

Analysis Of Correlation On Electronic-Based Government System Index Values On The Number Of Web-Defacement Cases Using Linear Regression

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ABSTRACT

The government has established an electronic-based government system (SPBE) program with the principles of effectiveness, integration, continuity, efficiency, accountability, interoperability and security. The implementation of SPBE has been evaluated with the achievement of 16 government agencies receiving a very good predicate in monitoring and evaluating the implementation of the Electronic Based Government System (SPBE) in 2022. Unfortunately, since 2022, there have been several agencies with very good predicates that have reported cases of web defacement in the system. electronically via the zone-h.org site as an open publication media regarding web defacement cases. This research aims to analyze the influence between the SPBE index value, especially the very good predicate, and the number of web defacement cases that have occurred. This research was carried out using quantitative research methods to process research data using a simple linear regression method. This research processes data in the form of the 2022 SPBE Index value as the independent variable (X) and the number of web defacement cases since 2022 as the dependent variable (Y). In the research, the results showed that $F\text{-count} = 2.363978 < \text{from } F\text{-table} = 4.60011$, so it was concluded that there was no relationship between the SPBE index value and the number of web defacement cases in agencies that received excellent predicate.

Keywords : Cyber Security; Government; Simple Linear Regression; SPBE Index; Web Defacement

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1. INTRODUCTION

The Indonesian government has established an Electronic-Based Government System (SPBE) program through Presidential Regulation of the Republic of Indonesia Number 95 of 2018 concerning Electronic-Based Government Systems. SPBE was held to increase the integration and efficiency of electronic-based government systems, which requires governance and management of electronic-based government systems nationally. In connection with Presidential Regulation of the Republic of Indonesia Number 95 of 2018 article 2 paragraph (1) that SPBE is implemented with the principles of effectiveness, integration, continuity, efficiency, accountability, interoperability and security. SPBE's vision and mission are in accordance with chapter II of the attachment to Presidential Decree of the Republic of Indonesia Number 95 of 2018. SPBE's vision is "The realization of an integrated and comprehensive electronic-based government system to realize high-performance bureaucracy and public services". To achieve SPBE's vision, SPBE's mission is: 1) structuring and strengthening the organization and governance of an electronic-based integrated government system; 2) develop electronic-based public services that are integrated, comprehensive, and reach the wider community; 3) building an integrated,

safe and reliable information and communication technology foundation; and 4) building competent and innovative human resources based on information and communication technology [1].

Strengthening SPBE policies is an important thing that must be done in implementing SPBE to support government and development business processes that are simple, efficient, transparent and integrated. One strategy that can be implemented is to evaluate the implementation of the SPBE policy nationally. Evaluation of SPBE implementation aims to measure progress achievements, as well as improve the quality of SPBE implementation in central and regional government agencies, which leads to improving the quality of public services, and includes an assessment of the level of maturity of SPBE policies and governance, management and service capabilities. SPBE evaluation is carried out comprehensively covering at least the policy, governance and SPBE service domains. SPBE evaluation is carried out to ensure that the implementation of SPBE elements is in accordance with the SPBE Governance and SPBE Management framework. The elements of SPBE as referred to in paragraph (1) of Presidential Decree Number 95 of 2018 include: a. National SPBE Master Plan; B. SPBE Architecture; C. SPBE Plan Map; D. SPBE plan and budget; e. Business process; F. data and information; G. SPBE Infrastructure; H. SPBE Application; I. SPBE Security; and J. SPBE Services. According to online media Cloud Computing Indonesia [2] reported that the role of the National Cyber and Crypto Agency (BSSN) in the SPBE evaluation is divided into three indicators, namely increasing internal policy security related to information security management, increasing internal policy security related to information security management, increasing information security, increased information security, and increased information security. maturity of the implementation of information security management [3], [4], and increasing the maturity of SPBE security audits.

In 2022, the Ministry of PANRB will monitor and evaluate 554 central and regional government agencies regarding the implementation of the Electronic Based Government System (SPBE) [5]. A total of 16 government agencies succeeded in obtaining the Very Good title in this assessment, including the Ministry of Home Affairs, Ministry of Agriculture, and DKI Jakarta Province. The results of this monitoring and evaluation are contained in PANRB Ministerial Decree Number 108 of 2023. During 2022, several agencies that received excellent predicate reported web defacement cases on their electronic systems via the zone-h.org site as an open publication medium regarding web defacement cases. The Zone-h.org site is a site that provides a data source for obtaining information about cyber attacks in the form of web defacement [6]. A web defacement attack is an attack carried out to exploit a vulnerable website or web server by exploiting existing vulnerabilities in the system so that the attacker can damage, change or delete the content of the hacked web page. The perpetrator of a web defacement attack is called a defacer. During 2022, BSSN recorded 2,348 web defacement cases occurring on Indonesian sites with the sector most affected by web defacement attacks being the Government Administration sector with a total of 885 cases [7].

In order to improve the quality of Electronic Based Government System (SPBE) implementation, an evaluation of SPBE implementation is carried out every year to measure the progress of SPBE implementation. In 2022, as many as 16 government agencies succeeded in obtaining the Very Good title in this assessment. However, there are several agencies that, despite receiving a Very Good title, still experience cases of web defacement in their electronic systems via the zone-h.org site. Therefore, it is necessary to carry out research aimed at analyzing the influence of the 2022 SPBE evaluation results on the number of web defacement cases that occur. This aims to see whether the Very Good predicate in the SPBE assessment can be a strong indicator in preventing web defacement cases. This research uses the Simple Linear Regression method to calculate this effect. It is hoped that this research can contribute to improving the safety and quality of SPBE implementation in Indonesia.

2. METHOD

This research was carried out using quantitative research methods by collecting SPBE Index results data and data on the number of cases of web defacement in the Government sector on the zone-h.org site. Next, to process the research data using a simple linear regression method to analyze the influence of two variables, namely the SPBE Index result value and the number of web defacement cases. In analyzing the influence between SPBE index value data and the number of web defacement cases in the government sector published on the zone-h.org site, there are several research stages using quantitative research methods and simple linear regression, as follows:

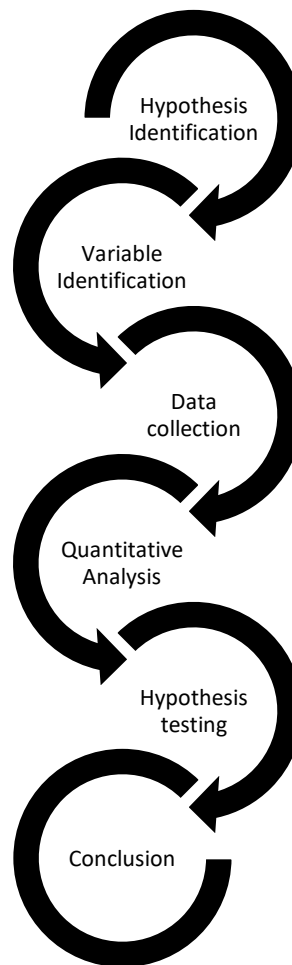


Figure 1. Research Method

According to [8], [9] the simple linear regression method (Simple Linear Regression) calculates the relationship between one dependent variable and one independent variable. The main goal of simple linear regression is to identify and measure the linear relationship between two variables. Analysis of the influence of two variables, namely the SPBE Index result value and the number of web defacement cases, can provide an in-depth picture of the relationship between the SPB Index value and the number of web defacement cases, which was carried out by collecting data since 2022 time period to ensure the representativeness of the results. The data obtained can then be used to form a hypothesis involving assumptions about how the SPBE Index value correlates with the number of web defacement cases.

A. Hypothesis Identification

At this stage the researcher formulates a hypothesis based on relevant literature, observations or theories consisting of the null hypothesis (H_0) which states there is no difference or relationship, and the alternative hypothesis (H_1) which states the opposite. Hypothesis determination provides the basis for the entire research process and helps researchers in designing appropriate experiments or data collection.

B. Variables Identification

At this stage the researcher identifies and determines the independent variables that can influence the dependent variable. The independent variable is the factor that is changed or manipulated in an experiment, while the dependent variable is the response or outcome that is measured. Variable identification helps researchers focus their efforts on relevant elements and provides a clear framework for research design.

C. Data Collection

This stage is carried out to collect the data needed to answer research questions or test hypotheses. In this research, the data collection method uses publicly available secondary data regarding the 2022 SPBE index value and the number of web defacement cases in the government sector.

D. Quantitative Analysis

The quantitative analysis stage involves processing numerical data using statistical or mathematical methods. It is used to identify relationships in the data that has been collected. By using appropriate statistical tools, researchers can present their findings objectively and draw conclusions based on empirical evidence. Quantitative analysis plays an important role in revealing the meaning of the data that has been collected.

E. Hypothesis Testing

The hypothesis testing stage is carried out to test the truth of the hypothesis that has been previously formulated. Using statistical methods, researchers evaluate whether the results obtained contain a significant relationship between the variables tested. Hypothesis testing results help researchers make scientific conclusions and conclude whether the null hypothesis can be accepted or rejected. This step becomes the basis for compiling the overall research findings.

F. Conclusion

At this stage, the results of hypothesis testing draw a scientific conclusion and conclude whether the null hypothesis can be accepted or rejected. So that it answers the relationship between the independent variable and the dependent variable that has been determined previously.

3. RESULT AND DISCUSSION

In this chapter, we will discuss the results of influence analysis using a simple linear regression method on SPBE index value data and data on web defacement cases in the government sector. The analysis stages carried out are as follows:

A. Hypothesis Identification

Hypothesis determination acts as a statement of conjecture or prediction put forward to describe the relationship between the phenomena being studied so that it can provide a framework that can be tested in order to gain a deeper understanding of the phenomena being studied [9]. Hypothesis testing is carried out using data obtained during the research. The simple linear regression method is used to test the significance of the relationship between the variables studied. The results of hypothesis testing can support or reject the initial hypothesis, thereby providing a better understanding of the nature of the relationship between variables. The hypothesis is as follows:

Table 1. Hypothesis

Hypothesis	Description
H_0	There is no Influence between Variables X and Y
H_1	There is an influence between variables X and Y

B. Variables Idemtification

The regression method is a statistical method that makes predictions using the development of mathematical relationships between variables, namely the dependent variable (Y) and the independent variable (X). The response variable is also called a dependent variable, namely a variable whose existence is influenced by other variables. In regression analysis, variable placement is very important to understand the relationship between variables. The dependent variable, which reflects the outcome of interest, is placed on the vertical y-axis. This variable is influenced by the independent variable which is placed on the horizontal x-axis. Graphical representation helps visualize the pattern and direction of relationships between these variables. By placing the dependent variable on the y-axis and the independent variable on the x-axis, the analyst can assess how changes in the independent variable contribute to variations in the dependent variable [10]. So in this research the variables used are as follows:

Table 2. Regression Research Variables

Variable	Description
Independent (X)	SPBE Index Score
Dependent (Y)	Number of web Defacement cases

C. Data Collection

In this research, data collection was carried out based on the PANRB Ministerial Decree No.108/2023 document regarding the SPBE index value in 2022 [5] and information was obtained via the zone-h.org site [11] for the number of web defacement cases in the Government sector in 2022 and The identified cases are still active. The data obtained will later be processed and analyzed to determine the influence between the SPBE index value and web defacement cases in the government sector. This research data refers to 16 government agencies listed in PANRB Ministerial Decree Number 108 of 2023 as government agencies that have a Very Good predicate on the SPBE index value obtained in 2022. The 2022 SPBE Index Value Data is used as an independent variable (X).

The data that is the focus of this research is the number of web deface cases reported on the zone-h.org site in agencies in 2022, including cases from the previous year that had not been handled until this research was conducted. So the determination of the dependent data (Y) in this research is the number of cases in 2022 and the number of cases in the previous year that had not been handled until this research was conducted in these 16 agencies. The following is data on the SPBE Index value with the title Very Good and data on the number of web deface cases:

Table 3. Data on SPBE Index Score (X)

No	Government Agencies	SPBE Index	Predicate
1	Ministry of State -Owned Enterprises	3,84	Very good
2	Ministry of Home Affairs	3,63	Very good
3	Ministry of Agriculture	3,75	Very good
4	Ministry of Energy and Mineral Resources	3,51	Very good
5	Ministry of Education and Culture	3,86	Very good
6	Ministry of National Development Planning/National Development Planning Agency	3,62	Very good
7	Ministry of Agrarian Affairs and Spatial Planning/National Land Agency	3,55	Very good
8	State Administration Agency	3,57	Very good
9	Indonesan National Library	3,51	Very good
10	DKI Jakarta Provincial Government	3,67	Very good
11	District Government Sumedang	3,84	Very good
12	Bandung City Government	3,61	Very good
13	Surakarta City Government	3,73	Very good
14	Surabaya City Government	3,69	Very good
15	District Government Polewali Mandar	3,58	Very good
16	Denpasar City Government	3,68	Very good

Table 4. Data on the Number of Web Defacement Cases (Y)

No	Government Agencies	A	B	C
1	Ministry of State -Owned Enterprises	0	0	0
2	Ministry of Home Affairs	6	1	7
3	Ministry of Agriculture	24	0	24
4	Ministry of Energy and Mineral Resources	1	0	1
5	Ministry of Education and Culture	29	0	29
6	Ministry of National Development Planning/National Development Planning Agency	3	2	5
7	Ministry of Agrarian Affairs and Spatial Planning/National Land Agency	2	0	2
8	State Administration Agency	5	2	7
9	Indonesan National Library	6	0	6
10	DKI Jakarta Provincial Government	17	0	17
11	District Government Sumedang	3	0	3
12	Bandung City Government	1	0	1
13	Surakarta City Government	0	0	0
14	Surabaya City Government	5	0	5
15	District Government Polewali Mandar	3	0	3
16	Denpasar City Government	1	0	1

A = Number of web defacement cases in 2022

B = Number of cases before 2022 and still not handled

C = Total cases of web defacement, where C = A+B

This research was conducted to analyze the influence of the 2022 SPBE Index value on the number of web defacement cases that occurred, which was carried out using the principles of effectiveness, integration, continuity, efficiency, accountability, interoperability and security [12]. Therefore, researchers used cases that had not been handled until this research was conducted to complete the number of cases that occurred at this agency. The following is an example of an active web deface case that has not been handled, namely:

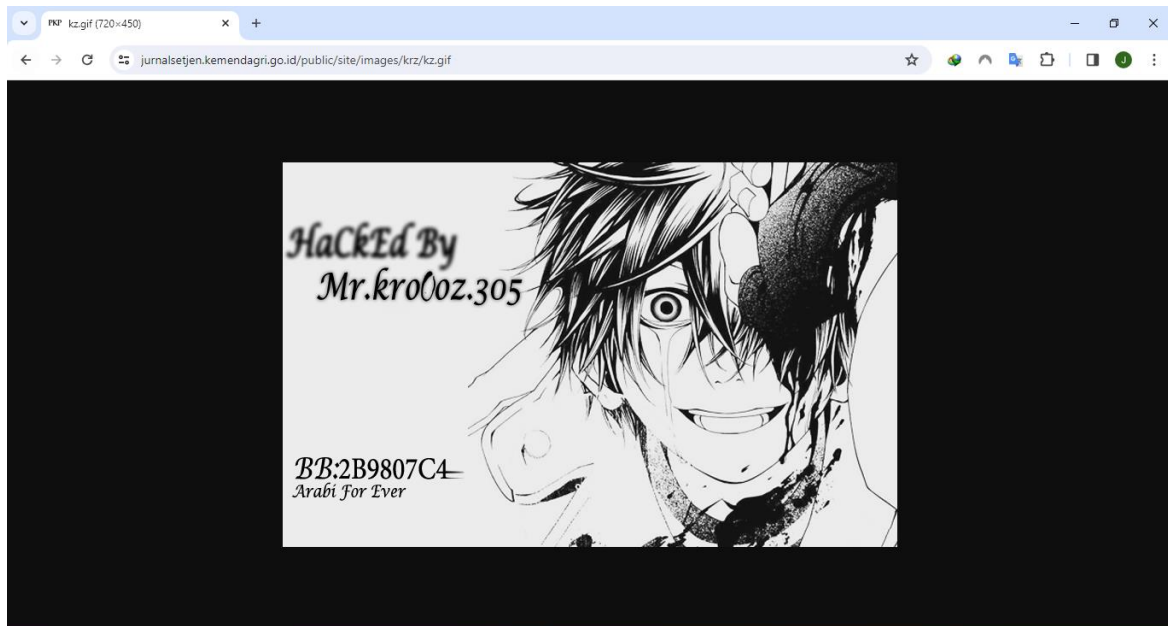


Figure 2. The web defacement case is still active at the Ministry of Home Affairs

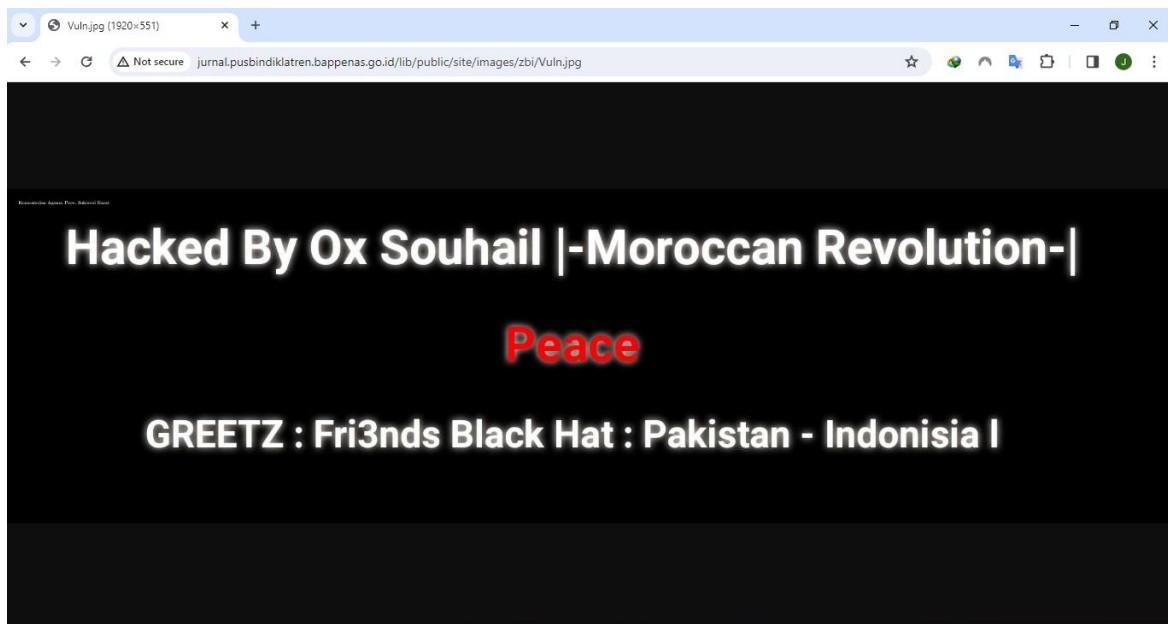


Figure 3. The web defacement case that are still active at Bappenas

D. Quantitative Analysis

To describe the relationship between the dependent variable (Y).and the independent variable (X).by calculating the predicted value of Y based on the given X value. The following is the calculation formula [13], [14]:

$$Y = \alpha + \beta x + \varepsilon \quad (1)$$

Description:

α = constant

x = independent variable

β = regression coefficient

ε = Galat is the difference between the actual value and the predicted value of the dependent variable

In calculating regression, it is important to estimate the estimator parameters using the least squares estimator [15]. Here is the calculation formula:

$$b = \frac{n \sum_{i=1}^n x_i y_i - \sum_{i=1}^n x_i \sum_{i=1}^n y_i}{n \sum_{i=1}^n x_i^2 - (\sum_{i=1}^n x_i)^2} ; \quad (2)$$

$$a = \bar{y} - b\bar{x} \quad (3)$$

Description:

a = estimator for α

b = estimator for β

So from the data held by X and Y , the relationship can be calculated using regression with parameter estimation using the least squared estimator with the following results on table Calculation of Obtained Data:

Table 5. Calculation of Obtained Data

x	y	x_i^2	y_i^2	$x_i y_i$
3,84	0	0	14,7456	0
3,63	7	25,41	13,1769	49
3,75	24	90	14,0625	576
3,51	1	3,51	12,3201	1
3,86	29	111,94	14,8996	841
3,62	5	18,1	13,1044	25
3,55	2	7,1	12,6025	4
3,57	7	24,99	12,7449	49
3,51	6	21,06	12,3201	36
3,67	17	62,39	13,4689	289
3,84	3	11,52	14,7456	9
3,61	1	3,61	13,0321	1
3,73	0	0	13,9129	0
3,69	5	18,45	13,6161	25
3,58	3	10,74	12,8164	9
3,68	1	3,68	13,5424	1
58,64	111	412,5	215,111	1915

Data calculations on x and y can then be used to obtain an estimator, namely:

$$a = -99,6926$$

$$b = 29,0942$$

Next, the Y value can be obtained using the estimator, namely:

$$Y = -99,6926 + 29,0942x$$

Analysis of variance (ANOVA) testing was carried out to evaluate how well the regression model built explained variation [16]. The following is a table of the ANOVA calculation formula. as follows:

Table 6. ANOVA Formulation

Source of Variation	Number of Squares	Degrees of Freedom	Mean Square	F-count	F-table
Regression	JKR	$dbf = 1$	JKR / dbf	F	p-value
Galat	JKG	$dbg = n - 2$	JKG / dbg		
Total	JKT	$dbt = n - 1$			

dbf : number of independent variables
 dbt : total degree of freedom = $n - 1$
 dbg : error- degree of freedom = $n - 2$
 JKR : Regression Square Sum
 JKG : Number of squares of errors = $JKT - JKR$
 JKT : Total Square Sum
 $F\text{-count}$: ratio between JKR/dbf and JKG/dbg
 $F\text{-table}$: $F_{(\alpha, dbf, dbg)}$ with significance 5%

Next, carry out calculations using the ANOVA calculation formula to produce the F-ratio value which will later be compared with the p-value to test the hypothesis, here are the calculation results:

Table 7. ANOVA Calculation Result

Source of Variation	Number of Squares	Degrees of Freedom	Mean Square	F-count	F-table
Regression	1	165,4003327	165,4003327	2,363978	4,60011
Galat	14	979,5371673	69,96694052		
Total	15	1144,9375			

E. Hypothesis Testing

Hypothesis testing is used to find out whether the regression coefficient has a significant effect or not [17]. Based on the ANOVA calculation results table, it can be seen that $F\text{-count} = 2.363978$ and $F\text{-table} = 4.60011$. Thus, based on simple linear regression it can be concluded that:

$$F\text{-count} < F\text{-table}$$

$$2,363978 < 4,60011$$

So H_0 is accepted and H_1 is rejected, this shows that there is no influence between the SPBE Index value on the number of web defacement cases that occur in government agencies.

4. CONCLUSION

Based on the results of hypothesis testing using simple linear regression in this research, it can be concluded that there is no significant influence between the SPBE Index value on the number of web defacement cases that occur in government agencies that are the focus of the research. The data used in this research is data from 16 government agencies that have received a Very Good predicate on the SPBE

index value in 2022 and the number of web defacement cases that occurred in these agencies. This research shows that although a high SPBE Index value indicates that the agency has good cyber security in accordance with the SPBE principles of effectiveness, integration, continuity, efficiency, accountability, interoperability and security, this cannot guarantee the avoidance of web defacement cases in the agency. government. The conclusion should clearly indicate the results obtained, the advantages and disadvantages, and the possibility of further development. Conclusions can be in the form of paragraphs, but must be in the form of dots using numbering.

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