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Notes For Contributors

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You are invited to contribute articles in: either or two areas: empirical research into urban problems confronting cities from researchers in urban fields including but not limited to architecture, sociology, geography, economics, politics, archaeology, education, engineering as well as urban and regional planning.

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1. Articles submitted for consideration must not have been published or under consideration for publication elsewhere.
2. Articles must reach the editor at least three months before the date of publication.
3. Articles must be written in good clear English.
4. The title, name of author(s), address, and e-mail should be submitted on a separate cover page
5. An abstract of not more than 200 words should be submitted on a separate page along with keywords.
6. Articles should be formatted A4, double line spaced with only the left margin justified; font should be Time New Roman set at 12 points, minimum 1 inch margin all round.
7. Articles should normally be 10 pages long including tables, diagrams and references.

maximum length is 15 pages

8. Short Articles describing best practices in planning or novel planning idea or techniques may be shorter.
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Contents

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Journal of Contemporary Urbanology

Evaluating the Operational Challenges of Truck Tracking System in Dangote Cement Transport, Obajana - Nigeria

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Abstract

Trucks operation for cement distribution by Dangote Cement Transport (DCT), Obajanahasfrom inception been facing challenges, some of which include: diversion of payload, unauthorized use of vehicles and violation of traffic rules. To address thesechallenges, the company engaged Nova-Track Technology Servicesfor real-time tracking of her trucks in October2014. Five years after, thesechallenges seems not to have abated, this study evaluate drivers' perception and operational challengesin the operation ofTruck Tracking System in DCT Obajana. Data were collected on drivers' perception of the technology and the challenges faced by the operators. Stratified sampling method was used to administer 642 copies of questionnaire to Drivers, Fleet Officers and DCT Central Control Room Staff. The instrument was validated using Cronbach alpha reliability method with reliability coefficient of 83%. Data were analyzed using descriptive and inferential statistics. Result shows that, while drivers are aware of the vehicle tracking device installed on their trucks, (M=2.94) they werehowever, not happy with the development (M=2.36).Furthermore, tampering with VTS device (M= 3.10), poor network (M= 2.91) and low battery life (M=2.66) were the dominantchallenges facing the Company truck tracking system. The correlation coefficient result shows that low battery life and GPS lock (r=.216) exhibited the highest positive correlation, while poor network connectivity and poor weather condition (r=-.170) has the highest negative correlation. It was recommended that DCT drivers should be reoriented on the benefit of the system after which enforcement team should be instituted to ensure strict compliance.

***Key Words:** Devices, GPS, Satellites, Tracking and Trucks.

Introduction

Truck Tracking is a system of using Global Positioning System (GPS), satellite and ground-based station devices to know the location of a vehicle, the tracking system allows for fast and precise measurement of the vehicle's location. According to I. GPS and vehicle tracking system have been in use for over a decade to identify the exact vehicle position through a set of earth orbiting satellites. However, existing vehicle tracking technologies consist of components such as GPS, satellite, car or compatible unit, GSM service provider, tracking server and client computer (Sammer, Atul. Rutujit, Amol and Archana (2012). Using tracking device, truck information such as: location details, speed, distance traveled among others can be shown on a digital mapping of an Internet computer. This can be an efficient tool for monitoring every truck over a given period of time.

The distribution of cement products across Nigeria by Dangote Cement Transport, Obajana using the company trucks has from inception faced numerous challenges, these challenges include diversion of payload from assigned routes, unauthorized selling of product, violation of traffic rules just to mention a few. The company instituted a truck tracking system witha view to providing adequate and real-time monitoring of her truck movement through an effective and dependable tracking system to ameliorate the problems. Nova-Track technology services-a leading provider of vehicle monitoring services was engaged in October 2014. The tracking system uses the GPS / GPRS vehicle tracking device in a 12-channel GPS monitoring satellite receiver that deliver second-by-secondprecise information on vehicle speed and direction to base location.

Five years after the adoption of the tracking system, feedback from the control room shows that issues of theft of goods on-board, loss of vehicles, accidents, deviation from assigned routes, violation of traffic rules, unauthorized use of the vehicles, late return of vehicle sent for delivery and mismanagement of fuel is still a common occurrence.The foregoing raises some concerns as to what are the operational challenges facing truck tracking system in Dangote Cement Transport Obajana- Nigeria. It is against this backdrop that this study attempt to evaluate the operational challenges facing truck tracking in DCT-Obajana with a view to making suggestions that will assist in improving effectiveness of the tracking system. The study answers the question of: drivers' perception, attitude towards the vehicle tracking system and the operational challenges faced by the Company in the implementation of the tracking system. This study will be of immense benefit to the Company fleet managers in their quest to finding solutions to the challenge of fleet management, trucks reduce visibility, location, monitoring and performance, thereby ensuring better optimization of truck routes, maintenance services and improved customer services.

Empirical Review on Vehicle Tracking System

A number of scholars have written on the universal application, benefits and barriers to the adoption of vehicle tracking system in fleet management. Markakis, Samaras, Polycarpou & Sahalos, (2013) investigated the universal applicationof vehicle tracking technology on private transport companies in South Korea, their findings revealed that about One-tenth of vehicle tracking is been applied to the tracking of big trucks carrying items to different site location and that private transport companies are living up to expectation with respect to tracking and real-time location of trucks conveying goods and services in the supply chain network. Global case studies in the adoption of vehicle tracking system according to Omofoman (2014), revealed that apart from basic tracking technologies applications in various aspect of transport management, vehicle tracking technology can also be applied in the areas of: aviation, hospitality, homeland security, education, healthcare logistics and supply chain management.

Yusof and Saman (2016), in their studies on the barriers to the adoption and implementation of vehicle tracking technology in Indianoted that: technological boundaries, intrusion concerns, exorbitant costs, absence of global ethics and confidentiality concerns are the major challenges to the effectiveness of tracking system. They recommended an improved design of vehicle tracking technology system that is accessible at low cost and addresses the confidentiality concerns of the users in order to enhance the role of vehicle tracking adoption in the value-chain of transportation system. Mehrjerdi (2011), in his study of the application of vehicle tracking technology in the transportation industry discovered that vehicle tracking technology for trucks would

provide an efficient and effective real-time monitoring of fleets, but it operation is likely to be tampered with by drivers, he recommended the development of truck tracking technology that is at par with other developed countries like the United States of American, United Kingdom where interference has been reduced to a minimal level through a redesign of the devices.

Kennedy and Kepha (2015), workfocuses on security and theft detection in trucks and car using the tracking system, they concluded that monitoring technology programmelike vehicle tracking technology tag which can be swapped as distinct security bit can provide a protection tool to thwart vehicle theft. Ambade and Shaikh (2011),studied the effect of tracking technology on transport management, in Goa and Coastal Karnataka, the study shows that, there is a major shift in the way information is created, obtained, processed and used by the tracking system hence creating an automation constraints in the way the technology is adopted. Manikandan and Balakrishnan (2012), in their study emphasized the relevance of Information and Communication Technology (ICT) enabled administration and management of the transport systems, as well as steps taken by the various transport company to use technology in tracking their vehicles. They suggested a robust vehicle monitoring system through automation activities and usage of car monitoring systems by the transport companies through technology collaboration, learning and implementation. While all the review above have pointed to the fact that vehicle tracking technology has transformed transportation administration and practices, not much of the study focuses on the challenges facing vehicle tracking system in developing countries especially Nigeria, hence the need for this study.

The Study Area

Dangote Cement Transport (DCT), Obajana is an integrated logistics Company that meets the Group's full Haulage needs from raw material transport, to final product.The Company enjoys the benefit of its more than 5000 in-house haulage fleet ensuring efficient delivery of goods around the country. The company huge fleet system is assisted by full-fledged workshops to handle preventive and repair breakdowns. DCT headquaters is located about 400km north-east of Lagos, in Obajana, Kogi State- Nigeria.The company has a vision to be an *excellent standard* haulage unit that will provide *effective, efficient and reliable* logistics support to the cement division of the group by offering a leading and *safe haulage services* which fully satisfy the customers and accurately meet other stakeholder's expectation and values. Figure 1 shows the location of Obajana in the context of Kogi State.

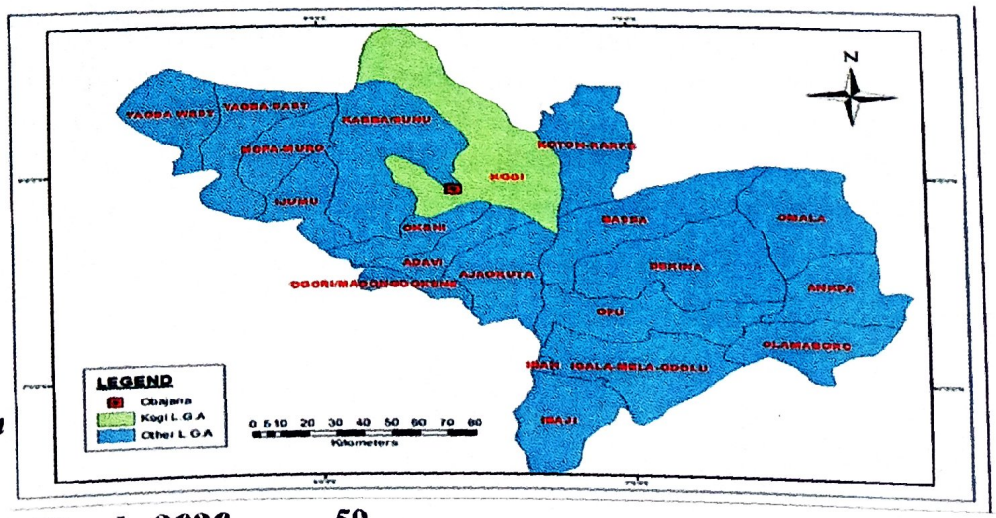

Figure 1: Obajana in the Context of Kogi State

The operational standards commonly adhered to by the Company is presented in table 1 below, the standard guide the smooth running of loading, dispatching and offloading of the goods to the depot or directly to the customers. This standard keep operational staff in check to reduce the turnaround time with a view to increasing productivity, optimal service delivery and customer satisfaction.

Table 1 Operational Standards of DCT- Obajana

Operational	**Abbreviation**	**Understanding**	**Tolerance Days**
Empty	E	In Obajana, Taking ATC	1
Loading	L	Awaiting entry/loading	
AGO Queue	Q		
Dispatched in Obajana	DO	Vehicle in Obajana & should move	0.5
Transiting Going	TG		1 up to 500KM, 2 > 500 km
Awaiting offloading	AO	Within 1 or 2 days after arrival	1
Offloading delay	OD	Starts a day after arrival	3
Transit Coming	TC		1 up to 500kms, 2 > 500KM
Transloading	TL	Transloading goods of a HBD/Accidented Truck	1 up to 500KM, 2 > 500 KM
Special Ops	SO	Detailed for one time/specific task	
Non Operational			
Transit to Workshop	TTW	Yet to enter workshop	1
Workshop	W		Workshop to indicate
Highway breakdown	HBD		2
Accidented Fatal	AF	Involved in a fatal accident	5
Accident	A	Does not involved any fatality	3
Awaiting Tyre	AT		Tyre unit to indicate
Awaiting Trailer	ATL	Require trailer through swapping	2
Impounded	Imp	With Police/Customs	15
Missing	M	Hijacked/Stolen & missing	30
Minor Repair	MR	No need to enter workshop	2

Source: DCT, Obajana (2019)

The truck originates from Obajana plant to different part of Nigeria as shown in figure 2 (DCT, Obajana truck routes) below.

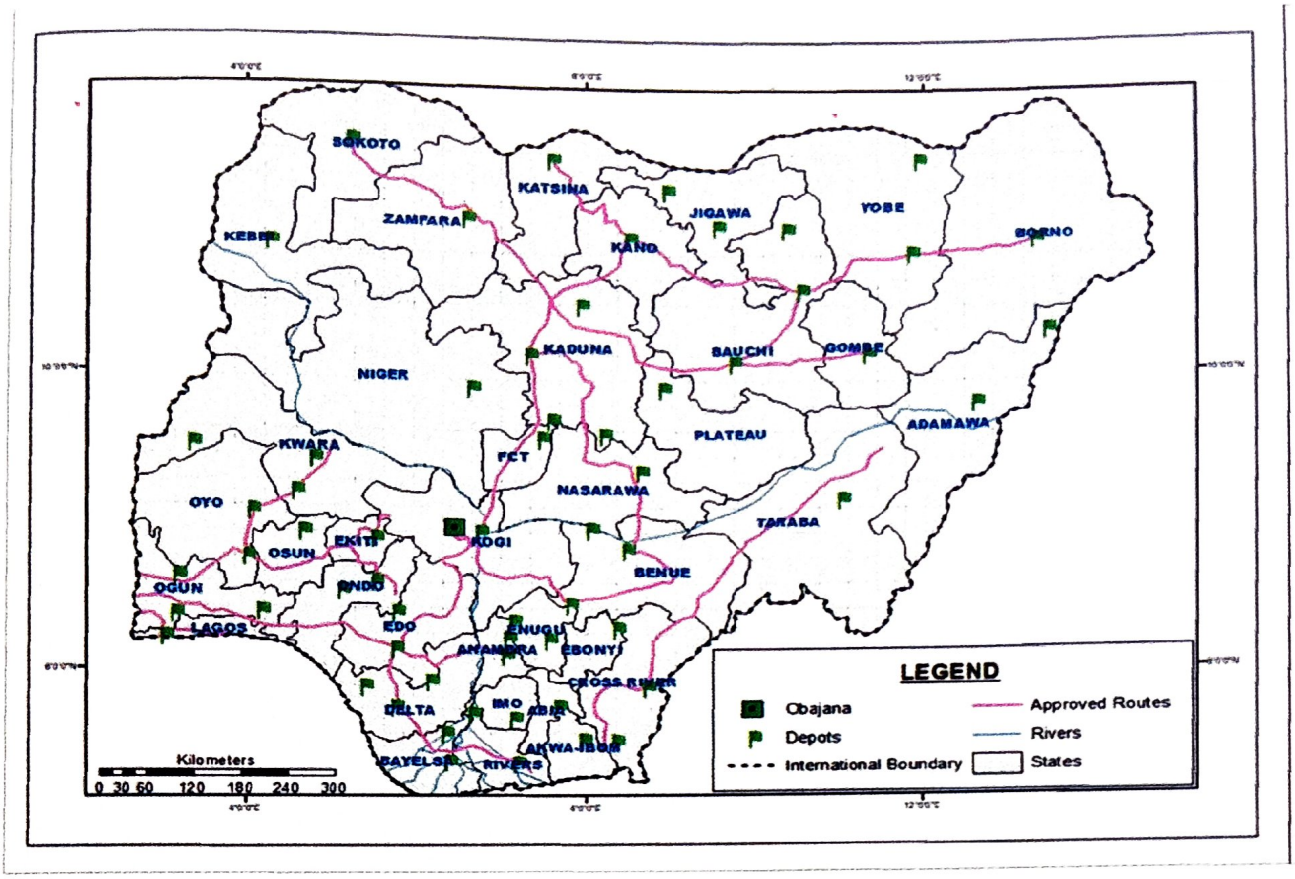

Figure 2 DCT- Obajana Truck Routes
Source: DCT- Obajana (2019)

Tracking System in DCT, Obajana

In October 2014 Novatrack was launched at DCT Obajana, it uses the GPS/GPRS vehicle tracking system in a 12-channel GPS tracking satellite receiver which provides second-by-second information on the exact position, direction and speed to the terminal. Using the aforementioned vehicle ignition information and status, the device continuously tracks vehicle operation day and night. A GPRS data modem connects the web servers of Novatrack using the GPRScomputer network to ensure coverage of the regional vehicle movement. The system is designed to work with either 12 or 24 V electrical vehicle systems for full flexibility. Novatrack equipment comes with tracking unit, antenna, speaker and microphone. The device has installed power solution, which protects the unit from battery problems, sparks, spikes, high temperature thereby making it ideal for use in almost any environment and in any type of DCT truck.This feature allows the company to control, track, and display each vehicle's status on a single screen as shown in figure 3 (truck monitoring and status on one screen).

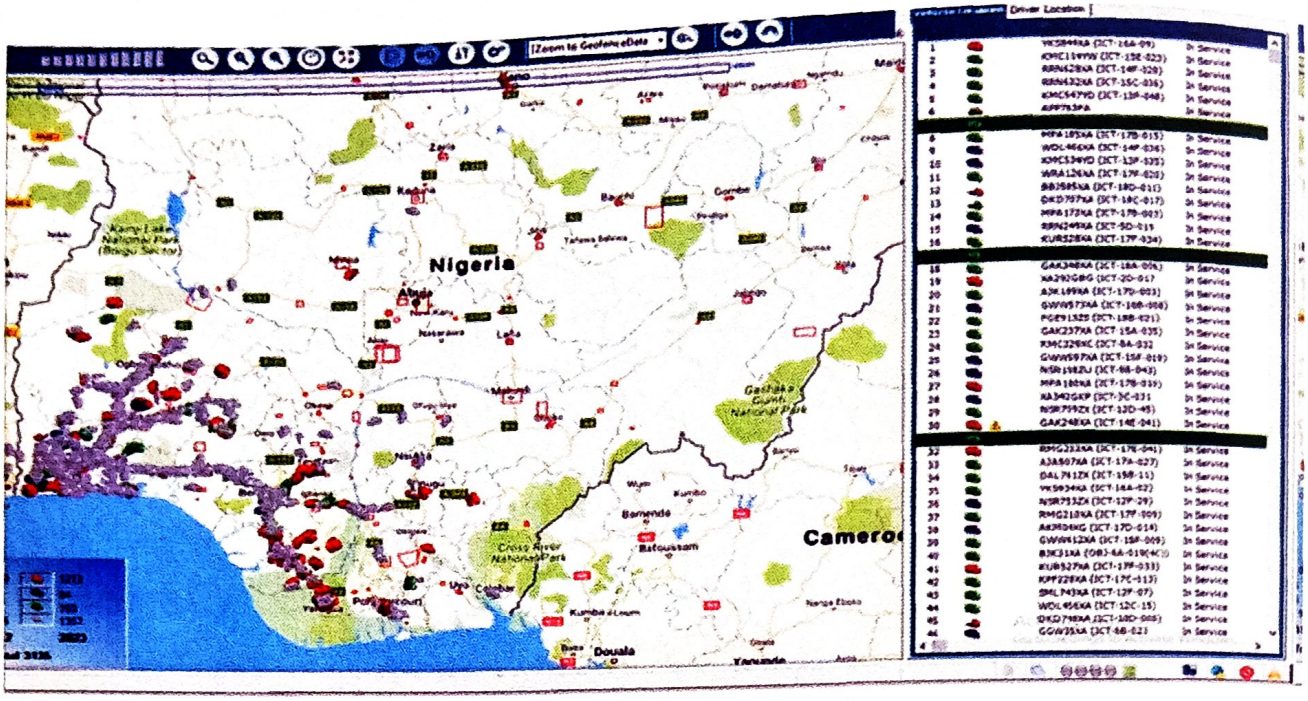

Figure 3: Truck Monitoring and Status on One Screen
Source: Nova track Application, 2019

The status of the vehicle is color coded to allow for a simple and fast assessment. Green colored vehicles mean that a vehicle is moving, red indicates that a vehicle is stationary, and blue indicate that the vehicle was in motion a while ago. The speed and time of the vehicle is shown by simply clicking on the vehicle icon on the screen. In addition, a list of all tracked vehicles by one user with color code status is also displayed on the right hand side of the dashboard. The live tracking of truck enables the company to monitor and track a vehicle and its details (location, speed, time, date and registration number) real-time on a single screen on Google maps. Figure 4 shows live sample of vehicle tracking with vehicle.

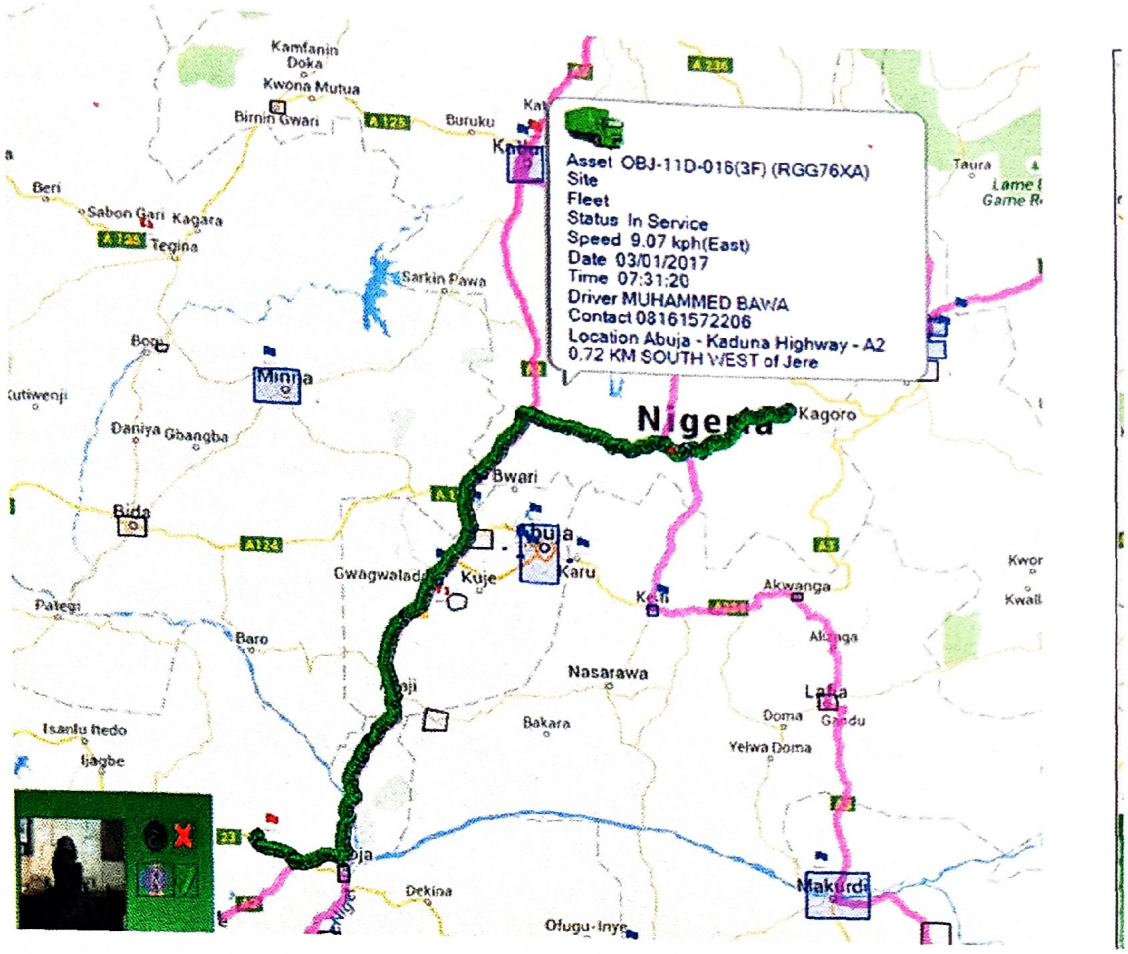

Figure 4: Live sample of vehicle tracking with vehicles details
Source: Novatrack Application (2019)

Methodology

The study uses a descriptive survey research design to investigate drivers' perception and challenges facing vehicle tracking system in DCT, Obajana. Data were collected on the drivers' awareness, effectiveness, acceptability, functionality, adaptability and general perception of the truck tracking system in the company. The scope of tracking challenges investigated include: weather condition as it affect the operation of the device, tampering with Vehicle Tracking Unit (VTU), poor internet connectivity, Global Positioning System (GPS) lock and low battery life).Stratified sampling technique was used to administer questionnaires to the truck drivers, fleet officers, tracking officers in the Central Vehicle Monitoring and Tracking Control Room of the Company. The total population of the study is 5186 and 642 were sampled based on Yamane's (1967) formula for sample size determination. The formula is expressed as:

$$\frac{N}{1+N(e)^2} = n$$

Where
N = Population Size
n = Sample size
e = margin of error (MoE), e = 0.05 based on the research condition

Table 2 below shows the proportional distribution of the questionnaire amongst the respondents. The respondents shared common characteristics on the installation, operation and usage of the tracking system.

S/N	Department	No. of Staff	Sampled Population
1.	Drivers	4752	369
2.	Tracking Officers	143	105
3.	Fleet Managers	291	168
	Total	**5186**	**642**

Source: DCT Obajana (2019)

Test of reliability to assess the internal accuracy of the instrument was also carried out using twenty-three (23) copies of the questionnaire administered within the scope of the analysis.The Cronbach Coefficient Alpha formula was used to test for reliability and overall reliability index of 83% was obtained. Because of the stratification of the respondents all of which need to be captured, the stratified random techniques was used to administered the questionnaire. A total of 582 copies (91% return rate) was successfully filled and retrieved out of the642 copies of questionnaires taken to the field. The data collected were analyzed using descriptive methods (mean) and inferential statistics (Pearson Product Moment Correlation) in the Statistical Package for Social Sciences (SPSS) version 21. The resulting mean scores were interpreted relative to the definition of the true lower and upper limit of numbers shown in Table 3. The lower the mean value recorded for a given question, the lower the level of perception or challenges it posed to the operation of the tracking system as the case may be.

Table 3 Decision rule for interpreting the mean score

S/N	Response Mode	Rate	Reg/Limit	Decision
1.	Strongly Agree	4	3.50 – 4.99	Strongly Agree
2.	Agree	3	2.50 – 3.49	Agree
3.	Disagree	2	1.50 – 2.49	Disagree
4.	Strongly Disagree	1	0.50 – 1.49	Strongly Disagree

The Product Moment Correlation matrix was used to investigate the types and strength of association between the operational challenge variables.The **Pearson Correlation Coefficient (PCC)**, also referred to as **Pearson's** *r*, is a statistical measure of linear correlation between two variables *X* and *Y*. the value is between +1 and −1, where 1 is total positive linear correlation, 0 is no linear correlation, and −1 is total negative linear correlation. Pearson's correlation coefficient is the covariance of the two variables divided by the product of their standard deviations. The form of the definition involves a "product moment", that is, the mean (the first moment about the origin) of the product of the mean-adjusted random variables.

This can be expressed mathematically as:

$$r = \frac{n\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[n\Sigma X^2 - (\Sigma X)^2]x\,[n\Sigma Y^2 - (\Sigma Y)^2]}}$$

Where:
YXX are variable
Σ= Summation sign
XXY are means of XXY
In this case the X variables are defined as follows:
X_1: Poor Weather condition
X_2: VTU Tampering
X_3: Poor network connectivity
X_4:GPS Lock

X_5: Low battery life

The strength of the relationship(positive or negative),can be interpreted asweak, fair, moderate, strong or perfect based on the range of coefficient of r as presented in table 4.

Table 4. Decision Rule for Interpreting Pearson Product Correlation Coefficient

S/N		Decision
1.	0.01 – 0.14	Very weak correlation
2.	0.15 – 0.24	Weak correlation
3.	0.25 – 0.34	Fair correlation
4.	0.35 – 0.54	Moderate correlation
5.	0.55 – 0.64	Strong correlation
6.	0.65 – 0.99	Very strong correlation
7	1.00	Perfect correlation

Discussion of Results

Drivers of truck tracking system

The mean response on drivers' perception towards the tracking system is presented in table 5 below.

Table 5: Mean of Responses of Perception Towards the Tracking System.

S/N	Item	4	3	2	1	Weight	Mean
1.	Are you aware there is a tracking device on your Truck?	440	402	116	36	994	2.94
2.	The Traditional method is more effective than the VTS	444	225	176	64	909	2.69
3.	Are you happy with the tracking device on your truck?	352	102	254	89	797	2.36
4	In case of Theft/Accident the Exact Location of drivers can be identified	416	390	128	40	974	2.88
5	It does not allows Drivers drive beyond speed limit	416	420	146	21	1003	2.97

Source: Authors' Computation (2019)

With a mean score of 2.94 on question 1,DCT drivers generally are aware of the tracking system on their trucks, but are generally not happy with the introduction of tracking system by the company as revealed by the response to question 3 which has mean score of 2.36. Drivers' perception of the traditional method of tracking using monitoring team with mean score of 2.69 in response to question 2 further support the argument that truck drivers are not very happy with the truck tracking system in the Company. Question 4 measure drivers' perception of the capacity of the device to track truck location in case of accident and theft, the mean score of 2.88 indicate their general agreement to the observation. The mean score of 2.97 on drivers' perception of how the tracking system can make drivers comply to regulated speed limit, implies that DCT truck drivers are also aware of the potential benefits of the tracking devices, hence the innovation can hinder them from achieving their unauthorized use of the Company truck. This finding agrees with Ngai et'al (2008), who opined that due to low literacy level among Kenyan policemen at the time of his study, they perceived vehicle tracking and monitoring systems as very complex and likely to make their job more difficult.

Challenges facing truck tracking system

The mean response of respondents to the challenges facing the adoption of truck tracking system in DCT- Obajana is presented in table 6.

Table 6: Mean Response of Challenges againstVehicle Tracking System

S/N	Item	4	3	2	1	Weight	Mean
1.	Poor weather condition	40	81	540	275	936	1.61
2.	VTU Tampering	972	615	164	52	1803	3.10
3.	Poor Internet connectivity	912	381	352	51	1696	2.91
4.	GPS Lock	232	222	476	212	1142	1.96
5	Low Battery Life	720	396	324	108	1548	2.66

Source: Authors Computation(2019)

The results shows the three major challenges facing vehicle tracking in the company at the moment are: Vehicle Tracking Unit (VTU) tempering mean score of 3.10), poor internet connectivity (mean score of 2.91) and devices low battery life (mean score of 2.66), a closer look shows that these three factors go hand-in-hand, if the internet coverage is weak especially when the vehicles moves away from major highway, they go 'off radar', thus making the battery run faster due to persistent search for internet service. This will further provide the impetus for the truck drivers to tamper with the device since they are not been monitored. Poor weather condition (mean score of 1.61) and GPS lock (mean score of 1.96) are less of a challenge at the time of this study. This findingagrees with the outcome of Sathe (2013) studies, who opined that,there could be some restrictions like: poor GPS network, bad weather, Signal multi-path error arising from obstacles such as tall buildings or other structures which may affect the efficiency of the vehicle tracking system.

Table 7provides the Pearson correlation coefficient for the pair of truck tracking operational challenges, the correlation matrix shows that all the variables (operational challenges) are either positively or negatively correlated with each other, hence exhibiting some statistical relationship at p values of $< p=0.05$.

Table 7: Correlation Matrix

		Poor weather condition	VTU Tampering	Poor Network Connectivity	GPS Lock	Low Battery Life
Correlation	Poor weather condition	1.000				
	VTU Tampering	-.025	1.000			
	Poor Network Connectivity	-.170	-.050	1.000		
	GPS Lock	-.048	-.001	.068	1.000	
	Low Battery Life	.052	-.045	.194	.216	1.000

Source: Author's Computation (2019).

The highest positive correlation is noted between low battery life and GPS lock (r=.216), this is followed by poor network connectivity and low battery life (r=.194). The implication of this is that, with low or flat battery, the devices will not be active to receive or transmit signal therefore making the GPS to lock-up, invariably this will lead to poor network connectivity. Poor weather condition and low battery life has correlation coefficient of r=.052, meaning that the poorer the weather condition, the lower the devices signal strength and vice versa. The highest negative correlation is noted between poor network connectivity and poor weather condition (r=-170), tracking devices tampering and poor connectivity with correlation coefficient of r=-050, this implies with an increasing tracking devices tampering, network connectivity between the devices in the vehicle and the base station will be low. This is expectedly so as some of its components would have been damaged. The correlation between poor weather condition and GPS lock has a coefficient of r=-048, which implies that if the devices is locked, it will no longer be sensitive to weather condition, whether good or bad.

Conclusion

The study investigated drivers' perception and operational challenges to truck tracking system in DCT, Obajana. The result shows that though drivers are aware of the tracking deviceon their truck, they are not happy with the adoption of the technology. Furthermore, vehicle tracking unit tampering, poor internet connectivity and low battery life are the major challenges facing the operation of the tracking system at the moment.It is recommended that DCT Obajana drivers should be re-oriented on the benefit of tracking system, after which strict rules, monitoring and enforcement team should be constituted with the objectives of checkmating the excesses of the drivers. The company should also put in place a solid internet and robust backup system to power the tracking device especially when the vehicle is idle.

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