

FACTORS INFLUENCING HEAVY VEHICLE DRIVERS'  
SERVICE PERFORMANCE WITH SAFETY PERFORMANCE AS MEDIATOR

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## **DEDICATION**

To my parents Hajah Ngadimah Sarman and Haji Miskam Suadi for their prayers, patient and love.

I could not have accomplished this thesis without the special emotional support from my beloved wife Munira Mokhtar and my children Muhammad Ammar, Muhammad Ariff and Muhammad Iman. Thank you for believing in me.

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## ABSTRAK

Para pengusaha kenderaan berat secara umumnya amat prihatin tentang kepentingan prestasi keselamatan yang tinggi kerana kekerapan berlakunya kemalangan jalan raya yang melibatkan pemandu-pemandu kenderaan berat akan menjejaskan produktiviti dan keseluruhan prestasi perkhidmatan mereka. Matlamat kajian ini adalah untuk menentukan faktor-faktor yang boleh mempengaruhi tahap keselamatan pemandu-pemandu kenderaan berat di kalangan pelbagai pengusaha kenderaan berat yang seterusnya dapat meningkatkan prestasi perkhidmatan mereka. Objektif utama kajian adalah bagi mengenalpasti faktor-faktor yang mempengaruhi kompetensi keselamatan pemandu-pemandu kenderaan berat yang mempunyai hubungan kait dengan prestasi perkhidmatan. Sejumlah 129 responden dari pelbagai jenis pengusaha kenderaan berat di Johor telah memberi maklumbalas di dalam kajian ini. Kajian telah dijalankan melalui kaedah kuantitative dengan aplikasi *Confirmatory Factor Analysis (CFA)*, *Structural Equation Modelling (SEM)* dan *Analysis of Moment Structure (AMOS)*. Keputusan daripada analisa data mendapati hanya 45 peratus responden telah mengamalkan peraturan sendiri dalam hal keselamatan untuk pemandu-pemandu kenderaan berat mereka. Hipotesis telah menyatakan bahawa kompetensi keselamatan pemandu-pemandu kenderaan berat akan mempengaruhi mutu perkhidmatan sesebuah organisasi. Perhubungan antara kompetensi keselamatan pemandu-pemandu kenderaan berat dan kriteria-kriteria prestasi perkhidmatan sesebuah organisasi telah dikaitkan. Empat faktor didapati mempunyai hubungan kait dengan prestasi perkhidmatan iaitu perjawatan dan pemilihan pemandu-pemandu kenderaan berat, latihan keselamatan, pemantuan selamat dan budaya keselamatan organisasi. Secara keseluruhan, hasil kajian adalah jelas membuktikan bahawa sebarang penambahbaikan atas inisiatif sesebuah organisasi terutamanya berkaitan dengan kemahiran pekerjaan akan menjurus kepada peningkatan prestasi perkhidmatan. Hasil kajian juga mempunyai implikasi terhadap keperluan dasar kerja sesebuah organisasi dan perubahan peraturan berkaitan peningkatan keselamatan kepada para pengusaha kenderaan berat di Malaysia.

## **ABSTRACT**

Heavy vehicle operators are generally very concerned with high safety performance since frequent road accidents involving heavy vehicle drivers will negatively affect productivity and the overall service performance. The aim of this study is to determine factors that can improve heavy vehicle drivers' safety among the various types of operators which will eventually contribute to high service performance. The main objective of the study is to identify factors influencing heavy vehicle drivers' safety competency and their relationship with service performance. A total of 129 respondents from various types of heavy vehicle operators in Johor had given their feedbacks in the study. The research was conducted in quantitative manner by employing confirmatory factor analysis (CFA), structural equation modelling (SEM) and analysis of moment structure (AMOS). The results revealed that only 45 percents of the respondents had practiced self regulation on safety for their heavy vehicle drivers. It was hypothesized that heavy vehicle drivers' safety competency would influence organizational service performance. Relationships between heavy vehicle drivers' safety competency and service performance were examined. Four factors were found to be correlated with service performance; namely the recruitment and selection of heavy vehicle drivers, safety training, defensive driving and organisation safety culture. The overall findings had proven that any improvement initiatives by the organisation particularly on the job related skills will lead to the above average productivity performance. One of the implications of the findings is the need for work organisation policy on safety and regulation changes with regard to the occupational safety improvement for heavy vehicle operators in Malaysia.

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## LIST OF ABBREVIATIONS

(%)	-	Percentage
(M)	-	Malaysia
3PL	-	Third party logistics
ACE	-	Academy Centre of Excellence
AFTA	-	ASEAN Free Trade Agreement
AGFI	-	Adjusted Goodness of-Fit Index
ALAM	-	Malaysia Maritime Academy
AMH	-	Association of Malaysian Hauliers
AMOS	-	Analysis of Moment Structure
AVE	-	Average Variance Extracted
CEO	-	Chief Executive Officer
CFA	-	Confirmatory Factor Analysis
CFI	-	Comparative Fit Index
CHAM	-	Container Haulage Association of Malaysia
CMIN	-	Chi-Square
CPC	-	Certificate of Professional Competence
CR	-	Composite Reliability
CVLB	-	Commercial Vehicle Licensing Board
df	-	degree of freedom
CIBA	-	Centre of Information Benchmark Australia
CiLT	-	Chartered in Logistics and Transport
CMIN	-	Minimum Discrepancy
CMINdf	-	Relative Chi-square
DOSH	-	Department of Safety and Health
DRS	-	Driver Recruitment and Selection
DT	-	Driver Training
e.i / e.g	-	Example
EFA	-	Exploratory Factor Analysis

et al.,	-	and Others
etc	-	and other things
FDI	-	Foreign Direct Investment
FTA	-	Free Trade Agreement
GDP	-	Gross Domestic Products
GFI	-	Goodness-of-Fit Index
H	-	Hypothesis
HSE	-	Health,Safety and Environment
GLC	-	Goverment-linked Company
GOF	-	Goodness-of-Fit
GPS	-	Global Positioning System
HF	-	Human Factors
H-V theory	-	Hunt and Vitell (2006)
JOFFA	-	Johor Freight Forwarders Association
ICOP	-	Industry Code of Safety Practice
LPTC	-	Land Public Transport Commission
LTIF	-	Loss Time Injury and Fatigue
MIROS	-	Malaysia Institute of Road Safety
MITRANS	-	Malaysia Institute of Transport
OSHA	-	Occupational Safety and Health Act
OSC	-	Organisational Safety Culture
PPE	-	Personal Protective Equipments
PDRM	-	Royal Malaysian Police
PUSPAKOM	-	Pusat Pemeriksaan Kenderaan Berkomputer ( Computerised Vehicle Inspection Centre)
RMSEA	-	Root Mean Square Error Approximation
RTD	-	Road Transport Department
SafeP	-	Safety Performance
ServP	-	Service performance
SEM	-	Structural Equation Modelling
SHE	-	Safety,Health and Environment
SOP	-	Standard Operating Procedure
SPAD	-	Land Public Transport Commission
SPSS	-	Statistical Package for Social Science
UK	-	United Kingdom
USA	-	United States of America

VF	-	Vehicle Factors
TPB	-	Theory of Planned Behaviour



**LIST OF SYMBOLS**

$a \times b$	-	Indirect effect
$B$	-	Beta
$c$	-	Direct effect
$cmin/df$	-	Normed Chi Square/ Likelihood ratio
*m	-	multiple choice answer
$R^2$	-	Squared multiple correlations
$\chi^2$	-	Chi-Square

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## **CHAPTER 1**

### **INTRODUCTION**

#### **1.1 Introduction**

The topic of safety performance among heavy vehicle operators is receiving increased attention (Kelindorder and Saad, 2005). Heavy vehicle managers are very interested in the topic of high safety performance since frequent road accidents involving heavy vehicle drivers will affect the loss of productivity and the overall service performance in the supply chain (Kelindorder and Saad, 2005). In the same scenario, work related accidents involving the heavy vehicle in Malaysia are on the rise from 2009 till 2014 (PDRM Annual Report, 2014). These accidents are the common cause of occupational injury (Hoskin, 2004). Safety is a pervasive issue in the trucking industry, as it is an important aspect of ethical, socially responsible logistics (Casey, Tristan et al., 2015; Li, Feng et al., 2013; Carter and Jennings, 2002). Difficult economic situations can have a negative impact on transport operators' safety commitment (Swartz et al., 2009) and the social implications of a reduction in the operators' safety performance are evident. Therefore, safety research is particularly important for the Malaysian heavy vehicle industry that regularly faces difficult economic conditions (ie., economic recession, liberalisation policy, stiff competition and fluctuating fuel prices). It has been estimated that 20 to 30 percents of commercial fleet vehicles involved in accident each year, with drivers of company vehicles experiencing 50 percents more accidents than private vehicle drivers (Gadd

et al., 2002). In addition to accidents that result in serious and prolonged injuries, there are many more vehicle accidents that result in minor injuries (i.e., injured workers not admitted to hospital and / or vehicle damage) ( Bottani et al., 2009).

This chapter discusses on the background of research, statement of problem, general aim of the study, significations of study, summary of methodology, operational definitions, and scope of study and outline of the thesis.

**Table 1.1** : Number of fatalities for road accidents in Malaysia 2010 -2014

Road Users	2010		2011		2012		2013		2014	
	No.	%	No.	%	No.	%	No.	%	No.	%
Pedestrian	566	9.2	595	9.4	636	10.1	598	9.1	593	8.7
Bike	3598	51.7	3693	54.3	3646	58.0	3898	61.7	4,070	63.3
Bicycle	238	3.1	242	3.3	190	3.2	203	3.1	215	3.1
Car	1198	19.3	1215	21.3	1228	24.5	1335	27.4	1,411	31.9
Van	98	1.6	103	1.6	133	2.1	96	1.4	87	1.2
Bus	32	0.6	39	0.6	75	1.1	48	0.7	31	0.4
<b>Trucks</b>	<b>218</b>	<b>3.5</b>	<b>229</b>	<b>3.6</b>	<b>238</b>	<b>3.7</b>	<b>246</b>	<b>3.7</b>	<b>282</b>	<b>4.1</b>
4wheel	110	1.7	110	1.7	99	1.5	106	1.6	78	1.1
Others	61	0.9	61	0.9	71	1.1	48	0.7	47	0.70
Total	<b>6167</b>		<b>6287</b>		<b>6382</b>		<b>6565</b>		<b>6777</b>	

Table 1.1 indicates the statistics of fatalities due to road accidents by different types of road users in Malaysia from 2010 until 2014 (PDRM Annual Report, 2014). In 2014, the total number of fatality is 6777 or an average of 19 people died daily due to road accident. Apparently the number of fatalities had increased over the years and the statistics showed that fatalities involving trucks or heavy vehicle had also increased from 218 cases in 2010 to 282 in 2014. By comparison, another commercial vehicle which is bus had registered smaller number of accidents through the period. The figures had prompted the researcher to explore the contributing factors for the accident on both the heavy vehicle drivers and operators.

The study will include the definition of the heavy vehicle operators, driver safety, safety program, productivity and performance and road accidents. Heavy vehicles are defined as weighing 4.5 tonnes or more and include articulated trucks and rigid trucks. It includes off-site delivery vehicles such as cement mixer trucks and tipper truck and on site road haulage vehicles such as container truck and other conventional or specialized trucks. Therefore, this study will cover transport operators with a number of trucks in the Johor state comprising eight different types of cargo carriage namely container haulage, general cargo, cement tanker, livestock carrier, bonded cargo, earth and sand as well as road tanker for oil and gas.

## **1.2 Needs for heavy vehicle drivers' research**

Based on the number of fatalities due to road accident from 2010 until 2014 as shown in Table 1.1, an average of 6554 people killed every year or equivalent to 19 people killed every day due to road accident in Malaysia (Royal Police Malaysia, 2014). Road accidents involving heavy vehicle drivers have a tremendous impact on society and as such they must avoid operations that pose a risk to the other road users (Mejza and Corsi, 2003). The figures are very alarming as it shows that most of the heavy vehicle operators in Malaysia have not really adopted the best practices in managing fleet safety in their organization with the number of road accidents involving the heavy vehicle drivers are on the rise over the years. Some of these operators are in small scale business and financial constraints have always been the hindrance in implementing such practices. However, under the amended Road Transport Act 1989, it stipulates that any operator who has recorded certain percentage of road accidents and poor practice of safety both on the drivers and the vehicle may face its license being revoked.

These accidents directly affect and disrupt the lives of the victims as well as their families and friends. The indirect costs such as supply chain disruption and delays in shippers' cargo further increase the affect of an accident involving heavy goods vehicles. As such, safety research in this area is valuable and likely to be beneficial to society and industries with similar attributes (i.e., other transport modes,

healthcare, etc.). Most safety researchers across disciplines lament the fact that little academic research on safety related issues (Zohar, 2002). Many researchers in the past had been focusing on the effects of regulation (Corsi, Fanara et al., 2012) carrier safety management and practices (Morrow and Crum, 2004), and driver fatigue (Hakkanen, Summala, 2006).

The researcher attempted to understand and comprehend some basic antecedents of drivers' and operator safety performance. With the exception of an extensive body of driver fatigue research, very little or probably none of the Malaysian commercial vehicle safety research involving both the heavy good vehicle drivers and operators. Likewise, such study had been very little existed in the United States which focusing on heavy vehicle drivers' safety in general (Kim and Yamashita 2008; Roetting et al., 2003). At least one study on commercial vehicle concluded that the operators' organizational safety climate as well as drivers' attitudes and perceived behavioural control were important in determining drivers' behavioural intentions to commit unsafe driving actions particularly speeding and tailgating (Swartz and Douglas 2009b). However, the underlying of such process which resulted in either safe or unsafe behaviour is not fully understood. Moreover, no integrated theory or framework that explains on driver, operator and regulatory factors which impact on drivers' safety and service performance has been demonstrated in the heavy vehicle safety literature. As such it is a crucial limitation in understanding and improving the operators' safety performance which would simultaneously improve the overall service performance to their respective clients.

### **1.3 Gap of knowledge**

Managing risks in an integrated way with the organisation's operations has become increasingly important in recent years, since it not only cuts accident rates but can also improve the company's productivity and better financial results (Probst, Tahira M et al., 2013; O'Toole, 2002). However, researchers have paid little attention to defining what exactly constitute an effective heavy vehicle drivers safety competency towards improving the accident rates among heavy vehicle drivers.

Drivers' safety competency is akin to the safety management systems where it incorporates mechanism in organisations designed to control the risks that can affect workers' health and safety, and at the same time to ensure the company can easily comply with the authorities' legislation. Such heavy vehicle drivers safety competency should be fully integrated into the operators and be a cohesive system, consisting of policies, strategies and procedures that provide internal consistency and harmonisation. Thus, developing the heavy vehicle drivers' safety competency should be regarded as a way of creating awareness, understanding, motivation and commitment among the drivers and operators. But its success will depend on the management's commitment to it.

Given the lack of empirical research identifying the specific dimensions of drivers safety competency, the researcher have obtained a combination of the past empirical studies investigating the safety culture (Stuart, Andrew, 2013; Huang et al., 2013; Nielsen, Kent J, 2014; Glendon and Stanton, 2000; Arboleda et al., 2003) as well as works analysing the practices that distinguish between high and low accident rate companies( Chen et al., 2011; Vredenburg, 2002; Mearns et al., 2003).

#### **1.4 Issues**

If the risky driving is studied in professionals, organizational factors should necessarily be taken into account. Scholars suggest that emphasis within safety issue had been shifted away from individual factors, which influence involvement in road accidents towards organizational factors (Park et al, 2015;Neal et al, 2000).In this research, organisational safety climate and work motivation are taken as a focus. Safety climate refers to workforce perceptions of value and importance associated with safety in organization (Hajmohammad et al., 2014;Newnam et al, 2005).It might include several components like perceptions about how committed managers and supervisors are to employees' safety, how well safety policies are communicated to employees, how work pressure is compliant with safety procedures, are employees trained to follow safety rules, etc (Reiman et al., 2014;Will et al, 2005).

## **1.5 Statement of problem**

Heavy vehicle drivers' safety had been compromised by the operators in their pursuit of organizational goals due to the competitive market structure while investing in safety is deemed a cost instead of an investment.

Judging from the importance of safety in the heavy vehicle industry and the fact that a large number of these accidents are partly due to truck drivers' negligence and the lack of safety practices by the operators, hence more studies in this area are warranted. Specifically, the gap in the current body of knowledge provides the opportunity to study how do the heavy vehicle operators response to the need for work related safety for their truck drivers and how do they leverage on the improvement of driver safety competency on their level of service. The current study seeks to answer the question, 'How do heavy vehicle operators make their drivers more competent in managing safety and how such safety competency will contribute to the service performance'.

## **1.6 Research questions**

The purpose of the current study is to explore the possible factors in influencing the heavy goods vehicle drivers' safety competency which will in turn improving the safety and service performance for heavy vehicle operators. This broad research question can be answered through the following investigative questions:

1. Why do many heavy vehicle drivers involve in road accidents
2. How do an improvement in drivers' safety competency affect safety performance and service performance?
3. Could a general safety culture among the heavy goods vehicle operators be developed?
4. What are the leading indicators of safety performance and service performance?



## 1.7 Objectives of study

The aim of this study is to examine the factors for improving the heavy vehicle drivers' safety competencies safety practices. For example, the Department of Occupational Safety and Health (OSH) had introduced the OSH Industrial Code of Practice for Transport Activities in 2010 but very little researchers had so far conducted any studies or response from these operators on its effectiveness in terms of practicality, safety awareness, training, costs and other factors which are deemed crucial for the Operators for its implementation. The researcher will then relate the effective heavy vehicle driver safety towards the improvement in safety performance and company performance. In short, this study attempts to specifically identify the following:

1. To evaluate the current heavy vehicle drivers' safety practices among the operators
2. To examine the operators commitment on the organizational safety culture
3. To examine the drivers' safety competencies improvement on the safety and service performance
4. To identify factors on influencing the heavy vehicle drivers safety on service performance

Data were collected from the managers of heavy goods vehicles operators through written survey questionnaires. The quantitative research method was appropriate because the purpose of the research was to measure the responses of the respondents in an objective manner. The decision to remain or leave the trucking industry in the self regulation manner for the drivers' safety competency was the criterion variable.

The predictor variables were operationalized and measured by the responses to questions on the perceived effect of driver training, defensive driving, safety culture and the improved drivers' safety competency. Hence the study will explore the overall initiatives and commitments towards drivers' competencies and making safety as part of the heavy vehicle operators' culture and organisation goals. This

could be explored through getting the necessary feedbacks on the existing safety practices and the desired heavy vehicle safety standard that we are projecting for, in our efforts to minimize the number of road accidents involving heavy vehicle vehicles in particular and other road users in general.

## **1.8 Assumptions**

This study operated under several assumptions. The first assumption was that all participants responded honestly. This assumption was based on the premise that responses will not be subject to a bias which results in the participant answering the questions in a manner that is vindictive or self-serving. A further participant assumption was the participants had the capacity to understand both the research instrument and the concepts. This assumption was based on the assertion that participants were familiar and capable of understanding the industry specific language used within the questionnaire. In addition, some of the respondents were the established operators in the industry with all the necessary work practices had been in place for years and as such they should have responded objectively with the survey instrument during the data collection exercise. With the many operators with fewer establishments in their safety operational set up, their response in the survey should have reflected the actual practices in their daily operations and the management approach in dealing with drivers' safety.

## **1.9 Significance of Study**

This study is significant because it will be able to identify the importance and longstanding gap in the literature, namely the lack of scholarly investigations into the cause of high number of fatalities and injuries among heavy vehicle drivers in Malaysia. Despite most of the past literature dwelled on the fatigue and stress as the main contributors to the road accidents among commercial vehicle drivers but this

research will look at the drivers themselves in terms of safety competencies as well as on the operators' commitment with regard to safety as part of their work culture.

### **1.10 Expected contribution**

The researcher has identified the following key aspects as critical for a good driver's safety competency which capable of reducing workplace accident in a sustained manner. This includes the employers' commitment to safety, and formally expresses the objectives such as the principles and guidelines to follow with the standard benchmarking from the best practices in the transport industry is still lacking. As such, relevant training and development of employee competences are needed, in order to improve ability, skills and risk prevention (Turner et al., 2014; Guldenmund, 2000; O'Toole, 2002; Vredenburg, 2002; Silva et al., 2004). Planning for safe driving (Li, Feng et al, 2013; O'Toole, 2002) which is distinguishing between preventive and emergency planning for heavy vehicle drivers.

The researcher attempts to develop an organised method of putting into practice actions designed to avoid accidents or better known as defensive driving technique. At the same time, the emergency plan attempts on the possible actions to be taken to provide a quick and efficient response to any incident, thus reducing its adverse effects. Control and review of activities carried out within the organisation (Zwetsloot et al., 2013; Vredenburg, 2002), will permit continuous improvement. This control is executed by means of an analysis of working conditions and events occurring within the company and through comparisons with other companies on best industry practices (Silva, Kampanart et al, 2014).

To achieve excellence in prevention, safety must be integrated into all the organisation's decisions and actions and the prevention must be more organisational and strategic, given the important role that the human component plays in the causal chain of road accidents. Thus, companies especially the heavy vehicle operators need to implement a system to manage accident risk prevention in order to foster the commitment and participation of all members particularly the top management

(Kemp et al., 2013; Fernandez-Muniz et al., 2007). There must consequently be a profound change in organisations' objectives which eventually lead to a true safety culture.

### **1.11 Scope and Limitations**

Although the constructs used in this research have been defined as precisely as possible, based on the available relevant literature, clearly articulating the conceptual framework and carry out a meticulous process of generation and revision of items, the measures developed should be understood as an approximately to latent phenomena, which cannot be measured in full.

Moreover, it should be borne in mind that, the relations have been evaluated from the viewpoint of the Transport Managers or Safety Managers among the selected heavy vehicle operators in Johor only. Although, the sampling of the respondents merely from Johor state only, but the researcher believe the outcome of the study will be reflecting the same sentiments among the other states in Malaysia, judging from the nature of the business environment, institutional framework and the governing authorities in the country.

In addition, we should be bear mind that the sample is based on the Transport Managers or Safety Managers concerned willingness to respond. This fact could originate biases, with the operators with the best safety culture being more predisposed to the particular study. Such bias response may have associated with self reporting data (Qu and Weina et al., 2015; Newman and Griffin et al., 2008). But this is a common problem in studies that use this methodology based on questionnaires. Finally, the study was carried out at specific moment in time, and therefore it is cross-sectional strategy survey. Thus, conclusions of a causal type may be debatable. But the methodology used does not allow us to reject causal models that do not conform to the patterns of association detected in the data, and accept models that do conform to them (Park and Sanghee et al., 2015; Mearns et.al., 2003).

In this case, the results indicate that the data are consistent with the hypothesised causal relations.

Another limitation of the current study was that, with the lack of specific data to indicate how safety performance and service performance were accurately assessed, it was impossible to have wide variability in determining what constitutes exactly the safety performance and service performance. The research was designed to allow that flexibility in order to take advantage of the safety professional's assessment that includes both programmatic and procedural evaluations of numerous regulatory requirements and the intangible observations of actions that affect safety performance but are difficult to quantify due to its intangibility nature with latent effects such as safety and service efficiency for performance measurement.

### **1.12 Research Design**

The research will be carried out based on problem statement concerning the issues of road accidents involving heavy vehicle drivers and how it will relate to the overall service performance. Justifications based on abundance number of researches that have verified that drivers' safety competency has strong relationship in producing high service performance. In Figure 1.2, the research starts with the first stage in identifying problem statement and research questions relevant to the heavy vehicle drivers' safety by conceptualizing and defining the potential variables or attributes on drivers' safety competency. Then only the researcher will indicate the purpose and contribution of the study.

Next, under the stage two of the research design, the study had compiled relevant and recent studies under the literature review. It involves conceptualizing, method of assessment and sampling by identifying the definition and factors on heavy vehicle drivers' safety, the suitable method to analyze data, targeted population, sampling method and sampling study.

For stage three in the research design, it indicates the data collection exercise which involving both primary and secondary data relevant to the heavy vehicle drivers' safety performance particularly from past reports, journals and articles. Subsequently, the researcher set the relevant questionnaire survey for the study. The fourth stage will involve the analysis of study where the data will be selected based on the findings in the literature review. For this study, it employed the described analysis, factor analysis, confirmatory factor analysis and structural equation modelling. The last stage will be the conclusion and recommendation based on the findings of the study which are deemed fit and relevant for the improvement in service performance due to the high drivers' safety competency improvement.

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