Implementation Cognitive Ergonomic on Measurement Mental Workload (Case study: Marketing Employee of Insurance Company)

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Abstract. Employee marketing of insurance company (PT.X) met pressure because increasing work demands added to the mental workload. These pressure resulting in fatigue and increase absenteeism due to illness by 50% from the previous year. The data shows that the level of employee health has decreased, and it can be said that the quality of life is related to health in insurance marketing employees is also low. The purpose of this research are to apply te cognitive ergonomic in order measurement the level of mental workload and marketing employee quality of life. The measurement of the level of mental workload was carried out using the NASA-TLX method, while the measurement of the level of quality of life was carried out using the SF-36 method. Based on the measurement mental workload using cognitive ergonomic approach with the NASA-TLX method, the highest average mental workload fell on marketing work when overtime was 70.04, the value is in the high category. As for the measurement using the SF-36 method, the lowest average score fell to the Role Limitation Emotional dimension of 55.6. The results of the correlation test using Spearman Rho concluded that there is a relationship between the profile of respondents with mental workload, the profile of respondents with quality of life, and the relationship between mental workload with quality of life. The results of the measurement shows that are used to redesign the work system in the form of proposals and improvements
Keywords*:* ergonomic cognitive, mental workload, quality of life, NASA-TLX, SF-36

1. Introduction

According to the International Ergonomics Association, cognitive ergonomics is concerned with mental processes such as perception, memory, reasoning, and motor response, as they affect interactions amongst humans and other elements of a system [1]. It is the discipline and practices for making human-system interaction compatible with human cognitive abilities and limitations, particularly at work The ergonomic cognitive especially of mental workload are important aspect to increase productivity of employee. The demands of performance at work and conflicts at work and family became the most important and the most significant contributing sources of stress among employees in the insurance industry. Other sources of stress in the insurance industry include dealing with interactions in dealing with clients, the ability of individuals to be consistent in achieving the desired position, time pressure and deadline meetings, working continuously to achieve targets, mental tension, and excessive workload. Workload, both physical and mental, is experienced by every employee, one of which is fatigue due to working late into the night/overtime to pursue work

deadlines. The fatigue is likely to result in absenteeism due to increased employee absenteeism and in other words, shows that the level of employee health has decreased. It can be concluded that the quality of life of employees is low because health is one of the nine indicators of the level of quality of life.

The workload can be interpreted as the difference between the ability or capacity of employees with work demands [1]. The workload is divided into two namely, physical workload and mental workload. When workers experience excessive mental workload it can cause health problems for workers both directly and indirectly. Quality of life has two basic components, subjectivity, and multidimensionality. Subjectivity means that the quality of life can only be determined from the point of view of the client itself, and this can only be known by asking the client directly. While multidimensional means that the quality of life is seen from all aspects of a person's life. holistically, including physical, psychological, social, and environmental aspects.

PT. X as insurance company issued a new product called Travel Insurance. Therefore the insurance marketing employees are required to do more work. The increasing work demands added to the mental workload resulting in fatigue resulting in an increase in absenteeism due to illness by 50% from the previous three months. The data shows that the level of employee health has decreased, and it can be said that the quality of life is related to health in PT.X insurance marketing employees is also low. So it is needed to measure the level of mental workload and the level of quality of life. In this study, the measurement of the level of mental workload was carried out using the NASA-TLX method, while the measurement of the level of quality of life was carried out using the SF-36 method.

Insurance marketing is a job that has a high mental workload. According to [3] marketing is a whole system of business activities aimed at planning, pricing, promoting and distributing goods and services that satisfy the needs of both existing and potential buyers. The objects in this study were all insurance marketing employees at PT. X, a total of 15 people, including two assistant managers and one team manager. PT. X insurance marketing sales target achievement of all insurance products reaches 15 billion rupiah per year. The purpose of this study is to apply of cognitive ergonomomic in order to measure the level of mental workload and quality of life, find out whether there is a relationship between the two, and make proposals that aim to improve the work system of marketing employees.

2. Methods

2.1 Research Methodology

To measure the level of mental workload in this study using the NASA-Task Load Index (NASA-TLX). This method uses 6 attributes or also called dimensions that are used as a representation of the workload supported by employees (Hart and Staveland, 1988). The dimensions used in this method are Mental Request (MD), Physical Request (PD), Temporal Request (TD), Effort (E), Performance (P), and Frustration (F).Measurement with this method uses 2 stages to produce the final value of measurement, namely:

a. Rating Granting for work
   This stage is done by ranking each dimension. The rating scale is 0-100 with a range of values of 5. mployees give an (x) sign on the scale that has been provided based on the mental workload served.
b. Paired weighting done. This stage will provide 15 pairs of attributes which employees will then choose by circling one of the dimensions that suit the more dominant company they face.

Measurements using NASA-TLX method will be carried out 3 times, namely for all jobs and 2 division of work. The division of labor are classification as Overall (W1), Meeting (W2) and Overtime (W3). To measure the level of quality of life, are used the Medical Outcome Study Short Form-36 (SF-36). The SF-36 is a survey questionnaire to measure the value of quality of life related to health. The questionnaire consisted of a total of 36 questions in which there were eight health criteria. The eight health criteria of the SF-36 are Physical Function, Physical Role Limitation, Emotional Role

Limitation, Energy, Emotional Well Being, Social Function, Pain, General Health. To measure the relationship between the 2 variables used the correlation coefficient test using the Spearman rank. The correlation coefficient is a statistical measurement of covariance or association between two variables. The correlation coefficient shows the strength of the linear relationship and the direction of the relationship between the two random variables. If the correlation coefficient is positive, then the two variables have a direct relationship.

2.2 Data Collection and Processing

Mental workload data are measured using a questionnaire, the next step is to do the calculation by combining the results of the rating and weighting. The average rating and weight of the measurement results using the NASA-Task Load Index method can be seen in Table 1.

Table 1. Average Rating and Weight Wokload of Dimension

Dimension	Job Classification		
	W1	W2	W3
MD (Mental Request)	71.0	72.3	73.3
PD (Physical Request)	68.3	65.0	72.7
TD (Temporal Request)	74.0	71.7	75.0
P (Performance)	43.0	46.3	61.3
E (Effort)	73.7	74.3	70.7
F (Frustration)	74.3	70.7	71.3

3. Result and Discussion

At the level of quality of life data processing, the results of scoring are divided into 2, namely physical components and mental components. The results of scoring the average value of recapitulation by the SF-36 method can be seen in Table 2

Table 2. Average NASA-TLX rating values

Dimension	Job Classification		
	W1	W2	W3
MD (Mental Request)	2.7	2.6	2.8
PD (Physical Request)	2.2	2.2	1.9
TD (Temporal Request)	2.0	2.5	2.8
P (Performance)	2.9	3.5	3.1
E (Effort)	3.0	2.5	2,0
F (Frustration)	2.2	1.7	2.4
WWL Average	66.62	66.38	70.04

According to value of NASA -TLX scoring there are fourth categorize such as ; low (10-33), middle (34-56), high (57-79) and very high (80-100).At the level of quality of life data processing, the results of scoring are divided into 2, namely physical components and mental components. The results of scoring the average value of recapitulation by the SF-36 method can be seen in Table 3

Table 3. Average physical rating scores of

Dimension	Job Classification			
	P	RLP	Pain	GH
Physic workload	86.3	63.3	82.3	75.7
Mental workoad	68.3	65.0	72.7	75.7

Measurement of the relationship between mental workload and quality o f life are used correlation coefficient test. The correlation coefficient test used is the Spearman Rank. In addition, statistical tests were also conducted to see the relationship between respondents' profiles and mental orkload and quality of life. The steps taken for the statistical test are as follows:

a. Determine the hypothesis
H0: There is no relationship between WWL NASA-TLX and SF-36
H1: There is a NASA-TLX WWL relationship with SF-36

b. Determine the decision making criteria by comparing the value of sig with a 0.05, namely:
H0 is accepted if sig > 0.05
H1 is rejected if sig < 0.05

c. The Spearman test processed with the SPSS STATISTIC 20 program can be seen in Figure 1.

Correlations

			Physical	Role Limitation P	Role Limitation E	Energy	Emotional	Social	Pain	General Health
Spearman's rho	W1	Correlation Coefficient	.070	-.397	-.175	.244	.027	-.254	.228	.237
		Sig. (2-tailed)	.804	.143	.532	.380	.924	.360	.414	.394
		N	15	15	15	15	15	15	15	15
	W2	Correlation Coefficient	.288	-.668	-.246	.106	.064	.162	.148	.262
		Sig. (2-tailed)	.298	.006	.378	.707	.820	.564	.598	.345
		N	15	15	15	15	15	15	15	15
	W3	Correlation Coefficient	.463	-.590	.304	.168	.016	-.127	.158	.087
		Sig. (2-tailed)	.082	.021	.270	.550	.954	.651	.575	.759
		N	15	15	15	15	15	15	15	15

Figure 1. NASA TLX and SF-36 Spearman Rank Test

Based on the measurement results with the NASA-TLX method, the highest average mental workload fell on marketing work when overtime was 70.04, the value is in the high category. As for the measurement using the SF-36 method, the lowest average score fell to the Role Limitation Emotional dimension of 55.6. The results of the correlation test using Spearman Rho concluded that there is a relationship between the profile of respondents with mental workload, the profile of respondents with quality of life, and the relationship between mental workload with quality of life. The results of the measurement and analysis of the data are used to redesign the work system in the form of proposals and improvements

4. Conclusion

Based on the results of measurements, processing, testing, and analysis of data that has been done the conclusions that can be given are as follows:

a. The measurement of the level of mental workload experienced by marketing employees on PT.X insurance by using NASA-TLX, it can be seen that none of the work codes are in a low category. The highest mental workload found in the W3 work code is mental workload during overtime activities with score of 70.04, and the lowest mentalworkload falls on the work code W2 or mental workload during meeting activities with score of 66.38.
b. Based on the results of the measurement of the level of quality of life-related to health produced by marketing employees using SF-36 it can be seen that the Role Limitation Emotional dimension has the lowest value of 55.6 and the Physical dimension has the highest value of 86.3.
c. It is known that there is a relationship between the respondent's profile and mental workload. This was proven based on the results of the correlation test using Spearman Rho.

d. It is known that there is a relationship between the respondent's profile and the level of quality of life. This was proven based on the results of the correlation test using Spearman Rho.
e. It is known that there is a relationship between mental workload and quality of life. This was proven based on the results of the correlation test using Spearman Rho.
f. The improvements that can be applied to companies are as follows: Evaluate normal working hours and overtime hours, evaluation of working outside working hours, evaluate the implementation of meetings, evaluate the determination of targets and deadlines

5. References

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