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*Driving Research Towards Excellence*

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## ANALYSIS OF THE EFFECT OF HOAX NEWS DEVELOPMENT IN INDONESIA USING STRUCTURAL EQUATION MODELING-PARTIAL LEAST SQUARE

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Freedom of the press as one of the pillars of the Sustainable Development Goals (SDGs) has made information dissemination more widespread. However, this freedom is followed by the development of hoax news that continues to grow in Indonesia. For this reason, a study was conducted to analyze the factors that significantly influence the development of hoax news in Indonesia. In this case, the exogenous variables used are internal factors, external factors, media credibility, and government regulations. The endogenous variables used are the development of hoax news in mass media and social media. By applying the Structural Equation Modeling-Partial Least Square (SEM-PLS) method, it is found that internal factors and government regulations have a significant influence on the development of hoax news on social media. Through this research, policy recommendations related to internal factors and government regulations can be formulated so that the development of hoax news can be minimized.

**Keywords:** hoax news, mass media, SEM-PLS, social media

### 1. Introduction

Press freedom is one of the focuses in realizing the Sustainable Development Goals (SDGs), especially on the 16th pillar, namely strengthening an inclusive and peaceful society for sustainable development to building effective, accountable, and inclusive institutions at all levels. The freedom of the press is followed by the rapid flow of information. In a matter of seconds, various information can be spread throughout the world through various social media platforms, including fake news or hoaxes. Hoax news is growing with the freedom of the press. The development of hoax news has become a serious problem in various countries, including Indonesia (The Asean Post, 2019).

In Indonesia, hoax news develops through various media including mass media which includes print media, electronic media, and online media. A survey conducted by the Indonesian Telematics Society (Mastel) in February 2017 involving 1146 respondents showed that most respondents often found hoax information through websites (34.9%), television (8.7%), print media (5%), and radio (1.2%) (Mastel, 2017). Furthermore, the development of hoax news also occurs on social media. This is supported by the results of the Mastel survey which shows that people often find hoax information on social media (92.4%) and short message applications (62.8%) than in mass media.

On the other hand, the condition of the Coronavirus Disease 2019 (Covid-19) pandemic has made the use of information technology increase drastically so that the emergence of hoax news is increasing. Since 2018, the spread of hoax news in Indonesia has been dominated by news and issues related to politics, government, and health. However, in the period 23 January 2020 – 9 June 2021, 1636 hoax issues related to Covid-19 were found spread on 3592 social media platforms with 83.13% of them spread on the Facebook platform (Ministry of Communication and Information of the Republic of Indonesia, 2021).

The development of hoax news often makes people feel restless. The Mastel survey shows that 84.50% of the public are disturbed by hoax news and 54.00% of the public are hesitant in distinguishing whether a news item is true or fake (Mastel, 2017). In addition, the presence of hoax



news often forms the public opinion that is propaganda so that it can incite hatred and threaten the security and integrity of the country. This shows that hoax news is a big problem in Indonesia, so the cause is very important to investigate to minimize the development of hoax news in the future.

Research related to the development of hoax news has been carried out several times. Manalu et al. (2018) show that a person's internal factors such as education level and income level correlate with hoax spread behavior. Age also affects the development of hoax news. Data from the Ministry of Communication and Information in 2020 revealed that >35 years old are considered more vulnerable to becoming perpetrators and recipients of hoax news. This is due to the habit of going forward by simply reading provocative titles without verifying (Machmudi, 2020). In this case, the lower the level of education and income level of a person, the more likely it is to spread the hoax news. At a certain level, the lack of moral responsibility for journalists can lead to the birth of hoax information (Hadzialic and Phuong, 2020). For this reason, the government has issued various regulations to regulate the existence of the media so that they have principles and norms that are following the community (Nugroho, et. al., 2012). In other words, the credibility of the media affects every regulation issued by the government. In addition, external factors such as community culture also influence the regulations made by the government because basically, the law will always follow the development of society (Arif, 2013). The government regulation also regulates the development of hoax news in the community either through mass media or social media (Ministry of Communication and Information of the Republic of Indonesia, 2017). In addition, internal factors also affect the development of hoax news (Buchanan, 2020).

In this study, the development of hoax news in the mass and social media will be analyzed from several variables, including internal factors, external factors, media credibility, and government regulations. These variables have a complex relationship and cannot be measured directly so that each variable is measured by several indicators and resolved by the Structural Equation Modeling – Partial Least Square (SEM-PLS) method. Various studies apply SEM-PLS such as analysis of depositor trust in conventional banks and Islamic banks in Indonesia (Cahyono, et. al., 2021). SEM-PLS can also be used to analyze student motivation at tutoring institutions (Mardianto, et. al, 2019). In addition, the Madura community's perception of compliance and the analysis of competitive comparisons between Indonesian cinema films and international cinema films was also solved using a structural equation model (Mardianto, et. al., 2021; Mardianto, et. al, 2019). By applying the SEM-PLS model, the relationship of each variable can be estimated together and the factors that have a significant effect on the development of hoax news can be identified.

In addition, this study also discusses the characteristics of people's behavior in responding to the development of hoax news in Indonesia, especially during the Covid-19 pandemic. The use of research variables that are standardized and by the literature and analysis of the development of hoax news during the Covid-19 pandemic with SEM-PLS are the novelties of this research. Furthermore, this study produces a statistical model that explains the relationship between variables and a statistical review related to the characteristics of people's behavior in responding to the development of hoax news in Indonesia. This is the basis for formulating policies to address the development of hoax news in Indonesia. Thus, the results of this study are very useful for the government to overcome the development of hoax news in Indonesia.

## 2. Literature Review

### 2.1 Hoax News

Hoax news is news that is not following facts, fake news, news that is not sourced but is made as if it were true. Wang (2020) defines hoax news as fake news that is funny or malicious. The term hoax news has a similar meaning to news satire, junk news, pseudo-news, and propaganda news.

### 2.2 SEM-PLS

Structural Equation Modeling (SEM) is a multivariate analysis technique that combines factor analysis and path analysis so that it can be used to simultaneously test and estimate the relationship between one or more dependent variables and various indicators (Wang, et al., 2020). Partial Least Square (PLS) is a very strong analytical method, does not require many assumptions, and the sample size does not have to be large. If  $b_1$  represents the number of exogenous variables,  $j_2$  represents the

number of endogenous variables,  $\eta_j$  is the  $j$ -th endogenous variable,  $\beta_{ji}$  is the coefficient of relationship between the  $i$ -th endogenous latent variable and the  $j$ -th endogenous variable,  $\gamma_{jb}$  is the coefficient of the relationship between the  $b$ -th exogenous variable and the endogenous variable.  $j$ -th and  $\zeta_j$  is the measurement error of the  $j$ -th variable, then the SEM-PLS model can be expressed as follows.

$$\eta_j = \sum_{i=1}^{j_2} \beta_{ji} \eta_i + \sum_{b=1}^{b_2} \gamma_{jb} \xi_b + \zeta_j; j = 1, 2, \dots, j_1, i = 1, 2, \dots, j_2, b = 1, 2, \dots, b_1 \quad (1)$$

Parameter estimation in SEM-PLS includes 3 things, namely weight estimate, path estimate, and average estimate (mean), and location parameter (regression constant value) for latent indicators and variables (Latan and Noonan, 2017).

### 2.3 Model Evaluation in SEM-PLS

Model evaluation in SEM-PLS includes two stages, namely evaluation of the outer model and evaluation of the inner model, with the following criteria (Hair, et. al, 2017).

1. Convergent Validity
  - a. Loading factor. The loading factor value above 0.7 can be said to be ideal.
  - b. Average Variance Extracted (AVE). The minimum AVE value is 0.5 to show good convergent validity. AVE can be calculated as follows.

$$AVE = \frac{\sum_i^k l_{jk}^2}{\sum_i^k l_{jk}^2 + \sum_i^k var(\varepsilon_{jk})} \quad (2)$$

Where  $var(\varepsilon_{jk}) = 1 - l_{jk}^2$  and  $l_{jk}^2 = (y_j' y_j)^{-1} y_j' x_k$ ;  $y$  is the latent variable score;  $j$  is the number of latent variables; and  $k$  = number of indicator variables

2. Discriminant Validity. Valid if the AVE value is higher than the square of the correlation between constructs.
3. Reliability. Reliability testing can use the composite reliability method. The composite reliability value must be greater than 0.7 and is stated as follows.

$$\rho_{cj} = \frac{(\sum_i^k l_{jk}^2)^2}{(\sum_i^k l_{jk}^2)^2 + \sum_i^k var(\varepsilon_{jk})} \quad (3)$$

Evaluation of the structural model can use the following criteria.

1. Significance (two-sided). Significance was carried out to determine the effect of latent variables through the bootstrapping process.
2. *Goodness of Fit* (GoF) Index. The calculation of the GoF index is defined as follows.

$$GoF = \sqrt{\overline{com} \times \overline{R^2}} \quad (4)$$

The value of  $\overline{com}$  obtained utilizing AVE and  $\overline{R^2}$  is the average value of *R-Square* with criteria of 0.1 (GoF small), 0.25 (GoF moderate), and 0.36 (GoF large) (Hair, et. al., 2017).

## 3. Methodology of Research

### 3.1 Data and Data Source

The data used are primary data obtained through a survey with respondents of Indonesian citizens in each province in Indonesia as many as 467. The survey was conducted by distributing printed questionnaires offline in the city of Surabaya. In addition, the survey was also conducted online to reach respondents outside the Surabaya City area using a digital questionnaire or Google Form. The sampling technique used is quota sampling. Hair, et al. (2017) stated that the ideal minimum sample size is ten times the number of indicators so that the minimum sample size in this study of 280 has been met.

### 3.2 Research Variable

The research variables and the indicators used in this study are presented in Table 1. Each of these indicators has an indicator scale with a value range of 1 to 5, each of which states very low to very high or very bad to very good values. Meanwhile, indicators of age, education level, income level, and the number of people in one house have categorical ordinal scale values.

Table 1: Research Variable.

Variable	Information	Variable	Information
Internal Factor ( $\xi_1$ )		Government Regulation ( $\xi_4$ )	
$x_{11}$	Age	$x_{41}$	Strict action against hoax makers
$x_{12}$	Education Level	$x_{42}$	Strict action against hoax spreaders
$x_{13}$	Income Level	$x_{43}$	Dissemination of the dangers of spreading hoax news
$x_{14}$	The intensity of news consumption time	$x_{44}$	Clarification of hoax news
$x_{15}$	Time to study or work	$x_{45}$	Doing news filter
External Factors ( $\xi_2$ )		$x_{46}$	Open space for reporting hoaxes
$x_{21}$	Population density	The Development of Hoax News on Social Media ( $\eta_1$ )	
$x_{22}$	Community literacy culture		
$x_{23}$	Number of people in 1 house	$y_{11}$	Whatsapp
$x_{24}$	Internet Network	$y_{12}$	Facebook
$x_{25}$	The influence of the surrounding community	$y_{13}$	Instagram
Media Credibility ( $\xi_3$ )		The Development of Hoax News in the Mass Media ( $\eta_2$ )	
$x_{31}$	Journalism ethics and responsibilities	$y_{21}$	Newspaper print media
$x_{32}$	Media is independent	$y_{22}$	Television electronic media
$x_{33}$	Internal media selection	$y_{23}$	Radio electronic media
$x_{34}$	Ease of public reporting	$y_{24}$	Online media
$x_{35}$	Public trust in the media		

### 3.3 Analysis Procedure

The analytical procedure in this study begins with determining endogenous and exogenous variables, compiling a structural model based on concepts and theories, drawing relationships between variables in a path diagram. The path diagram is converted to a structural equation using the SEM-PLS method for parameter estimation which includes weight estimation, path coefficient estimation, and average estimation. After that, an evaluation of the SEM-PLS model was carried out in terms of the outer model, namely validity testing through outer loading criteria, cross-loading, and AVE values, as well as reliability testing through composite reliability criteria. If the model obtained is not valid or reliable, then re-estimation is carried out. Furthermore, the evaluation of the model in terms of the inner model is carried out by testing the significance of the path coefficient parameters. Overall, the SEM-PLS model was evaluated based on GoF. Furthermore, interpretation of the modeling results, drawing conclusions, and making recommendations based on the structural model obtained is carried out.

## 4. Research Result

### 4.1 Characteristics of the Development of Hoax News in Indonesia

Based on the results of a survey of 467 respondents, as many as 58% of respondents often find hoax news. 84.6% of survey respondents stated that political news content is mostly used as hoax news. The media for spreading hoax news is dominated by social media (93.7%), electronic media (35.1%), print media (6.7%), online media (1.5%), and the surrounding environment (0.03%). The spread of hoax news is caused by the spreader of hoax news obtaining information or news from trusted people so that the spreader assumes that the information obtained is correct for other people. The spread of hoax news also occurs because of a sense of laziness to seek the truth of the information obtained and the desire to make the news or information obtained more viral. In general, there are various actions of respondents when receiving hoax news including clarifying the truth of the news (53.2%), deleting the hoax news obtained (47.5%), allowing the spread of hoax news (36%), reporting the news to the authorities (11.5%), participated in spreading the hoax news obtained (2.5%).

### 4.2 SEM-PLS Modeling

Each indicator used must be valid before SEM-PLS modeling is carried out. Based on the outer loading value for each indicator, 11 indicators are declared invalid as marked in red in Table 2.

Therefore, re-estimation should be done by removing invalid indicators. In this case, the variables of external factors and the development of hoax news in the mass media are not used in the modeling because they only have 1 valid indicator. The result of re-estimation shows that all indicators are valid, which is indicated by the value of outer loading  $>0.7$ . The value of outer loading on the initial estimation results and the re-estimation results are presented in Table 2.

Table 2: The value of outer loading on the initial estimation results and the re-estimation results.

Indicator	Outer Loading Value Initial Estimation Results	Outer Loading Value Re-Estimated Results	Indicator	Outer Loading Value Initial Estimation Results	Outer Loading Value Re-Estimated Results
$x_{11}$	0.915	0.925	$x_{41}$	0.877	0.874
$x_{12}$	0.841	0.842	$x_{42}$	0.872	0.869
$x_{13}$	0.890	0.889	$x_{43}$	0.785	0.783
$x_{14}$	0.389	-	$x_{44}$	0.861	0.861
$x_{15}$	0.053	-	$x_{45}$	0.845	0.846
$x_{21}$	0.309	-	$x_{46}$	0.780	0.788
$x_{22}$	0.878	-	$y_{11}$	0.371	-
$x_{23}$	0.036	-	$y_{12}$	0.802	0.819
$x_{24}$	0.337	-	$y_{13}$	0.784	0.767
$x_{25}$	0.483	-	$y_{21}$	0.058	-
$x_{31}$	0.717	0.748	$y_{22}$	0.781	-
$x_{32}$	0.783	0.787	$y_{23}$	0.575	-
$x_{33}$	0.784	0.821	$y_{24}$	0.565	-
$x_{34}$	0.711	0.714			
$x_{35}$	0.636	-			

In this case, the estimation of the structural model with the SEM-PLS approach is carried out based on the conversion of the path diagram into the form of structural model equations. After that, an evaluation of the obtained SEM-PLS model was carried out in terms of the outer model and inner model. Evaluation of the outer model includes testing the validity and reliability. In this case, testing the validity of the outer model is done by testing discriminant validity using cross-loading and AVE criteria. The cross-loading value of each indicator is presented in Table 3.

Table 3: Cross Loading Value on Each Indicator.

Indicator	Internal Factor	Media Credibility	Government Regulation	The Development of Hoax News on Social Media
$x_{11}$	0.925	0.065	0.037	-0.153
$x_{12}$	0.842	0.022	0.024	-0.065
$x_{13}$	0.889	0.100	0.037	-0.101
$x_{31}$	0.043	0.748	0.338	0.091
$x_{32}$	0.017	0.787	0.362	0.083
$x_{33}$	0.072	0.821	0.372	0.034
$x_{34}$	0.092	0.714	0.405	0.078
$x_{41}$	0.073	0.378	0.874	0.090
$x_{42}$	0.050	0.378	0.869	0.085
$x_{43}$	0.046	0.362	0.783	0.060
$x_{44}$	-0.032	0.409	0.861	0.123
$x_{45}$	0.001	0.474	0.846	0.073
$x_{46}$	0.064	0.410	0.788	0.103
$y_{12}$	-0.117	0.012	0.080	0.819
$y_{13}$	-0.090	0.143	0.090	0.767

Based on Table 3, it can be seen that the cross-loading value of each indicator on the variable itself has a greater value than the cross-loading value of other variables which indicates that the indicator meets discriminant validity. In addition, the AVE values for internal factors, media credibility, government regulations, and the development of hoax news on social media are 0.785,

0.591, 0.702, and 0.630, respectively. All of these variables have an AVE value of  $\geq 0.5$  which indicates that the latent variable used is valid. In addition, reliability testing on the outer model can be done with the criteria of the composite reliability value. The composite reliability values for each variable are 0.916, 0.852, 0.934, and 0.773 respectively. The composite reliability value for each variable is  $>0.7$ , which means that all variables have a good level of reliability.

Next, an evaluation of the inner model is carried out. This evaluation includes hypothesis testing to see the significance of the relationship between latent variables. With the bootstrapping process, the path coefficient values and T statistics for each path are presented in Table 4. Based on Table 4, it can be seen that internal factors have no significant effect on government regulations. This is indicated by the P-Value  $< 5\%$ . On the other hand, internal factors have a significant effect on the development of hoax news on social media. In addition, media credibility has a significant effect on government regulations and government regulations have a significant effect on the development of hoax news on social media.

Table 4: Path coefficient values and T statistics.

Variables	Original Sample	T Statistics	P-Value
Internal Factor → Government Regulation	0.002	0.046	0.964
Internal Factor → The Development of Hoax News on Social Media	-0.136	2.317	0.021
Media Credibility → Government Regulation	0.484	12.014	0.000
Government Regulation → The Development of Hoax News on Social Media	0.112	2.349	0.019

Next, the GoF value is used to validate the overall model. Based on the modeling that has been done, the GoF value is 0.2989. This value is in the mid-level range. In other words, the SEM-PLS model has a moderate ability to explain empirical data so that the overall model is valid and reliable. The results of the SEM-PLS modeling are presented in Figure 1. Mathematically, the structural model obtained from the results of the SEM-PLS modeling can be written as follows.

$$\hat{\eta}_1 = -0.136 \xi_1 + 0.112 \xi_4 \tag{5}$$

$$\hat{\xi}_4 = 0.484 \xi_3 + 0.002 \xi_1 \tag{6}$$

Equation (5) shows that an increase in the value of internal factors will cause the development of hoax news on social media to decrease by 0.136. This is in line with previous research which states that someone with better internal factors will tend to be careful in receiving any information so that it is not easy to spread hoax news (Buchanan, 2020). Also, increasing government regulations will cause the development of hoax news on social media to increase by 0.112. This fact is supported by the results of research which states that increasingly complex rules are more likely to be broken.

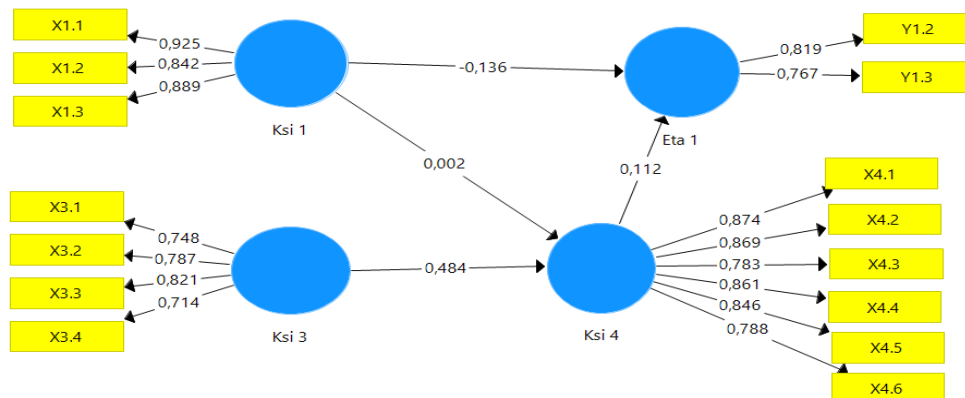


Figure 1: Final Form of SEM-PLS Model.

Lehman et. al. (2019) shows that rules designed for a good cause can create challenges for policymakers. Violations of a rule will continue to occur and are difficult to correct. For this reason, finding the root of the problem and making positive routines can be applied as an alternative to making complex regulations to avoid a problem. From Equation (6), the increase in media credibility

will affect the increase in government regulations by 0.484. Meanwhile, internal factors do not have a significant influence on government regulations. This is appropriate because the law is formed on a culture that is a group in nature so that the influence of media credibility on government regulations is more significant than the influence of internal factors (Varner, 2014). Furthermore, the modeling results are used as a basis for policymaking. Policy recommendations to reduce the development of hoax news are presented in Table 5.

Table 5: Policy Recommendations.

For Government: Related to Government Regulation 1. Clarify regulations related to the spread of hoaxes and carry out fair law enforcement. 2. Provide space and legal protection for people who report hoax news. 3. Blocking hoax sites and cooperating with press agencies to constantly verify the news.	For Government: Related to Internal Factors 1. Applying literacy and critical thinking habits for the community. 2. Provide education for the community regarding the importance of literacy. 3. Improving the quality of human resources. 4. Improving community welfare through various job training programs and social assistance.
For Media 1. Provide training for journalists to improve their competence at work. 2. Improve the internal selection of news production. 3. Provide clarification on hoax news.	For Community 1. Take an active role in reporting any hoax news found on the complaint service. 2. Do not spread or create hoax news. 3. Participate in providing clarification on hoax news.

## 5. Conclusion

The development of hoax news in Indonesia on social media is significantly influenced by internal factors and government regulations. With increasing age, education level, and income level, the development of hoax news in Indonesia will decline. On the other hand, the stricter government regulations do not make the development of hoax news decline. Therefore, the government can improve the quality of human resources, welfare, and provide education about the importance of countering hoax news so that the development of hoax news can be minimized. Further research can be done by adding other variables for more complex and comprehensive modeling related to the development of hoax news in Indonesia.

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