THE MEASUREMENT OF WORKLOAD AND OPTIMAL NUMBER OF EDUCATION PERSONNEL USING WORK SAMPLING AND TASK PER JOB METHODS (A CASE STUDY AT PT X.)

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ABSTRACT
PT X is an institution of higher education under the ministry of industry. Bureaucratic reform that has been rolled out by Indonesian government demand the institution to demonstrate good performance and to provide optimal service to the clients. Workload measurement become important because it could be indicators of work efficiency and could be contributed to quality of service. The objectives of this study are to measure workload and determine the optimal number of education personnel in work units at PT X. Object of this study are personnel who work on the study program units and the library, where they are selected due to directly related to student services. There are two methods used : work sampling and task per job based on KEP/75/M.PAN/7/2004. Data collection was done by direct observation to personnel's activity and interviewed with the personnel and the supervisors concerned. The results indicate that the personnel's workload were not optimal, there were shortage and excess workload condition. This study proposes the optimal number of personnel in each work units which fits to personnel's workload.

Keywords: workload, number of personnel, work sampling, task per job method

1. INTRODUCTION

In a few years ago, Indonesian government has rolled out a program of bureaucratic reform. Among the important objectives to be achieved are clean government and biorecration, increasing quality of conducting policy/ institution programs, increasing efficiency cost and time of implementation of all tasks in organization. Bureaucratic reforms could be started from management of organizations and human resources. The apparent consequences are institution or organization must demonstrate good performance include efficiency and work effectivity issues. The effective organizational management could be carried out on all of aspects including on human resource development.

PT X is an institution of higher education under the ministry of industry that holds vocational education. PT X keeps to improve its performance and to provide optimal service primarily to its internal customers “the students”. Among strategic objectives to be achieved are creating quality and competitive graduates. To obtain a good output should be through good process includes obtaining optimal service from personnel and lecturers.

PT X has work units where each unit has a certain number of personnel. From initial survey found that the workload intensity of the personnel are not always fixed but fluctuated in some periods. The allocation of personnel in work unit will respected to work unit workload. Both work efficiency and service quality will respected to personnel workload. Despite overload conditions seem efficient (optimal using of resources) but could degrade the quality of service. Otherwise, underload condition indicates low work efficiency.

All this time, PT X’s management in allocating personnel on unit works was not through in-depth analysis, the result was some of the personnel are in idle but the others are in busy at a time. From initial survey found fact some personnel complained high workload intensity at a time. If the condition not corrected soon, it would make negative effects both sociological and psychological to personnel. This means that the organization’s human resources have not been optimally empowered.
Based on above issues, this study was conducted to measure personnel’s workload and to determine the optimal number of personnel at PT X. Through workload information, the management can direct personnel to work at an ideal level workload and allocate personnel optimally in the organization. The previous researches that concerned to workload measurement or quantifying the personnel need on manufacturing industry such as (Rinawati, 2012) at batik company, (Kiayi, 2010) at agro-industry, (Hutagalung, 2012) at mining industry. Whereas case study on service industry such as (Singgih, 2006) at publishing company, (Gustomo, 2006) at transportation agency, (Ernawati, 2011) and (Mudayana, 2012) at hospital, (Agustinus, 2007), (Sutalaksana, 2005) to hospital, (Hariandja, 2002). Workload is not only the amount of worker which it contributed to inefficiency. The shortage of workload means over of the productivity so that it contributed to inefficiency costs. Otherwise, overworkload means more jobs with lesser personnel so that it contributed to physical and mental fatigue to personnel, in the end, personnel become non productive because of too tired. (Simanjuntak, 2010).

2. THEORETICAL BACKGROUND

2.1 Human Resource Planning
Focus of human resource planning are the steps that taken by management for more secure organization to obtain the right personnel to various job position, and the right job for the right time. (Siagian, 2009)

Human resource planning is decision making process in hiring and placing personnel in organization or company. One of the advantages of human resource planning is use existing human resource in organization for better condition. By good human resource planning, it will make work productivity of existing worker could be improved. Human resource planning is respected to worker need on the future, both quantity or quality to hold various job and perform various new activities. (Siagian, 2009)

2.2 Job Analysis
Job analysis is a systematic effort, collecting, judging, and organizing all type of works in a organization. (Siagian, 2009) Job analysis is conducted therefore it can be basis for the management to adjust job with personnel, to find out the possibility of various obstacles that will faced by executive, and in the implementation of all activities of human resource management in effort to hold its function. (Hariandja, 2002).

2.3 Workload
Workload indicates intensity of task or job. Changing of workload will tend to change stress level that will affect personnel’s performance. (Shah, 2011). The workload is a consequence of someone’s/worker’s activities. (Simanjuntak, 2010). Workload refers to time parameter, it means proportion of effective working time utilization used by worker along his/her working time. Workload is importance factor in determining human resource management policy in a system, such as personnel need planning. (Niebel, 2002). Workload is not only calculate the time spent for productive work but includes calculating the human aspects, such as fatigue, personal needs, and looseness factors. (Barnes, 1980)

The workload that demanded on workers may occure in three conditions; standard workload, over workload, and under workload. Both overload and under load condition will contribute to work inefficiency. The shortage of workload means over of the productivity so that it contributed to inefficiency costs. Otherwise, overworkload means more jobs with lesser personnel so that it could be contributed to physical and mental fatigue to personnel, in the end, personnel become non productive because of too tired. (Simanjuntak, 2010).

2.4 Work Sampling
Work sampling is a method to measure and record the activities of job randomly with specific time interval. (Gustomo, 2006). Work sampling is a direct work measurement at the work place. Work sampling is a work measurement activity to observe non productive activity proportion (ratio delay study). (Sutalaksana, 2005). There are three main objectives of work sampling. First, activity and delay sampling, is to measure activity of a worker. For example, measures the proportion of working and idle time of a worker. Second, performance sampling, is to measure rating of worker. Third, work measurement, is to
determine standard time of the activity. (Barnes, 1980)

2.5 KEP/M.PAN/7/2004
The ministry of State Personnels Empowerment (MENPAN) published a guide or method to calculate personnels need in 2004. One of primary tools in calculating personnels need is the good job description. There are some methods to calculate personnels need in an organization. They are output of work, object of work, work tools, and task per job. (MENPAN, 2004)

3. RESEARCH METHOD
The research was conducted at PT X that located in Padang, West Sumatera. The study was conducted from April 2013 to October 2013. The type of this research is descriptive survey with quantitative analysis. The research was not performed to all objects but only a portion of personnels at PT X. Of the total population of 25 personnels, 10 personnels were took for the calculation of the workload. They are education personnels who worked on four study program office and one library. The work units are selected with consideration of higher service intensity to the students than other work units. Because of privacy considerations, the fifth unit further named by A, B, C, D, and E. The variables in this research are activities (working time). The collection of data was conducted by direct observation and interview. There are two methods used, they are work sampling and task per job based on KEP/75/M.PAN/7/2004.

Work sampling procedure follow the steps below: (Sutalaksana, 2005), (Gustomo, 2006), (Hutagalung, 2012).

a. Identifying objects to be observed.
b. Dividing work to some work elements that satisfie properties of mutually exclusive and exhaustive.
c. Designing observation form.
d. Determining the amount of observation per day and making observation schedule based on random number.
e. Recording data through direct observation
f. Conducting statistical test (homogeneity test and sufficiency test to data obtained). For the homogenity test use confidence level 99% and accuracy level 5% with formula : (Wignosoebroto, 1995), (Gustomo, 2006), (Hutagalung, 2013)

\[ CL = \bar{p} \pm 3 \sqrt{\frac{\bar{p}(1-\bar{p})}{n}} \]  

(1)

With : \( \bar{p} \) = % productive average, \( n \) = the mean number of observation per day. CL = control limit. While for the sufficient test use 95% and accuracy level 10% with formula :

\[ N' = \frac{k^2(1-p)}{s^2} \]  

(2)

With : \( k \) = confidence level coefficient, \( s \) = accuracy level, \( N' \) = number of data required.

Workload that would be computed must demonstrates workload average for a year. In practice, it is impossible to observe activities more than one year of work. The observational data would be converted to one year workload by using a load factor rating. One year workload is used to calculate the optimal number of personnels. (Hutagalung, 2013). Calculating personnels’ workload as the following steps : (Gustomo, 2006), (Hutagalung, 2013).

a. Calculating workload for one week

\[ WLN \ (1 \ week) = p \times r \]  

(3)

With : \( WLN \) = normal workload, \( p \) = % productive average, \( r \) = rating factor

b. Calculating workload for one month

\[ WLN \ (1 \ month) = WLN \ (1 \ week) \times \{(k_1 \times a) + (k_2 \times b) + (k_3 \times c)\} \]  

(4)

With : \( k_1 \) = conversion factor for daily high load, \( k_2 \) = conversion factor for daily average load \( d \), \( k_3 \) conversion factor for daily low load \( h \), \( a \) = percent of high load in one month, \( b \) percent of average load in one month, \( c \) = percent of low load in one month.

c. Calculatig normal workload for one year

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WL_n (1 year) = WL_n (1 month) x 
\{(k_4 \times q) + (k_5 \times r) + (k_6 \times s)\} \quad (5)

With: k_4 = conversion factor for monthly high load, k_5 = conversion factor for monthly average load, k_6 = conversion factor for monthly low load, q = percent of high load in one year, r = percent of average load in one year, s = percent of low load in one year.

d. Calculating standard workload 1 year

WL_i (1 year) = WL_n (1 year) x (1+L) \quad (6)

With: WL_i = workload per year for personnel-i, L = allowances factor

Workload was also calculated by the second method, the task per job method that based on KEP/75/M.PAN/7/2004, the formula: (MENPAN, 2004)

\[ WL = \frac{\sum TCT}{\sum EWT} \quad (7) \]

With: TCT = task completion time, and EWT = effective working time.

TCT would be obtained by job description and direct interviews with personnel concerned. For each task was calculated the cycle time, normal time, and standard time, the formula:

\[ NT = CT \times r \quad (8) \]

With: NT = normal time, CT = cycle time, and r = rating.

\[ ST = NT \times (1+A) \quad (9) \]

With ST = standard time, and A = allowances

While EWT would be obtained by amount of days in one year subtracted to holiday days in one year.

4. RESULT AND DISCUSSION

The amount of personnel that become object in work sampling observation were eight personnel. Unit A: one personnel, Unit B: two personnel, Unit C: two personnel, Unit D: one personnel, and unit E: two personnel. The number of observation per day and time set were determined through the following steps. First, effective working time duration per day is 7.5 hours or 450 minutes per day divided by the time interval 3 minutes so that would be obtained the maximum amount of observation 150 per day. Second, taking 2/3 of the maximum number of observations, so that would got 100 times the number of observations per day. Third, taking random numbers 100 unit by lot system of 150 available number. This way is done manually. Fourth, the random numbers that have been obtained to be sorted from the smallest to the largest number. Fifth, determining observation time by obtained random number with minimum interval 3 minutes and excluding of lunch break time.

Work sampling was carried out to observe activities of personnel during working hours in each work units. For this observation tasks was helped by students. Observation form divides personnel activities into 6 activities as can be seen in Table 1. Activity number 1 to 4 are categorized to productive, whereas activity number 5 and 6 are are categorized to non productive. Table 2 represent number of observation that has been done.

In order to sample could be representative of the population, data that have been taken must be tested through homogeneity test and adequacy test. The homogeneity test was performed at 99% confidence level and 5% degree of accuracy. For example at Unit A personnel obtained p bar = 0.83, LCL = 0.72, and UCL= 0.95. All of productive activity proportion day-1 (p_i) to day-5 (p_5) in Upper Control Line (UCL) and Lower Control Line (LCL). Overall, data observations were homogenous. The observation was undertook during 5 days consecutively in August 2013. Exception for personnel in Unit B (B-1 and B-2) added 1 and 2 day to fulfilled sufficiency test. Specifically for the B-2 was only observed as many as 81 times per day because of shorter working hours. Additional days of observation was done in september September 2013. The adequacy test was conducted at 95% confidence level and 10% degree of accuracy. For example, personnel at work unit A (A-1), data required (N' = 80)
smaller than data observed (N = 500). Overall, number of observations were sufficient. The percentage of productive value obtained not taking into account differences in weekly and monthly workload. Therefore, normal workload (WLn) 1 week obtained by including rating factor (r). By the observations found that skill level of workers relatively were same so that r = 1, it meant equal to nilai WLn (1 week).

Table 1. Dividing of Personnells' Activity

<table>
<thead>
<tr>
<th>No</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Providing services to students</td>
</tr>
<tr>
<td>2</td>
<td>Using a computer to do a task</td>
</tr>
<tr>
<td>3</td>
<td>Handling documents/files/books</td>
</tr>
<tr>
<td>4</td>
<td>Other tasks</td>
</tr>
<tr>
<td>5</td>
<td>Personal need &amp; unavoidable delay</td>
</tr>
<tr>
<td>6</td>
<td>Unrelevant activities, idle condition</td>
</tr>
</tbody>
</table>

Table 2. Work Sampling Observation

<table>
<thead>
<tr>
<th>Work unit - personnel</th>
<th>Σp</th>
<th>Σnp</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1</td>
<td>417</td>
<td>83</td>
<td>500</td>
</tr>
<tr>
<td>B-1</td>
<td>289</td>
<td>311</td>
<td>600</td>
</tr>
<tr>
<td>B-2</td>
<td>453</td>
<td>114</td>
<td>567</td>
</tr>
<tr>
<td>C-1</td>
<td>412</td>
<td>88</td>
<td>500</td>
</tr>
<tr>
<td>C-2</td>
<td>384</td>
<td>116</td>
<td>500</td>
</tr>
<tr>
<td>D-1</td>
<td>431</td>
<td>69</td>
<td>500</td>
</tr>
<tr>
<td>E-1</td>
<td>280</td>
<td>220</td>
<td>500</td>
</tr>
<tr>
<td>E-2</td>
<td>231</td>
<td>269</td>
<td>500</td>
</tr>
</tbody>
</table>

Table 3. Weighting and Conversion Factor

<table>
<thead>
<tr>
<th>Work unit</th>
<th>Workload weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>low</td>
</tr>
<tr>
<td>A</td>
<td>0,00</td>
</tr>
<tr>
<td>B</td>
<td>0,00</td>
</tr>
<tr>
<td>C</td>
<td>0,00</td>
</tr>
<tr>
<td>D</td>
<td>0,00</td>
</tr>
<tr>
<td>E</td>
<td>0,25</td>
</tr>
</tbody>
</table>

Table 4. Normal-WL and WLs (Method I)

<table>
<thead>
<tr>
<th>Work unit - Personnel</th>
<th>Normal-WL</th>
<th>WLs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1 w)</td>
<td>(1 m)</td>
</tr>
<tr>
<td>A-1</td>
<td>0,83</td>
<td>0,83</td>
</tr>
<tr>
<td>B-1</td>
<td>0,48</td>
<td>0,48</td>
</tr>
<tr>
<td>B-2</td>
<td>0,80</td>
<td>0,80</td>
</tr>
<tr>
<td>C-1</td>
<td>0,82</td>
<td>0,82</td>
</tr>
<tr>
<td>C-2</td>
<td>0,77</td>
<td>0,77</td>
</tr>
<tr>
<td>D-1</td>
<td>0,86</td>
<td>0,86</td>
</tr>
<tr>
<td>E-1</td>
<td>0,56</td>
<td>0,56</td>
</tr>
<tr>
<td>E-2</td>
<td>0,46</td>
<td>0,46</td>
</tr>
</tbody>
</table>

The Measurement of Workload
(Syamsul Anwar)
The results of interview with related personnel and head unit obtained facts that workload level was indistinguishable for each weeks so that WL\(^n\) (1 week) assumed to be equal to WL\(^m\) (1 month). The workload intensity of each month in a year is different, therefore to calculate WL\(^n\) (1 year) must be multiplied by conversion factor and weighting value. The summary of conversion factor and workload weight of each work units as can be seen in Table 3. By the interviewed results with personnel and head unit, obtained conversion factor of low workload, average, and high by ratio 0.5 : 1 : 1.5. Next stage, to obtain standard workload (WL one year) must consider allowance time for personnel to do personal needs and unavoidable delays. The allowances were determined 16% that referred to guide of determining allowances (Sutalaksana, 2005). Because of personnel activities and working environment condition of all units were relatively same therefore we used allowances 16% for all personnel. The personnel’s workload by work sampling (method I) as can be seen in Table 4. From table 4, it could be seen that Unit A had standard workload (WLS) 1,17. Unit B had WLS (0,70 + 1,16 = 1,86). Unit C had WLS (1,12 + 1,04 = 2,15). Unit D had WLS 1,21. Unit E had WLS (0,62 + 0,51 = 1,14).

Next stage, calculation of personnel’s workload was also conducted by the task per job method based on KEP/75/MAN/7/2004.

Firstly, calculating task completion time (TCT) for each work units as can be seen in Table 5. Secondly, calculating effective working time (EWT) per year by subtracted amount of days in one year to total holiday days in one year, that obtained 240 days. Then it multiplied by 7,5 effective working hours per day so that obtained 1800 hours. Next stage, calculating workload by task per job method as could be look on Table 6.

Furthermore, calculating the average workload of the two methods. The information could be used to allocate the optimal number of personnel for each work unit as can be seen in Table 7. Personnel’s workload obtained by dividing workload of work unit to real number of personnel. Workload (WL) personnel unit A is 1,22, it means overload condition. WL personnel unit B and C are 0,89 and 0,84 nearly reach optimal level. WL personnel unit D is 0,6, it means underload condition and not optimal. Work unit A is proposed to add one personnel. Work unit B, C, and D is not proposed to add personnel, and better keep maintain two personnel for optimality of service. Work unit of E is proposed to reduce one personnel.

5. CONCLUSION

Overall, the level of personnel’s workload were not optimal. This study suggests that the number of personnel for each work units amounted to two personnel. The workload level should be re-evaluated if there were significant changes of parameters (such as job description, number of student). The results of this study could be the basis for PT X’s management in allocating personnel in work unit optimally. This study could be extended for example by taking into account the areas of personnel competence with the job.

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6. REFERENCES


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