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IDENTIFICATION AND ANALYSIS ON CAUSES OF TRAFFIC ACCIDENT FACTORS IN THE URBAN ROADS IN PARINGIN

Dedy Harianto*[1]& Iphan F. Radam[2]

*[1]Graduate Student of Transportation Engineering and Management, Magister Study Program of Civil Engineering, Lambung Mangkurat University, Indonesia

[2]Ass.Prof., Magister Study Program of Civil Engineering, Lambung Mangkurat University, Indonesia

ABSTRACT

Traffic accidents are a global problem, therefore an approach method is needed to reduce accident rates by identifying and analyzing the causes. This research was conducted on the urban road in Paringin City through a media questionnaire by asking the opinion of the community as road users to participate in providing input on the factors that cause traffic accidents. There are four causative factors and twenty nine indicators are used as research variables and the data is processed by Partial Least Square (PLS) analysis. The results of the study are derived from the human factor (the driver) who are fatigue is the dominant cause of traffic accidents, other causes are lack of concentration, lack of discipline, lack of anticipation, and high speed. In vehicle factors, it was found that tire damage was the dominant cause of traffic accidents, other causes were over dimension and over load (ODOL), damage to the steering system, slippage, untreated vehicle spare parts, damage to the light system and the age of the vehicle is too old. On the road factor, it was found that the road / slope geometry was the dominant cause of traffic accidents, other causes were road damage, lack of road facilities, misuse of road functions and road pavement conditions. In environmental factors it was found that flooding was the dominant cause of traffic accidents, other causes were side obstacles and densely populated.

Keywords*: traffic accident, Partial Least Square, urban road.*

I. INTRODUCTION

Indonesia ranks fifth with the number of deaths caused by traffic accidents and first place for an increase in the number of traffic accidents [1]. Lack of coordination between agencies/ institutions that records the data on traffic accidents (police, hospitals, insurance, etc.) and still many people who do not report the incidence of traffic accidents make data different. So another approach is needed in handling traffic accidents with the opinion of the community as road users.

Paringin City, the center of Balangan Regency in South Kalimantan Province, recorded the number of accidents in 2016 had 31 incidents with 27 fatalities, in 2017 there were 17 incidents with 14 fatalities and 2018 to August 6 incidents with 4 fatalities with the most location of the incident is on Ahmad Yani Street which is a crossing road between the provinces of Central Kalimantan and East Kalimantan[2].

This study aims to identify the factors that cause traffic accidents on the urban road in Paringin City, therefore it becomes a technical input for relevant agencies in handling traffic accidents. From the results of research on districts/ cities in East Java, it is known that the factors that affect traffic accidents are significantly very useful for local governments to handle the reduce of traffic accidents [3].

II. LITERATURE REVIEW

A traffic accident is an unexpected and unintentional incident on road involving a vehicle with or without another road user which results in human casualties and / or property losses [4]. Factors that cause traffic accidents are road user factors (human), vehicle factors, road factors, and environment [5]. Traffic is caused by the movement of transportation equipment because of the need to move people and / or goods. The factors that cause accidents are

identical to the traffic-forming elements are road users, vehicles, roads, and the environment. Accidents can arise if one of these elements does not act properly.

Partial Least Square (PLS) is a regression-based family method introduced by Herman O.A Wold to create the models and methods for the social sciences with predictive-oriented approaches. The aim is to predict the effect of variable X on Y and to explain the theoretical relationship between the two variables. Regression method is used to identify factors which are combinations of variable X as explanatory and variable Y as response [6].

The PLS approach for models with LV (Latent Variable) has been developed gradually since 1971 which was documented in a series of progress reports [7]. PLS modeling is primarily designed for predictive analysis of problems with high complexity but low information. Complex problems with low information often occur in the sciences relating to psychology, social, and human and natural behavior. PLS estimation do not impose restrictions on the format or data even though it would be better to use a lot of data [8]. Data with a number of not less than 500 will get very accurate results [9].

The PLS approach using LV is very suitable for multidisciplinary applications that have difficulties in exploring problems and limited theoretical, or in terms of PLS can be used if there are 3 (three) characteristics that are interwoven[7], namely: (a) predictive analysis of a causal ; (b) complexity of problems explored; and (c) scarcity of previous theoretical knowledge. Variables used as latent variables or unmeasured variables can be categorized into 3 (three) types of variables [10], that is:

1. LV in principle, this immeasurable variable is usually because theoretically it is not observed in a model such as the occurrence of a phenomenon.
2. LV empirically, variables that are not observed in principle, but empirically can be concluded from observing the example of attitudes or behavior that might be reflected in the evaluation.
3. LV by definition, unmeasured variables defined in terms of observations such as the spirit of salespeople can be defined as observations of the moral average values of individual sellers.

When viewed on non-measurable factors in the field of transportation such as lifestyle factors that influence choice of modes, it can be categorized in LV type empirically. These lifestyle factors in PLS terms are called 'constructs' and those that affect the emergence of lifestyle are 'indicators' or 'manifest'. The causal relationship between constructs and indicators is then known as the indicator model [11].

Based on the explanation above, it can be assumed by this research that lifestyle factors can be assumed by the factors causing traffic accidents and the choice of modes can be assumed by traffic accidents. Therefore, to reduce the number of traffic accidents can be done with the PLS approach, which is by identifying the causes that affect traffic accidents, these causes in the PLS term are called "constructs" and those that affect these factors are "indicators" or "manifest". In identifying constructs and indicators, it is necessary to do a literature study of the theories, studies, research that has been carried out and conduct a pilot survey to gather input and opinions based on the perceptions of the community / respondents.

SmartPLS is one of the software used for the execution of PLS-SEM analysis [12], developed by Professor Cristian M. Ringle, Sven Wended and Alexander Will in 2005. Using this tool will simplify the process of data analysis.

III. METHODS

This type of research is an explanatory research, aims to determine the relationship of five variables which is human variable (driver) (X1), vehicle variable (X2), road variable (X3), and environment variable (X4) on traffic accidents (Y). The research variables and indicators are shown in Table 1.

Table 1. Research Variables and Indicators

VARIABLE		INDICATORS
Human (Driver) X1	X1.1	Less Concentration of Internal Factors
	X1.2	Less Concentration of External Factors
	X1.3	Lack of Discipline
	X1.4	Less Anticipation
	X1.5	High speed
	X1.6	Fatigue
Vehicle X2	X2.1	Tire Damage
	X2.2	Over Dimension and Over Load (ODOL)
	X2.3	Damage to the Steering System
	X2.4	Skid
	X2.5	Unmanaged Vehicle Spare Parts
	X2.6	Lamp System Damage
	X2.7	Brake System Damage
	X2.8	Film Glass (*Riben*) Too Dark
	X2.9	Age of Vehicle Too Old
Road X3	X3.1	Road Geometric / Road Slope
	X3.2	Road Damage
	X3.3	lack of road facilities
	X3.4	Misuse of Road Functions
	X3.5	Road Pavement Conditions
	X3.6	Nonstandard Bend
	X3.7	Straight Road Too Long
Environment X4	X4.1	Side Obstacles
	X4.2	Weather / Climate
	X4.3	Population Solid
	X4.4	Solidness of Motor Vehicles
	X4.5	*Kamtibmas* Disturbance
	X4.6	Animals Cross the Road
	X4.7	Flood

Data collection techniques with multiple choice questionnaire media using a Likert scale to 150 respondents of road users and communities around the study location, each question is divided into five size scales which strongly agree with the score 5, agree with the score 4, neutral with a score of 3, no agree with the score 2 and strongly disagree with the score 1.

Data collection was carried out for 8 days on the urban road section on the national road locations (Ahmad Yani Street), Provincial Roads (Paringin-Lampihong Road and Paringin-Halong Roads) and Regency Roads.

Analysis of data processing using smartPLS software with the design of the Partial Least Square (PLS) relationship model can be seen in Figure 1.

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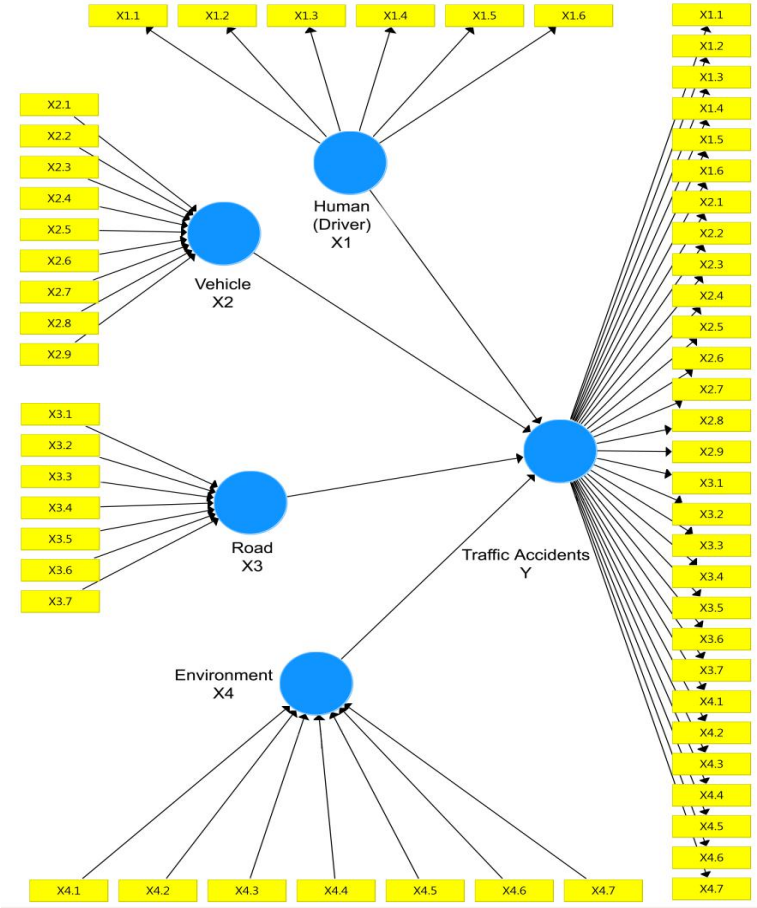

Figure 1. Design of Partial Least Square (PLS) Relationship Model

IV. ANALYSIS OF INFLUENCE FACTORS

Partial Least Square (PLS) model evaluation is a step in reducing the indicators of variables that do not meet the requirements. The results of the model evaluation are shown in Table 2.

Table 2. Evaluation of Partial Least Square (PLS) Model

Formative Model Criteria	Analysis	Indicators	Value	Explanation
Significance of Weights	*Bootstrapping* (*Run* No.2)	X4.2	0.943	Reduced
p-value< 0.05	*Bootstrapping* (*Run* No.3)	X4.5	0.715	Reduced
	Bootstrapping (*Run* No.4)	X3.7	0.668	Reduced
	Bootstrapping (*Run* No.5)	X2.8	0.318	Reduced
	Bootstrapping (*Run* No.6)	X4.4	0.270	Reduced
	Bootstrapping (*Run* No.7)	X3.6	0.194	Reduced
	Bootstrapping (*Run* No.8)	X4.6	0.155	Reduced
Multicolinearity	Algorithm PLS (*Run* No.2)	X2.7	5.908	Reduced
VIF < 5				

The final analysis results can be seen in Figure 2 for the results of the loading factor value, Figure 3 for the p-value and Table 3 for the final measurement results.

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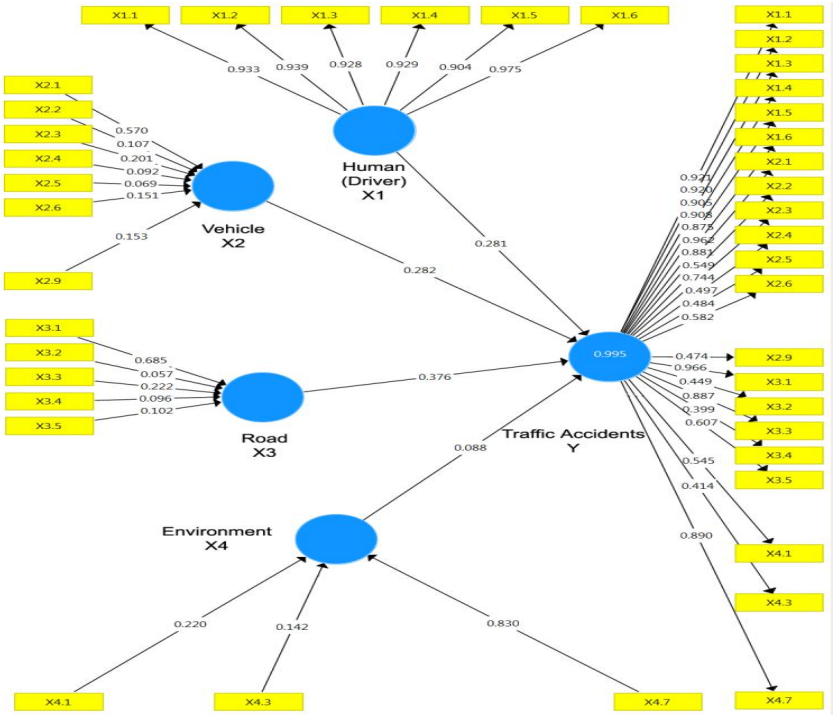

Figure 2. Final Partial Least Square (PLS) Relationship Model (loading factor)

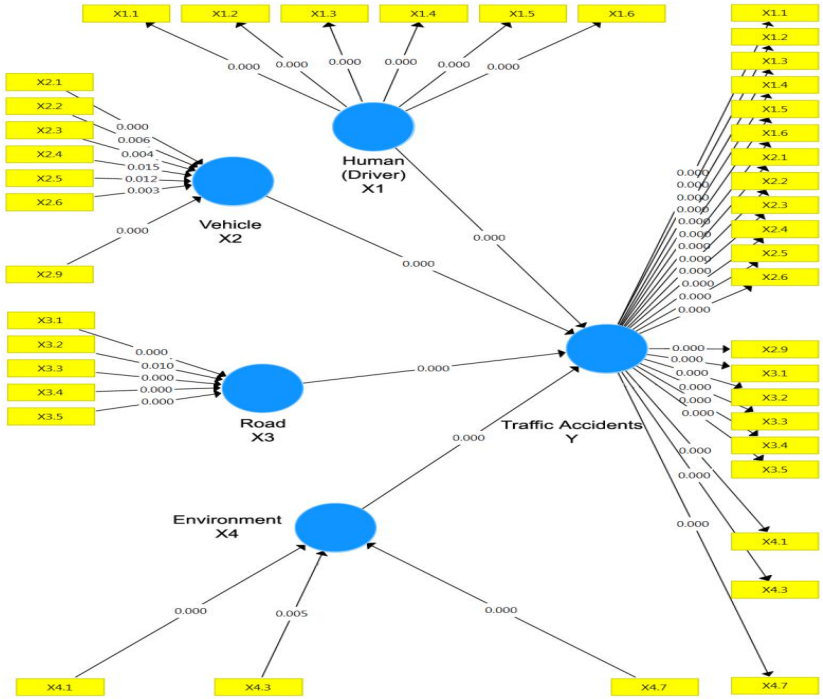

Figure 3. Final Partial Least Square (PLS) Relationship Model (p-value)

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Table 3. Final Results of Partial Least Square (PLS) Analysis

Criteria	Description	Indicators	Value	Explanation
Reflective Measurement Model on Human Indicators (Drivers)				
Convergent Validity	*Loading Factor* >0.70	X1.1	0.933	*Valid*
		X1.2	0.939	*Valid*
		X1.3	0.928	*Valid*
		X1.4	0.929	*Valid*
		X1.5	0.904	*Valid*
		X1.6	0.975	*Valid*
Reliability	AVE > 0.50		0.874	*Reliable*
	Cronbach 's Alpha >0.70		0.971	*Reliable*
	Composite Reliability> 0.70		0.977	*Reliable*
Discriminant Validity	*Cross Loading.*	X1.1	0.933>0.921	*Valid*
	Loading Factor Indicator>its	X1.2	0.939>0.920	*Valid*
	Respective Latent Variable	X1.3	0.928>0.905	*Valid*
		X1.4	0.929>0.908	*Valid*
		X1.5	0.904>0.875	*Valid*
		X1.6	0.975>0.962	*Valid*
Formative Measurement Model on Vehicle, Road and Environment Indicators				
Significance of Weights	*p-value*< 0.05	X2.1	0.000	*Significant*
		X2.2	0.006	*Significant*
		X2.3	0.004	*Significant*
		X2.4	0.015	*Significant*
		X2.5	0.012	*Significant*
		X2.6	0.003	*Significant*
		X2.9	0.000	*Significant*
		X3.1	0.000	*Significant*
		X3.2	0.010	*Significant*
		X3.3	0.000	*Significant*
		X3.4	0.000	*Significant*
		X3.6	0.000	*Significant*
		X4.1	0.000	*Significant*
		X4.3	0.005	*Significant*
		X4.7	0.000	*Significant*
Multicollinearity	VIF < 5	X2.1	2.239	*No Multicol*
		X2.2	1.344	*No Multicol*
		X2.3	2.309	*No Multicol*
		X2.4	2.298	*No Multicol*
		X2.5	2.063	*No Multicol*
		X2.6	1.377	*No Multicol*
		X2.9	1.186	*No Multicol*
		X3.1	3.961	*No Multicol*
		X3.2	1.226	*No Multicol*
		X3.3	3.588	*No Multicol*
		X3.4	1.124	*No Multicol*
		X3.5	1.440	*No Multicol*
		X4.1	1.220	*No Multicol*
		X4.3	1.125	*No Multicol*
		X4.7	1.342	*No Multicol*

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V. DISCUSSION OF RESULTS

From the data of Table. 3 can be explained that the factors causing traffic accidents:

5.1 Human Factor (Driver)

1. Lack Concentration of Internal Factor
   Drivers who lack concentration due to internal/ self-factors such as drowsiness, negligence, carelessness, confusion, many thoughts, work pressure, etc. cause traffic accidents. In line with the results of the study that there was a relationship between sleepy drivers (lack of concentration) with the incidence of death on the road, data obtained from the death toll from sleepy drivers amounted to 13 accidents (48.1%) [13].
2. Lack Concentration of External Factors
   Drivers who lack concentration due to external factors such as driving while using cellphones, driving listening to music, getting drunk, driving while smoking, too busy chatting, driving while eating, and others affect traffic accidents. In line with the results of the study that there is a relationship between drunk drivers (lack of concentration) with the incidence of death due to traffic accidents, of the 11 accidents involving drivers in the influence of alcohol 6 caused the death toll (54.6%) [13].
3. Lack of Discipline
   In line with the results of the study that drivers who are less orderly (lack of discipline) on the road cause traffic accidents to reach 80% [14].
4. Less Anticipation
   In line with the results of the study that drivers who were less anticipated were the biggest cause of accidents at 142 events (72.45%) [15].
5. High Speed
   In line with the results of the study that high-speed violations of road users (drivers) trigger traffic accidents [16].
6. Fatigue
   In line with the results of the study that drowsiness, lack of anticipation and negligence which are symptoms of fatigue result in the largest number of accidents [17].

The dominant factor that causes traffic accidents on the urban road from the human factor (driver) is fatigue with T-value 96.124.

5.2 Vehicle Factors

1. Tire Damage
   In line with the data stating the causes of traffic accidents in 2013 due to poor tires as many as 461 incidents [18].
2. Over Dimensions and Over Load (ODOL)
   In line with the results of the study that the trigger for the accident was a vehicle with an excessive load (not in accordance with the provisions) [19].
3. Damage to the Steering System
   In line with the data stating the causes of traffic accidents in 2013 due to poor steering as many as 886 incidents [18].
4. Slip
   In line with the results of the study that the skid vehicle resulted in as many as 29 accidents (12.66%) [20].
5. Vehicle parts that are not maintained
   In line with the results of the study that the trigger for the accident is the absence of standardization of spare parts by regulators and technical maintenance of vehicles by the driver / vehicle owner [19].
6. Lamp System Damage
   In line with the results of the study that there was 1 incident (0.1%) of 851 accidents caused by the malfunction of the vehicle lights (not running) [21].
7. Age of Vehicles Too Old
   The results of the study respondents in the City of Paringin, that the age of the vehicle is too old can lead to traffic accidents.

The dominant factor causing traffic accidents on the urban road from vehicle factors is tire damage with a T-value of 7.743.

5.3 Road Factors

1. Geometric Road / Road Slope
   In line with the results of the study that geometric factors as factors causing traffic accidents [22].
2. Road Damage
   In line with the results of the study that one of the causes of fatal accidents is damaged road conditions [21].
3. Lack of Road Facilities
   In line with the results of the study that the trigger for the accident was the lack of road equipment such as street lighting, traffic signs, road markings and traffic signaling devices (APILL), and also controlling and safety equipment for motorists (road users) [19].
4. Misuse of Road Function
   In line with the results of the analysis that changes in land use near the center of activity cause the accident rate to increase [23], because changes in land use at the center of activities usually occur on the side of the road which results in changes in the function of the road that causes disrupt on traffic activities.
5. Road Pavement Conditions
   In line with the research that Accident Frequency and EAN (Equivalent Accident Number) produced a strong correlation with the independent variable that affected it, namely pavement [24].

The dominant factor causing traffic accidents on the urban road from the road factor is the geometric of the road / slope of the road with a T-value of 10.482.

5.4 Environment Factors

1. Side Obstacles
   In line with the results of the study that the roadside as a place of dismissal or rise and fall of passengers, narrowing the vehicle's movement space (side barriers) and causing traffic accidents [25].
2. Densely Populated
   In line with the results of the study that in the road segment there are crowded (densely populated) resulting in high rates of traffic accidents [26].
3. Flood
   In line with the data that stated the causes of traffic accidents in 2013 due to flooding were 34 incidents [18].

The dominant factor causing traffic accidents on the urban road from environmental factors is flooding with a T-value of 17,839.

VI. CONCLUSION

Factors that cause traffic accidents on the urban road in Paringin City from human factors (driver) are lack of concentration, lack of discipline, lack of anticipation, high speed and fatigue. From the factors of the vehicle are tire damage, over dimension and over load (ODOL), damage to the steering system, slip, untreated vehicle spare parts, damage to the light system and the age of the vehicle is too old. From the road factors are road geometry/ road slope, road damage, lack of road facilities, misuse of road functions and road pavement conditions. From environmental factors are side obstacles, overcrowding and flooding.

The dominant factor of the human factor (driver) is fatigue, the vehicle factor is tire damage, the road factor is the road geometric/ slope of the road and environmental factors are flooding.

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