PROJECT MANAGEMENT INFORMATION SYSTEM AT PT HEGAR DAYA

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ABSTRACT

PT Hegar daya is one of the private consulting firms in Bandung which is engaged in non construction consultancy services. In 2016 PT Hegar Daya got a chance to work on the project poverty alleviation management information system. In project work PT Hegar Daya had a Delay, The delay occurred due to various factors which is, the complexity of the system, error in controlling the cost and time of ongoing project and difficulty in estimating the time and cost of the project that has to be done. Based on that exist problems it is necessary to takes an analysis and development system with the application of methods that could improve the effectiveness in planning and controlling the implementation of the project.

Of the existing problems, then it is necessary to have Project Management Information System, to simplify the management process in PT Hegar Daya in planning and controlling project with perform planning analysis estimated project time and cost using Function Point. Function Point is use to calculation of complexity level estimation. And for controlling time and cost using Earned Value Management. Earned Value Management Method is use because it can integrate time and cost so it will reveal performance of activities that have been done.

From the result of research and testing it can be deduced that system can make estimated time planning and project cost, and system can be helping in controlling time and cost of ongoing project.

Keywords: *project management, function point, earned value management, PT Hegar Daya.*

1. INTRODUCTION

1.1 *Background*

Along with improvement of technology this days, now information technology is become one of necessary thing. One of the use of information technology by the development of software to help a business company processes to become more effective and efficient.

The project can ben defined as non-routine and non-repetitive activities, done within a certain period of time to obtain some results that are technically desirable [1].

Based on interview with Mr. Undang Shaleh as a technical director in PT. Hegar Daya said that to determine time estimation and software development cost, technical director usually make estimates by comparing the large size and complexity of software to be built with similar projects that have been done before. If the technical director is experienced enough, in the sense that it has been relatively often handled similar projects, then to determine the estimate is relatively not to be difficult. But if the technical director have not experienced to do relatively project then he will have a problem to determine time and project cost which will be done so that the budget plan for project cost is sometimes too low and the profit of the company decreases.

In time that PT. Hegar Daya had a chance to handle a poverty alleviation management information system which is started at October, 12 2016 where on the contract agreement the project should be completed on December 10, 2016 was delayed until December 14, 2016. It is happened because many thing which is, the complexity of the system that makes project team difficulty in doing it, mistakes in estimating project cost and time. The longer the delay, the greater the costs to be incurred by the company. So of course delayed project give a disadvantage to company and project owner, because a long it takes to finish a project then the cost the costs to be incurred the company will be greater, both for the cost of the company's expenses, employee salaries also loss of time for the next project.

Based on that problems that has been explained to handle that problems it needs an analysis with some method implementation that can increase effectiveness in monitoring and controlling the implementation of integrated projects, that the parameters can be controlled really efficient and can show the exact condition of a project, and also can perform precise and accurate calculations at the time of estimating at the cost and time of implementation of software projects, so that will be decrease the possibility of the occurrence of project irregularities.

Many method that can be use to calculate scope of software which is Function Point Method, Metric Size-Oriented Method and Metric Function Oriented Method. Technic controlling cast and time which is

Earned Value Management Method, value Engineering and Quantity take-off. This is some method which can fulfill the purposes which is Function Point Method and Earned Value Management (EVM). Function Point Method is one software measurement approach to measure system size based on system requirements. EVM is a method that facilitates the cost control and time of the project. From the exposures that is described earlier, this time the study is titled "Project Management Infromation System at PT. Hegar Daya"

1.2 *Purpose and Objectives*

Based on the description of the problem, the purpose of this Research is to Build Project Management Information System at PT. Hegar Daya.

The objectives to be achieved from the development of project management information system which is :

1. *Assist the technical director in doing calculation of complexity level project estimation of software so it can be so it can estimate the time and cost of the project to be done.*
2. *Assist the Technical Director to knowing the cost and time of the project that being worked on and controlling time and cost of the project to conform to the previous plan.*

1.3 *Project Management*

Project management is application of science, skills and skills, best technical means and limited resources, to achieve predetermined goals and objectives in order to achieve optimal results in terms of cost, quality and time, and safety performance [4]. Project management is the science and art of leading and coordinating limited resources to achieve effective and efficient goals by using modern management techniques to achieve predetermined objectives of scope, quality, timeliness and cost, as well as meeting the needs of stakeholders.

1.4 *Function Point Method*

Function Point is one software measurement approach to measure system size based on system requirements. Function Point analysis (FPA) is an indirect measure of the functional size of a system [4].

Function Point Analysis was first developed by Allan J. Albrecht in the mid-1970s with the goal of trying to resolve difficulties associated with the Line of Code (LOC), and assisting in the development of a mechanism to forecast the burden associated with software development. The first Function Point was published in 1979, then in 1983. In 1984, Albrecht refined this method and since 1986, when the International Function Point User Group (IFPUG) was formed, several versions of the Function Point Counting Practices Manual were published by IFPUG. (Albrecht, 1983). In Function Points method, the size of a system can be calculated with 3 components, namely information processing size (Crude Function Points-UFP), Relative complexity adjustment factors and Function Points.

1. *Crude Function Points (CFP)*

The Crude Function Point inside a software is identified and categorized into one of five types of user functions: External Input (EI), External Outputs (EO), Internal Logical Files (ILF), External Interface Files (EIF) and External Inquiry (EQ), then assessed its complexity and given a number of Function Points value.

2. *Relative complexity adjustment factors(RCAF)*

After accumulating CFP then calculate RCAF accumulation. RCAF is calculated based on the overall complexity of the system using 14 General System Characteristics (GCS), where the value of each GCS is 0 (zero) to 5 (five). Scale 0 (zero) shows no effect and a 5 (five) scale indicates a broad influence on all project. The scoring of each GSC is subjected to subjective, hence to determine the giving of the weights in this process requires people who have experienced or have handled applications with similar system specifications. Table 1 shows 14 General System Characteristics to be assessed. Assessment Complexity has a scale of 0 s / d 5 namely:
Information :
0 = No effect, 1 = Incidental, 2 = Moderate 3 = Average, 4 = Significant, 5 = Essential.

Tabel 1. 14 General system characteristic

General System Characteristic	*weight*
Level complexity of data communication	*[0/1/2/3/4/5]*
Level complexity of processing data	*[0/1/2/3/4/5]*
Level complexity of performance	*[0/1/2/3/4/5]*
Level complexity of configuration	*[0/1/2/3/4/5]*
Level complexity of software using	*[0/1/2/3/4/5]*
Level complexity of input data frequency	*[0/1/2/3/4/5]*
Level complexity of easily using for user	*[0/1/2/3/4/5]*
Level complexity of data update	*[0/1/2/3/4/5]*
Level complexity of data processing	*[0/1/2/3/4/5]*
Level complexity of reusable code	*[0/1/2/3/4/5]*
Level complexity in installation	*[0/1/2/3/4/5]*
Level complexity of software operational (backup/recovery, etc)	*[0/1/2/3/4/5]*
Level complexity of software that can be use in multi company	*[0/1/2/3/4/5]*
Level complexity of flexibilities to follow change.	*[0/1/2/3/4/5]*
Total RCAF	*?*

3. *Function Point (FP)*

Function Point is the process of doing calculations to get the Function point value of the

software to be built. FP obtained from CFP and RCAF multiplication by the formula:

$$FP = CFP*(0.65+(0.01*RCAF) \quad (1)$$

The numbers 0.65 and 0.01 are the constant value that created by the International Function Point User Group (IFPUG).

1.5 *Earned Value Management Method*

The EVM method is a more progressive project performance control method. This method can provide information about the progress of the project in a certain period of time and can estimate the progress of the project in the next period either in terms of cost and project completion time [4].
This method uses the S curve as the information display with the X axis indicating the project duration and the Y axis to express the cumulative cost. Where the advantages of this method are as follows [4]:

1. *Display information of earned value method is more progressive than conventional S curve.*
2. *This method can predict cost and time losses based on slowly progressing work, so that additional project duration and final cost can be calculated by systematic approach.*
3. *Information from Predictions The final settlement cost and the prediction of the final settlement period can be used to initiate corrective action in accelerating the progress of the project by the exchange of costs and time or with the addition of labor or overtime and rescheduling of resources such as labor, equipment, and materials.*

The terms used in the EVM method are as follows :

1. *Planned Value(PV)*

PV or formerly known as the budgeted Cost for Work Scheduled (BCWS) is the budgeted cost for the work scheduled in a given period and set in the budget. Obtained by multiplying the percentage of plan progress with total project budget (BAC) [6].

$$PV = (\%\ progress\ plan)\ x\ BAC \quad (2)$$

2. *Earned Value(EV)*

EV or Budgeted Cost of Word Performed (BCWP) is the budgeted cost for completed work. Obtained by multiplying the percentage of progress that has been implemented with the total project budget (BAC) [6].

$$EV = (\%actual\ progress)\ x\ BAC \quad (3)$$

3. *Cost Variance(CV)*

CV is the difference between the value obtained after completing the work packages with the actual costs incurred during the project implementation.

$$CV = EV - AC \quad (4)$$

4. *Schedule Variance(SV)*

SV is used to calculate the deviation between EV and PV

$$SV = EV - PV \quad (5)$$

5. *Cost Performance Index (CPI)*

Is a cost-efficiency factor that has been issued can be shown by comparing the value of work that has been physically resolved (EV) with the costs incurred in the same period (AC) [6].

$$CPI = EV / AC \quad (6)$$

6. *Scedule Performance Index (SPI)*

It is a performance efficiency factor in completing the work shown by comparison between the value of the physically completed work (EV) with the expenditure plan incurred based on the work plan (PV) [6].

$$CPI = EV / PV \quad (7)$$

7. *Predicted final settlement cost (EAC)*

Predicting final project completion costs can be calculated by comparison between Total budget (BAC) and CPI.

$$EAC = BAC/CP \quad (8)$$

8. *Predicted end-time (ETC)*

Predicted end time can be calculated by comparison between project duration (OD) and SPI

$$ETC = OD/SPI \quad (9)$$

2. *RESEARCH CONTENT*

2.1 *Problem Analysis*

Based on the results of research conducted, got the problem as follows:

1. *Complex system built so as to cause technical director difficulties in estimating the cost and time of the software project.*
2. *The occurrence of errors in controlling the cost and time of the project being worked on so that the delay of the project would provide losses for the company*

2.2 *Function Point Method Analysis*

Function point is a method that can be used to estimate software complexity. providing project volume estimates in the form of the required development resources before the project goes a long way. This estimate provides an important basis for providing estimates of the resources required by software companies to prepare tender proposals and project plans. The use of this method may also prevent or at least substantially reduce the risk of managerial errors due to underestimate of project cost planning.

The steps in determining the Function Point is to analyze the application to be created and then

perform the calculation. Briefly it will be explained as follows :

1. *Calculating Crude Function Points (CFP). The number of functional components of the system is first identified and followed by evaluating the weighted quantity of complexity of each component. The weighting then sums and becomes the CFP number.*
2. *Calculating the complexity factor of complexity adjustment factor (RCAF) factor for the project.*
3. *Calculate the Function Point with the equation.*

2.2.1 Calculating Crude Function Point (CFP)

CFP calculations are used to measure information processes. There are several components involved in this measurement. Components of this component have categories of "simple", "medium" or "complex" depending on the characteristics of its complexity. CFP calculations involve five components in the analysis of software systems such as:

1. *Number of input applications*
2. *Number of applications of output*
3. *Number of online query applications / inquiries - applications related to queries against stored data*
4. *The number of file types / logic tables involved*
5. *The number of external output interfaces or inputs that can be related to the computer through data communications, CDs, disks and others.*

The first step in performing CFP calculations is to identify the components in the software design and then grouped into "simple", "medium" and "complex" based on its complexity. The number of each grouped component can be entered into the CFP table. Assessment of the weight of complexity is done by discussing with the company namely Mr. Ir. Nugroho Kristianto, MT as the team leader in the project work of Poverty Reduction Management Information System Tasikmalaya City in PT. Hegar Daya.

From the results of weighting obtained the total value of CFP is equal to 844 points.

2.2.2 Calculating Relative Complexity Adjusment Factor (RCAF)

Relative Complexity Adjustment Factor (RCAF) is calculated based on the overall complexity of the system. Relative Complexity Adjustment Factor (RCAF) is calculated using 14 General System Characteristic (GSC), where GSC scales zero to five. The zero scale shows no effect and the scale of five indicates a broad influence on the whole project. Assessment of the complexity of 14 criteria for General System Characteristic (GSC) calculations has a scale of zero to five where the value is zero = no effect, 1 = incidental, 2 = moderate, 3 = average, 4 = significant 5 = essential. giving the value of each General System Characteristic (GSC) is done by discussing with the company, that is with Mr. Ir. Nugroho Kristianto, MT as team leader in Tasikmalaya City's poverty alleviation management information management consultancy, to determine the importance of each General System Characteristic (GSC). The result of system complexity assessment using General System Characteristic (GSC) can be seen in table 2

Tabel 2 GSC weight

General System Characteristic	*weight*
Level complexity of data communication	*5*
Level complexity of processing data	*4*
Level complexity of performance	*4*
Level complexity of configuration	*3*
Level complexity of software using	*3*
Level complexity of input data frequency	*2*
Level complexity of easily using for user	*4*
Level complexity of data update	*2*
Level complexity of data processing	*4*
Level complexity of reusable code	*5*
Level complexity in installation	*3*
Level complexity of software operational (backup/recovery, etc)	*3*
Level complexity of software that can be use in multi company	*5*
Level complexity of flexibilities to follow change.	*2*
Total RCAF	*49*

2.2.3 Calculating Function Point (FP)

After performing General System Characteristic (GSC) calculation the last step of this method is to calculate function point value (FP). The function point value for Tasikmalaya city poverty management information system application is calculated based on the results of stages one and two which are substituted into equation of formula 1.

$$FP = CFP*(0.65+(0.01*RCAF) \quad (2.1)$$

*The result of function point calculation is as follows: FP = 844 * (0.65 + 0.01 * 49)*

*= **962.16** FP*

Based on the FP obtained 962.16 points, the Tasikmalaya City Poverty Reduction Management Information System project includes complex software.

After going through several stages Function Point calculation, then obtained Function Point value with a total of 962.16 then it can be calculated the estimated time of completion of the project by distributing the total Function Point with 4 developers multiplied by 6 Function Point. The following is a calculation of the estimated time required for the completion of the project.

estimated time = total Function Point / (number developer x 6 Function Point)

estimated time = 962.16 / (4 x 6)

= 41 calendar days

whereas for estimated costs can be calculated by multiplying the labor rates per day multiplied by the estimated amount of time. The following is a calculation of the estimated cost required for the completion of the project.

cost estimates = labor rates x estimated time amount + non personnel costs

estimated cost = 600,000 x 41
= 24.600.000 + 5.300.000
= Rp. 29.900.000

So that the poverty alleviation management information system project can estimate the time and cost of completion of 41 (forty-one) calendar days at a cost of Rp. 29.900.000

2.3 Method Earned Value Management Analysis

The problem in the analysis is on one of the data report of the poverty reduction management information system project. This project is done by PT. Hegar Daya with budget 41.300.000, - and working time for 60 calendar days divided into 3 stages of workmanship. From the results of the report in the second week obtained report data as follows :

Tabel 3 Tabel Project reporting table

Activity Name	Weight(%)	Execution(%)	
		Week 1	Week 2
Designing	10%	10%	10%
Stage 1	30%	0%	9%
Stage 2	30%	0%	
Stage 3	30%	0%	
	100%		19%
AC		4.310.000	8.620.000
OD		60	60

1. Planned Value(PV)

PV calculation at 1st week :

PV = (%progress plan) x BAC (2)
= 10% x 43.100.000
= Rp. 4.310.000

PV calculation at 2nd week :

PV = (%progress plan) x BAC
= 20% x 43.100.000
= Rp. 8.620.000

2. Earned Value(EV)

EV calculation at 1st week :

EV = (%actual progress) x BAC (3)
= 10% x 43.100.000
= 4.310.000

EV calculation at 2nd week :

EV = (%actual progress) x BAC
= 19% x 43.100.000
= 8.189.000

3. Variant Analysis

Calculation of CV and SV at week 1 :

CV = EV – AC (4)
= 4.310.000 – 4.310.000
= Rp. 0

SV = EV – PV (5)
= 4.310.000 – 4.310.000
= Rp. 0

Calculation of CV and SV at 2nd week :

CV = EV – AC
= 8.189.000 – 8.620.000
= - Rp. 431.000

SV = EV – PV
= 8.189.000 – 8.620.000
= - Rp. 431.000

4. Performance Index Analysis

Calculation of CPI and SPI at 1st week :

SPI = EV / PV (6)
= 4.310.000 / 4.310.000
= 1

CPI = EV / AC (7)
= 4.310.000 / 4.310.000
= 1

Calculation of CPI and SPI at the 2nd week:

SPI = EV / PV
= 8.189.000 / 8.620.000
= 0,950

CPI = EV / AC
= 8.189.000 / 8.620.000
= 0,950

5. Project Cost Estimation and Project Completion Analysis

ETC and EAC calculations at 1st week :

ETC = OD / SPI (8)
= 60 / 1
= 60 days

EAC = BAC / CPI (9)
= 43.100.000 / 1
= Rp. 43.100.000

ETC and EAC calculations at week 2 :

ETC = OD / SPI
= 60 / 0,950
= 63,158
= 64 days

EAC = BAC / CPI
= 43.100.000 / 0,950
= Rp. 45.368.421

From the results of the above analysis can be concluded if the project management information system poverty alleviation Tasikmalaya City experiencing delays from the schedule that has been specified. The delay is known because the estimated time of settlement (ETC) is 64 (sixty four) calendar days, greater than the project duration (OD) 60 (sixty) calendar days and estimated cost of Rp. 45,368,421 greater than the total budget (BAC) Rp. 43.100.000,00. Then this result is what helps a team leader to decide what to do in order to complete the project schedule in accordance with a predetermined

schedule is to add one manpower with the following details :

cost = labor rate x time of delay
= 150,000 x 4
= 600,000

So the cost to be spent by the company to make the project according to the previous plan is as follows

cost = contract value + late fee
= 43.100.000 + 600,000
= 43.700.000

Dari hasil yang telah dipaparkan diatas bawah dengan penambahan biaya tenaga kerja kerugian perusahaan bisa diminimalkan dari estimasi Rp. 45.368.421 menjadi Rp. 43.700.000. Serta berdasarkan nilai ETC dan EAC yang didapat maka apabila kinerja tidak diperbaharui akan terjadi keterlambatan yang menyebabkan pergeseran waktu sebanyak 4 hari dan biaya sebanyak Rp. 2.268.421.

3 CLOSING

3.1 Conclusion

Based on research and test results that have been done on Project Management Information System at PT. Hegar Daya, it can be drawn some conclusions as follows :

1. *The system can assist the technical director in making project time and cost estimates.*
2. *The project management information system at PT Hegar Daya can assist the technical director in controlling the time and cost of the project.*

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