

CONTRIBUTIONS OF VEHICLE INSPECTION OPERATIONS TO TRAFFIC SYSTEM IN ABUJA, NIGERIA

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Abstract

The general view about the routine vehicle inspection operations is to ensure that vehicles are road worthy and meet safety requirements. This is done to enhance safe and clean transport within urban centres since the nature and condition of vehicles on roads can be associated with the efficiency of traffic system. This study examines the contributions of the routine vehicle inspection operations to the overall traffic system in Abuja, Nigeria. The study made use of secondary data collected from the records of the Directorates of Road Traffic Services (DRTS) on the number of vehicles inspected from 2007 – 2014 in Abuja. The study undertakes respondents' perception on the contributions of vehicle inspection operations to transport system using questionnaire designed to elicit information to achieve the objective of the study. A total of 142 respondents who were commercial taxi and bus drivers in Abuja were randomly sampled for the study. The study employed simple descriptive statistics and a combination of correlation and factor analysis as techniques for data analysis. The correlation analysis showed that the variables for considerations have positive relationships with one another except reduction in accident rates. The result of the factor loadings identified increased safety level (80.2%) and reduction in the number of vehicles with poor parts (67.6%) as the most significant contributions of the routine vehicle inspection operations to the overall transport system in Abuja. It concludes that vehicle inspection operations have other significant contributions to transportation system of urban centres aside ensuring road worthiness of vehicles.

Key Words: *Vehicle Inspection, Transport System, Safety standards, Vehicle Road Worthiness*

Introduction

Transportation system of urban centres is designed to provide effective movement of passengers and goods from one point to another. The design is such that it contributes substantially to the growth and development of nations because of its roles in the economic

activities of cities. In Nigeria, the road transport sector remains the dominant mode in the movement of passengers, goods and services from one point to another within and across urban cities. Despite government's huge investments in the provision of road transport infrastructure in Nigeria, the road traffic

system is characterised with poor performance in terms of vehicle administration, poor physical condition of vehicles, level of service, poor traffic and safety regulations (Filibus, 2012). This tells much on the level of efficiency of transport system in Nigeria.

Vehicle inspection is a process authorised by governments through which a vehicle is inspected to ensure that it conforms to regulations governing safety and emissions to ensure proper condition of vehicles on urban roads for effective movement of passengers and goods (Aruwa, 2014). In Nigeria, proof of inspection is required before a vehicle is registered or vehicle license can be renewed. According to Filibus (2012), vehicles are supposed to be driven and maintained by owners in accordance with road traffic regulations. The laws require certain standards of efficiency of most mechanical components of a vehicle to ascertain the level of its safety. Such components are the brakes, lights, horn, steering, windscreen, wipers, mirrors, exhaust pipes, tyres etc. These components must be properly inspected by inspection officers before vehicle registration. Alade (2012) identified the functions of vehicle inspection officers to include inspect and certify vehicle before registration or renewal of vehicle particulars, collaboration with companies with large fleets for on-site vehicle inspection to ensure compliance to safety regulations, and patrols on roads and highway to carry out routine checks and enforce compliance.

Many studies on vehicle inspection operations had been carried out in Nigeria in different dimension. Among such studies is the work of Aruwa (2014), Gana and Emmanuel (2014) which

conclude that improper vehicle inspection and certification often results to road accidents. Oyeyemi (2003) also found that the operations of mechanically deficient vehicles may cause accident on roads. Adenigbo *et al.* (2016) found that vehicle inspection officers are faced with various operational challenges. Aruwa (2014) also found inadequate funding as the major source of challenges facing vehicle inspection operations in Abuja. Alade (2012) identified over focusing on the revenue generating aspect of vehicle inspection at the expense of safety in Nigeria as major challenge to vehicle inspections.

This study is an attempt to examine the contributions of vehicle inspection operations to the traffic system in Abuja. The efficiency in the overall transport system may reflect in clean and safe vehicular traffic on roads. Based on this, the study intends to find out if vehicle inspection operations contribute efficiently to transport system in Abuja. It is against this backdrop that this study examines possible contributions of vehicle inspection operations with a view to identifying the most significant contribution(s) to efficient traffic system in Abuja. The paper is structured such that section one deals with the introduction, section two is a description of the methodology while section three handles the results and discussion, and section four presents an highlight of the policy recommendation and conclusion.

Methodology

The study relied on both primary and secondary sources of data collection. Secondary data were extracted from the records of the Directorates of Road Traffic Services (DRTS), Abuja on the

number and status of vehicles inspected in Abuja from 2007 – 2014. The primary data made use of survey of commercial taxi and bus drivers within the Federal capital Territory (FCT), Abuja through questionnaire administration. The questionnaires were administered at Kuje, Nyanya, Karu, Toyota, and Kubwa motor parks with the help of four trained research assistants. These are part of the major motor parks in FCT, Abuja. In all, a total of 142 respondents were sampled using the simple random technique. The sample size for the study is said to be adequate according to the suggestion of Hair *et al.* (1995) referred to in Williams *et al.* (2010) that sample sizes should be 100 or greater. The sampling technique ensures that the respondents were surveyed with equal chance of probability. This was meant to certify that the information obtained reflects the intents of the commercial drivers as regards the contributions of routine vehicle inspection operations to traffic system in Abuja. The instrument was designed on a multiple-item measurement fashioned on the 5-point Likert scale to allow for a wide measurement of the degree of the respondents' consideration of each contributions presented in the questionnaire. The variables were tabulated for the drivers to rank in order of significance from 1 – Not Significant to 5 – Highly Significant. The variables subjected to factor analysis are accident reduction, reduced number of vehicles with poor parts, reduced environmental pollution, on-road vehicle breakdown reduction, increased safety level, increased vehicle life span, proper vehicle maintenance culture, prevents abuse of vehicle capacity, detect fake vehicle documentation, improving fuel

efficiency and increase resale value of vehicles.

Factor analysis was used as a technique for data analysis. This is in the light of the need to reduce the variables to a few orthogonal ones that could be used to explain the major contribution of vehicle inspection to efficient traffic system in Abuja. The main purpose of the factor analysis is to determine the number of common factors needed that can adequately describe the correlations between the observed variables, and estimating how each factor is related to each observed variable by estimating the factor loading (Oyesiku, 2000). A discussion of the model and application of factor analysis was presented by Laudau and Everitt (2004) as variable reduction technique. Ubogu (2013) and Adenigbo (2016) applied the model to study passenger choice of airport and cargo agents' choice of routing cargo respectively.

Results and Discussion

DRTS constantly conducts routine inspection operations where vehicles are randomly checked on roads. If faults are discovered, a defect notice will be issued in which case the owner will be required to have repairs made, and obtain a full inspection from a licensed examiner within 14 days to clear the notice. If serious safety violations are found, the vehicle's registration could be suspended on the spot and the operator will need to have the vehicle towed for litigation and payment of fines.

An increasing trend in the total number of vehicles inspected in Abuja is observed in Figure 1 from 2007 – 2014. This is in the sense that the total number of vehicles inspected stood at 65,397 in

2007 and by 2014, it has increased to 145,537 vehicles. This might be as a result of increasing car ownership rate in Nigeria due to increasing disposable income and population as at 2014. Based on this, it is expected that the trend in the number of vehicles for inspection will continue to increase in the years ahead as income and urban migration rates

increases. The status of vehicles inspected in Abuja from 2007 – 2014 shows the number of vehicles that failed and passed inspection test. Fig. 1 further shows an increasing trend in the number of vehicles that passed inspection tests and a decreasing trend for those that failed the tests.

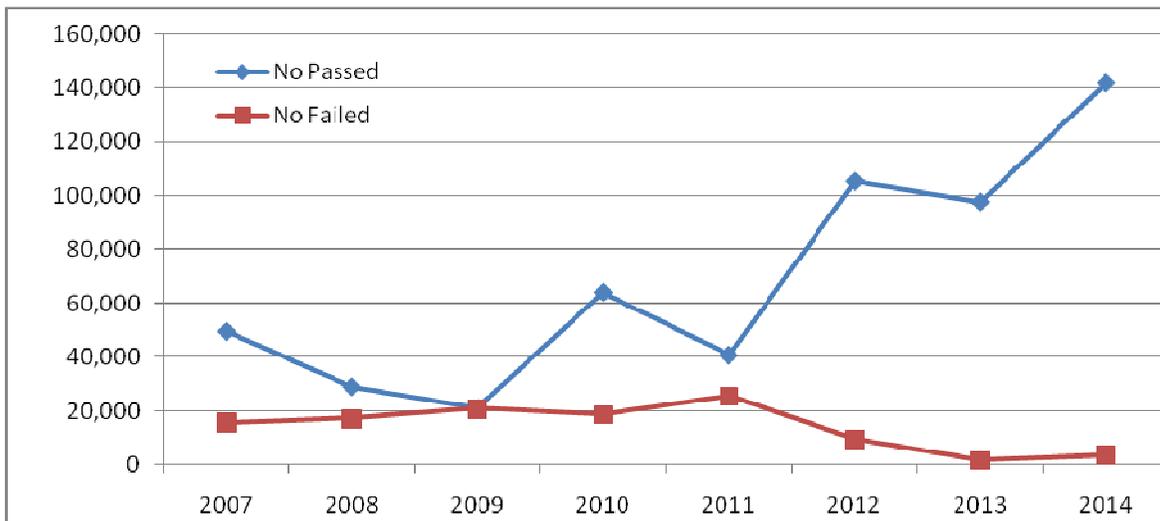


Fig 1: Number of vehicles Inspected in Abuja from 2007 – 2014
Source: DRTS, FCT

In order to assess the contributions of vehicle inspection operations to efficient traffic system in Abuja, some of the positive effects of vehicle inspection operations were examined in order to bring out the most significant ones. Factor analysis of the variables was carried out in order to determine the major ones among them.

It is normal that a data set to be used in statistics of this nature be subjected to test of suitability and

adequacy. Therefore, to evaluate the suitability of the data, internal consistency checks were conducted using Kaiser-Meyer-Olkin (KMO) measure of sample adequacy and the Bartlett test of sphericity (Table 1). These tests were employed based on the requirement of factor analysis prior to factor extraction as suggested by Williams *et al.* (2010). The importance of the test is to determine if the samples were adequate to allow the use of factor analysis.

Table 1: Result of KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.937
Bartlett's Test of Sphericity	Approx. Chi-Square	1687.023
	Df	55
	Sig.	.000

The result in Table 1 shows a sampling adequacy value of 93.7% and significant at $p < 0.01$, which indicates that the data obtained is significantly adequate and suitable for the analysis. This is according to Cornish (2007) statement that a KMO result should be over 70% to be sufficiently correlated. Therefore, with a value above this threshold, the data are considered to be reliable for the use of factor analysis.

The possible contributions of vehicle inspection operations to efficient traffic system in Abuja are naturally dependent on one another by a degree of relationship that respondents attached to them. The correlation matrix (Table 2) of the variables under investigation reveals the nature and the extent of the relationship between the variables subjected to investigation in this study. For ease of table presentation, the variables are represented by AR, RVPP,

REP, RVB, ISL, VLSP, VMC, AVC, FVD, IFF, and RVV where AR = Accident Reduction; RVPP = Reduced Number of Vehicle with Poor Parts; REP = Reduced Environmental Pollution; RVB = on Road Vehicle Breakdown; ISL = Increased Safety Level; VLSP = Increased Vehicle Lifespan; VMC = Proper Vehicle Maintenance Culture; AVC = Prevent Abuse of Vehicle Capacity; FVD = Detect Fake Vehicle Documentation; IFF = Improving Fuel Efficiency; and RVV = Increased Resale Value of Vehicles. It is observed that the correlation between all the variables shows a positive relationship except "AR - Accident Reduction" that has negative relationship with all other variables. This implies that any effect on one factor will produce a corresponding positive measure on the other variables except accident reduction with negative effect, which will produce a reverse effect.

Table 2: Correlation Matrix of the Effects of Vehicle Inspection on Traffic System

	AR	RVPP	REP	RVB	ISL	VLSP	VMC	AVC	FVD	IFF	RVV
AR	1.000										
RVPP	-.122	1.000									
REP	-.141	.724	1.000								
RVB	-.083	.627	.741	1.000							
ISL	-.068	.644	.652	.673	1.000						
VLSP	-.065	.654	.624	.570	.744	1.000					
VMC	-.060	.494	.578	.623	.554	.501	1.000				
AVC	-.033	.602	.671	.619	.634	.604	.559	1.000			
FVD	-.042	.603	.575	.574	.680	.558	.483	.645	1.000		
IFF	-.009	.598	.552	.560	.668	.625	.448	.520	.635	1.000	
RVV	-.098	.534	.613	.626	.626	.548	.597	.601	.553	.459	1.000

The result as presented in Table 2 further indicates that 10 of the variables can be said to have strong and positive relationships with one another. The level of their relationship is said to be strong with r having a threshold value greater than 0.500. The weak correlated pair of variables exist between VMC and RVPP ($r = 0.494$); FVD and VMC ($r = 0.483$); IFF and VMC ($r = 0.448$); and RVV and IFF ($r = 0.459$). It should be noted that the said weak correlation has r value greater than 0.400, which indicates these variables are fairly related to influence one another.

Table 3 presents the communalities estimates of the variables after extraction shows that the item “Accident Reduction” (with 2.2%) cannot be attributed to the three common factors that will form the major contributions of vehicle inspection operations to the overall transport system in Abuja. It implies that vehicle inspection operations

in Abuja do not contribute to the reduction in road traffic accident as expected to enhance efficient traffic system within the city. This can be attributed to the fact that there exist other major factors that constitute road traffic accidents, and follows many findings that majority of road accidents are caused by human behaviour rather than mechanical faults.

Two (2) factors with eigen-values greater than one (1) were produced and accounted for 67.9% of the total variance of the variables (see Table 4). In determining the number of factors needed to represent the data set, the Kaiser’s procedure of selecting the factor with eigen value greater than 1 criterion was adopted. The first factor accounted for 59% of the variance with eigen value of 7.138 while the other factor has 8.5% of the total cumulative variance with eigen value 1.019.

Table 3: Communalities of the Effects of Vehicle Inspection on Traffic System

	Initial	Extraction
Accident Reduction	.039	.022
Reduced number of vehicles with poor parts	.626	.621
Reduced environmental pollution	.699	.728
Road vehicle breakdown reduction	.656	.698
Increased safety level	.714	.756
Increased vehicle lifespan	.635	.641
Ensured proper vehicle maintenance culture	.485	.524
Prevent abuse of vehicle capacity	.599	.612
Detect fake vehicle documentation	.594	.602
Improving fuel efficiency	.556	.648
Increase Resale value of vehicles	.543	.585

Extraction Method: Principal Axis Factoring

Table 4: Percentage of Total Variance Explained by

Factor	Initial Eigen values		
	Total	% of Variance	Cumulative %
1	7.138	59.485	59.485
2	1.019	8.495	67.981
3	.729	6.078	74.059

Extraction Method: Principal Axis Factoring

Table 5 shows the rotated factor matrix of the explanatory variables. In the table, three contributions were extracted to explain the underlying similarities of the 11 variables. The contributions were rotated using varimax rotation in order to maximise their orthogonality and clearly describe the pattern of the three major contributions of vehicle inspection operations on efficient traffic system in Abuja. Variables with absolute value of score below 0.4 were suppressed because in practice, according to Laudau and Everitt (2004), a largely arbitrary threshold value of 0.4 is often equated to 'high' loadings; in addition, variables were sorted by size (Table 5). It implies the greater the value the more significant is the variable as regards the contributions of vehicle inspection operations to traffic system in Abuja.

It can be seen from the Table 5 that all the 11 variables are loaded on the three extracted factors except "accident

reduction". This implies that all the variables that loaded on the extracted factors are significant contributions of vehicle inspection operations to efficient traffic system in Abuja. It further shows that vehicle inspection operations do not contribute to reduction in road traffic accidents. This implies that road traffic accidents can occur if vehicles are road worthy and meet all safety regulations. Loaded on Factor 1 are all the variables except accident reduction. Factor 2 has reduced number of vehicles with poor parts, prevent abuse of vehicle capacity, reduce environmental pollution, reduce on-road vehicle breakdown rate, increase resale value of vehicles, and ensure proper vehicle maintenance culture; while Factor 3 loads on increased safety and detect fake vehicle documentation. All these variables are listed in order of significance as contributions of vehicle inspection operations to the overall transportation system in Abuja.

Table 5: Rotated Factor Matrix of the effects of vehicle inspection in Abuja

Effects	Factor		
	1	2	3
Increased safety level	.802		.416
Improving fuel efficiency	.794		
Increased vehicle lifespan	.746		
Detect fake vehicle documentation	.720		.445
Reduced number of vehicles with poor parts	.676	.404	
Prevent abuse of vehicle capacity	.616	.482	
Reduced environmental pollution	.590	.616	
On road vehicle break down reduction	.567	.614	
Increase resale value of vehicles	.505	.574	
Ensured proper vehicle maintenance culture	.450	.567	
Accident Reduction	-	-	

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization

Of the 11 variables identified and factor analysed, 10 loaded on Factor 1 and arranged by size according to their values. Increased safety level, improving fuel efficiency and increased vehicle life span loaded high with 80.2%, 79.4% and 74.6% respectively. Notwithstanding, it is pertinent to note that increased safety level with the highest value (80.2%) is attributed to be the most significant contribution of vehicle inspection operations to the overall traffic system in Abuja. This can be as a result of the nature of the inspection operations requiring a thorough check on vehicles covering the engine, tyres, and other parts of the vehicles. These checks invariably tend to enhance safe movement of vehicles on roads. Inspection checks on safety level of vehicles have a relationship that tends towards reducing the number of vehicles with poor parts on roads, a variable that loads on both factor 1 and 2 with 67% and 40% respectively. As a result, it can be concluded that increased safety level and reducing number of vehicles with poor parts are the most significant contributions of

vehicle inspection operations to efficient traffic system in Abuja. That the variable “Accident Reduction” does not load on any of the three extracted factors after suppressing all values less than 0.4 indicates that effective vehicle inspection operations does not have any contribution to reducing accidents on roads as expected. This result supports the study of Crain (1981) which noted that ‘.....vehicle inspection programs do not have the expected effect of reducing accident rates’ (p 29) and that ‘.....more frequent inspections do not tend to reduce accident rates’ (p 32).

Policy Recommendation and Conclusion

The contributions of vehicle inspection operations to efficient traffic system in cities can be said to be enormous. This calls for the need to put more efforts geared towards the development of vehicle inspection operations in Nigeria. The government should endeavour to promote the operations of vehicle inspection office (VIO) as it contributes to the efficiency

of the overall transport system in Nigeria. This should be done such that campaigns on the need for vehicle owners and drivers to ensure all safety gadgets are well fitted in their vehicles as they are being used on roads. The government campaigns through its agencies such as VIO and Federal Road Safety Commission (FRSC) should include correct drivers attitude to reducing accidents as vehicle inspection operations do not contribute to accident reduction.

In conclusion, the study highlighted the number of vehicles inspected in Abuja from 2007 - 2014, and subjected 11 variables believed to be derived contributions vehicle inspection operations in Abuja to correlation and factor analyses. The study therefore concludes that vehicle inspection operations do not have significant effect as to the reduction in accident rates. It further highlighted increased safety level and reduced number of vehicles with poor parts on roads as the most significant contributions of vehicle inspection operations in Abuja.

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