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The Relation of EEG and NASA- TLX Score of Errors in the Sample Inspection Process.

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Abstract : *The purpose of this research was finding the factors that cause human error in inspection process by using the 2k Factorial Design between the EEG and NASA Task Load Index (NASA-TLX) to evaluate mental workload. Based on surveys and analyzes from Pareto charts, the factors that cause errors are mostly from fonts and sizes. When analyzing the results of the experiment, it was found that first subject, factor that caused the error s was the font and size. The second subject which failed to identify the cause of the error. The third subject, factor that caused the error s was the size. So it is concluded that the factor that caused the error is size. By analyzing the relationship of the variable font size, the number of errors, EEG, and NASA-TLX found that the number of errors and EEG have the Pearson correlation coefficient = 0.582, indicating that two variables are related to each other in the same direction and with the P-Value = 0.018 < 0.05, ie the two variables are correlated to each other significantly.*

Keywords *-2k Factorial Design, Ergonomics, Electroencephalograph, EEG, NASA-TLX*

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I. INTRODUCTION

The work from factory has complex quality of inspection such as label inspection before send to production process, Inspection of a car structure, aircraft assembly and including products other. These quality checks are complicated. The physical load is also affects the thought and mind [1], [2]. This makes the quality and efficiency of the job a mistake and delay in the work. It can lead to many accidents and losses to the factory. To assess the workload are appropriate for the operation, so it's important for the efficiency and operation of the plant. Workload from operation if not appropriate, it's will cause the cognitive of the fatigue from the work and decrease performance [3].

Ergonomics is a study of working conditions that correlate between work, environment and consideration of the workplace [4]. Design a comfortable for operation. To prevent problems that may affect safety, health in work and can enhance performance. As well as make the operator feels more comfortable. Ergonomics is important for improving workplace use the principles of ergonomics can be achieved by modifying new forms of work such as design tool and work stations to reduce fatigue, errors from operation.

Machines, robots, or high technology used in many industries. However, some jobs in the sample process still require worker such as the Production process, Inspection work or Machine control, these works were often mistake by worker.

Especially in the Inspection process if the employee misses the check will make the product is not quality if it is sent to the customer may cause damage to the company.

This research objective was focuses on finding the factors that cause human error in Inspection process. Experimental Design with 2kFactorial Design and Statistical Evaluation ofbrainwave(Electroencephalograph: EEG), NASA-TLX[5],[6],[7] and errorsfind relation of 3 factors.

II. METHODS

The purpose of this research to find the factors that cause human error in label pick out process by EEG), NASA-TLX and proposed solutions to reduce the error in process. The procedure is as follows:[8], [9],[10]

1. Study of basic principles of ergonomics and measurement of brainwave (EEG)
2. Study and survey in Inspection process of the sample company.
3. Study related researchandprinciples.
4. Design a surveyquestionnaire and explore the factors that cause the error.
5. The data obtained from the survey was analyzed by Pareto chart.

6. Design the experiments by 2k Factorial Designs and using the factors that analyzed by Pareto chart is the main factor.
7. Performing an experiment.
8. Evaluate workloads from EEG and NASA-TLX.
9. Statistical analysis
10. Summarize the results and examine the relationship of equipment.

The installation of EEGandMINICAP

The sampleofbrainwave signal (EEG) of workload test.

III. RESULTS

3.1. The results of thecause of errorbysurvey and analysis. The interrogation by 8 workers shown in the following table

Table 1 Overall scores of factors.

Factors	**Scores**	**%**
Font	25	33.78
Color	23	31.08
Size	20	27.03
Storage	5	6.76
Interval	1	1.35
Total	74	100.00

Then, create a Pareto chart by total score of each factor to find the most likely cause of the error in the work.

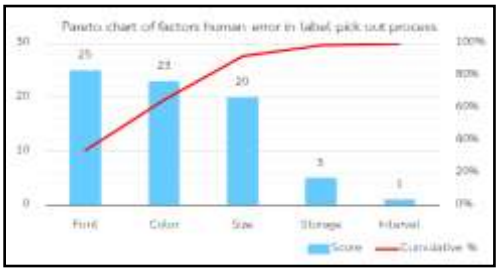

Fig. 1 Pareto charts show the cause of error in label pick out process.

From the Pareto charts, the factors that caused errors in process were font and color, but due to size, the scores were very high and close to the two factors mentioned above so that researcher will also studied this factor and the scope of this research was to test only the productofcar label. From the information that has been made mistakes in the past 3 months, we saw that Size label had the most error. The color of the label was not different.

So that, this studied investigated two factors were font and size.

3.2 Results of Experimental by 2^k Factorial Design

The experimental design defines the inputs and attributes as follows:

1.From the analysis of the Pareto chart, the factors that are studied were font and size.

2. Set2 levels of font were old and new.

3. Set2 levels of size were old and new.

Table 2 Defined Factors and Level and Experimental model

Factors	Level	
Font	old	new
Size	old	new

No.	Font	Size
1	old	old
2	old	new
3	new	old
4	new	new

There were 4 models,then experimented with 3subjectand replicate 4 times (except EEG replicate 2 times). All experiments are 4 x 4 x 3 = 48. Experiment time 60 minutes or 600 labels. The result was number of errors as follows:

Assumptions to be tested include: Test of Main Factors and Test of Interaction Factors. The hypotheses are as follows:

H_0= The factor did not affect the number of errors.

H_1 = The factor affects the number of errors.

1. Main effect case from font (factor A)

$H_0 : \alpha_1 = \alpha_2 = 0$

$H_1 : \alpha_i \neq 0$At least 1 value

2. Main effect case from size (factor B)

$H_0 : \beta_1 = \beta_2 = 0$

$H_1 : \beta_j \neq 0$At least1value

3. Interaction effects between fonts and sizes

$H_0 : (\alpha\beta)_{ij} = 0 \ \forall_{i,j}$Then i ,j = 1and2

$H_1 : (\alpha\beta)_{ij} \neq 0 \ \exists_{i,j}$ At least 1 value

When

α = the influence of font

β = the influence of size.

$\alpha\beta$ = the influence of the font and size.

The statistics used to test the hypothesis are F

$$\mathbf{F_0 = \frac{MS_{Factor\ or\ Interaction}}{MS_E}; V_{Factor\ or\ Interaction}, V_E}$$

The test was a one-way test, so it was possible to reject H0 at $F_0 > F_{\alpha, V1, V2}$. Moreover, the hypothesis could be tested by considering the P-Value if the P-value of any factor was greater than the significance level set, the factor did not affected the response variable. On the other hand, if any factor had a P-value less than the significance level, the factor Effected on response variables. The level of significance $\alpha = 0.05$. The results of the analysis of the number of errors in the experiments of 3 subject with the Statistical analysis shown as follows:

1. Analysis of errors by Statistical analysis of the first subject.

```
Analysis of Variance
Source             DF Adj SS  Adj MS F-Value P-Value
Model               3 117.250 39.0833  8.30 0.003
  Linear            2 117.000 58.5000 12.42  0.001
    Font            1  36.000 36.0000  7.65  0.017
    Size            1  81.000 81.0000 17.20  0.001
  2-Way Interactions1   0.250  0.2500 0.05  0.822
    Font*Size       1   0.250  0.25000.05  0.822
Error              12  56.500  4.7083
Total              15 173.750

Model Summary
      S    R-sq R-sq(adj)  R-sq(pred)
2.16987  67.48%     59.35%      42.19%
```

Fig.2 Results of Experimental Analysis of the first subject.

The two main factors were font and size had a p-value less than 0.05.
- Font had a p-value = 0.017 < 0.05.
- Size had a p-value = 0.001 < 0.05

When P-Value < α; Rejection H_0, it could be concluded that factor affect the number of errors significantly.
When considering Interaction, P-Value was greater than 0.05.
- Fonts*Size had p-value = 0.822 > 0.05.

When P-Value > α; Fail Reject H_0, it could be concluded that factor did not affected to the errors significantly.

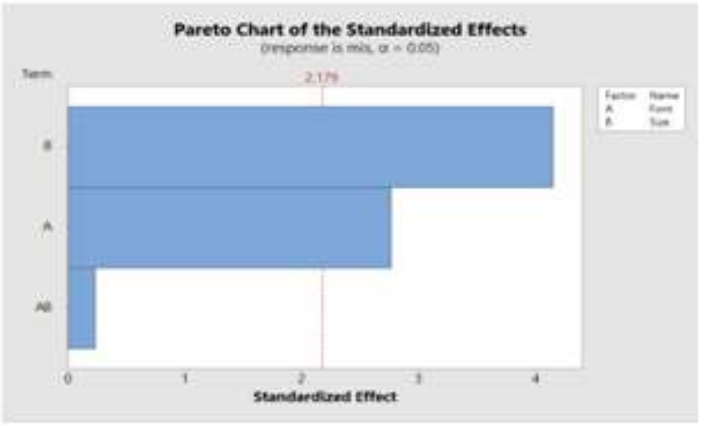

Fig. 3 Identifies significant factors for errors with the Pareto diagram and the main effects of the first subject.

Fig. 3 shown the absolute value of the effect on the Pareto Chart. If the graph of the factor exceeds the baseline, it indicates that the factor had a significant effect. It could not be eliminated from Fig. 3. The factors were Font: A and Size: B, which significantly affected to errors.

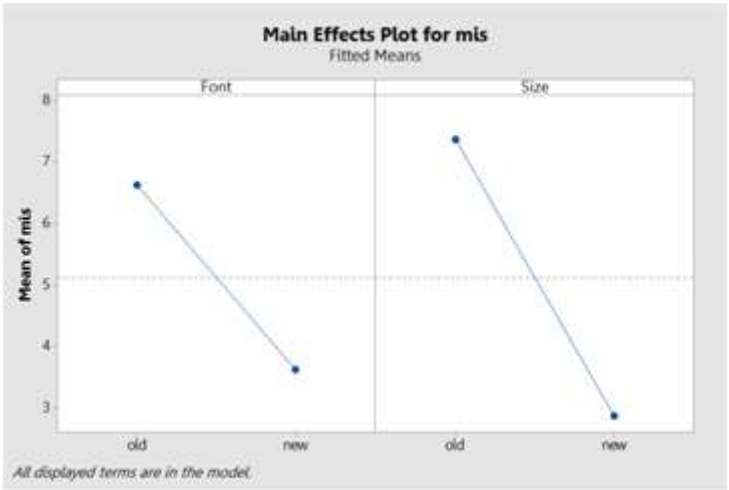

Fig. 4 Main Experimental Plot of the first subject.

Main Effects Plot shown font and size had similar errors.
- Old Font was the effect of increasing the errors compared to the New Font.
- Old Size was the effect of increasing the errors compared to the New Size.

It could be concluded that the levels of both factors had an effect on the number of errors. Therefore, the Interaction Plot was considered. If the mutual influence between the two factors was significant, it could be influenced.

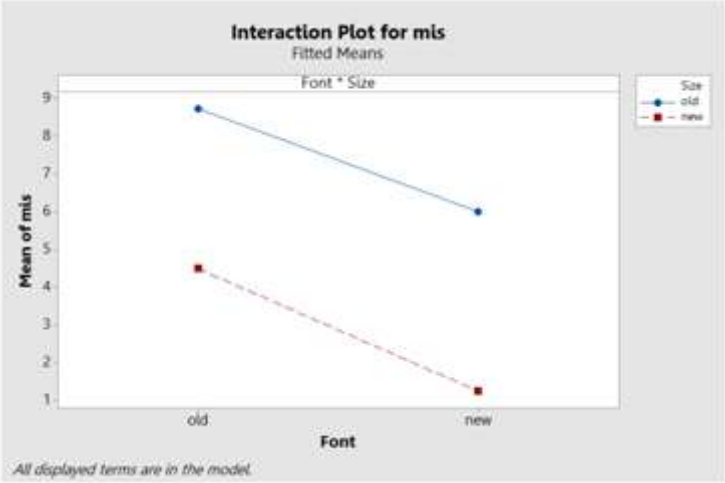

Fig. 4 Interaction Plot of the first subject.

Interaction Plot shown the effect of changing the level of factors on another factor because the interaction effected to main effect to more or less. Therefore, the interaction of factors was very important.Fig. 4 shown that font and size were not Interaction Effect.

2. Analysis of errors by Statistical analysis of the second subject.

```
Analysis of Variance
Source            DF Adj SS   Adj MS F-Value P-Value
Model              3  8.5000 2.83333   1.94   0.177
  Linear           2  2.2500 1.12500   0.77   0.484
    Font           1  0.0000 0.00000   0.00   1.000
    Size           1  2.2500 2.25000   1.54   0.238
  2-Way Interactions1   6.2500 6.25000   4.29   0.061
    Font*Size      1  6.2500 6.25000   4.29   0.061
Error             12 17.5000 1.45833
Total             15 26.0000

Model Summary
      S    R-sq R-sq(adj)  R-sq(pred)
1.20761  32.69%     15.87%        0.00%
```

Fig. 5 Results of Experimental Analysis of the second subject.

The two main factors were font and size had a p-value greater than 0.05.
- Font had a p-value = 1.000 > 0.05
- Size had a p-value = 0.238 > 0.05

When P-Value > α; Fail Rejection H0, it could be concluded that factor did not affect the number of errors significantly.
When considering Interaction, P-Value was greater than 0.05.
- Fonts*Size has p-value 0.061 > 0.05.

When P-Value > α; Fail Reject H0, it can be concluded that factor did not affect to the errors significantly.

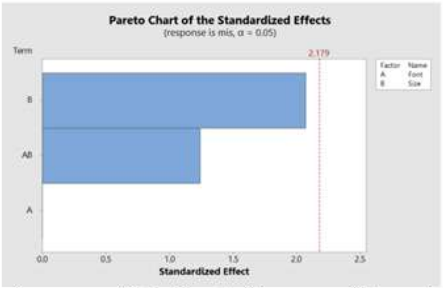

Fig. 6 Identifies significant factors for errors with the Pareto diagram and the main effects of the second subject.

Fig. 6 shown the absolute value of the effect on the Pareto Chart. If the graph of the factor exceeded the baseline, it indicates that the factor had a significant effect. It could not be eliminated from Fig. 6 The factors were Font: A and Size: B, which no significantly affected to the errors.

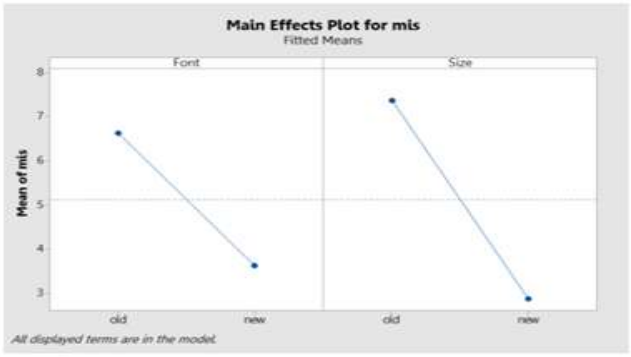

Fig. 7 Main Experimental Plot of the second subject.

Main Effects Plot shown the effect of font and size determines that the size factor was only factor that affected to errors.

- Old Font and New Font levels were not affected by the number of errors.
- Old Size was the effect of increasing the errors compared to the New Size.

It could be concluded that the size factors affect the errors in label pick out process. Therefore, the Interaction Plot was considered. If the mutual influence between the two factors was significant, it could be influenced.

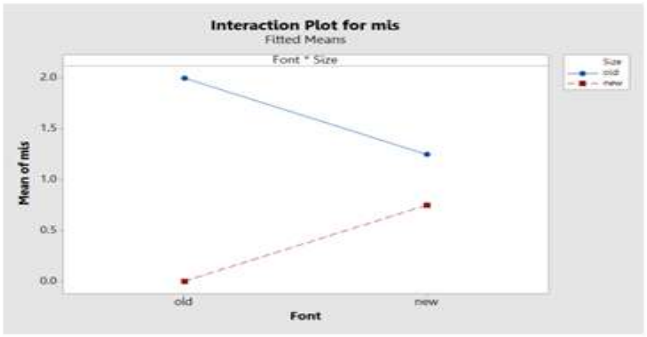

Fig. 8 Interaction Plot of the second subject.

Interaction Plot shown the effected of changing the level of factors on another factor because the interaction effected to main effect to more or less. Therefore, the interaction of factors was very important.Fig. 8 shown that font and size were not Interaction Effect

2. Analysis of errors by Statistical analysis of the third subject.

```
Analysis of Variance
Source             DF Adj SS Adj MS F-Value  P-Value
Model               3 86.750  28.9167 3.65   0.044
  Linear            2 86.500  43.2500 5.46   0.021
    Font            1 30.250  30.2500 3.82   0.074
    Size            1 56.250  56.2500 7.11   0.021
  2-Way Interactions1   0.250   0.2500 0.03   0.862
    Font*Size       1   0.250   0.2500 0.03   0.862
Error              12   95.000    7.9167
Total              15  181.750

Model Summary
      S    R-sq R-sq (adj)  R-sq(pred)
2.81366  47.73%      34.66%        7.08%
```

Fig. 9 Results of Experimental Analysis of the third subject.

The main factors was font size had a p-value less than 0.05.
- Size had a p-value = 0.021 < 0.05
When P-Value < α; Rejection H0, it could be concluded that factor affect the number of errors significantly.
When considering Interaction, P-Value was greater than 0.05.
- Font had a p-value = 0.074 > 0.05.
- Fonts*Size had p-value = 0.862 > 0.05.
When P-Value > α; Fail Reject H0, it could be concluded that factor did not affected to errors significantly.

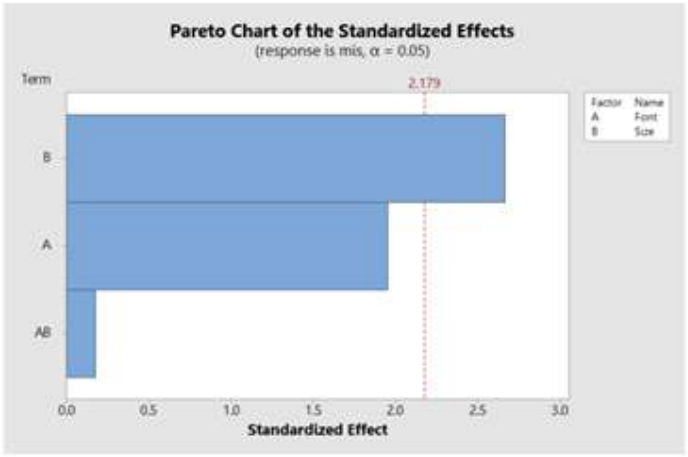

Fig. 10 Identifies significant factors for errors with the Pareto diagram and the main effects of the third subject.

Fig. 10 shown the absolute value of the effect on the Pareto Chart. If the graph of the factor exceeds the baseline, it indicates that the factor had a significant effect. It could not be eliminated from Fig. 12. The factors was Size: B, which significantly affected to the errors.

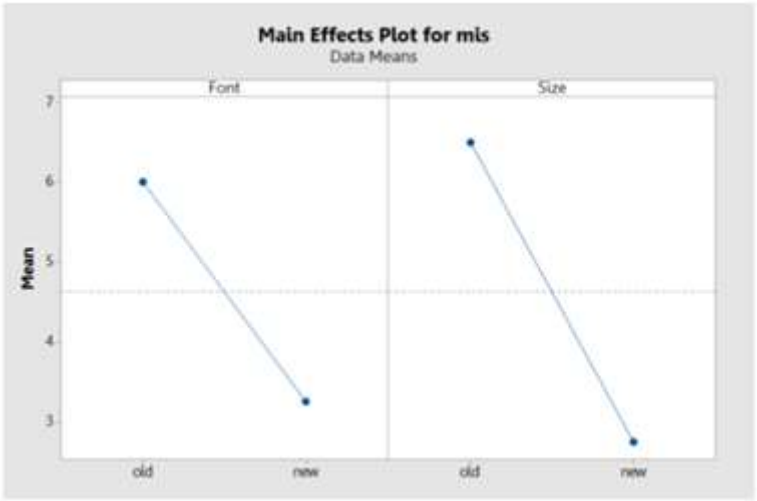

Fig. 11 Main Experimental Plot of the third subject.

Main Effects Plot shown font and size had similar errors.
- Old Font was the effected of increasing the errors compared to the New Font.
- Old Size was the effected of increasing the errors compared to the New Size.

It could be concluded that the levels of both factors had an effected on the number of errors. Therefore, the Interaction Plot was considered. If the mutual influence between the two factors was significant, it could be influenced.

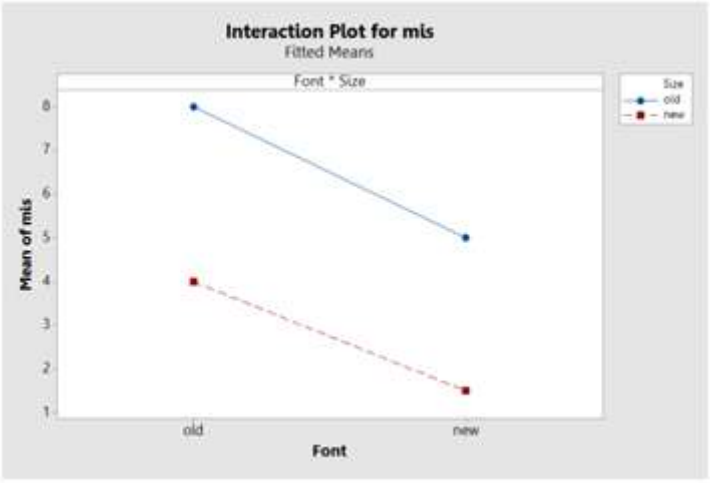

Fig. 12 Interaction Plot of the third subject.

Interaction Plot shown the effect of changing the level of factors on another factor because the interaction effected to main effect to more or less. Therefore, the interaction of factors was very important. Fig. 12 shown that font and size were not Interaction Effect

4. The results of the EEG, obtained from the simulation of working condition, were compared with the workload of each subject by giving the same work and having 4 different types of work.

Table 4 EEG Analysis Results, first subject.

Models	Average of difference
Old Font + Old Size	2.90 µVolt
Old Font + New Size	1.75 µVolt
New Font + Old Size	2.62 µVolt
New Font + New Size	1.51 µVolt

Table 4 the most stressed was model1; Old Font Old Size, next was model 3;New Font Old Size.

Table 5 EEG Analysis Results, second subject.

Models	**Average of difference**
Old Font + Old Size	3.44 µVolt
Old Font + New Size	3.13 µVolt
New Font + Old Size	2.08 µVolt
New Font + New Size	3.89 µVolt

Table 5 the most stressed was model4; New FontNew Size, next was model 1; Old Font Old Size.

Table 6 EEG Analysis Results, third subject.

Models	**Average of difference**
Old Font + Old Size	2.25 µVolt
Old Font + New Size	1.99 µVolt
New Font + Old Size	2.30 µVolt
New Font + New Size	1.45 µVolt

Table 6 The most stressed was model3; New Font Old Size, next was model 1; Old Font Old Size.

5. **Analysis of NASA-TLX.**
It is assessment by the subjects to compare the workload.

Table 7 NASA-TLX Assessment Report of first Subject.

Models	**Work load**
Old Font + Old Size	12.93
Old Font + New Size	12.43
New Font + Old Size	11.10
New Font + New Size	10.33

Table 7 The heaviest workload was model1; Old Font Old Size, next was model 2; Old FontNew Size

Table 8 NASA-TLX Assessment Report of second Subject.

Models	**Work load**
Old Font + Old Size	11.83
Old Font + New Size	11.53
New Font + Old Size	10.00
New Font + New Size	12.17

Table 8 The heaviest workload was model4; Old Font New Size, next was model 1; Old FontOld Size.

Table 9 NASA-TLX Assessment Report of third Subject.

Models	**Work load**
Old Font + Old Size	15.17
Old Font + New Size	11.17
New Font + Old Size	13.20
New Font + New Size	13.60

Table 9The heaviest workload was model 1; Old Font Old Size, next was model 4; Old Font New Size.

IV. CONCLUSION

Table 10 Summarizes the experimental results of the first subject. The factor that caused the error of the EEG was the size and NASA-TLX was the font that was the same as the statistical test results from the Minitab.

Table 10 Comparison of the factors that caused the failure of 3 equipment of the first subject.

Equipment	1st Heavy Workload	2nd heavy work load	Factors that cause error.
EEG	Old Font Old Size	New Font Old Size	Size
NASA-TLX	Old Font Old Size	Old Font New Size	Font
Statistical analysis	The cause errors were fonts and sizes.		

Table 11 Comparison of the factors that caused the failure of 3 equipment of the second subject.

Equipment	1st Heavy Workload	2nd heavy work load	Factors that cause error.
EEG	New Font New Size	Old Font Old Size	Could not be identified
NASA-TLX	New Font New Size	Old Font Old Size	Could not be identified
Statistical analysis	Factors do not effect to error.		

Table 11 EEG and NASA-TLX could not be determined the factor and the statistical test results from the Statistical analysis shown that the factors did not affected to the errors.

Table 12 Comparison of the factors that caused the failure of 3 equipment of the third subject.

Equipment	1st Heavy Workload	2nd heavy work load	Factors that cause error.
EEG	New Font Old Size	Old Font Old Size	Size
NASA-TLX	Old Font Old Size	New Font New Size	Could not be identified
Statistical analysis	The cause errors was sizes.		

Table 12 Summarizes the experimental results of the third subject. The factor that caused the error of the EEG was the size, the same as the statistical test results from the Statistical analysis but NASA TASK LOAD INDEX (NASA-TLX) could not be identified factors.

Therefore, the application of EEG to find the factors that effected to error in label pick out process of the 3 subjects shown that 2 in 3 of the subjects had the size as the cause of the error.

The results of correlation analysis and regression equation between errors, average EEG of difference, and NASA TASK LOAD INDEX (NASA-TLX)

The hypothesis of correlation between variables were as follows:

H0 = the variable was not correlated.

H1 = the variable was correlated.

Relation analysis with the Statistical analysis of the 2 subjects as follows:

Correlations: Size, Font, Mis, EEG, NASA

	Size	Font	Mis	EEG
Font	0.000 1.000			
Mis	−0.588 0.017	−0.484 0.057		
EEG	−0.656 0.006	−0.234 0.384	0.583 0.018	
NASA	−0.316 0.234	−0.225 0.403	0.394 0.131	−0.072 0.790

Cell Contents: Pearson correlation
P-Value

Fig. 13 Results of correlation analysis of the 2 subjects.

Fig. 13 shown that

1. Size variables (Size) and Font variables (Font) have the Pearson correlation coefficient = 0.00, indicating that both variables have no correlation and the P-Value = 1.00 > 0.05, ie both variables did not correlate significantly.
2. Size variables (Size) and Errors variables (Mis) have the Pearson correlation coefficient = -0.588, indicating that both variables are related in the opposite direction. and the P-Value = 0.017<0.05, ie the two variables are correlated to each other significantly.
3. Size variables (Size) and EEG variables (EEG) have the Pearson correlation coefficient = -0.656, indicating that both variables are related in the opposite direction. and the P-Value = 0.006 < 0.05, ie the two variables are correlated to each other significantly.
4. Size variables (Size) and NASA-TLX variables (NASA) have the Pearson correlation coefficient = -0.316, indicating that both variables are related in the opposite direction. and the P-Value = 0.234 > 0.05, ie both variables did not correlate significantly.
5. Font variables (Font) and Errors variables (Mis) have the Pearson correlation coefficient = -0.484, indicating that both variables are related in the opposite direction. and the P-Value = 0.057 > 0.05, ie both variables did not correlate significantly.
6. Font variables (Font) and EEG variables (EEG) have the Pearson correlation coefficient = -0.233, indicating that both variables are related in the opposite direction. and the P-Value = 0.385 > 0.05, ie both variables did not correlate significantly.
7. Font variables (Font) and NASA-TLX variables (NASA) have the Pearson correlation coefficient = -0.225, indicating that both variables are related in the opposite direction. and the P-Value = 0.403 > 0.05, ie both variables did not correlate significantly.

8. Errors variables (Mis) and EEG variables (EEG) have the Pearson correlation coefficient = 0.582, indicating that two variables are related to each other in the same direction and with the P-Value = 0.018 < 0.05, ie the two variables are correlated to each other significantly.
9. Errors variables (Mis) and NASA-TLX variables (NASA) have the Pearson correlation coefficient = 0.394, indicating that two variables are related to each other in the same direction and with the P-Value = 0.131 > 0.05, ie both variables did not correlate significantly.
10. EEG variables (EEG) and NASA-TLX variables (NASA) have the Pearson correlation coefficient = -0.072, indicating that both variables are related in the opposite direction. and the P-Value = 0.791> 0.05, ie both variables did not correlate significantly.
After that, checking number of errors in 3 Model Adequacy Checking.

1. **Normal Probability Plot**

Consider the tolerances or error values that were normally distributed. If the data was dragged through a straight line. Shown that the data was normal distribution. The results of the normal distribution test for the number of errors from 2 subjects were shown thatthe data were distributed near normal line or the data were dragged through the line. This shown that the data were analyzed with normal distribution.

2. **Results of the variance of the error.**

The relationship between the error and the mean used to determine the error or error had a constant variance. If the data point were distributed randomly around the center line No Megaphone pattern, shown that the tolerances were constant. The results of the variance of errors in the experiments of the 2 subjects were shown thatthe data were uniformly distributed around the center line and no Megaphone.

3. **Results of the independent verification of errors**

Graph of correlation of error values with test sequence of independent test of tolerances. If the data point was scattered around the center line In this case, the error value was independent of the random variable. There were no correlation. The results of the independent verification of the errors from 2 subjects were presented it was found that the points of data dispersed around the center line and no trend or clear pattern mean that the error was an independent random variable, no correlation.

The results of the 3 model adequacy checks revealed that the data were normally distributed. The error, constant variance, and error value were independent variables. Correlation could be concluded that the data obtained from the experiment was accurate and appropriate.

The regression analysis between the errors and the average EEG of difference with Statistical analysis of the 2 subjects as follows:

Regression Analysis: Mis versus EEG

The regression equation is
Mis = - 5.67 + 5.25 EEG

Predictor	Coef	SE Coef	T	P
Constant	-5.671	2.836	-2.00	0.073
EEG	5.248	1.309	4.01	0.002

S = 2.72946 R-Sq = 61.6% R-Sq(adj) = 57.8%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	119.75	119.75	16.07	0.002
Residual Error	10	74.50	7.45		
Total	11	194.25			

Fig. 14 Results of the regression analysis between errors average EEG of difference of the 2subject.

Fig. 14 shown that
- The regression equation expressing the correlation between errors (Error was the dependent variable) and average EEG of difference (EEG was the independent variable) was
Mis = - 5.67 + 5.25 EEG
- The correlation between the errors and average EEG of difference had a P-value = 0.002 > 0.05. Shown that the variables were correlated.
- The total variation of average EEG of difference could be explained by the error rate of 61.6%
Thus, the regression equation could confirm that the independent variables directly affected to the variables. Therefore, it could be used to predict the EEG at the Errors or could be used to find the EEG corresponding to Errors.

After that, checking number of errors in 3 Model Adequacy Checking.

4. **Normal Probability Plot**

Consider the tolerances or error values that were normally distributed. If the data was dragged through a straight line. Shown that the data was normal distribution. The results of the normal distribution test for the number of errors from 2 subject were shown thatthe data were distributed near normal line or the data were dragged through the line. This shown that the data were analyzed with normal distribution.

5. **Results of the variance of the error.**

The relationship between the error and the mean used to determine the error or error had a constant variance. If the data point were distributed randomly around the center line No Megaphone pattern, shown that the tolerances were constant. The results of the variance of errors in the experiments of 2 subjects were shown thatthe data was uniformly distributed around the center line and no Megaphone.

6. **Results of the independent verification of errors**

Graph of correlation of error values with test sequence of independent test of tolerances. If the data point was scattered around the center line In this case, the error value was independent of the random variable. There was no correlation. The results of the independent verification of the errors from 2 subjects were presented that the points of data dispersed around the center line and no trend or clear pattern mean that the error was an independent random variable, no correlation.

The results of the 3 model adequacy checks revealed that the data were normally distributed. The error, constant variance, and error value were independent variables. Correlation could be concluded that the data obtained from the experiment was accurate and appropriate.

The regression analysis between the errors and the NASA-TEST LOAD INDEX (NASA-TLX) with Statistical analysis of the 2 subjects as follows:

Regression Analysis: Mis versus NASA

The regression equation is
Mis = - 12.8 + 1.52 NASA

Predictor	Coef	SE Coef	T	P
Constant	-12.788	5.482	-2.33	0.042
NASA	1.5211	0.4373	3.48	0.006

S = 2.74811 R-Sq = 54.8% R-Sq(adj) = 50.2%

Analysis of Variance

Source	DF	SS	MS	F	P
Regression	1	91.396	91.396	12.10	0.006
Residual Error	10	75.521	7.552		
Total	11	166.917			

Fig.15 Results of the regression analysis between errors and the NASA-TEST LOAD INDEX (NASA-TLX) of the 2 subjects.

Fig.15 shown that

- The regression equation expressing the correlation between errors (Error was the dependent variable) and NASA-TEST LOAD INDEX (NASA-TLX) (NASA-TLX was the independent variable) was

Mis = - 12.8 + 1.52NASA

- The correlation between the errors and NASA-TEST LOAD INDEX (NASA-TLX) had a P-value =0.006 < 0.05. Shown that the variables were correlated.
- The total variation of NASA-TEST LOAD INDEX (NASA-TLX could be explained by the error rate of 54.8% Thus, the regression equation couldconfirm that the independent variables directly affected to the variables. Therefore, it could be used to predict the NASA-TLX at the Errors or could be used to find the NASA-TLX corresponding to Errors.)

However,theexperimentisshownthesmallscalethefurtherstudyshouldbeperformingandtheleveloffactorsshouldbereviewtoavoidtheinterfereofpersonalfactors.

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