The Competency Assessment Model for Public Transport Drivers based on the Indonesian National Qualifications Framework (KKNI) uses Analytical Hierarchy Process

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Abstract.

This driver behavior assessment model discusses the expertise of public transport drivers based on the national Work Qualification with graduate competency standards (SKL). Graduate competency standards have parameters, namely competence, competency elements and graduation indicators. From these three parameters, the competency unit is abbreviated as UK, the competency element is abbreviated as EK, and the graduation indicator is abbreviated as IK. Assessment of the first competency unit is upon attitudes and values, the second competency unit is upon the ability in the field of work, the third competency unit isupon the area of knowledge mastered and the fourth competency unit is upon the rights and responsibilities. The first competency unit has 6 competency elements and 6 graduation indicators, the second competency unit has 27 competency elements and 41 graduation indicators, the third competency unit has 6 competencies and 11 graduation indicators, the fourth competency unit has 2 competency elements and 4 graduation indicators. The first unit is abbreviated as UK1, the first competency element is abbreviated as EK1, while for the first indicator of graduation is abbreviated as IK1. The combination of UK1, EK1 and IK1 becomes UK1EK1. The combination of the first competency unit becomes the first competency element and combined to become the first graduation indicator then becomes UK1IK1, and so do the next competency unit up to the fourth competency unit. The completion stages of this discussion is carried out in four steps, namely problem identification, model design, implementation and system evaluation. The calculation process uses Analytic Hierarchy Process (AHP).

Keywords: Driver, Kompentesi, KKNI, AHP.

I. INTRODUCTION

The behavior of drivers in public transportation is *variety: some are* good, polite and others are not good[1]. Drivers have the potential to cause accidents, unsafe, disorderly in traffic. Traffic accidents certainly have an adverse impact on society[2], from the point of view of comfort, order and smoothness of traffic. Driving without experience is one of the main predictors of accident rate. The higher accident rate among young drivers is due to poor cognitive[3]. One of the solutions to reduce traffic accidents is to have a driver competency standard. Driver competency standards based on the Beginner Level II Indonesian National Qualification Framework (KKNI) have 3 parameters, namely competency units, competency elements, and graduation indicators. With this solution, the handling of*driver's* problem is expected to be improved[4], so that passengers *will* feel safe, comfortable and orderly in using public transportation[5].

II. LITERATUR REVIEW

A driver is a person who drives a motorized vehicle on a road with an obligation of having a driving license. However, it is not yet efficient and effective to overcome the public transportation, as still occur in some underdeveloped areas where we can find drivers with high ego driving on the roads, plus with uneven mass transportation distribution, which this problem often occurs in the archipelago region[6]. For this reason, the

Ministry of Transportation is now developing 12 ports in the province of North Sumatra. The high use of private vehicles because the integration of the public transportation sectors is not built yet. Lack of infrastructure and transportation facilities, there is no system that can break the use of private vehicles, while there is a number of services and facilities that pamper private vehicle users, the problem of air pollution, vibration pollution, noise pollution which cause the*conditions of public transport* poorly maintained, low level of driver awareness, lack of road's allocation management are the factor of traffic accidents. Transportation problems in Indonesia are categorized into 4 categories, namely congestion, accidents, chaos, pollution[7]. There is a lot of thuggery, lack of government attention, many people on the road, not all drivers understand the traffic regulation, lack of attention to the driver's social security, people dress untidy, lack of personal hygiene, communication problem, carelessness of driving, even prone to harm passengers or others road users[8]. The number of traffic accidents involving public transport vehicles put the driver as the main cause. Taking this into account, road traffic safety should naturally become a national priority which needs to be improved urgently. The results of the research showed that negligence in recognizing situations and negligence in making action taken decisions in driving were the dominant factors in human error[9]. The results *of the research* showed that the variables related to safety driving practices were knowledge, attitudes, safety briefings, participation in safety driving training and the role of supervisors, while the variables that were not related to safety driving practices were age, years of service, and the role of coworkers[8]. Based on daily phenomena, seen that many motorists violating the traffic signs. This behavior of violating traffic signs is an example of aggressive driving behavior that can *harm* other road users. The results *of the research* showed that there was a relationship between length of work, rest time, work schedule and unsafe driving.The model presented in this *research* shows that strategies to improve organizational safety culture can reduce the behavior of unskilled drivers and thus reduce the number of accidents. The results *of the research*showed that the main factors that influence driver performance that cause accidents are health, discipline, and driver competence. The behavior of young male drivers in Saudi Arabia is classified into three categories: making mistakes, driving aggressively and driving fast[11]. Aggressive and fast driving behavior has a significant effect on accident. Driving attitudes and skills are significant factors affecting driver accidents in China[9]. The behavior of drivers in China can become safer if their skills can be improved and their attitudes towards traffic safety are changed. Drivers in Norway demonstrate that there is a significant relationship between driver training, traffic safety attitudes and driving behavior. There is a strong relationship between accident and exposure (measured as months holding a license). The involvement of *newly* young drivers is related to driving skills and safety attitudes and driver behavior. This research aims to calculate the most significant driver behavior factors that have a critical impact on road safety[12]. The well-proven Analytical Hierarchy Process (AHP) was applied to the 20 driver behavior factors examined in a three-level hierarchical structure. The predicted results suggested that road management authorities should focus on significant high-level driver behavior criteria to solve road safety problems for sustainable traffic safety. Identifying and categorizing driver behavior using the Fuzzy Analytic Hierarchy Process (FAHP) can resolve the uncertainty of driver behavior[10]. Test the driver behavior criteria that significantly affect safety for different traffic cultures such as in Hungary, Turkey, Pakistan and China. The FAHP framework for comparing and measuring driver behavior criteria is designed on a three-level hierarchical structure. Proper description of driver behavior and evaluation with its context is a key factor for the efficient driving learning process[13]. The results of the research showed that a series of patterns designed to evaluate the application of driving techniques can identify the wrong actions of the driver, so it can make recommendations to improve driver performance. In this research, a hybrid of Discrete Wavelet Transformation (DWT) and Adaptive Neuro Fuzzy Inference System (ANFIS) is used to identify overall driving behavior. These behaviors are classified into safe, semi-aggressive, and aggressive classes which are adopted by self-reported questionnaire results by the Driver Anger Scale (DAS)[11]. This research introduces a concept proposal to access driving behavior in public transport through Mobile Crowd Sensing (MCS), as part of a long-term research project on Advanced Public Transportation

System (APTS). The proposed concept uses a mobile device accelerometer and a qualitative evaluation of passengers to identify aggressive driving behavior[14], which is believed to be a major factor in the occurrence of accidents and unnecessary fuel consumption. Conceptually, each qualification level in the IQF is composed of six main parameters, namely (a) science, (b) knowledge, (c) practical knowledge (know-how), (d) skills, (e) affection and (f) competency. The six parameters contained in each level are arranged in the form of a description called a Qualification Descriptors. In the field of driving a motorized vehicle, there are several provisions that become references related to the preparation of SKL, namely. 1. Legislation of the Republic of Indonesia Number 22 of 2009 concerning Road Traffic and Transportation 2. National General Safety Plan (RUNK) 3. Presidential Instruction Number 4 of 2013 concerning the Road Safety Action Decade program 4. KAPOLRI Regulation Number 9 of 2012 concerning Letters of Driving Permit[12]. SKL is a qualification standard for graduation abilities that includes attitudes, knowledge, and skills as stipulated in Kepmendiknas Number 23 of 2006. This is important so that students who have received training truly gain competence as motorized vehicle drivers. The IQF-based Graduate Competency Standards are stated by three parameters, namely: 1. Competence: Competence is the accumulation of a person's ability to carry out a measurable job description through a structured[16], independent and responsible assessment in the work environment. The Element of Competency: a detailed competency statement 3. Graduation indicators: elements as the parameter to measure the success of a graduated studentwhether is competent or not, for SKL competency standards are in table.1,2,3,4[13].

Table 1. Attitude and values (UK1)

COMPETENCY STANDARD GRADUATES BASED ON KKNI FOR DRIVING PROFESSION LEVEL II BEGINNERS			
NO	Competency Unit	ELEMENTS OF COMPETENCE	PASS INDICATOR
ATTITUDES AND VALUES			
1	Build and shape the character and personality of Indonesian people	a. Fear God The One and Only The One and Only	a) Always be vigilant in running the vehicle b.) Be polite in driving
		b. Have good morals, ethics and personality in completing their duties	c) Has no impact which endangers passengers and other road users
		c. Play a role in realizing good ethics and personality as citizens who are proud and love the country and support world peace	d) Comply with the prevailing traffic rules and regulations e) Honest at work
		d. Able to work together and have social sensitivity and high concern for society and the environment	f) Being a pioneer of road safety
		e. Respect the diversity of cultures, views, beliefs, and religions and respect the original opinions / findings of others	
		f. Upholding law enforcement and having the spirit to put interests first	

Table 2. Ability in the field of work (UK2)

Ability in the field of work		
1. Able to drive and control motorized vehicles independently by prioritizing traffic safety and security	a. Prepare for the operation of motorized vehicles and identify eligibility vehicle:	
	1) Identifying the completeness of motor vehicle certificates	Accuracy in identifying the completeness of motor vehicle documents
	2) Identifying and using basic equipment motor vehicle	Accuracy in identifying and using basic motor vehicle equipment
	3) Identifying and using vehicle cleaning tools and materials according to their designation	Accuracy in identifying and using vehicle cleaning tools and materials according to their designation
	4) Identifying indicators and checking the feasibility of a motorized vehicle engine components	Accuracy identifies indicators and components of the feasibility of a motorized vehicle engine (electrical and transmission instruments, oil, cooling water, wiper water, brake system and steering system)
	5) Identifying roadworthiness indicators for the outside of motorized vehicles	
	b. Drive and control motorized vehicles in an efficient and environmentally friendly manner by complying with regulations and	

Table 3. Master Knowledge (UK3)

Mastered Knowledge		
Mastering knowledge procedural, factual, principles about vehicles and light driving techniques	a. Mastering knowledge of driving ethics	a) Implementing traffic ethics in accordance with applicable regulations b) Obey traffic signs and signals with right
	b. Mastering specifications, instruments and indicators on vehicles	a) Distinguishing vehicle specifications properly b) Using instruments properly c) Understand indicators on the vehicle
	c. Understand the principles and techniques of operating motorized vehicles that are conomical and environmentally friendly	Have knowledge of speed regulation, engine speed, wind pressure related to the principles and techniques of operating an economical and environmentally friendly motor vehicle
	d. Understand the rules and traffic safety, health and safety work in a vehicle	Implement regulations and traffic safety, health and safety work in driving
	e. Understand factual knowledge about the conditions and principles of service for children, pregnant women, the elderly, people with disabilities and passengers with needs other specialty	Carry out procedures and actions in accordance with the principles of service for children, pregnant women, the elderly, people with disabilities and other passengers with special needs
	f. Understand the procedures for making SIM, vehicle insurance, life insurance and other vehicle documents	a) Carry out the procedure for making SIM A b) Carry out insurance management procedures c) Carry out procedures for handling documents Vehicle others

Table 4. Rights and Responsibilities (UK4)

Rights and Responsibilities		
Responsible as a driver in terms of personal safety and security for drivers, passengers and other road users and can be given the responsibility of guiding prospective novice drivers	a. Responsible for his job as a driver	a) Carry out the task of driving a motorized vehicle without any errors b) Maintain the vehicle in accordance with maintenance procedures c) Record and communicate every important event in running his job
	b. Can be given the responsibility of guiding candidates novice driver	Describe safety standards and basic techniques running the vehicle

III. RESULT AND DISCUSSION

This research consists of 4 stages, the first stage is problem identification consisting of Literature Review, Interview, Focus Group Discussion, Questionnaire, and data collection[14]. In identifying the problem, the research question is features needed to build a national public transportation driver behavior assessment model[15], The second stage is Model design where the model is designed using use-case diagrams and class diagrams, while the questions asked in the research design are is *"How to build a national public transportation driver behavior assessment model?"* The third stage is Implementation, using PHP and Mysql[16]. The fourth stage is system evaluation, using User Acception test, Black bock testing, White Box testing, and the research question posed is *"How to test a national public transportation driver behavior assessment model?"*

The research model carried out is the usage of KKNI rules Indonesian National Framework Qualification, which includes the Competency Standards for Graduates (SKL)[17], regarding motorized drivers, the calculation is done using the Decision Support System, namely AHP, and updating driver data[22], then the rules are made (Rule based system)[23]. The results of AHP calculations and the combination with the Rule based system,used to seta recommendation for the driver, such as having ethics and courtesy in driving[23], controlled abilities such as expertise in controlling vehicles both stopping and running, mastered knowledge, such as knowledge of vehicles, rights and responsibilities such as having responsibility for passenger safety. For the description of the flow Diagram is depicted in Figure 1
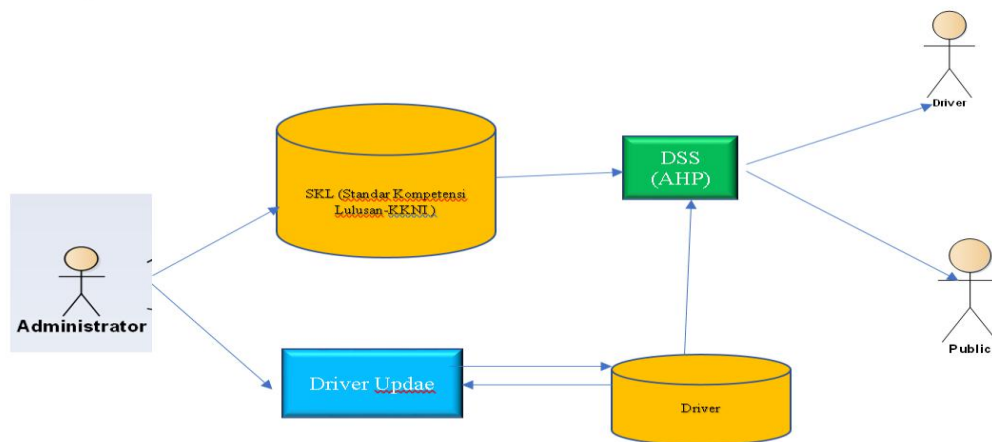

Fig 1. Flow Diagram

The second stage is model design, the model design used is Use Case Diagrams and Class Diagrams. Modeling using the Use Case Diagram can be seen in Figure 2 below.
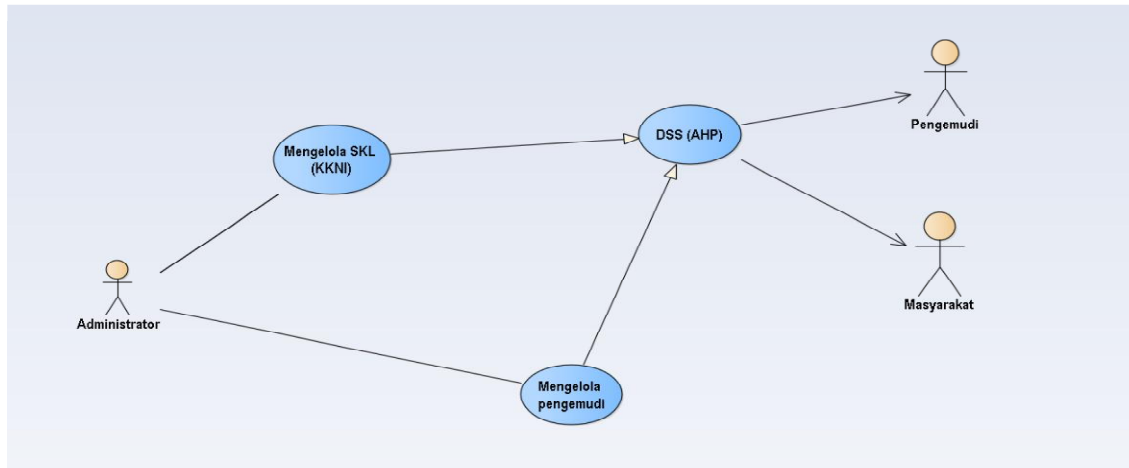

Fig 2. Driver Use Case Diagram

The next stage is designing a Class Diagram consisting of a driver's data base that has an ID number, address, name, place & date of birth, input into the SKL system which consists of 4 competency features, namely the first competency feature, the attitude of values, abbreviated as Uk1, the second feature is the feature ability in the field of work abbreviated as UK2, the third competency feature is knowledge mastered abbreviated as UK3, the fourth feature is rights and responsibilities abbreviated as UK4[24]. UK1 consists of 6 competency elements, so it is called UK1EK1 to UK1EK6, UK2 consists of 27 competency elements so it is called UK2EK1 to UK2EK27, UK3 consists of 6 competency elements so it is called UK3EK1 to UK3EK6 and UK4 consists of 2 competency elements namely UK4EK1 to UK4EK2. From the KKNI rules then create a database on the Rule Base. See the above descriptions in Figure 3[25].
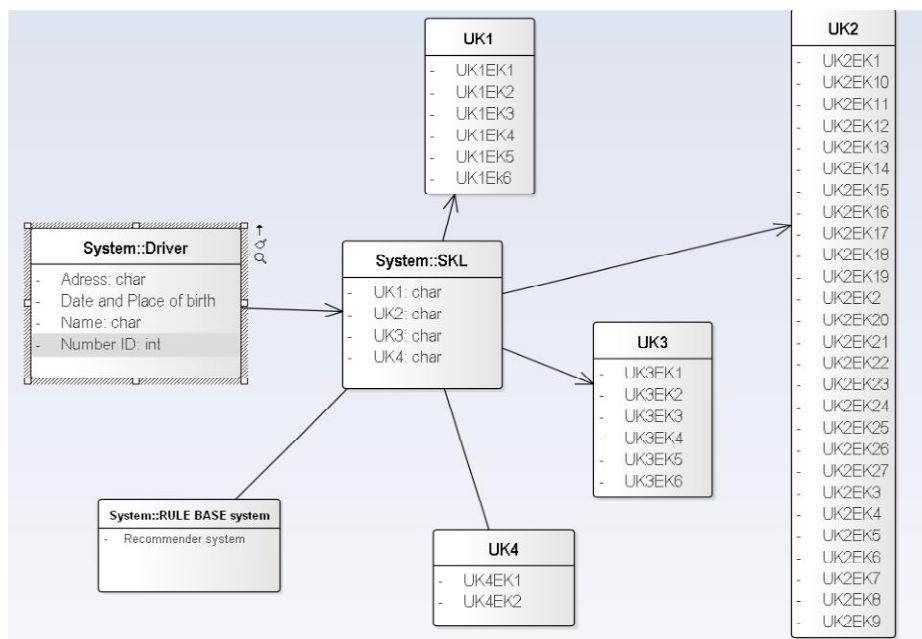

Fig 3. Class Diagram of the Driver

V. Conclusion

The conclusion is to answer the first and second research questions. The answer to the first research question is *"that the features needed to build a driver's behavior assessment model are in accordance with the criteria for KKNI-based drivers which consist of 4 assessment parameters, namely attitudes and values abbreviated as UK1, Ability in the field of work abbreviated as UK2, knowledge mastered abbreviated as UK3 and rights and responsibility is abbreviated as UK4"*. The answer to the second research question is *"to design a model made in the form of Use-case diagrams and class diagrams"*. As Depicted in figure 2 and figure 3

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