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RESEARCH ARTICLE

SOFTWARE PROJECT SCHEDULING ANALYSIS

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Abstract

Along with the number of projects received and must be completed on time by PT. EKIOSKU, where project scheduling has been carried out using the estimation method, so that it has an impact on the results of estimating time, human resources, and estimated costs of software projects that are quite large. In addition, for the tasks performed by the project manager, it's still carried out in an inefficient verbal way because each workforce has different abilities. Based on the existing problem conditions, it is necessary to recalculate for project scheduling by using the Function Point and COCOMO methods, it is hoped that it can give an ideal labor needs, processing time, and project costs required.

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Introduction:-

Building a software project must be in accordance with the needs desired by stakeholders. Good planning of a software project needs to be done in project management. A problem that often occurs in working on software projects is the suboptimal results of time estimates, human resources, and estimated costs of software projects carried out by project managers. The division of tasks performed by the project manager is carried out in an oral way (speaking directly) less efficiently because each workforce has different abilities so that if the project manager is not right in assigning tasks that are in accordance with their individual abilities, it will affect the cost and time of working on the project. Failure of implementation is also due to the lack of planned project activities and the lack of knowledge of project managers in determining how large the size of the project will be completed at a predetermined cost. There is no picture of project work and scheduling as a support so that the project manager does not know how the project is progressing, as a result of which when monitoring work on the project there are often errors, so that the project is not completed on time, lack of human resources to complete the project, and swelling implementation costs because it has exceeded the initial budget. Therefore, this software project management information system is built to assist in automation and calculations that will present the division of scope of work in detail as well as get the estimated results early so that the experts involved can be determined and accompanied by tasks and implementation schedules so that the software development project is well managed. Based on the description on the background of the problem, the formulation of the problem obtained is how compiling the scheduling of software engineering project at PT. EKIOSKU. This is a company engaged in the information technology and digital industry by offering innovative business solutions platform.

The purpose of this study is to compile a software project scheduling at the company in terms of measuring cost and time estimates. As for the benefits of this study, it is: providing information related to monitoring the scheduling of projects that will be running, and completed.

Research Methods:-

In this study, 2 (two) data collection techniques were applied, the first was the primary data collection technique through interview, observation, and literature study. And the second is a secondary data collection technique or commonly called the document material collection method, because the data collection technique utilizes documents or data produced by other parties. Secondary data used by researchers is generally to provide additional images, complementary images, or further processing.

In addition, to complete the scheduling of the project, researchers use 2 (two) method approaches, namely: the Function Point and COCOMO methods. The first step in scheduling a software project is to identify the functions used as calculation parameters in the software. The size is determined by the number of user inputs, the number of user outputs, the number of user probes, the number of files, and the number of internal interfaces. This component has simple, average and complex categories depending on the characteristics possessed.

Discussion:-

The first thing, namely: perform identification on those functions that are used as calculation parameters on the software. The size is determined by the number of user inputs, the number of user outputs, the number of user probes, the number of files, and the number of internal interfaces. This component has simple, average and complex categories depending on the characteristics possessed. Based on the data obtained from the QcChain Supply System Procurement project, the functions used as calculation parameters can be seen in **table 1**.

Table 1:- Functions of the Qc Chain Supply System Procurement Project.

| No | Measurement Parameters | Function Type | S | A | C |
|----|------------------------|---------------------------------|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | Number of User Inputs | Logging In | √ | | |
| 2 | | Change Password | √ | | |
| 3 | | Add Admin | | √ | |
| 4 | | Change Admin | | √ | |
| 5 | | Add Groceries | √ | | |
| 6 | | Change Groceries | √ | | |
| 7 | | Change The Type of Raw Material | √ | | |
| 8 | | Add Raw Material Type | √ | | |
| 9 | | Add Units of Raw Materials | √ | | |
| 10 | | Change Raw Material Units | √ | | |
| 11 | | Add Vendor | | √ | |
| 12 | | Change Vendor | | √ | |
| 13 | | Vendor Price Entry | | √ | |
| 14 | | Add Port Harbor | √ | | |
| 15 | | Change Port Harbor | √ | | |
| 16 | | Add a Ship | √ | | |
| 17 | | Change Ship | √ | | |
| 18 | | Save THE PO | | | √ |
| 19 | Number of User Inputs | Upload PO Documents | √ | | |
| 20 | | Add SPBM | | | √ |
| 21 | | SPBM converter | | | √ |
| 22 | | Upload SPBM Document | | √ | |

| No | Measurement Parameters | Function Type | S | A | C |
|----|-------------------------------|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 23 | | Upload to Microsoft Excel | | √ | |
| 24 | | Entry Order Acceptance (PO) | | √ | |
| 25 | Number of User Outputs | Displaying the Main Page | √ | | |
| 26 | | View the Admin List | √ | | |
| 27 | | View Admin Details | √ | | |
| 28 | | Displaying the Grocery List | √ | | |
| 29 | | Displaying the List of Raw Material Types | √ | | |
| 30 | | Displaying the List of Raw Material Units | √ | | |
| 31 | | Displaying a List of Vendors | √ | | |
| 32 | | Displaying Vendor Details | | √ | |
| 33 | | Displaying the Harbor List | √ | | |
| 34 | | Displaying Harbor Details | √ | | |
| 35 | | Displaying the Ship List | √ | | |
| 36 | | Displaying the PO List | | √ | |
| 37 | | View PO Details | | √ | |
| 38 | | Displaying the SPBM List | | √ | |
| 39 | | View SPBM Details | | √ | |
| 40 | | Displaying the Order Acceptance List (PO) | | √ | |
| 41 | | Displaying Order Acceptance Details (PO) | | √ | |
| 42 | | View the Request Report | | | √ |
| 43 | | Displaying Grocery Supply Reports | | | √ |
| 44 | | Displaying profit reports | | | √ |
| 45 | Number of User Investigations | Logging Out | √ | | |
| 46 | | Perform Admin Data Search | √ | | |
| 47 | | Remove Admin | √ | | |
| 48 | | Searching for Foodstuffs | √ | | |
| 49 | | Remove Groceries | √ | | |
| 50 | | Searching for Raw Material Types | √ | | |
| 51 | | Conduct Raw Material Unit Data Search | √ | | |
| 52 | | Remove Raw Material Units | √ | | |
| 53 | | Perform Vendor Data Search | √ | | |
| 54 | Number of User Investigations | Remove Vendors | √ | | |
| 55 | | Perform a Port Data Search | √ | | |
| 56 | | Clear Port | √ | | |
| 57 | | Performing a Ship Data Search | √ | | |
| 58 | | Delete Ship | √ | | |
| 59 | | Perform a PO Data Search | √ | | |

| No | Measurement Parameters | Function Type | S | A | C |
|----|-------------------------------------|--|------------------------|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 60 | | Cancel PO | √ | | |
| 61 | | Po Print | | √ | |
| 62 | | Print a Road Letter | | √ | |
| 63 | | Print Minutes | | √ | |
| 64 | | Print BSTB | | √ | |
| 65 | | Send us mail | | √ | |
| 66 | | Perform an SPBM Data Lookup | √ | | |
| 67 | | Remove SPBM | √ | | |
| 68 | | Send SPBM to PIDC | √ | | |
| 69 | | Export SPBM | | √ | |
| 70 | | Print Cover Letter | | √ | |
| 71 | | Print SPBM | | √ | |
| 72 | | Perform an Order Acceptance Data (PO) Search | √ | | |
| 73 | | Perform a Search Query Report | | √ | |
| 74 | | Print Request Report | | | √ |
| 75 | | Searching the Food Supply Report | | √ | |
| 76 | | Print Grocery Supply Report | | | √ |
| 77 | | Perform a Profit Report Search | | √ | |
| 78 | | Print Profit Report | | | √ |
| 79 | | Number of Files | Create an Admins Table | √ | |
| 80 | Create a Raw Material Table | | √ | | |
| 81 | Create a Config Table | | √ | | |
| 82 | Create a Config Mail Table | | √ | | |
| 83 | Create a Price to Harbor Table | | √ | | |
| 84 | Create a Price to Vendor Table | | √ | | |
| 85 | Create a Type of Raw Material Table | | √ | | |
| 86 | Create a Ship Table | | √ | | |
| 87 | Create a Log Table | | √ | | |
| 88 | Create a Log Admin Table | | √ | | |
| 89 | Create a Log App Table | | √ | | |
| 90 | Number of Files | Create a Port Table | √ | | |
| 91 | | Create a POTable | √ | | |
| 92 | | Create a PO detail table | | √ | |
| 93 | | Create a PO PELNI table | √ | | |
| 94 | | Create a PO PELNI detail table | | √ | |
| 95 | | Create a Raw Material Unit Table | √ | | |
| 96 | | Create an Uploads Table | | √ | |

| No | Measurement Parameters | Function Type | S | A | C |
|-----|-------------------------------|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 97 | | Create a Vendors Table | √ | | |
| 98 | | Create a Vendorto JBBTable | √ | | |
| 99 | | Create a Vendorto HarborTable | √ | | |
| 100 | Number of Internal Interfaces | Interconnection of PIDC Qc Chain Supply System Applications | | | √ |

Where S: Simple; A: Average; C: Complex. The second step, the number of criteria of each component function owned is multiplied by each factor weight, based on the calculation of the function point metric in figure 2 which can be seen in **table 2**.

Table 2:- Calculation of Function Point Metrics in Procurement Projects System Qc Chain Supply.

| Measurement Parameters | Sample | | Average | | Complex | | Weighting Factor |
|-------------------------------|--------|---|---------|----|---------|----|------------------|
| | Qty | W | Qty | W | Qty | W | |
| Number of User Inputs | 13 | 3 | 8 | 4 | 3 | 6 | 89 |
| Number of User Outputs | 10 | 4 | 7 | 5 | 3 | 7 | 96 |
| Number of User Investigations | 20 | 3 | 11 | 4 | 3 | 6 | 122 |
| Number of Files | 18 | 7 | 3 | 10 | 0 | 15 | 156 |
| Number of Internal Interfaces | 0 | 6 | 0 | 7 | 1 | 10 | 10 |
| Total | | | | | | | 473 |

Where Qty:

Quantity; and W: Weight. Based on the calculations in **table 2**, the total weighting factor was 473. The third step is to calculate the price of adjusting the complexity by assessing the 14 questions in table 3 for the answers to each factor worth between 0-5 based on **figure 1**.

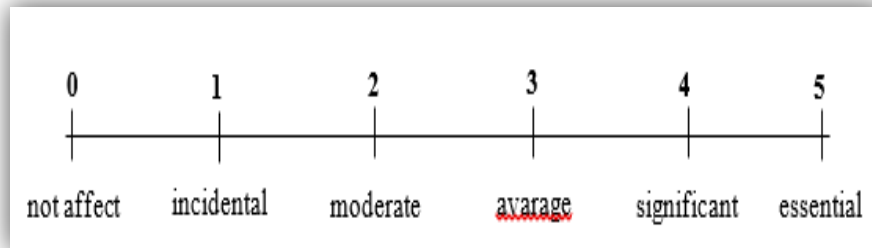


Figure 1:- Meaning of Factors at The Function Point.

Table 3:- Price Adjustment complexity in Qc Chain Supply System Procurement Project.

| No | Factor | Weight of Interest |
|----|---|--------------------|
| 1 | Does the system need reliable backups and recovery? | 5 |
| 2 | Is data communication necessary? | 4 |
| 3 | Is the processing function distributed? | 4 |
| 4 | Does performance matter? | 4 |
| 5 | Is the system running on the most widely used existing operational environment? | 0 |
| 6 | Does the system require online data entry? | 3 |
| 7 | Does online data entry require input transactions against the screen or dual | 2 |

| | | |
|------------------|--|----|
| | operations? | |
| 8 | Is the master file updated online? | 2 |
| 9 | Are inputs, outputs, files or investigations complex? | 3 |
| 10 | Is internal processing complex? | 3 |
| 11 | Is the code designed to be reusable? | 3 |
| 12 | Does the design involve conversion and installation? | 2 |
| 13 | Is the system designed for dual installation in different organizations? | 2 |
| 14 | Is the app designed to facilitate change and make it easier for users to use it? | 3 |
| Total Complexity | | 40 |

After obtaining the total value of the weighting factor and the total complexity, the fourth step is to determine the value of the function point by entering the total weighting factor and the total complexity based on the equation $FP = \text{total number} \times (0.65 + (0.01 \times \sum F_i))$. So that the result is obtained $FP = 473 \times (0.65 + (0.01 \times 40)) = 473 \times 1.05 = 496.65$. Then do the FP to LOC conversion based on **table 4**. Source: Albrecht & Gaffney, November 1983

Table 4:- Convert FP to LOC.

| Programming language | LOC/FP (the average) |
|------------------------------------|----------------------|
| Bahasa assembly | 320 |
| C | 128 |
| Cobol | 105 |
| Fortran | 105 |
| Pascal | 90 |
| Ada | 70 |
| Object-oriented languages | 30 |
| Fourth generation languages (4GLs) | 20 |
| Code generator | 15 |
| Spreadsheets | 6 |
| Graphic language (icon) | 4 |

The Qc Chain Supply System Procurement Project is built using an object-oriented programming language, so a conversion calculation is obtained where the LOC value is 30. So that the LOC value can be included in the equation $LOC_{\text{estimation}} = FP \times LOC$, so that the result is that the estimated $LOC = 496.65 \times 30 = 14,899.5$ is obtained. The next step, calculating the KLOC by dividing the LOC estimate according to the equation $KLOC = LOC_{\text{estimation}} / 1000$, until the result is obtained $KLOC = 14,899.5 / 1000 = 14.8995$.

The next step, after all the stages in the Function Point method have been passed, proceed to the calculation stage using the COCOMO method. Based on the COCOMO project category, the Qc Chain Supply System Procurement project is a small project because it consists of several people. In addition, the project type is semi-detached, based on the basic COCOMO model table which has the values of a_b and b_b , namely 3.0 and 1.12, respectively. To find out how much effort (Effort) to complete the Qc Chain Supply System Procurement project, the formula equation is used, namely: $E = a_b(KLOC)^{b_b}$. So that the result is obtained $E = 3.0 (14.8995)^{1.12} = 3.0 (20.6040) = 61.8121$ PM.

Based on effort calculations, it takes 62 people / month to complete the Qc Chain Supply System Procurement project. The eighth step, to determine the time it takes to complete the project using the equation of the formula, namely: $D = c_b(E)^{d_b}$, until the result is obtained $D = 2.5 (61.8120)^{0.35} = 10.588$ M. Based on the calculation above, the time required is 10.6 months. Furthermore, it can be determined the number of people needed is to use the equation of the formula six. $P = E / D = 61.8120 / 10.588 = 5.8379$. So that it is known that the number of people needed to complete the Qc Chain Supply System Procurement project is 6 people. The tenth step to calculate the cost of FP is used in formula seven, with employee wages of Rp. 4,500,000 per month. $FP \text{ Cost} = \text{Wages} / LOC = 4,500,000 / 30 = 150,000$. Next, to calculate the estimated cost of the project = $\text{Cost of FP} * \text{Estimated FP} = 150,000$

* $496.65 = 74,497,500$. Based on the calculations above, the estimated cost of working on the Qc Chain Supply System Procurement project was Rp. 74,497,500 with a processing time of 11 months with 6 workers.

Conclusion:-

The results of the analysis of the comparison of estimates using the Function Point (FP) and COCOMO methods in the Qc Chain Supply System Procurement project work with the estimation method, namely:

| | FP and COCOMO methods | Estimation Method |
|------------------|------------------------------|--------------------------|
| Human Resources | 6 people | 7 people |
| Duration of Work | 10.6 months | 3 months |
| Total Cost | IDR 74,497,500 | IDR 81,125,000 |

This is company estimated the time to complete the Qc Chain Supply System Procurement project for 3 months by looking at the existing human resources. Meanwhile, using the Function Point (FP) method and Cocomo, the project is expected to be completed within 10.6 months. There is a considerable difference in the estimated time to complete this project, because the Function Point (FP) and COCOMO methods assess each component function owned by each factor weight. In addition, the Function Point (FP) and COCOMO methods also assess the complexity adjustment factor filled with project managers and analysts. So, it can be concluded that the difference in the total cost of the project is due to the difference in the completion time of the project. The difference is influenced by several factors that are not carried out in the estimation method used by company. So that more accurate cost estimation results are obtained and can reduce the problems that will be caused when working on the project using the Function Point (FP) and COCOMO methods compared to the estimation method.

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