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| **The Effectiveness of the Role of Vessel Traffic Service (VTS) in Monitoring the Order of Ship Movement and the Docking Area in the West Shipping Channel of Surabaya***1Rizky Cahyaningrum, 2Muhammad Dahri, 3Diyah Purwitasari, 4Indah Ayu Johanda Putri**1Politeknik Pelayaran Surabaya**2Politeknik Pelayaran Surabaya**3Politeknik Pelayaran Surabaya**4Politeknik Pelayaran Surabaya**Correspondence email of author: hyarzkychy@gmail.com* |
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***Abstract***

*Vessel Traffic Service (VTS) plays an important role in maintaining the safety and order of ship traffic, especially in congested water areas such as the West Shipping Channel of Surabaya. With this system, it is hoped that the movement of ships can be more organized, so that the risk of accidents and violations can be minimized. However, the effectiveness of VTS in supporting the monitoring of the order of ship movement and berth areas still needs to be further studied. This study aims to analyze the effectiveness of Vessel Traffic Service (VTS) in supporting the monitoring of the order of ship movement and the berth area in the West Shipping Channel of Surabaya. This study uses a quantitative method with a simple linear regression approach. Data was collected through observation and analysis of secondary data, then processed using the SPSS 22 application. The results showed that the effectiveness of VTS had a significant effect on order monitoring, with a significance value of 0.001 less than 0.05. The value of the determination coefficient is 29.1% which means that the effectiveness of VTS contributes to the orderliness of ship movements and the berth area, and from the regression equation obtained it shows that every increase in the effectiveness of VTS by one unit will increase the monitoring of order by 0.470 units.*

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| ***Keywords:*** *Vessel Traffic Service (VTS), Effectiveness, Movement, West Shipping Channel Surabaya* |

# INTRODUCTION

To ensure the safety of shipping when entering and exiting the port and processing the ship's movement, the port must have a shipping channel. To realize shipping safety, the role of all parties is needed, namely the government as regulators, entrepreneurs as operators and not to forget the community as service users (Haryanto & Purwitasari, 2018). This groove must be safe in terms of depth, width, and free from other obstacles. The shipping flow is also important so that ships can navigate smoothly and safely, and avoid danger, in this study focuses on the West Shipping Channel of Surabaya. The Surabaya West Shipping Channel is regulated in the Decree of the Minister of Transportation of the Republic of Indonesia Number KP 455 2016 concerning the Determination of Shipping Flows, Route Systems, Traffic Procedures and Shipyard Areas in accordance with the Interests in the Surabaya West Shipping Channel (APBS). This channel uses a two-way route system with a width of 150 meters. There are two routes that are set, namely the new flow and the old flow. The minimum depth for the new groove is -13 meters LWS with a length of 39.65 Nautical Miles, while the old groove has a depth of -8.4 meters LWS and a length of 4.2 Nautical Miles. Vessels with a minimum draft of 8.5 meters must pass through the new shipping channel.

Cruise safety is a key aspect of cruise. Shipping safety and security arrangements follow technological advances and international conventions, with the use of modern equipment for safety. Law Number 17, 2008 also regulates shipping security systems. Information is important to the skipper requiring information management and communication in ship traffic, including ship movement advice and alerts. *The Vessel Traffic Service* (VTS) at Tanjung Perak Port has been operating since 2015 to improve safety and efficiency and protect the maritime environment. VTS can interact with vessels and provide information on the current traffic situation in the VTS area. In Surabaya, VTS provides ship services in the Surabaya West Shipping Channel (APBS) and the Surabaya East Shipping Channel (APTS). Currently, Surabaya has a dense shipping channel. In 2023, there were 14,966 incoming and 15,435 outgoing ships, with a total of 16,337 ships in the docking area. VTS is responsible for monitoring the movement of ships and berth areas.

From the data obtained, the role of VTS in monitoring ships through communication has not been effective. Many ships reported that their AIS were inactive, so VTS operators could not perform their duties optimally. VTS duties such as providing shipping safety information, navigation guidance, and ship traffic organization are affected and not in accordance with the provisions.

Based on several previous studies, the author found important information regarding the use of Vessel Traffic Services (VTS) in ports. Research shows that VTS improves the safety and smoothness of shipping, although there are still service constraints. Thus, the purpose of this study is to determine the relationship and influence of the effectiveness of *Vessel Traffic Service* (VTS) on the monitoring of order in the area***.***

# METHOD

In this study, a simple linear regression analysis with a quantitative approach was used. The author used two data sources, primary data was obtained directly through questionnaires from respondents at VTS Surabaya and could not be generalized. Secondary data complements primary data, taken from books, journals, and other sources. The quantitative survey method is used to obtain data on beliefs, opinions, and variable relationships. This research was conducted by the author at the Type A Navigation District Office Class I Surabaya, especially in the *Vessel Traffic Service* (VTS) office.

In this study, which is included in the independent variable, namely the Effectiveness *of Vessel Traffic Service* (VTS). Effectiveness is not only related to the end result, but also includes the success of the process to achieve that outcome (Mulyani, Sianturi, Purwitasari, Rahmawati, & Amrullah, 2024). Meanwhile, the dependent variable in this study is the monitoring of the order of ship movement and the berth area which is influenced by the existing variable, namely the effectiveness of *the Vessel Traffic Service* so that it can measure the impact given. The population of this study is service users in the West Shipping Channel of Surabaya, namely 35 ship agents who use the *Surabaya Vessel Traffic Service*  facility. Samples were taken from all 35 agents that passed through the 39.65 NM APBS at Tanjung Perak Port.

The data collection techniques in this study include questionnaires, observations, and literature studies. Questionnaires were used to get measurable responses from respondents, observations were made in the field, and literature studies provided theoretical foundations. In the data analysis technique, the item validity test is used to measure the validity of the questionnaire. The validity test determines the accuracy of the measuring instrument. The reliability test tests the consistency of the questionnaire. The classical assumption test prevents problems in regression analysis. Simple linear regression analysis measures the impact of variables. The Paired Sample T test is used to test hypotheses.

# RESULTS AND DISCUSSION

In this study, a questionnaire was used to obtain data from respondents, namely ship agencies in the area of Type A Class I Navigation District of Surabaya and Tanjung Perak Port. The questionnaire was distributed through an online survey using Google Form, where respondents were asked to rate each question item. Independent variables are measured through indicators of the effectiveness of the Vessel Traffic Service's role, including information quality, traffic management, and navigation assistance. Dependent variables are measured through order monitoring indicators and the availability of observation systems in accordance with P2TL regulations.

**Validity Test**

Table 1. SPSS Data Processing Results for Variable X and Y Validity

|  |  |  |  |
| --- | --- | --- | --- |
| Statement | Result | R Table | Information |
| **The Effectiveness of the Role of Vessel Traffic Service** |
| X1 | 0,712 | 0,43 | *Valid* |
| X2 | 0,819 | *Valid* |
| X3 | 0,737 | *Valid* |
| X4 | 0,708 | *Valid* |
| X5 | 0,503 | *Valid* |
| X6 | 0,629 | *Valid* |
| X7 | 0,649 | *Valid* |
| X8 | 0,706 | *Valid* |
| X9 | 0,691 | *Valid* |
| X10 | 0,667 | *Valid* |
| **Monitoring of the Order of Movement and Anchorage Area** |
| Y1 | 0,642 | 0,43 | *Valid* |
| Y2 | 0,627 | *Valid* |
| Y3 | 0,812 | *Valid* |
| Y4 | 0,712 | *Valid* |
| Y5 | 0,522 | *Valid* |
| Y6 | 0,619 | *Valid* |
| Y7 | 0,714 | *Valid* |
| Y8 | 0,692 | *Valid* |
| Y9 | 0,589 | *Valid* |
| Y10 | 0,51 | *Valid* |

Source: SPSS 22 Output

Based on the results of the validity test on the results of this research questionnaire, it can be seen that the calculated r value in each component of the questionnaire statement is greater than the r table value, which is 0.430, so looking at the results of these results, it can be concluded that the data from the results of the questionnaire has valid results because it is greater than 0.430.

**Reliability Test**

Looking at the results of the reliability test, it can be seen that the results of the questionnaire variable x, namely the effectiveness of the role  *of the Vessel Traffic Service*, have *a cronbach's alpha* value of 0.682 which is greater than the reference value of 0.872. So it can be concluded that the data from the variable x questionnaire can be said *to be reliable*. Meanwhile, from the reliability test, it was found that the results of the y-variable questionnaire, namely monitoring the order of movement and the anchorage area, had *a Cronbach's alpha value*  of 0.846. So that it can be concluded that the data from the questionnaire results of variable y from the respondents is said *to be reliable.*

**Classic Assumption Test**

**Normality Test**

Table 2. Kolomogorov-Smirnov Normality Test Results

|  |
| --- |
| **One-Sample Kolmogorov-Smirnov Test** |
|   | Unstandardized Residual |
| N | 35 |
| Normal Parametersa,b | Mean | ,0000000 |
| Std. Deviation | 2,73341243 |
| Most Extreme Differences | Absolute | ,101 |
| Positive | ,078 |
| Negative | -,101 |
| Test Statistic | ,101 |
| Asymp. Sig. (2-tailed) | .200c,d |

Source: SPSS 22 Output

The results of the normality test are known that *the value of Asymp. Sig (2-tailed)* is 0.200 which in the normality test requirements can be said to be normal when *Asymp. Significance (2-tailed)* > 0.05. So it can be concluded that the data used is normally distributed data because of *the Asymp value. Significance (2-tailed) was* 0.200>0.05.

**Linearity Test**

Table 3. Linearity Test Results

|  |
| --- |
| **ANOVA Table** |
|   | Sum of Squares | df | Mean Square | F | Sig. |
| Pemantauan \* Efektivitas | Between Groups | (Combined) | 188,171 | 9 | 20,908 | 3,075 | ,013 |
| Linearity | 104,139 | 1 | 104,139 | 15,315 | ,001 |
| Deviation from Linearity | 84,032 | 8 | 10,504 | 1,545 | ,192 |
| Within Groups | 170,000 | 25 | 6,800 |   |   |
| Total | 358,171 | 34 |   |   |   |

Source: SPSS 22 Output

In the Anova Table, it can be seen that the *Deviation from Linearity value*  in this data is 0.192. The basis for decision-making from the linearity test is that if the significance value of > 0.05, then it can be said that there is a linearity relationship between variable X and variable Y, so from this it can be concluded that the linear relationship between variable X and variable Y is said to have a significant relationship because the values are 0.192 > 0.05.

**Heteroscedasticity Test**

Table 4. Heteroscedasticity Test Results

|  |
| --- |
| Coefficientsa |
| Model | Unstandardized Coefficients | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
| 1 | (Constant) | 9.424 | 2.686 |  | 3.509 | .001 |
| Efektivitas | -.207 | .075 | -.433 | -2.763 | .009 |
| a. Dependent Variable: ABS\_Res |

Source: SPSS 22 Output

 In this study, it was carried out by regressing the residual absolute value (*ABS\_Res*) to the independent variable. The regression results showed that the effectiveness variable had a significance value of 0.009, indicating the presence of heteroscedasticity in the model. With this test, the assumption of homooscedasticity is not met, which can cause the estimation of regression parameters to be inefficient. So it can be concluded that with the existence of this heteroscedasticity, the estimation of regression parameters becomes efficient

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**Simple Linear Regression Test**

The value of R is a symbol of the coefficient. The correlation value is 0.539. This value can be interpreted as the relationship between the two research variables is in a strong category. According to the table above, the value of R square or Coefficient of Determination (KD) is also obtained which shows how good the regression model formed by the interaction of independent and dependent variables is. The value of the determination coefficient obtained was 29.1%. So it can be interpreted that the independent variable (x) has a contribution effect of 29.1% on the dependent variable (y).

The significance test is used to determine the degree of significance or linearity of the regression. The criteria can be determined based on the significance value test (Sig.), provided that the significance value < 0.05. Based on the table above, the Significance value = 0.001 is obtained, meaning that the significance of the < of the significance criterion is 0.05. Thus, the regression equation model based on research data is significant or the regression equation model meets the criteria.

Table 5. Simple Regression Coefficients

|  |
| --- |
| **Coefficientsa** |
| Model | Unstandardized Coefficients | Standardized Coefficients | t | Sig. |
| B | Std. Error | Beta |
| 1 | (Constant) | 20,057 | 4,569 |   | 4,390 | ,000 |
| Efektivitas | ,470 | ,128 | ,539 | 3,678 | ,001 |

Source: SPSS 22 Output

The results of the calculation of the simple linear regression coefficient above show that the value of the constant coefficient is 20.057 and the free variable coefficient (X) is 0.470. So that the regression equation Y = 20.057+0.470X is obtained. Based on the equation above, it is known that the constant value is 20,057. Systematically the value of this constant states that at the time of the change of 0, then the delay has a value of 20.057. Furthermore, the positive value (0.470) contained in the regression coefficient of the independent variable (effectiveness) illustrates that the direction of the relationship between the independent variable (effectiveness) and the dependent variable (monitoring) is unidirectional, so that every increase in one unit of the effectiveness variable will cause an increase in monitoring of 0.470.

**Paired Sample T Test**

Based on the results of the partial t-test, it was shown that the significant value of the effectiveness of the role  *of the Vessel Traffic Service* (X) in monitoring the order of ship movement and the berth area (Y) was 0.001 < 0.05 and the tcal value was 3.678 > the ttable value was 1.690, so Ho was rejected and Ha was accepted. This means that there is an effectiveness of the role of *the Vessel Traffic Service* in monitoring the order of movement and the berth area significantly.

**Discussion**

This research was carried out to find out and test the effectiveness of the role  *of Vessel Traffic Service* in monitoring ship movement and berth areas in the West Shipping Channel of Surabaya using *the SPSS 22 application*. Based on the results of the paired T test that I have conducted, it shows that the tcal value is 3.678 > the ttable value is 1.690 and the significant value of the effectiveness of the role  *of Vessel Traffic Service* (X) in monitoring the order of ship movement and the berth area (Y) is 0.001 < 0.05. So based on these results, it can be concluded that Ha was accepted and Ho was rejected, which means that the effectiveness of the role  *of the Vessel Traffic Service* has a significant effect on the monitoring of the order of ship movement and the berth area in the West Surabaya Shipping Channel because the tcal value is greater than the ttable with a significant level of less than 0.05, and the determination coefficient value of 29.1% obtained from the R square is 0.290.

The result *of the R square* means that the ability of the variable effectiveness of the role of *the Vessel Traffic Service* to affect the variables of monitoring the order of ship movements and the berth area. Meanwhile, 70.9% with a value of 0.709 is another variable that can affect the monitoring variables of the order of ship movements and the berth area in the West Shipping Channel of Surabaya. In this case, other variables in question are the role of syahbandar in its supervision, inadequate means of navigation, guidance officers whose handling is not appropriate, human resources who do not implement the rules as they should, and regulations that are not too strong in regulating resources that are directly related to the order in the berth area and also when there is a ship movement.

Based on the simple linear regression test that has been carried out, the result of the equation Y = 20.057+0.470X. The equation is in accordance with a simple linear regression formula, namely Y=a+bX.

X = Independent variable

Y = Variabel depend

a = constant

b = Regression coefficient

This shows that it means that every 1% increase in the effectiveness value of the role of *the Vessel Traffic Service*, the value of monitoring the order of ship movements and the berth area will increase by 0.470.

The constant of 20,057 means that if the effectiveness of the role  *of Vessel Traffic Service* (X) is 0, then the monitoring of the order of ship movement and the berth area (Y) is negative, which is 20,057. The regression coefficient of the variable monitoring of the order of ship movement and the berthing area is 0.470. A positive coefficient means that there is a positive relationship between variable X and variable Y, the greater the effectiveness of the role, the more the monitoring of the order. And also the results of the paired sample T test are known that there is a significant influence of independent variables (X) and dependent variables (Y). This is evidenced by the results of the paired T test of 3.678 while in table 1.690 at a significance level of 0.05 which means that Ha is acceptable.

# CONCLUSION > T.N Roman 11 Bold

Based on the study entitled "The Effectiveness of the Role of Vessel Traffic Service in Monitoring the Order of Ship Movement and the Docking Area in the West Shipping Channel of Surabaya", it was concluded that there is a positive and significant influence of the role of the Vessel Traffic Service on the monitoring of ship order. The paired sample T test showed a significant result between the effectiveness of Vessel Traffic Service and the monitoring of order with a significance value of 0.001. Its effectiveness contributed 29.1% to the order of movement and berth area in the West Shipping Channel of Surabaya, while the rest was influenced by other variables. There are suggestions to increase the effectiveness of the role of Vessel Traffic Service in the West Surabaya Shipping Channel, such as e-pilotage services and more comprehensive research***.***

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