III. More than 50% in average stated that the team can help the contractor to avoid failure, hence the team is required to control and ensure the project performance run as plan. Both implications question about the importance of the project control team in PWU Kota Langsa.

Meanwhile, respondents state that implication II is also important (about 40% in average agree), however the project control method is not applicable in the area. Respondents do not recognize EVM and never use it in a project performance control, instead they use traditional way of equation to measure the progress elaboration. The weakness of traditional way, one of which is, can not predict the project completion time as EVM which can help us to.

We suggest for the government project team to study EVM, use it in their job and therefore it can measure the progress of projects in order to understand the project status. In order to do that, the team should actually understand the project's circumstances such as the relation between progress completed and budget performance, the complex works, the resources consequences, the time limit, budget efficiency e.t.c. Moreover, EVM is not a single curve for a single work. There are many activities to explain in one curve, thus the team should understand the method meticulously.

5. CONCLUSION

In conclusion, EVM is unfamiliar to the PWU project control team Kota Langsa, and they do not use other project controlling method in their work either. Therefore, PWU Kota Langsa needs to be introduced to EVM and learn more about the project control and performance monitoring tools. Hence, if there is an indication of fail, the project manager can take immediate corrective actions to prevent the project failure. Because a project is a complex work that includes many activities, therefore we cannot see it as a doing simple project control work. Eventually, people in charge should understand the project control tool/method thoroughly, whether they are from government or enterprises. Consequently, we recommend that EVM should be applied with appropriate training at large.

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