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 importance 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 personnels in work units at PT X. Object of this study are personnels 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 personnels 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 birocration, 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 personnels and lecturers.

PT X has work units where each unit has a certain number of personnels. From initial survey found that the workload intensity of the personnels are not always fixed but fluctuated in some periods. The allocation of personnels in work unit will respected to work unit workload. Both work efficiency and service quality will respected to personnels 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 personnels on unit works was not through in-depth analysis, the result was some of the personnels are in idle but the others are in busy at a time. From intial survey found fact some personnels 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 personnels' workload and to determine the optimal number of personnels at PT X. Through workload information, the management can direct personnels to work at an ideal level workload and allocate personnels optimally in the organization. The previous researchs that concerned to workload measurement or quantifying the personnels 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, 2008) at publishing company, (Gustomo, 2006) at transportation agency, (Ernawati, 2011) and (Mudayana, 2012) at hospital, (Agustinus, 2007), (Novera, 2010) and (Arsi, 2012) at public university.

This research give a contribution with respect to workload measurement by combining of work sampling and the task per job methods based on (KEP/75/M.PAN/7/2004).

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 personnels performance. (Shah, 2011). The workload is a consequency 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 amount of worker which companies pay more with the same level of productivity so that it contributed to inefficiency costs. Otherwise, over workload means more jobs with lesser personnels so that it could be contributed to physical and mental fatique to personnels, in the end, personnels 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 spesific time interval. (Gustomo, 2006). Work sampling is a direct work measurement at the work place. Work sampling is a work measuremet 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 a 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 (homogenity

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)

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

With : 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 :

$$N' = \frac{k^2(1-\bar{p})}{s^2\bar{p}} \qquad (2)$$

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 imposibble 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

$$WLn \ (1 \ week) = p \ x \ r \qquad (3)$$

With : WLn = normal workload p = % productive average, r = rating factor

b. Calculating workload for one month

WLn (1 month) = WLn (1 week) x
{(k$_1$ x a)+ (k$_2$ x b)+ (k$_3$ x c) (4)

With : k$_1$ = convertion factor for daily high load, k$_2$ = convertion factor for daily average load d, k$_3$ convertion factor for daily low load h, a = percent of high load in one month, b percent of average load in one month, dan c = percent of low load in one month.

c. Calculatig normal workload for one year

WLn (1 year) = Wln (1 month) x
{(k_4 x q)+ (k_5 x r)+ (k_6 x s)}   (5)

With : k_4 = convertion factor for monthly high load, k_5 = convertion factor for monthly average load, k_6 = convertion 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

WLi (1 year) = WLn (1 year) x (1+L)   (6)

With : WLi = 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 = ∑ TCT / ∑ EWT   (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 x r   (8)

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

ST= NT (1+A)   (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 personnels that become object in work sampling observation were eight personnels. Unit A : one personnel, Unit B : two personnels, Unit C : two personnels, Unit D : one personnel, and unit E : two personnels. 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. Activitiy number 1 to 4 are categorized to productive, whereas activitiy 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 homogenity test and adequacy test. The homogenity 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_1) to day-5 (p_5) in Upper Control Line (UCL) and Lower Control Line (LCL). Overall, data observations were homogent. The observation was undertook during 5 days consecutively in August 2013. Exception for personnels in Unit B (B-1 and B-2) added 1 and 2 day to fulfiled 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 Personnels' Activity

No	Activities
1	Providing services to students
2	Using a computer to do a task
3	Handling documents/files/books
4	Other tasks
5	Personal need & unavoidable delay
6	Unrelevant activities , idle condition

Table 2. Work Sampling Observation

Work unit - personnel	∑p	∑np	Total
A-1	417	83	500
B-1	289	311	600
B-2	453	114	567
C-1	412	88	500
C-2	384	116	500
D-1	431	69	500
E-1	280	220	500
E-2	231	269	500

Nb. p = productive, np = non productive

Table 3. Weighting and Convertion Factor

Work unit	Workload weight		
	low	average	high
A	0,00	0,58	0,42
B	0,00	0,50	0,50
C	0,00	0,67	0,33
D	0,00	0,58	0,42
E	0,25	0,58	0,17
Convertion	0,5	1	1,5

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

Work unit - Personnel	Normal-WL			WLs
	(1 w)	(1 m)	(1 y)	(1 y)
A-1	0,83	0,83	1,01	1,17
B-1	0,48	0,48	0,60	0,70
B-2	0,80	0,80	1,00	1,16
C-1	0,82	0,82	0,96	1,12
C-2	0,77	0,77	0,90	1,04
D-1	0,86	0,86	1,04	1,21
E-1	0,56	0,56	0,54	0,62
E-2	0,46	0,46	0,44	0,51
Avg	0,70	0,70	0,81	0,94

nb : w = week, m = month, y = year, WLs = standard workload, avg = average

Table 5.Calculating of Task Completion Time

	WPT (hour) per work units				
	A	B	C	D	E
CT	1977,1	2648,7	1855,4	1853,0	1201,2
NT	1977,1	2648,7	1855,4	1853,0	1201,2
ST	2.293	3.072	2.152	2.149	1.393

Nb : CT : cycle time, NT : normal time, ST : standard time

Table 6. Calculating of Workload (Method II)

Work unit	∑ TCT (hour)	∑ EWT (hour)	Work-load
A	2.293	1800	1,27
B	3.072	1800	1,71
C	2.152	1800	1,20
D	2.149	1800	1,19
E	1.393	1800	0,77
Average	2.212	1.800	1,23

Table 7. Workload of Units and Personnels

Work Unit	Mean Workload	Number of Personnels	
		Real (WL)	Opt. (WL)
A	1,22	1 (1,22)	2 (0,61)
B	1,78	2 (0,89)	2 (0,89)
C	1,68	2 (0,84)	2 (0,84)
D	1,20	2 (0,60)	2 (0,60)
E	0,96	3 (0,32)	2 (0,48)

Nb. WL = workload level

The results of interview with related personnels and head unit obtained facts that workload level was indistinguishable for each weeks so that WLn (1 week) assumed to be equal to WLn (1 month). The workload intensity of each month in a year is different, therefore to calculate WLn (1 year) must be multiplied by conversion factor and weighting value. The summary of convertion factor and workload weight of each work units as can be seen in Table 3. By the interviewed results with personnels and head unit, obtained convertion 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 personnels activities and working environment condition of all units were relatively same therefore we used allowances 16% for all personnels. The personnels' 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 personnels' 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 personnels for each work unit as can be seen in Table 7. Personnels' workload obtained by dividing workload of work unit to real number of personnels. Workload (WL) personnels unit A is 1,22, it means overload condition. WL personnels B and C are 0,89 and 0,84 nearly reach optimal level. WL personnels 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 personnels, and better keep maintain two personnels for optimality of service. Work unit of E is proposed to reduce one personnel.

5. CONCLUSION

Overall, the level of personnels' workload were not optimal. This study suggests that the number of personnels for each work units amounted to two personnels. 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 personnels in work unit optimally. This study could be extended for example by taking into account the areas of personnels competence with the job.

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