Designing employee workload calculation based on Java-based full time equivalent method

N Wahyuni*, A Gunawan, P F Ferdinand and E Fitriyanti
Industrial Engineering Departement, Faculty of Engineering, University of Sultan Ageng Tirtayasa, Jalan Jend. Sudirman Km 3, Cilegon, 42435, Indonesia

*E-mail: nrdwahyuni@gmail.com

Abstract. The measurement of workload is carried out to determine the amount of burden on a position through job description. Before determining the number of man power, it is necessary to measure the workload for a certain position. The method commonly used is the Full Time Equivalent (FTE) method. The FTE method is used to calculate workloads with various task variations. The case study is ABC, a machine maintenance service company. As a company engaged in the service sector, having high quality and proportional number of human resources (HR) is important in order to provide the best service for customers. For this reason, an application is needed that can support FTE calculations. The purpose of this study was to find out the number of employees by calculating workloads based on the Java-based FTE method. The design of this application is done using the System Development Life Cycle (SDLC) approach. The design of this application starts from the stage of analysis, design, coding, testing, and maintenance. Functional needs refer to the HR division as user and administrator. The research findings to facilitate the relevant divisions or decision maker to add personnel or reduce them using the application.

1. Introduction
To obtain competent human resources, a method of workload measurement is needed. The measurement of workload is useful to find out the workload through job descriptions from each available position. In the measurement of workload there is a description of the position, the frequency of the execution of tasks within 1 year, the time of completion of tasks, and the workload of each job description.

According to [1] workload measurement is a technique used to obtain information about the effectiveness and efficiency of employee’s performance to complete his task. Therefore, measuring workload is expected to determine employee performance effectively and efficiently, especially in terms of the number of employees.

This study using Full Time Equivalent (FTE) method to measure the workload. FTE is used to regulate employee work hours to be better (effective and efficient) [2]. The FTE is assumed to be a measure of the time needed to do its activities comprehensively. One FTE is equivalent to one person who works full time within one calendar year running. Therefore, FTE is often associated with Workloads in Organizations. Because by knowing how many hours one person works, we can predict the optimum number of workers in the organization.

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2. Method

The stages of SDLC can be explained as follows [3]:

a) Analysis. At this stage, the author carries out several activities i.e. problem identification, proposed problem solving and analysis of system requirements. This modeling begins with finding the requirements of the whole system that will be applied in the application.

b) Design. The next stage is design, at this stage the author begins to do modeling based on the results of the analysis. Designing determines how an application completes what needs to be done. At this stage a model is made from the application. The purpose of making this model is to obtain a better understanding of the data flow and control of functional processes, operating behavior and the information contained in it.

c) Code Generation. The next step is programming or coding. This stage is the result of the transfer from the design into the predetermined programming language and then tested if it passes the test then the system will be operated.

d) Test. At this stage, testing each feature and function to find out whether it can work properly. testing is done by trying the application independently. The author tests whether the application features are running properly or not.

e) Support. This resistance is a stage that needs to be carried out in carrying out maintenance by updating the application and performing maintenance regularly so that the application can be maintained properly.

The FTE workload calculation is a method where the time spent completing various jobs is compared to the effective working time available. To get the FTE from a work process are as follows [4]:

\[ FTE = \frac{Number \ of \ hours \ of \ work \ per \ year + Allowance}{Total \ effective \ working \ hours \ in \ a \ year} \]  

3. Result and discussion

Calculating FTE can help related department understand the workload felt by workers. Job descriptions are the guideline in carrying out work are the basis of this calculation. The frequency and time of completion of the assignment is a further study in calculating the FTE. All data is made in units of years. The calculation results will categorize as an Underload position (FTE value 0-0.99), Fit (FTE value 1-1.28), or Overload (FTE value> 1.28) [5].

In designing the FTE calculation application, the first step is the needs analysis. What is needed by ABC is an FTE calculation application that can be accessed by an administrator or in this case the HR section. The data needed is data on position and job description. Because the access needs are only in the HR section, a Login page is required before going to the main page.

The next step is to design, to understand the flow of data. In figure 1, we can see one terminator i.e. admin or in this study, the admin is the HR section. There are no default rules for entities on the context diagram. More than two entities can be added according to the needs of the system to be designed. The DFD in [6] shows that the amount of the terminator or the user is five. In figure 1 there is only one process, it is the FTE application or FTE calculation. Data entry to the process is workload data. And data exit from the process is FTE calculation.

The decomposition from the context diagram is DFD level 0 (figure 2). It is explaining the process of FTE application. The process then expressed to three processes. The processes are Login, Choose Department, and FTE Calculation. Login process need username and password data from the user. The
data out from Login is department data, which is also an entry to the next process, Choose Department. In this process, user can choose which department will be chosen to calculate its workload. The data out from that process is FTE data, then to be entered to the last process, FTE calculation. The last data out from the last process is the result of the calculation, it is then the user get.

Figure 3 is an example of an entity relationship diagram (ERD). The ERD is the relation of the data come from DFD process. It can be seen that the main entity of this database is admin data, department data and data position. With the relation entity is the login and FTE calculation. The primary key in Admin, is the employee number (NIP), in Department, is department number (No DPT), and in Position, is the position code. It is necessary to define the primary key to connect to another entity. As in [7] the entity has total of five entities with each primary key of the entities to relate with other entity.

Furthermore, code generation, in this case, making an application based on the Java programming language. Based on the need’s analysis, a Login page, job selection page and department will be created to calculate the FTE, and the FTE calculation page itself. On the login page and job selection there is a button with the caption "Ok" which means the data input is successful, and the button with the "Exit" caption means canceling the running program. An example of an FTE calculation page can be seen in figure 4. It can be seen that there is a calculation of the workload in minutes that obtained from the multiplication of the frequency of assignments in one year by the time of completion of tasks in minutes. The effective working time is 80360 minutes. The user no need to fill the job description, it was entered before. User has to fill the blank space only; it is the frequency of assignments and time of completion the task.
The test phase is designed to function as expected. The test is not only functional testing but also non-functional testing. Functional testing is done with Blackbox [8]. The last stage is support, maintenance is needed by updating data regularly, and training admin in running the application.

The FTE calculation is illustrated in Figure 4.

**4. Conclusion**

SDLC makes it easy for designers to design an application comprehensively. The stages used can help designers to carry out the overall steps. Step by step, which helps define the desired application. FTE calculations can facilitate the relevant division or decision makers to add personnel or reduce them.

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