

Determination Of The Number Of Employees Using The Full Time Equivalent Method Based On Workload (Case Study In The Cold Chain Administration Division Of PT. XYZ Makassar)

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ABSTRACT: PT. XYZ Cold Chain branch, especially in the Cold Chain Administration Division, has never measured the workload of employees in every existing position. This results in the number of employees in each position are not proportional to the number of job desk activities that must be done. Based on these problems, it is necessary to measure workload as a basis for calculating optimal employee needs. Workload analysis is very important to calculate how many employees are needed to complete tasks in a division of the company. In this study, the job description of each employee was identified, analyzed the workload for each employee and the number of employees needs in the Cold Chain Administration Division using the Full Time Equivalent method. Based on the results of the study, it was found that the FTE value of all employees was in the overload or > category of 1.28 for Administration Head / Supervisor of 1.41, Revenue Control (RC) of 1.86, Sales Admin of 2.70, and Accounting & Cashier amounted to 2.32. Based on the calculation of the proposal to determine the number of employees, the optimal number of employees in the Cold Chain Administration Division is 6 employees.

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NOMENCLATURE

Symbol	Description
FTE	Full Time Equivalent
K	Level of Confidence
LCL	Lower Class Limit
N	The Amount of Observational Data
N'	Amount of Theoretical Data
s	Level of Accuracy
UCL	Upper Class Limit
xi	Cycle Time
σ	Standar Deviation
$\sum xi$	Total Cycle Time

I. INTRODUCTION

A corporate organization must have people in it, be it a small-scale or large-scale corporate organization. Humans become one of the elements that determine whether a company's organization can be said to operate effectively and efficiently to achieve its goals of the company's organization. Humans or employees who work in an organization or company are known as human resources or known as HR [1]. Human resources can also be interpreted as individuals who work in a company and become part of the company known as employees, employees, workers, and laborers [2]. Human resources are included as an important component of a working system [3]. Human resources as a vital organ determining the productivity of a company require special attention in it.

In managing human resources owned by the company, separate management science is needed, namely human resource management, because humans have characteristics that are different from other resources. Human resource management is a process, and activity to manage, develop, maintain, and utilize humans to

support an organization or company in achieving its goals [4]. Human resource management or better known as HR is part of specific management science in managing the functions of employees or individuals to realize company goals, human resource management is also associated with the art of managing relationships between employee tasks starting from recruitment, selection, training, reward, to performance evaluation. In line with that, the function of human resource management is needed in planning good human resources which consists of planning human resource needs, filling in formations that are by company needs, employee work assessment, improving employee quality and work environment as well as human resource management objectives which include social goals and organizational goals [5].

Employees in carrying out the duties given must certainly provide good performance to obtain good results as well. Performance is the result of work carried out by individuals and groups in an organization or company following the authority and responsibility given to achieve company targets legally and not violate the rules [6]. Several factors can affect the performance of employees, namely motivation, job satisfaction, stress levels, work conditions, compensation systems, and job design [7].

PT. XYZ is a company engaged in transportation and logistics services.in carrying out the operations of the company PT. XYZ Cold Chain Branch is divided into 3 divisions, namely the marketing division, logistics division, and administration division. The administrative division is a division in charge of taking care of all administrative, and financial in the product delivery process.

Problems that exist at PT. XYZ administration division is employees cannot complete work on time because the number of employees in each position is not proportional to the number of work activities (job descriptions) that must be done. This condition results in work often being hampered and not infrequently this condition also results in employees having to work beyond the applicable operating hours so that the work given can be completed following predetermined targets. Based on these problems, it is necessary to calculate the workload as a basis for determining the appropriate number of employee needs. Workload analysis is very important for a company to find out how many employees are needed in a division or department to complete the work given. Workload needs to be considered to be able to know and adjust the provision of responsibility to the ability of employees in detail, a balance is needed in every part of a company between the capabilities possessed and the workload given [8].

In this research, observations, and identification of employee activity/work elements from each employee were carried out, knowing the duration of work time by measuring the length of employee work completion time, analyzing employee workload, and determining the number of employee's needs under job demands in the cold chain administration division using the Full Time Equivalent (FTE) method. Full Time Equivalent (FTE) is a method used to analyze workloads based on time, which measures the time needed to complete a job and then the time will be converted into the form of an FTE value index [4].

Five procedures must be carried out in workload analysis with the Full Time Equivalent (FTE) method [9], that is:

1. Determine the work unit along with the category of energy owned
2. Establish available working time in a year The data needed in determining working time in a year are:
 - a. Weekdays
 - b. Annual leave
 - c. Education and training
 - d. National holidays
 - e. Work absence
 - f. Working Time
3. Make allowance standards to know employee allowance factors which include the type of activity and time needed to complete an activity that is not included in their work activities. Activities that are not included with work activities are rest, prayer, going to the toilet, and several other activities.
4. Establish workload standards, namely, the volume of workload received by employees in completing their work (average time).

Calculate employee needs per work unit. At this stage, researchers analyze and calculate the number and category of employees who work according to the workload received.

II. EXPERIMENTAL SETUP

This research was conducted at the Cold Chain Administration Division of PT. XYZ Makassar for one month in December 2022 – January 2023. In this research, there are several stages carried out in collecting and sorting data, as for the stages as follows.

There are several data needed in this study, while the data in question are primary data and secondary data. Primary data includes the measurement of working time which aims to obtain standard time [10]. The measurement of working time in this study was carried out by measuring time directly with the downtime method which is suitable for use in short and repetitive work [11], allowance data for each employee, and factor

rating data from each employee's work activity determined by the Westinghouse method which includes the assessment of employee work in four factors that are considered to cause fairness and impropriety in work, namely skills, effort, condition, and consistency [12]. While secondary data include the number of employees, employee activities/work elements, and the amount of available time obtained from company archives and documents related to this study.

After the data needed for research has been collected, the next stage is processing data. The data processing in this study went through several stages as follows.

II.1. Determine the number of employees and the number of activities/elements of employee work

Determining the number of employees and the number of activities/elements of work is carried out by interviews, observations, and also using job description data of each employee of the company.

II.2. Determine the amount of time available in a year

To calculate the workload with the Full Time Equivalent (FTE) method, it is necessary to know the applicable or available working time at the company. The data used in determining the amount of time available in a year consists of working days, annual leave, public holidays, weekend holidays, and the average number of sick leave.

II.3. Determine the percentage of allowance from each employee

Allowance is the time needed by employees for personal purposes, such as rest and other reasons that are not related to the natural work process [13]. Allowance is classified into three categories, namely allowance for personal needs, allowance for fatigue allowance, and allowance for unavoidable things [14]. In this study, the allowance value was determined based on the ILO (International Labour Organization) table by making direct observations.

II.4. Calculation of total effective working time

Employee effective working time is obtained from the effectiveness of employee work that has been influenced by each employee's allowance value.

II.5. Data adequacy test and data uniformity tests

The data adequacy test is used as a basis for whether the data that has been collected is sufficient for data processing purposes. Meanwhile, the data uniformity test is used to determine whether the data that has been collected is within the control limit [15].

$$N' = \left[\frac{k/s \sqrt{N(\sum Xi^2) - (\sum Xi)^2}}{\sum Xi} \right]^2$$

$$\sigma = \sqrt{\frac{\sum (xi - \bar{x})^2}{N - 1}}$$

II.6. Calculation of activity processing time

The calculation of activity processing time or normal time is obtained from the cycle time of each element of employee activity which has been influenced by the performance rating value of each element of employee activity [16].

$$\text{Normal time} = \text{Cycle Time} \times \text{Performance rating}$$

II.7. Full Time Equivalent Method

Full Time Equivalent (FTE) is a workload analysis method used to convert working hours into the number of employees needed to complete certain jobs [17]. The advantages of the Full Time Equivalent (FTE) method are that it can increase company productivity, optimize employee work performance, and can find out the optimal number of employees needed by the company based on workload [18]. To get the Full Time Equivalent value of a work process, it is expressed in the following equation:

$$FTE = \frac{(\text{Total Hours})}{\text{Effective Hours/Years}}$$

Where total hours and effective hours/years can be calculated using the following equation:

1. Total Hours = frequency x normal time x number of working days / 60
2. Effective Hours/Years = total working hours in a year x allowance

After calculating the workload, the determination of results of the workload calculation is determined into three Full Time Equivalent index values in the table below [19].

TABLE I

FULL TIME EQUIVALENT VALUE INDEX

Value Index	FTE	Category
1,28	0 – 0,99	Underload
	0,99 –	Normal
	> 1,28	Overload

II.8. Determination of the number of employee needs

After conducting workload analysis using the Full Time Equivalent Method, the last step is to calculate the optimal number of employee needs. The equation for calculating employee needs is as follows [20].

$$Employee\ Needs = \frac{Workload}{Effective\ Working\ Time}$$

(5)

III. RESULTS AND DISCUSSION

III.1. Number of Employees and Elements of Work/Employee Activity

The number of employees in the Cold Chain Administration Division is 4 person, as for the division based on position and the number of work activities can be seen in the following table.

TABLE II
Number of Employees and Work Activities of the Cold Chain Administration Division

Position	Number of Employees	Number of Activities/Elements
Administration Head / Supervisor	1	8
Revenue Control (RC)	1	7
Sales Admin Accounting &	1	10
Cashier	1	6

III.2. Amount of Time Available

TABLE III
Amount of Time Available

Count	Amount	Unit
Number of days in a year	365	Days
Number of holidays in 2022	72	Days
Number of working days in 2022	293	Days
Number of hours worked in 2022	1957	Hours

From the table above, the total working hours for one year in the Cold Chain Administration Division are 1957 hours. The total working hours per year will be influenced by the percentage of allowance for each employee which will result in effective working hours per year for each employee.

III.3. Allowance

In this research, the allowance value was determined based on the International Labour Organization (ILO) table. Allowance assessment is carried out by researchers by making direct observations and approval by the company. The following is the total percentage of allowance from each employee in the cold chain administration division.

TABLE IV
Total Allowance Percentage for Each Employee

Position	Total Percentage Allowance
Administration Head / Supervisor	11%
Revenue Control (RC)	15%
Sales Admin	12%
Accounting & Cashier	15%

III.4. Effective Working Time of Employees

Effective working time is obtained from the effectiveness of employee work which has been influenced by the value of each employee's allowance.

TABLE V
Effective Working Time of Employee

Position	Work Effectiveness	Effective working time/year
Administration Head / Supervisor	89%	1741,73 Hours
Revenue Control (RC)	85%	1663,45 Hours
Admin Sales	88%	1722,16 Hours
Accounting & Cashier	85%	1663,45 Hours

III.5. Data Adequacy Test and Data Uniformity Test

At this stage, the time measurement data that has been obtained (cycle time) will be tested with data adequacy tests and data uniformity tests. There are two influencing factors, namely the level of confidence (k) and the level of accuracy.

TABLE VI
Results of Data Adequacy Test and Data Uniformity Test

Position	Activity	Σxi	le Time	Cyc		UC		LC		N	N	ory	Categ			
				L	L	L	L									
Administration Head/Supervisor	ity 1	48	240,	5	24,0	3	27,8	7	20,2	0	1	,7	4	ate	Adequ	
	ity 2	12	311,	1	31,1	1	34,9	2	27,3	0	1	,8	2	ate	Adequ	
	ity 3	17	139,	2	13,9	6	16,4	7	11,3	0	1	,5	9	ate	Adequ	
	ity 4	66	455,	7	45,5	9	51,0	4	40,0	0	1	,9	1	ate	Adequ	
	ity 5	97	922,	0	92,3	1	98,6	9	85,9	0	1	,5	0	ate	Adequ	
	ity 6	53	201,	5	20,1	0	23,0	1	17,3	0	1	,0	5	ate	Adequ	
	ity 7	28	397,	3	39,7	7	44,5	9	34,8	0	1	,2	2	ate	Adequ	
	ity 8	01	109,	0	10,9	8	12,4		9,33	0	1	,5	9	ate	Adequ	
Revenue Control (RC)	ity 1	Activ	1971	11	197,	48	223,	74	170,	0	1	,5	0	ate	Adequ	
	ity 2	Activ	285,	0	28,5	2	38,6	8	18,3	0	1	,0	9	ate	Adequ	
	ity 3	Activ	100,	9	10,0	0	11,3		8,87	0	1	,6	8	ate	Adequ	
	ity 4	Activ	140,	7	14,0	5	16,6	0	11,5	0	1	,4	9	ate	Adequ	
	ity 5	Activ	234,	5	23,4	6	29,7	3	17,1	0	1	,3	8	ate	Adequ	
	ity 6	Activ	635,	7	63,5	6	68,0	9	59,0	0	1	,8	0	ate	Adequ	
	ity 7	Activ	187,	1	18,7	1	22,9	2	14,5	0	1	,6	8	ate	Adequ	
Admin Sales	ity 1	Activ	1376	64	137,	22	150,	07	125,	0	1	,5	0	ate	Adequ	
	ity 2	Activ	753,	6	75,3	1	89,2	0	61,5	0	1	,8	1	ate	Adequ	
	ity 3	Activ	605,	6	60,5	1	75,1	0	45,8	0	1	,8	2	ate	Adequ	
	ity 4	Activ	248,	2	24,8	5	33,0	9	16,5	0	1	,9	9	ate	Adequ	
	ity 5	Activ	11	534,	1	53,4	9	83,5	3	23,2	0	1	,7	7	ate	Adequ
	ity 6	Activ	04	393,	0	39,3	7	53,7	4	24,8	0	1	,6	6	ate	Adequ
	ity 7	Activ	04	410,	0	41,0	2	60,3	9	21,7	0	1	,7	8	ate	Adequ
	ity 8	Activ	39	201,	4	20,1	1	25,0	7	15,1	0	1	,2	8	ate	Adequ
	ity 9	Activ	05	322,	1	32,2	5	44,6	6	19,7	0	1	,8	8	ate	Adequ

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	ity 10	Activ	19	490,	2	49,0	7	63,1	6	34,8	0	1	,2	4	ate	Adequ
	ity 1	Activ	,76	1131	18	113,	80	136,	5	89,5	0	1	,3	1	ate	Adequ
	ity 2	Activ	76	843,	8	84,3	2	88,2	4	80,5	0	1	,4	0	ate	Adequ
	ity 3	Activ	62	712,	6	71,2	9	77,5	3	64,9	0	1	,9	0	ate	Adequ
Accounting & Cashier	ity 4	Activ	11	750,	1	75,0	20	107,	2	42,8	0	1	,1	4	ate	Adequ
	ity 5	Activ	83	595,	8	59,5	2	93,4	5	25,7	0	1	,9	6	ate	Adequ
	ity 6	Activ	26	486,	3	48,6	3	75,0	2	22,2	0	1	,0	8	ate	Adequ

III.6. Activity Processing Time (Normal Time)

Activity processing time (normal time) is obtained from the cycle time of each employee activity which is influenced by the performance rating value of each employee activity.

TABLE VII
Activity Processing Time (Normal Time)

Position	No	Activity	Rating	Performance	Cycle Time (Mminutes)	Normal Time (Mminutes)
Administration Head / Supervisor	1	1	Activity	1,06	24,05	25,49
	2	2	Activity	1,11	31,11	34,53
	3	3	Activity	1,13	13,92	15,73
	4	4	Activity	1,08	45,57	49,21
	5	5	Activity	1,11	92,30	102,45
	6	6	Activity	1,03	20,15	20,76
	7	7	Activity	1,08	39,73	42,91
	8	8	Activity	1,03	10,90	11,23
Revenue Control (RC)	1	1	Activity	1,09	197,11	214,85
	2	2	Activity	1,06	28,50	30,21
	3	3	Activity	1,03	10,09	10,39
	4	4	Activity	1,01	14,07	14,21
	5	5	Activity	1,08	23,45	25,32
	6	6	Activity	1,02	63,57	64,84
	7	7	Activity	1,04	18,71	19,46
Sales Admin	1	1	Activity	1,06	137,64	145,90
	2	2	Activity	1,06	75,36	79,88
	3	3	Activity	1,15	60,52	69,60
	4	4	Activity	1,08	24,81	26,80
	5	5	Activity	1,06	53,40	56,51
	6	6	Activity	1,01	39,30	39,70
	7	7	Activity	1,08	41,04	44,32
	8	8	Activity	1,08	20,11	21,71
	9	9	Activity	1,11	32,23	35,77
	10	10	Activity	1,03	49,02	50,49
Accounting & Cashier	1	1	Activity	1,06	113,18	119,97
	2	2	Activity	1,05	84,38	88,59
	3	3	Activity	1,06	71,26	75,54
	4	4	Activity	1,06	75,01	79,51
	5	5	Activity	1,02	59,58	60,77
	6	6	Activity	1,03	48,63	50,08

III.7. Full Time Equivalent (FTE) Method

The calculation of workload with the Full Time Equivalent method is carried out based on total hours/years then divided by the total effective working time that has been affected by the allowance factor.

TABLE VIII
FULL TIME EQUIVALENT Score of Administration Head / Supervisor

Administration Head / Supervisor					
Activity	Intensity	Total Hours/Years	Effective (Hours/year)	working	FTE
1	Activity	Daily	207,46	1741,73	0,12
2	Activity	Daily	281,04	1741,73	0,16
3	Activity	Daily	128,02	1741,73	0,07
4	Activity	Daily	400,51	1741,73	0,23
5	Activity	Daily	833,83	1741,73	0,48
6	Activity	Daily	168,96	1741,73	0,10
7	Activity	Daily	349,24	1741,73	0,20
8	Activity	Daily	91,40	1741,73	0,05
TOTAL					1,41

TABLE IX
FULL TIME EQUIVALENT Score of REVENUE CONTROL (RC)

Revenue Control (RC)					
Activity	Intensity	Total Hours/Years	Effective working (Hours/year)		FTE
1	Activity	Daily	1748,64	1663,45	1,05
2	Activity	Daily	245,88	1663,45	0,15
3	Activity	Daily	84,56	1663,45	0,05
4	Activity	Daily	115,65	1663,45	0,07
5	Activity	Daily	206,08	1663,45	0,12
6	Activity	Daily	527,73	1663,45	0,32
7	Activity	Daily	158,38	1663,45	0,10
TOTAL					1,86

TABLE X
FULL TIME EQUIVALENT Score of SALES ADMIN

Sales Admin					
Activity	Intensity	total Hours/Years	T (Hours/year)	Effective working	FTE
Activity 1	Daily	187,46	1	1722,16	0,69
Activity 2	Daily	50,13	6	1722,16	0,38
Activity 3	Daily	66,47	5	1722,16	0,33
Activity 4	Daily	18,12	2	1722,16	0,13
Activity 5	Daily	59,93	4	1722,16	0,27
Activity 6	Daily	23,11	3	1722,16	0,19
Activity 7	Daily	60,72	3	1722,16	0,21

Activity 8	Daily	76,70	1	1722,16	0,10
Activity 9	Daily	91,13	2	1722,16	0,17
Activity 10	Daily	10,93	4	1722,16	0,24
TOTAL					2,70

TABLE X
FULL TIME EQUIVALENT Score of SALES ACCOUNTING & CASHIER

Accounting & Cashier				
Activity	Intensity	Total Hours/Years	Effective working (Hours/year)	FTE
Activity 1	Daily	976,42	1663,45	0,59
Activity 2	Daily	721,02	1663,45	0,43
Activity 3	Daily	614,81	1663,45	0,37
Activity 4	Daily	647,12	1663,45	0,39
Activity 5	Daily	494,60	1663,45	0,30
Activity 6	Daily	407,60	1663,45	0,25
TOTAL				2,32

III.8. Determination The Number of Employees

The determination of the number of employees in the cold chain administration division is carried out by considering the total value of the full time equivalent index of all work activities of each employee, the total working time required from each activity, and also what types of activities are carried out by employees.

TABLE XI
Analysis of the number of employee needs

Position	FTE	Initial Number of Employees	Number of Theoretical Employee Needs	Proposed Optimal Number of Employees
Administration Head / Supervisor	1,41	1	1,15	1
Revenue Control (RC)	1,86	1	1,88	2
Sales Admin	2,70	1	1,62	1
Accounting & Cashier	2,32	1	1,93	2
TOTAL	8,29	4	6,58	6

IV. CONCLUSION

This study discusses workload analysis using the Full Time Equivalent method to determine the optimal number of employees needed in the cold chain administration division of PT. XYZ.

Workload analysis is very important to apply to a company to know and adjust the division of tasks and responsibilities of each existing employee so that it can create a balance in each work unit which will result in increased company performance and productivity.

The Full Time Equivalent method is very suitable for use in workload analysis to find out the optimal number of employees in a work unit or company because this method aims to convert working hours into the number of people needed to complete the job. In addition to using the full time equivalent value, effective working time, and time needed to complete a job, in determining the optimal number of employees it is also necessary to consider the type of work activity being carried out.

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