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Factors that Influence Performance Assessment of the Number of Seafarer Requests in the Manning Agency

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ABSTRACT

Manning Agency, better known as the Barombong Maritime Polytechnic, founded BMP Manning Agency as a forum for producing reliable and professional sailors in the global maritime industry. Based on the results of social and stakeholder studies as well as several literature reviews, it is known that prospective ship crews who will be transferred to Manning agency partner companies set several quality standards apart from the administration and expertise that prospective crew members have because the Manning agency's task is to prepare ship crews, so this aspect is also a significant concern in addition to the theory of expertise required. For this reason, this research covers the problem of assessing the self-quality of seafarers, which indicates a problem and challenge that seafarers must resolve. The method used is multiple linear regression, where it is known that the variables that influence the number of sailors transferred are the Discipline Level Variable (X1), the Responsibility Level Variable (X3) and the Team Cooperation Level Variable (X4) with model goodness of 74.41%. Therefore, the Manning Agency must pay more attention to these three variables.

Keywords: *Borombong Maritime Polytechnic, Manning Agency, Multiple Linear Regression, Seaman, Self Assessment.*

1. INTRODUCTION

Barombong Maritime Polytechnic, as one of the maritime colleges, also took this opportunity by establishing the BMP Manning Agency, which has a vision and mission to produce professional and reliable ship crew in their field so they are ready to work in national and international shipping business entities. [1]. As an agency founded by the best polytechnics in Indonesia and Asia, BMP Manning Agency has many corporate partners who hire prospective ship crew from this agency but still based on the qualifications of both parties. The role of the Manning Agency in producing professional staff must comply with market standards and demands by implementing appropriate regulations and systems, starting from the initial crew interview, the input process to the outcome, which must be of high quality, efficient and effective [1]. Even though the system, theory, expertise and rules applied by the Manning Agency are up to standard, in practice, prospective crew members must also maintain the quality of self-assessment or performance.

Performance appraisal (P.A.) is central to managing organizational human resources [2]. The term performance appraisal (or performance evaluation) refers to the methods and processes used by organizations to assess the level of performance of their employees [3]. As of January 1 2017, national seafarers must have international standard seafarer qualifications regarding the Manila Amendment. The certification in question is the International Maritime Organization (IMO) Training, Certification and Supervision Standards (STCW). This internationally recognized set of regulations and standards defines the skills and knowledge seafarers need to perform their jobs safely at sea, consisting of firefighting training, survival techniques, personal safety and social responsibility, as well as first aid and CPR [4]. If, by the stipulated time limit, it turns out that our seafarers do not yet have international standard seafarer qualifications, then international shipping companies, where most of our seafarers work, will refuse Indonesian seafarers to work on their ships [5]. So, partner agencies or companies who see and experience the work of employees or, in this case, ship crew can find out the quality of education, training and the potential staff at the Manning Agency and can always be confident in hiring prospective ship crew at the Manning Agency and can expand the likely staff's career opportunities. in international waters. Based on the results of social and stakeholder studies as well as several literature reviews, it is known that prospective ship crews who will be transferred to Manning agency partner companies set several quality standards apart from the administration and expertise that prospective staff members have because the Manning agency's task is to prepare ship crews, so This aspect is also a significant concern in addition to the theory of expertise required. According to the results of surveys

and interviews with several ship crew members, Manning Agency partners and especially the Manning Agency, there are problems regarding the self-assessment and performance of ship crew members who have been moved to partner companies, which has resulted in the number of ship crew members transferred to partner companies experiencing a decrease. However, it is not so significant from year to year. Still, it remains a problem that will later disrupt the quality of the Manning Agency, which is under the auspices of the Barom-bong Maritime Polytechnic. One of the problems is the need for self-assessment when going out into the field to apply the knowledge and skills during the study training at the Manning Agency. Aspects of particular concern are the level of discipline, expertise, responsibility, and average working time while in shipping services. Thus, in this study, it is necessary to study these aspects more deeply and determine the safety aspects that must be considered further, significantly influencing the number of prospective crew members transferred by the Manning Agency to partner companies. Therefore, this research will analyze the problem of self-assessment of seafarers, which indicates a problem and challenge that seafarers must resolve, Manning agency and Borombong Maritime Polytechnic to improve the image, quality and especially the number of seafarers transferred to the Company so as not to only meet the requirements at the beginning, but still maintain self-quality until going into the field to work with the multiple linear regression method. The main concept regarding the technique used in this analysis is to model data related to the number of seafarers transferred by the Manning Agency based on the variable level of discipline (X1), level of expertise (X2), level of responsibility (X3) and level of collaboration within the team (X4). The results of the modelling carried out will be able to answer questions related to this challenge. They will then be used as a new strategy to solve the problem and improve the quality of the transferred seafarers by increasing attention to these influential factors.

2. METHODOLOGY

The research method used for this analysis is multiple linear regression, which is considered to be based on the characteristics of the research data used. The data used meets the requirements for using the multiple linear regression method, such as classical assumptions, the amount of data, and the research objective, namely knowing the relationship between dependent and independent variables.

2.1 Multiple Linear Regression Analysis

Regression analysis is a method of statistical analysis used to see the effect of two or more variables. Regression analysis is also a statistical method that explains the relationship pattern (model) between two or more variables [6]. Regression analysis is performed to determine the correlations between two or more variables having cause-effect relations and to make predictions for the topic using the relation [7]. The regression using one single independent variable is called univariate regression analysis, while the analysis using more than one independent variable is called multivariate regression analysis [6]. With the model,

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n + \varepsilon \quad (1)$$

Where,
y: dependent variable
x_i: independent variable
β_i: parameter
ε: error

The multivariate regression analysis has a few assumptions: normal distribution, linearity, freedom from extreme values, and no multiple ties between independent variables [8]. This method uses simultaneous and partial testing to determine which predictor factors influence the response variable. Linear and multiple regression analyses are affected by factors, namely [9],

1. A small sample size may only demonstrate connections among variables with strong relationships. Therefore, the sample size must be chosen based on the number of independent variables and the expected strength of the relationship.
2. More missing values in the data set may be needed to affect the sample size. Therefore, all the missing matters should be adequately addressed before regression analyses.

The larger sample's subsamples may mask the effect of independent and dependent variables. Therefore, if subsamples are predefined, a regression within the sample could be used to detect genuine relationships. Otherwise, the analysis should be undertaken on the whole sample.

2.2 Numerical Modeling of Debonding Damage Simultaneous Testing

A Simultaneous test is a test of the significance of the model parameters as a whole or to find out whether all the predictor variables included in the model influence the response variable together using the F test with the hypothesis,

$$\mathrm{H}_0 : \beta_1 = \beta_2 = \beta_3 = \cdots = \beta_p = 0 \quad (1)$$

$$\mathrm{H}_1 : \text{at least one } \beta_p \neq 0 \quad \text{where } p = 1, 2, 3, \cdots, n$$

H_0 rejected if $p - value < \alpha$. If H_0 is rejected, it can be concluded that at least one parameter in the regression model is significant to the model.

2.3 Partial Testing Parameters

Partial or individual testing is carried out if, when simultaneously testing parameters, it is concluded that there is at least one parameter in the regression model that is significant to the hypothesis,

$$H_0 : \beta_p = 0$$
$$H_1 : \beta_p \neq 0 \quad \text{where } p = 1, 2, 3, \cdots, n$$

The rejection area is when $|t_{hitung}| > t_{\alpha/2;(n-p-1)}$ or $p - value < \alpha$. So, it can be concluded that the p-th predictor variable significantly affects the response variable [6].

2.4 Partial Testing

2.4.1 Assumption of Identical Residuals

The identical residual assumption test was carried out using the Glejser test to determine whether the residual variance was homogeneous or heteroscedasticity did not occur.

$$H_0 : \sigma_1^2 = \sigma_2^2 = \sigma_3^2 = \cdots = \sigma_n^2 = \sigma^2$$
$$H_1 : \text{ at least one } \sigma_i^2 \neq \sigma^2 \quad ; i = 1, 2, 3, \cdots, n$$

The Glejser test statistic is formulated in the equation 2,

$$F_{count} = \frac{\dfrac{\sum_{i=1}^{n}\left(|\hat{\varepsilon}_i| - |\bar{\varepsilon}|^2\right)}{v}}{\dfrac{\sum_{i=1}^{n}\left(|\varepsilon_i| - |\hat{\varepsilon}_i|^2\right)}{n-v-1}} \qquad (2)$$

H_0 rejected if $F_{hitung} > F_{\alpha;(v,n-v-1)}$ or $p - value < \alpha$. If you get a conclusion that rejects H_0, it can be concluded that there are indications of a case of heteroscedasticity so that the identical assumption is not fulfilled.

2.4.2 Independent Residual Assumption

The independent residual assumption aims to detect whether or not there is a correlation between residuals or what can be called autocorrelation. The test carried out to test the independent assumptions in this research used the Durbin-Watson test. The hypothesis used in testing the independent residual assumption is as follows,

$$H_0 : \rho = 0 \ (\text{no correlation occurs})$$
$$H_1 : \rho \neq 0 \ (\text{correlation occurs})$$

Durbin-Watson Test Statistics,

$$d = \frac{\sum_{i=1}^{n}(e_i - e_{i-1})}{\sum_{i=1}^{n} e_i^2} \qquad (3)$$

The residual can be said to have autocorrelation if the value of d > dL or d < dU.

2.4.3 Assumptions of Normal Distribution Residuals

A regression model can be good if the residual values are normally distributed. Testing the assumption of normal distribution residuals uses the Kolmogorov-Smirnov test with the following hypothesis.

$$H_0 : F_n(x) = F_0(x) (\text{residuals are normally distributed})$$
$$H_1 : F_n(x) \neq F_0(x) \ (\text{residuals are not normally distributed})$$

H_0 is rejected if $|D| > D_\alpha$ on the Kolmogorov Smirnov table or $p - value < \alpha$, where if H_0 is rejected, it can be concluded that the residuals are not normally distributed.

3. RESULTS AND DISCUSSION

3.1 Data Characteristics

This research will display general information regarding the response variable: the number of sailors transferred by the Manning Agency (Figure 1).

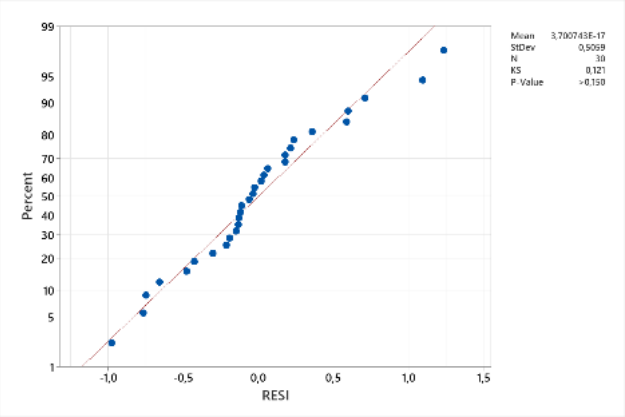

Figure 1. Number of Sailors Assigned (Y)

Figure 1 shows that the number of seafarers assigned to partner companies by the Manning Agency has fluctuating or inconsistent numbers. Therefore, it is necessary to know the influencing factors so that inputs or policies can be given and followed up to increase the number of seafarers transferred. It is also known that the variance of the data on the response variable is very heterogeneous or varied. This can be caused by the varying demands of partner companies,

which are associated with needs in the field that are sometimes different and can also be caused by the variable number of students who have graduated and are ready to transfer.

3.2 Multiple Linear Regression Analysis

Meanwhile, before carrying out the analysis using multiple linear regression, data standardization is carried out for the variables used in the research so that they have the same units so that they can be easily interpreted so that the model for multiple linear regression analysis of the data is obtained.,

$$Y = 0.000 + 0.587X_1 + 0.146X_2 - 0.525X_3 - 0.375X_4$$
$$= 0.587X_1 + 0.146X_2 - 0.525X_3 - 0.375X_4$$

It is not yet known which variable significantly affects the number of seafarers transferred, so it must be tested simultaneously and partially to determine which variable has a significant impact.

3.3 Simultaneous Testing

The hypothesis used is as follows.

$$H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$$
$$H_1 : \text{at least one } \beta_p \neq 0 \quad \text{where } p = 1,2,3,4$$

Based on the test results with multiple linear regression analysis, the results of the Analysis of Variance (ANOVA) test for the resulting model are in Table 1.

Table 1. ANOVA Multiple Linear Regression Model

Source	df	Sum of Square (S.S.)	Mean Square (M.S.)	F_{count}	P-value
Regression	4	21.579	5.395	18.17	0.000
Error	25	7.422	0.297		
Total	29	29.000			

Based on Table 1, it is known that the resulting F_{count} value is 18.17, so it can be seen that the F_{count} value is greater than the $F_{(0.05;4;25)}$ value, which is 2.760, and the p-value obtained in the model is 0.000 < 0 .05; then the decision to reject H_0 is obtained. This means that at least one predictor variable significantly affects the number of sailors transferred by the Manning Agency to partner companies so that partial or individual parameter testing can be continued.

3.4 Partial Testing Result

Partial testing is carried out if, in simultaneous testing, a conclusion is obtained that rejects H_0 or accepts H_1, with the hypothesis used being,

$$H_0 : \beta_p = 0$$
$$H_1 : \beta_p \neq 0 \quad \text{where } p = 1,2,3,4$$

The results of partial parameter testing are in Table 2.

Table 2. Partial Parameter Test Results

Variable	Parameter	Estimation	Count	*P-value*	Decision
Constant	β_0	0.000	0.000	1.000	Not Significant
X_1	β_1	0.587	5.720	0.000	Significant
X_2	β_2	0.146	1.410	0.170	Not Significant
X3	β_3	-0.525	-5.180	0.000	Significant
X4	β_4	-0.375	-3.660	0.001	Significant

Three parameters are significant to the model because of the |t| value greater than $t_{(0.025;25)}$ = 2.05954 and p-value < α (0.05). Thus, it was found that only the variable level of discipline (X_1), level of responsibility (X_3) and level of teamwork (X_4) had a significant effect on the number of sailors transferred by the Manning Agency.

3.5 Residual Assumption Testing

After knowing the variables that have a significant effect, the next step is to test the residual assumptions of the resulting model so that the feasibility of the resulting model can be determined,

3.5.1 Assumption of Identical Residuals

The identical residual assumption test was carried out using the Glejser test to determine whether the residual variance was homogeneous or heteroscedasticity did not occur.

$$H_0 : \sigma_1^2 = \sigma_2^2 = \sigma_3^2 = \cdots = \sigma_{25}^2 = \sigma^2$$
$$H_1 : \text{ at least one } \sigma_i^2 \neq \sigma^2 \quad ; i = 1,2,3,\cdots,25$$

This research shows that $F_{(0.05;4;25)}$ = 2.760, where this value will be compared with the Glejser test statistics (Table 3).

Table 3. Glejser Test Results

Source	df	Sum of Square (S.S.)	Mean Square (M.S.)	F_{count}	P-value
Regression	4	1.013	0.253	2.680	0.055
Error	25	2.365	0.095		
Total	29	3.378			

Based on the table, it is known that the resulting p-value is 0.055, and this value is greater than the significance level of 0.05, so it can be concluded that it fails to reject H_0, which means that there is no heteroscedasticity because the resulting residuals are homogeneous. This is also supported by the resulting F_{count} value of 2.680, which means that the value is less than $F_{(0.05;4;25)} = 2.760$, which means it fails to reject H_0.

3.5.2 Independent Residual Assumption

The test carried out to test the independent assumptions in this research used the Durbin-Watson test. The hypothesis used in testing the independent residual assumption is as follows,

$$H_0 : \rho = 0 \ \left(\text{no correlation occurs}\right)$$
$$H_1 : \rho \neq 0 \ \left(\text{correlation occurs}\right)$$

Based on the results of the analysis of the Durbin-Watson test obtained, it can be seen that the Durbin-Watson value obtained is 1.815; based on the results obtained, the value of d (1.815) > dL (dL=1.143) and d (1.815) > dU (dU=1.739) or the value of dL (dL=1.143) < d (1.815) < 4-dU (2.261) so that the decision is Failed to reject H0. The conclusion is that it has been proven that the residuals are independent.

3.5.3 Assumptions of Normal Distribution Residuals

Testing the normal distribution residual assumption uses the Kolmogorov-Smirnov test with the following hypothesis,

$$H_0 : F_n\left(x\right) = F_0\left(x\right) \left(\text{residuals are normally distributed}\right)$$
$$H_1 : F_n\left(x\right) \neq F_0\left(x\right) \ \left(\text{residuals are not normally distributed}\right)$$

The residual plot obtained using the Kolmogorov-Smirnov test is presented in Figure 2.

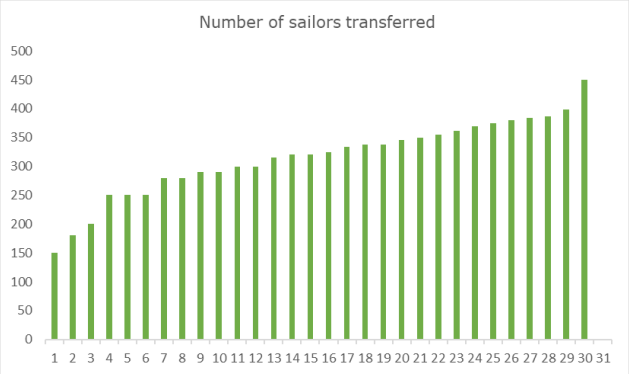

Figure 2. Residual Normality Plot

Based on Figure 2, the residual points are located around the diagonal axis of the graph, so visually, the residuals meet the normal distribution assumption. In addition, the value D = 0.121 is obtained, which is less than $D_{(0.05)} = 0.246$ and the p-value resulting from this test is >0.150, which is more than a significant level of 0.05, so it is decided that H_0 will fail. This means the residuals are normally distributed, and the normal distribution assumption has been met.

4. CONCLUSIONS

Free vibration analysis based on Lanczos solver has been developed to investigate the damage location and multiple damages of the steel-clamshell sandwich plate. MSCS algorithm has been designed to measure the damage detected on sandwich plates. A validation test was initially conducted to compare the natural frequency between EMA and the developed FEM model. The natural frequency comparison shows that the greatest error is 6.1-11.22%. Based on accuracy calculations by comparing the actual location of damage with the location of MSCS prediction results, the algorithm obtained an average accuracy of 99.43% to detect five debonding locations and an accuracy of 99.1% to detect multiple debonding.

After all the assumptions and tests have been carried out, it is found that the coefficient of determination (R^2) is the value of the proportion of total diversity around the Y value that the regression model can explain. The higher the R^2 value produced by a model (more than 70% is considered good), the better the predictor variables in the model describe the variability of the response variable. The coefficient of determination is also called the goodness of the model, which in this study yielded 74.41%, which means the number of sailors transferred by the Manning Agency can be explained by three significant predictor variables, namely the level of discipline (X_1), the level of responsibility (X_3) and the level of cooperation in the team (X_4) which has an effect of 74.41 per cent. In contrast, the remaining 25.59 per cent can be explained by other variables not included in the model. Because there are only three variables that significantly affect the response variable, the model produced in this study is,

$$Y = 0.000 + 0.587X_1 - 0.525X_3 - 0.375X_4$$
$$= 0.587X_1 - 0.525X_3 - 0.375X_4$$

As the introduction explains, the resulting model aligns with international seafarer quality standards. Where based on this model, it is known that the third variable, namely the level of discipline (X_1), the level of responsibility (X_3) and the level of cooperation in the team (X_4), is part of the international seafarer qualification standards that can be obtained through STCW training, namely the personal safety and social responsibilities section. This means that sailors from the Manning Agency already have the initial capital needed as seafarers for international shipping. As for many things that can be used as suggestions regarding the problems examined in this study, it is hoped that the Manning Agency can pay attention to the variables that affect the number of seafarers transferred to increase the number of seafarers who partner companies can employ and also to improve the quality of self-assessment of seafarers assigned. Based on the analysis results, seafarers' skill level is less important than a benchmark for increasing the number of seafarers transferred. Still, self-assessment or personality aspects are essential benchmarks that can increase the number of seafarers assigned. If this is considered, it cannot be denied that more and more students or sailors will study at the Manning Agency, and many partner companies and new companies are not afraid to cooperate with the Manning Agency because of their qualified quality in producing reliable sailors with good personalities. This research is also very relevant to be applied to other companies in the future, considering that nowadays there are so many people who are experts in a field and can be found easily. Still, finding people with a good personality is complicated.

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