PT RTI PRODUCTION DIVISION MANPOWER PLANNING BASED ON WORKLOAD ANALYSIS USING WORK SAMPLING METHOD

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Abstract

Human resources have a role to support the realization of the company's strategic plan and increase company productivity. In the last three years PT RTI can't fulfill the demand target on time and also due to the lack of manpower, causing the workload in the production division to increase. Workload analysis and manpower planning will be done by using work sampling method. Result of calculation is a standard time that can be used for the manpower planning.
The results of the workload analysis show that the workload limit control is from 107,96% to 126,62%. The workload for each job is as follows: Designer (107,11% - Underload), Mechanic (145,59% - Overload), System Developer (118,61% - Optimal), Quality Control Staff (98,46% - Underload). The manpower planning needed in the company are one designer, five mechanics, three system developers and one quality control staff.

Keywords : manpower planning, work sampling, workload

I. Introduction

Human resources play an important role in improving the company's competitiveness. In addition, human resources have a role to support the realization of the company's strategic plan and increase company productivity [1]. The availability of human resources in organization is an important element in the organization or company. Even though, human resources itself is one of the biggest expenses of a company's operations, so every company wants to optimize their human resources

PT RTI dominates the radar market in the military, police and other government organizations. Besides that, the radar user of PT RTI is also come from the marine sector. PT RTI is included in the type of telecommunications and electronics manufacturing because the product is focus in telecommunications sector. As the time goes by, in the last three years company can't fulfil their demands and it means the company productivity is low. A good company productivity is when the company can reach the company's production target on time [2].

There are 2 designers, 3 mechanics,3 system developers and 2 quality control staff. The total number of employees in the production division is 10 persons. The high demand every year causes the company to have regulations that are adding working hours and working days. Poor air circulation and relatively small rooms have an impact on the difficulty of production division employees to work on some of their work and this has an impact on the workload of employees [3].

The main problem faced by PT RTI is that there is no balance in the workload of employees in the production division because there are employees who do tasks that are not their job and become a multiple workload and also the number of employees is not proportional to the number of demands received each year and it cause their physical workload increased.

Because the production time take a long time to produce the goods so this research will use work sampling method to analyze the workload of employee because work sampling method is easier to apply. In addition, the time used is more efficient because the information needed for research is easy to get in a short time and of course the cost used is also small. This method is very suitable for the company's condition because the production part has a non-repetitive work process and a long cycle time. As a result, from the problem described before, by using the work sampling method will be design the manpower planning for the company based on the workload of each employee.

II. Literature Review

II.1 HR Planning

HR planning is a specific step taken by management to ensure that the organization has the right workforce available to occupy the right positions and jobs at the right time [4]. Based on the definition, it can be interpreted that human resource planning is a process of determine the needs of the workforce based on forecasting, development, implementation, and control of those needs that are integrated with the organization's plan in order to create a number of employees appropriately and usefully effectively and efficiently.

II.1 Workload

Workloads are a number of targets that must be achieved in a given unit of time. Workload is an important aspect to account for the number of employees. If the employees's ability is higher than the workload obtained, then the employees will feel bored and vice versa if the employees's ability is lower compared to the workload it will cause fatigue.

II.2 Work Sampling Method

Work sampling is a technique for observing the work activities of a machine, human or a process. This method is performed to measure the workload directly because the implementation of workload measurement must be directly in the observed place. Work sampling method can also be used to know productive and non-productive activities of employees [5]. The formula to calculate the activities is as follows:

$$\% \text{ Productive} = \frac{\text{Total productive activities}}{\text{Number of observation}} \quad \ldots\ldots\ldots \text{(II-1)}$$

After that allowance factors and adjustment factors must be determined and calculated with the result of productive activities. Then, calculated the UCL and LCL to defined the limit of the data. From that the workload can be known whether it is optimal, overload or underload.

II.3 Adjustment Factors

There are several ways of determining the adjustment factor, one of them is by using Westinghouse. The Westinghouse provides the benchmarks used to direct the assessment of the gauge to the work of employees, Westinghouse's technique directs the assessment to 4 factors that determine fairness or abnormality in work such as skills, working conditions, effort, and consistency.

II.4 Allowance Factors

Allowance is given to three things such as personal needs, personal fatigue, and unavoidable problems. These three things are real things that employees experience and are not counted, recorded and observed in the study.

1. **Personal Allowance**
   Allowance for personal needs such as drinking to relieve thirst, performing worship, urinating or talking to friends in the work environment to eliminate boredom in doing work.
2. **Fatigue Allowance**
   Fatigue can be seen from the decrease in production of either quantity or quality. One of the way to measure allowance is by observing employees throughout the workday and recording when production is down
3. **Unavoidable Problems Allowance**
   At the time of doing a job, employees can not escape obstacles. There are avoidable and unavoidable obstacles. The obstacles that can be avoided are excessive chatting, idle, playing games during working hours.

II.5 Employee Calculation Needs

By determining the amount of time taken, it can be used to calculate the amount of employees needed to complete a job. Then it can also be used to determine the percentage of time used to perform activities that are not directly related to the production process but can benefit the organization, break time and time for personal purposes. Each of these times is summed up to obtain the amount of time it takes to complete a job. After that, the amount of time it takes to complete the work is divided by the amount of time provided to complete the work. That time it is also called the standard time of doing task. The formula is as follows:

$$Manpower\ Needs = \frac{Total\ Standard\ Time\ x\ Demands\ per\ periods}{Total\ Working\ Hours} \quad \ldots\ldots\ldots \text{(II-2)}$$

Standard time obtained from the activity and the output of employee during the observation. A total standard time for period obtained from the standard time during observation multiply with the demands.

III. Problem Solving Methods

III. 1 HR Planning Framework

In Figure III.1 is a framework of human resources planning. This framework will be help on doing the research.

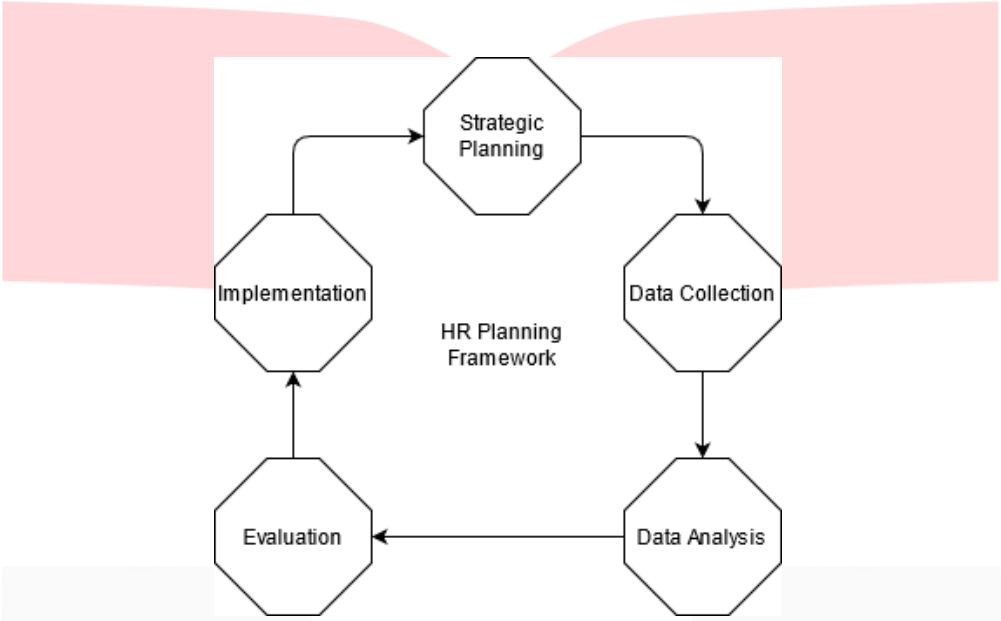

Figure III.1 Problem Solving Systematic

The framework above described about how to do manpower planning based on a structured framework to support the research. This framework begins with studying existing strategies. After that proceed to the data collection stage which serves to collect data used in research. After the data is collected, the data will be processed further after it is analyzed on the data. The analysis here is a gap analysis of the existing condition with the results of the calculation.

After that, the calculated data will be implemented. Because this is a manpower planning, the calculated data is the optimal number of employees in the company. Implementation here is how the company can implement the suggestion from the research. The company can reduce, train or recruit new employees. After that, an evaluation is carried out whether the step is beneficial or not, if it is beneficial, then the suggestion will be implemented in the company.

IV. Discussion

IV.1 Work Sampling Calculation

IV.1.1 Activities Calculation

Observation done for ten days to each job such as designer, mechanic, system developer and quality control staff. Observation process done using work sampling observation form. The activities observed divide into productive, non-productive and personal activities. After the observation has been done then it can continue to calculate the percentage of each activities. The formula to calculate activities as follows.

$$\%\ Productive = \frac{Total\ \ productive\ activities}{Number\ of\ observation} \text{ …….. (IV-1)}$$

$$\%\ Non - Productive = \frac{Total\ non{-}productive\ activities}{Number\ of\ observation} \text{ …… (IV-2)}$$

$$\%\ \text{Personal} = \frac{\text{Total personal activities}}{\text{Number of observation}} \text{ …….. (IV-3)}$$

By using those formula, the result from the production division is the employee doing the productive activities in range 76,67% until 93,33%, employee doing the non-productive activities in range 0,00% until 13,33% and in personal activities employee doing the activities in range 0,00% until 10,00%. With the average of productive activities 86,67%, non-productive activities 7,17% and personal activities 6,17%.

IV.1.2 Adjustment Factors

In determine the adjustment factors by Westinghouse, the employee will be given score according to the criteria that exist in Westinghouse method. The score is give to the four factors in Westinghouse, there are skill, effort, condition and consistency. After give the score to each factor then the score must be calculated to get the P score. P score is the adjustment score. Calculating the P score use the formula below.

$$P\ Score = 1 + total\ adjustment\ score \quad \text{..... (IV-4)}$$

After calculated the P score then it can be proceed to defined the normal time of each employee. The result is in the table below.

Table IV. 1 Normal Time

Job	Average Percentage	Observation Time	Average Normal Time
Desainer	84,67%	4800	4064,32 min
Mechanic	94,85%	4800	4552,80 min
System Developer	90,89%	4800	4362,56 min
Quality Control	80,38%	4800	3858,08 min

IV.1.3 Allowance Factors

Allowance is given for three types of things, namely personal needs, relieving fatigue, and obstacles that can not be avoided. In determining the allowance in each work process can be seen in seven factors of allowance such as exertion, work attitude, work movement, workplace temperature, atmospheric condition and good environmental conditions. An allowance score is given to each type of work. Scores will be given according to the work they do on a daily.

After the allowance score is defined then it can proceed to calculate the workload for each employee by using formula below.

$$Workload = Bkn + (Bkn\ x\ Allowance) \quad \text{..... (IV-5)}$$

This workload with allowance factors it can be called the standard time. The standard time is like in the table below.

Table IV.2 Standard Time

Jobs	Percentage Average	Observation Time	Time Average
Designer	107,11%	4800 min	5141,36 min
Mechanic	145,59%	4800 min	6988,53 min
System Developer	118,61%	4800 min	5693,16 min
Quality Control Staff	98,46%	4800 min	4726,15 min

IV.1.3 Workload Categories

From the calculation of workload percentage that has been calculated by the allowance and adjustment factor, the next step is to calculate the optimal workload range by using a formula for upper control limits and lower control limits. The result of the categorized workloads is shown in the table below.

Table IV.3 Workload Categories

Jobs	Workload	NCL	UCL	LCL	Category
Designer	107.11%	117.29%	126.62%	107.96%	Underload
Mechanic	145.59%	117.29%	126.62%	107.96%	Overload
System Developer	118.61%	117.29%	126.62%	107.96%	Optimal
Quality Control Staff	98.46%	117.29%	126.62%	107.96%	Underload

IV.2 Design of Estimated Employee Needs

The workload was obtained during ten days of observation. In ten days of observation each employee has a different output. Output is an achievement of the employees during a certain time. After it is known the output of each employee's work for ten days of observation, the standard time can be calculated.

After obtained the standard time during observation then to calculate the total standard time, it must be multiplied by company demand in a period. After that it can be able to calculate the manpower needs using the formula (II-2). The result from the calculation is like in the table below.

Table IV.4 Empployee Needs Suggestion

Jobs	Expected Demand/years	Total Standard Time	Expected Working Time/Period	Employee Suggestions	Rounded
Designer	10	64267.06 min	86400 min	0,744	1
Mechanic	10	349427.40 min	86400 min	4,044	5
System Developer	18	227725.63 min	86400 min	2,636	3
Quality Control Staff	10	72709.97 min	86400 min	0,842	1

After that from the data obtained it can be used to arrange the manpower planning table which is like in the table below.

Table IV.5 Manpower Planning Table

Jobs	Existing Employee	Employee Suggestion Needs	Gap
Designer	2 persons	1 person	(-) 1

Mechanic	3 persons	5 people	(+) 2
System Developer	3 persons	3 persons	(+) 0
Quality Control Staff Staff	2 persons	1 person	(-) 1

To find a new employee, the company needs a recruitment process. The recruitment process itself is divided into three steps, namely sourcing process, selection process and user process [6]. The recruitment process must be done immediately so that the company can meet the existing demand. Companies prefer to provide training so that employees who have workloads below the control limit can be more productive and contribute. Training itself is a way to increase employee productivity, improve employee quality and improve the development of employee skills and expertise [7].

IV.3 Integrated System Design

From all the problem and calculation that already explain in the previous sub chapter, an integrated system design can be arranged from all the data above. The integrated system design as illustrated in figure below.

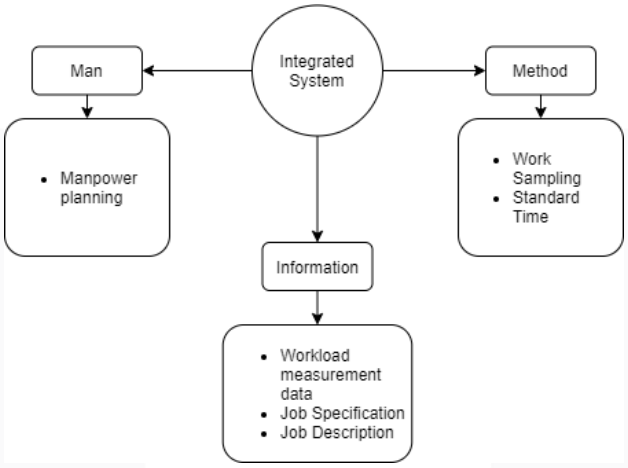

Figure IV.1 Integrated System Design

Man, method, and information play significant role in the concept of designing an integrated system for manpower planning. The man factor is consist of manpower planning data. The method factor consists of work sampling and standard time which applied to calculate the workload measurement and manpower planning. The information factor consists of workload measurement data, job specification and job description which the workload measurement data can be used to calculate the manpower planning and there is a job specification and job description for the employees.

V. Conclusion

The workload value of the production division employees measured using the work sampling method is as follows: Designer at 107.11%, Mechanical at 145.59%, System Developer at 118.61% and Quality Control Staff at 98.46 %. The manpower suggestion based on the workload sampling value is as follows: Designer consist only one employee while the existing condition are two people, mechanics consists of five employees while the existing condition are three people and quality control staff consist only one employee while the existing condition are two people.

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