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THE ANALYSIS OF THE CAUSATIVE FACTORS OF TRAFFIC ACCIDENTS RURAL ROADS IN BUNTOK

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ABSTRACT

In order to decline and prevent traffic accident rates, there is a need of traffic data, that can be obtained from the Indonesian National Police. However, if the data are not available, there is a need of another approach, namely by asking the opinion of the community as road users to participate in providing inputs on the causative factors of traffic accidents through questionnaires. Data in the form of road user opinions were analyzed using the Partial Least Square (PLS) approach. The purpose of using PLS is because PLS is more oriented towards prediction. In general, in the research questionnaire, there were 26 indicators of the causes of accidents. Based on the results of the test using PLS, there were 15 indicators remaining that met the assessment criteria as well as 4 dominant indicators that could potentially cause traffic accidents, namely aggressive behavior, brake system disorders, sharp turns, and wildlife crossing. The study showed that the analysis and field conditions did not have significant different results.

Keywords: *Causative factors of traffic accident, Rural roads, PLS.*

I. INTRODUCTION

According to data from the Central Kalimantan Regional Police, the traffic accident rate in the Province of Central Kalimantan in 2017 was 848, and 756 in 2018 [1]. Based on the data above, there was a decrease in the traffic accident rate. However, the actual data on the field regarding fatality and traffic accident rates can be higher than the results of data recorded by the Police. It is due to many reasons for people to not to report the accidents to the Police. if the data are not available, there is a need of another approach, namely by asking the opinion of the community as road users to participate in providing inputs. There have been several studies conducted related to traffic accidents, including, a study entitled Correlation between the Assessment of Accident Rate and Geometric Factors, Road Equipment, and the Environment (A Case Study on the Muara Teweh-Puruk Cahu Road Section) [2].

Based on the reasons above, the researcher conducted a study entitled "**The Analysis of the Causative Factors of Traffic Accidents Rural Roads In Buntok"**.

II. LITERATURE REVIEW

Traffic accident is defined as an event that occurs due to errors on roads and environments, vehicles, and drivers as a part of the traffic system, both individually and interrelated, namely: humans, vehicles, roads, and environments [3]. Population is the whole subject of research, thus, population is individuals who have the same nature [4]. So that, the population referred to include the characteristics/properties possessed by the object or subject under study.

The non-probability sampling method is the method of sampling for research, that is the sampling method that does not provide equal opportunity for each member of the population to become a sample. Purposive sampling technique that is sampling technique with certain considerations [5].

In this study, there were 150 respondents taken as the sample based on the ideal number suggested to use a high prediction model because the larger the sample size, the less the difference or a small asymmetric effect for each group [6].

The data were collected through questionnaire. Questionnaire is a data collection technique that is done by giving a set of questions or written statements to respondents to answer [5]. The main purpose in making a questionnaire is to obtain information relevant to the purpose of the survey as well as to obtain information with the highest possible reliability and validity [7].

The questionnaire for the study contained clarifying and confirmation questions which were then assessed using a Likert scale.

Partial Least Square (PLS) is a variance-based statistical method of Structural Equation Modeling (SEM) that is designed to solve multiple regression when specific data problems occur. PLS is an analysis of variance-based structural equations that can simultaneously test measurement models as well as structural model testing. The measurement model is used to test the validity and reliability, while the structural model is used to test the causality [8]. PLS is used to make a prediction of relationships between constructs, it can be said that PLS is more oriented towards a prediction. SmartPLS is one of the software used for PLS-SEM analysis [9].

III. RESEARCH METHOD

This study aimed to determine the relationship between the four causative factors with traffic accident variables, namely the independent variables; consisting of human/driver factors (X1), vehicle factors (X2), road factors (X3), and environmental factors (X4); on the dependent variable, namely traffic accident (Y).

The study was started by carrying out a literature study to be able to identify variables and indicators which were then used as a reference for making a research questionnaire, while the results of the study were analyzed using SmartPLS software (Student version).

This study analyzed the causative factors of traffic accident rural roads in Buntok with each indicator described in Table 1.

Table 1. Independent Variable Indicators

Exogenous Variable (X)	Indicator	Code
Human/Driver Factor (X1)	Fatigue and Sleepiness	X1.1
	Aggressive Behavior	X1.2
	Lack of concentration due to internal factor	X1.3
	Lack of concentration due to external factor	X1.4
	Lack of discipline	X1.5
	Lack of anticipation	X1.6
Vehicle Factor (X2)	Brake system failure	X.2.1
	Tire failure	X2.2
	Over dimension and over load (ODOL)	X2.3
	Lighting system failure	X2.4
	Disturbed visibility inside the vehicle	X2.5
	Incomplete vehicle parts (lost/worn)	X2.6
Road Factor (X3)	Potholes	X3.1
	Narrow Road	X3.2
	Slippery road when wet	X3.3
	Public Street Lighting	X3.4
	Rocky roads; slippery on oily roads; half asphalt road	X3.5
	Sharp turns	X3.6
	Road Equipment	X3.7
Environmental Factor (X4)	Heavy rain	X4.1
	Thick fog	X4.2
	Thick smoke from vehicles	X4.3
	Wildlife crossing	X4.4

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Side barriers	X4.5
School zone (children crossing)	X4.6
Unguarged heavy transport	X4.7

The Path Diagram Construction can be described in Figure 1.

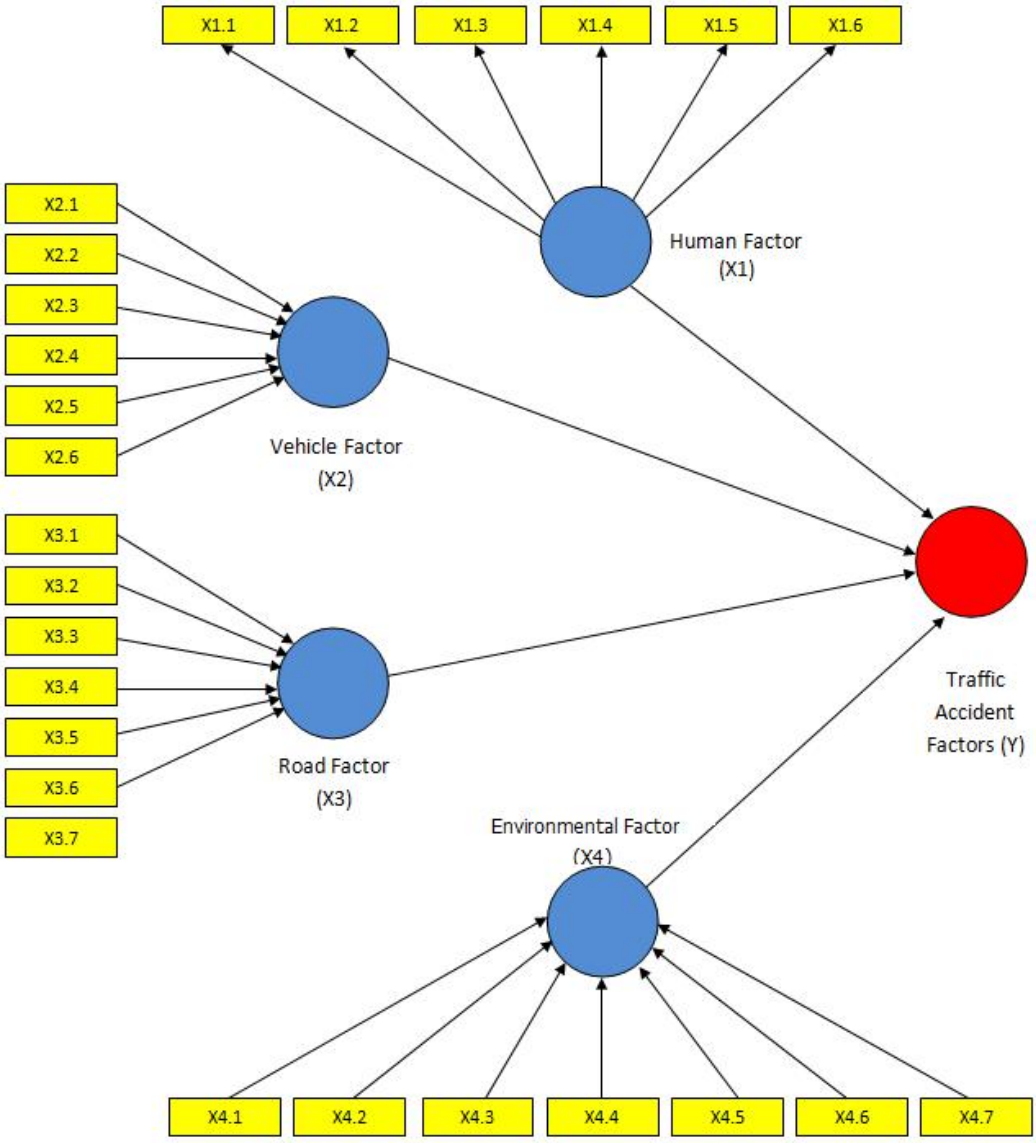

Figure 1. The Path Diagram Construction

IV. RESULT & DISCUSSION

1. Respondent Data

The questionnaires were distributed only to drivers who already had their own Driving License (SIM). There were 150 respondents filled in the questionnaires.

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2. Respondent's Statement to Research Questionnaire

Respondent's Statement to the Research questionnaire was based on a Likert scale as can be seen in Figure 2.

Figure 2. Respondent's Statement to the Research Questionnaire

3. Evaluation of PLS on Reflective Indicators

To evaluate the reflective indicators, an Outer Model Analysis was performed by running the PLS Algorithm. The flow diagram of the PLS Algorithm analysis is shown in Figure 3.

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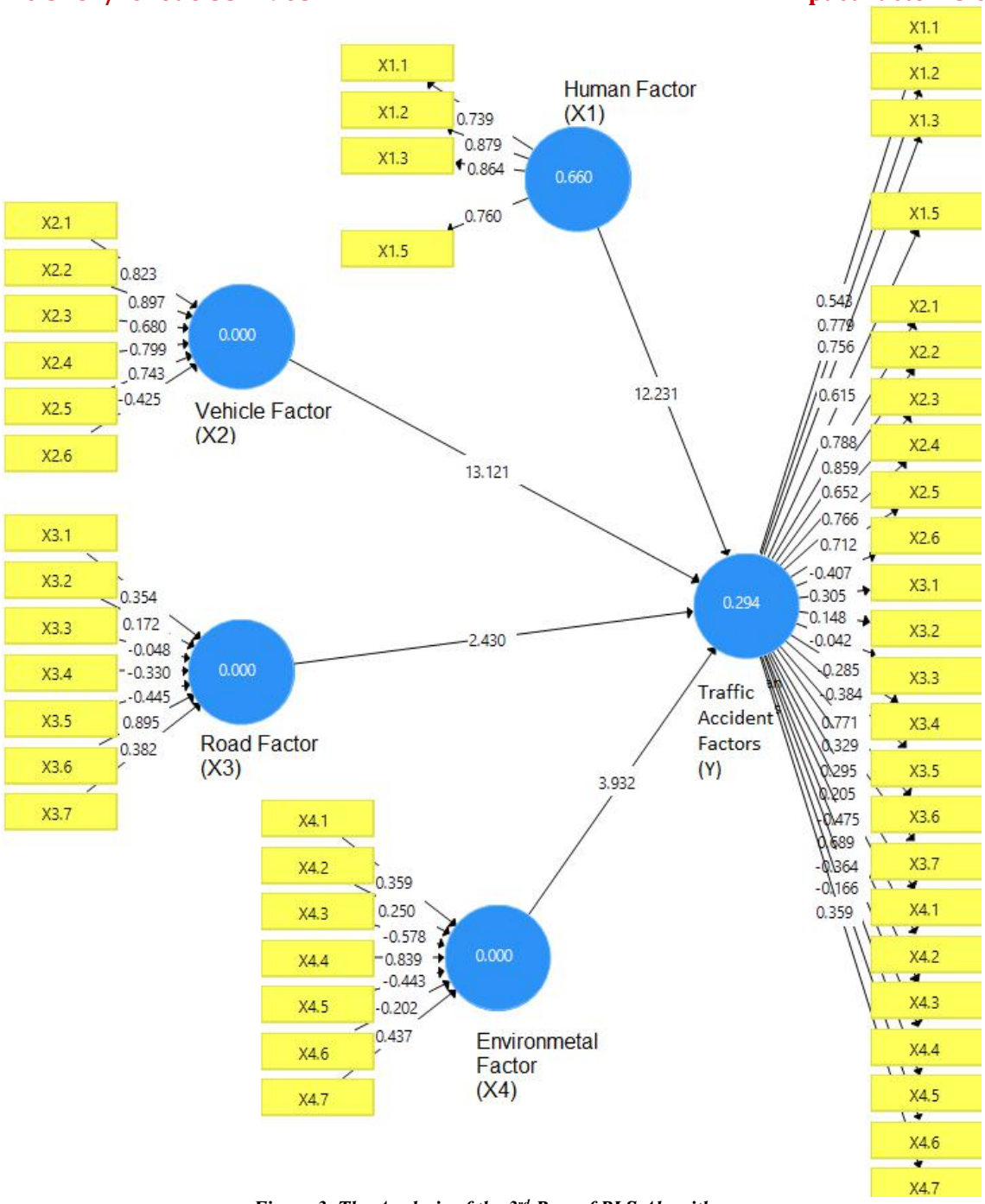

Figure 3. The Analysis of the 3rd Run of PLS Algorithm

The results of the Analysis of the 3rd Run of PLS Algorithmare shown in Table 2.

Table 2. The Results of the Analysis of the 3rd Run of PLS Algorithm

	Reflective Model Criteria	Results of Analysis			Information
1.	Loading Factor > 0.70	X1.1	= 0.739		Valid
		X1.2	= 0.879		Valid
		X1.3	= 0.864		Valid
		X1.5	= 0.760		Valid
2.	Discriminant Validity	X1.1	= 0.739	> 0.543	Valid
		X1.2	= 0.879	> 0.779	Valid
		X1.3	= 0.864	> 0.756	Valid
		X1.5	= 0.760	> 0.615	Valid
3.	Composite Reability> 0.70		= 0.885		Reliable
4.	Cronbach Alpha > 0.70		= 0.828		Reliable
5.	Averange Variance Extracted (AVE) > 0.50		= 0.660		Reliable

From Table 2, it can be seen that all indicators obtained are reflective which have a loading factor value above 0.70 and AVE value above 0.50, so that the resulting data are valid.

4. The Evaluation of PLS on Formative Indicators

The estimated value for the formative measurement model must be significant. The Significance of Weights assessment procedures were done through the Bootstrapping process with a probability value or p-value below 0.50. If the p-value is above 0.50, the indicator with the largest value must be reduced and the bootstrapping process is resumed until the p-value is below 0.50. The results of the 6thrun of bootstrapping process are shown in Figure 4. From the 6th run of bootstrapping process, it can be concluded that the indicators and their significance assessment are as shown in Table 3.

Table 3. The Results of the 6th Run of Bootstrapping Test

Indicator	P-Value	Information
X.2.1	0.000	Significant
X2.2	0.000	Significant
X2.3	0.000	Significant
X2.4	0.000	Significant
X2.5	0.000	Significant
X2.6	0.005	Significant
X3.1	0.000	Significant
X3.3	0.022	Significant
X3.4	0.002	Significant
X3.6	0.000	Significant
X4.1	0.006	Significant
X4.2	0.002	Significant
X4.4	0.000	Significant
X4.5	0.002	Significant
X4.7	0.002	Significant

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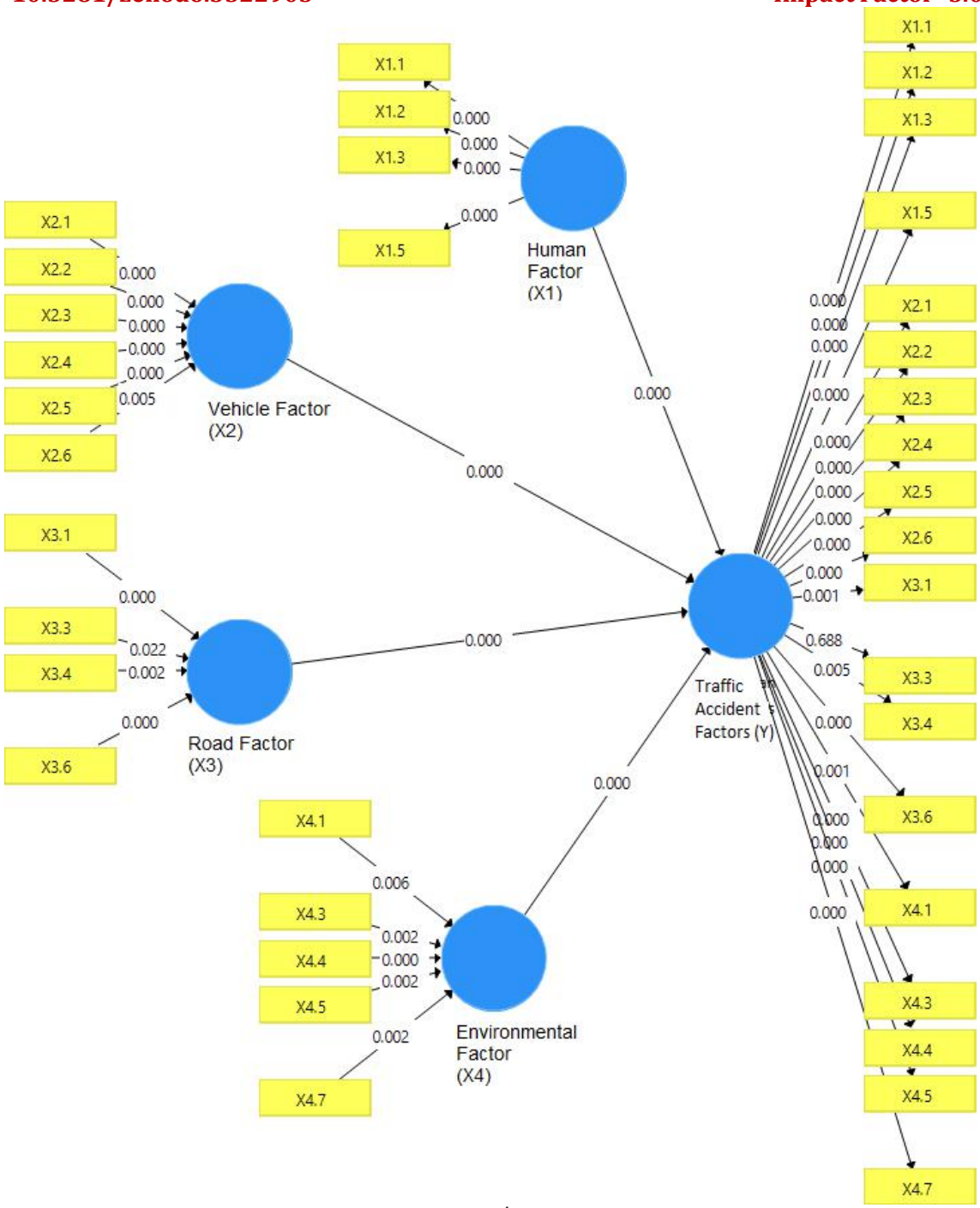

Figure 4. Diagram of Results of the 6th Run of Bootstrapping (final run)

5. Results of Analysis

The results of the evaluation on the causative factors of traffic accident rural roads in Buntok are shown in Table 4.

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Impact Factor- 5.070

Table 4. The Indicators of Causative Factors of Traffic Accident Rural Roads in Buntok

Exogenous Variable (X)	Indicator	Code
Human/Driver Factor (X1)	Fatigue and Sleepiness	X1.1
	Aggressive behavior	X1.2
	Lack of concentration due to internal factor	X1.3
	Lack of discipline	X1.5
Vehicle Factor (X2)	Brake system failure	X.2.1
	Tire failure	X2.2
	Over dimension and over load (ODOL)	X2.3
	Lighting system failure	X2.4
	Disturbed visibility inside the vehicle	X2.5
	Incomplete vehicle parts (lost/worn)	X2.6
Road Factor (X3)	Potholes	X3.1
	Slippery road when wet	X3.3
	Public street lighting	X3.4
	Sharp turns	X3.6
Environmental Factor (X4)	Heavy rain	X4.1
	Thick smoke from vehicles	X4.3
	Wildlife crossing	X4.4
	Side barriers	X4.5
	Unguarged heavy transport	X4.7

V. CONCLUSION

Based on the analysis of the causative factors of traffic accidents rural roads in Buntok, there were 15 indicators that potentially have an effect on the traffic accident rate rural roads in Buntok. There were four indicators caused by human or driver factor, namely fatigue and sleepiness, aggressive behavior or driving, lack of concentration due to internal factor and lack of discipline. From the vehicle factor, there were six indicators that potentially have an effect on the traffic accident rate, namely brake system failure, tire failure, Over dimension and over load (ODOL), lighting system failure, disturbed visibility inside the vehicle, and incomplete vehicle parts (lost/worn). From the road factor, there were four potential indicators, namely, potholes, slippery roads when wet, Public Street Lighting, and sharp turns. From the environmental factor, there were 4 indicators that potentially have an effect on the traffic accident rate, namely heavy rain, thick smoke from vehicles, wildlife crossing, side barriers, and unguarded heavy transport.

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