



## ICT IN DIMINISHING ROAD ACCIDENT: PROSPECTS AND CHALLENGES

**Oluwakayode Moses Akinboboye**

Department of Public Administration, The Federal Polytechnic, Ilaro, Ogun State, Nigeria.

Phone Number: +2347062218128

Email: [oluwakayode.akinboboye@federalpolyilaro.edu.ng](mailto:oluwakayode.akinboboye@federalpolyilaro.edu.ng)

**Ilesola Folayemi Adegeye**

Department of Guidance and Counselling, Adeyemi College of Education, Ondo, Ondo State, Nigeria.

Phone Number: +2348070610247

Email: [afolayemia@gmail.com](mailto:afolayemia@gmail.com)

### Abstract

*Technological innovation and development has transverse social, political, economic and even transportation experience of countries across the globe, without discrimination between the great, medium, or small countries. The need for human safety has led to advancement in road, air, and sea transportation mechanisms through the introduction of protection, and prevention ICT transport mechanisms. Realizing the vital need for these mechanisms in protecting and preventing humans from transportation hazards, this study investigated the causes of road accident; availability; and challenges impeding effective utilization of ICT traffic tools in Abeokuta, Ogun State. The study engaged a descriptive research design with survey instrument of well structured questionnaire as primary data source. Questionnaires were distributed to all 127 population of Federal Road Safety Commission officials, although, 100 questionnaires were filled and returned. Results received from 100 respondents were analyzed with Frequency and Percentages, and tabulated. The results revealed among others that Negligence and poor level of concentration; poor maintenance of motor vehicle/motorcycle; and over speeding significantly contributed to road accidents. ICT tools such as CCTV, Speed Cameras, Traffic Light Control system, and VMS were perceived beneficial in accident reduction, although they were poorly available. Inadequate power supply; inadequate training and retraining programs and poor database challenged the use of ICT traffic tools. The study recommended the arrest and detention of traffic offenders; provision and buffing up of ICT traffic tools; adequate investment in solar as a power alternative, and improved maintenance of ICT traffic tools.*

**Keywords:** FRSC, Transportation, Road Transportation, ICT traffic tools.

### Introduction

The facilitation of immigration, emigration, social, and economic integration of people, from historic times to more recent century has been made probable by the presence of road transportation, generally appreciated for its ease and divergence. The ease and divergence embedded in the qualities of road transportation has accrued a significant dependence emanating from national desires for movement of goods, capitals, humans, and services. Notwithstanding the myriad benefits provided by road transportation, records express that a significant number of global population, especially, in developing countries still experience difficulties in efficiently managing and enjoying the benefits and opportunities situated in effective implementation of road transportation (Siyan et al, 2015) and its mechanisms. World Bank report (2018) revealed the high rate of road accident experienced in the world, with developing countries representing 90% of these causalities.

Africa, unsurprisingly with the highest population of developing and underdeveloped economies, record the highest number of causalities and occurrence of road accidents. Nigeria being the most populated country in Africa has been recorded to experience the second highest rate of road accidents in the world (UN Economic and Social Council, 2016; International Transport Forum, 2016). Supporting this, the National Bureau of Statistics revealed that at the first quarter of 2017, Nigeria have 11,458,370 as her total cars' population, in which 53.89% of these cars were for commercial purposes, 44.5% were associated to be privately owned vehicle, while government vehicles represented 1.65% of these population; and 0.1% were diplomatic purposed vehicles. At the first quarter of 2017, revelations still emanating from the National Bureau of statistics showed that of 2,556 road associated accidents recorded this period, 42.69% were significantly caused by over speeding. Reports from the World Bank on road use and safety further



revealed that  $\frac{1}{4}$  of road accidents recorded in Africa occurred in Nigeria. To avert the incessant loss of lives and properties of dwellers all around the levels of the world, governments have engaged institutional and technological research aimed at solving the challenges and regulating the impact of road transportation related accidents. African countries, including Nigeria, have transited in their efforts at providing suitable experience in road use.

In Nigeria, the obvious need to proffer sustainable solutions to the events of loss of lives and properties to the cold hands of road accidents, has initiated the formation of road maintenance and safety agencies aimed at professional security of road users, both motorists, and pedestrians. This effort led to the establishment of the agency of the Federal Road Safety Corps (FRSC) in 1988 by the Military government of Major General Ibrahim Badamosi Babangida (FRSC, 2012).

Historically, FRSC (2009) indicated that 1974 signified the commencement of the deliberate effort to establish road safety agencies by the military government of General Yakubu Gowon, with the establishment of the National Road Safety Commission (NSRC), the commission although lacked significant impact in road accident reduction in the Nigerian roads. The failure of the NRSC amounted to the need to establish a replacement agency which will ensure that bloodshed becomes a forgotten occurrence on the Nigerian roads. FRSC (2009) further revealed the constant failed attempts at scaling up the then NRSC, one of which was the training of Nigerian military officers of the then NRSC on safety rules and discussions in early 1970s, with the first safety week campaign on the need and benefits of road safety in year 1972.

Eventually, the Federal Road Safety Corps (FRSC) was constitutionally created in line with Decree 45 of 1998, upon Decree 35 of 1992; the FRSC was amended, and passed by the law making body of the National Assembly of Nigeria in 2007 marking the institution's Establishment Act (Aikhionbara, 2016). From its inception, FRSC has been the singular constitutionally recognized agency to ensure safety of roads, accidents minimization through public and motorists education on the need for safety precautions on road; the need to abide by and obey road laws and regulations and punishment of road law breach, towards ascertaining accident free (Sunmola, 2014).

With the establishment, and favorable laws provided for the FRSC, the event of road accidents still remains on the rise in Nigeria. From 2019 – 2021, reports from FRSC data revealed that Nigeria experienced the highest events of road accidents with 31,116 from which 14,773 deaths were recorded in 2019, while in 2021, 35,791 individuals were recorded to have been involved in the total of 10,637 accident cases. Of these 35,791 individuals, 5,101 deaths were recorded, and injured people accrued to 30,690.

Despite efforts made by FRSC at reducing rate of accidents on the Nigeria roads, several cases of road accidents are still recorded, almost on daily basis. Several studies exemplified in Ally and Emmanuel (2014), they examined the adoption of ICT for tracking vehicles and apos; over speeding in Tanzania. Cross-cultural study of Akinro, Ailin and Naohiro (2022) tried an understanding into road safety from the perspective of Traffic culture difference. Also, Agi and Jackreece (2018) have employed behavior modification strategies and counseling in an attempt at reducing events of road accident in River State, Nigeria. In addition, Etim (2023) has attempted an examination into the effectiveness of road safety in accident reduction in Bayelsa State, Nigeria. From these studies, it is evident that aspects of ICT adoption in transportation and road safety has been under-researched, especially with focus on investigating the availability, usability, and challenges of adopting ICT traffic tools in traffic surveillance, and road accident reduction, with peculiar attention to Nigeria. It is therefore with this realization this research seeks to investigate the causes of road accident; determine the perceived benefits of ICT tools in road accident reduction; evaluate the availability of ICT tools in road accident reduction; and investigate the challenges impeding the effective use of ICT tools in road accident reduction, with focus on Federal Road Safety Corps (FRSC), Abeokuta, Ogun State.

Kayisire and Wei (2016) have described the significant contribution of Information Technology in providing sustainable development. Attesting to this position, Wang et al (2015) indicated the tools of radio frequency identification; Internet of Things (IoT); Graphic Information Systems (GIS); and Big Data as the enabling mechanisms of ICT in ensuring sustainable development. In transportation, literatures have attested the role played by



transportation in time efficiency, safety and navigation GIS, and passenger wellbeing through on-board computers and recreation (Sternberg et al., 2014; Davies et al., 2007; Harries et al., 2015; Wang et al., 2015; and Button et al., 2001). In the African experience, the impact of ICT in enabling improved transportation experience remains unfelt, not even after the UN (2016) expression of ICT and transportation as a panacea for ensuring sustainability in Africa, and the UN dissatisfaction with high cost social and economic implications experienced in African transportation system.

### **Technology Acceptance Model**

Here, technology acceptance describes Technology Acceptance Model (TAM). Firstly, this model was developed by Davis in 1989, and established on the Reasoned Action Theory, developed by Azjen and Fisbein (1980). TAM suggests two factors mitigating attitude of users towards technology use. The first factor, Perceived Usefulness (PU) postulates that users use a particular technology based on their personal convictions that such technology can assist them in enhancing their job output. The second factor expresses Perceived Ease of Use (PEOU) which suggests the convenience of applying the technology in job operation (Davis, 1989). This model simply describes individual acceptance and adaptability to technology use. Some researchers such as Hendrickson, Massey and Cronan (1993); Subramanian (1994) have after Davis (1989), continued to study the relationship existing between the two factors, the first factor being the internal element of availability of ICT facilities, and the second factor explaining external elements like facilitating conditions, systems quality, and perceived self-efficacy (Fathema, Shanon & Ross, 2015) affecting users' attitudes and behavioral intention.

Since the study examines the effectiveness of ICT in ensuring road safety on Nigerian roads, it is believed that officers of the Federal Road Safety Corps (FRSC) accept and are compliant with the use of technology, specifically, ICT technologies with capabilities of reducing the event and extent of road accident. The study investigates the causes of road accident; determines the perceived benefits of ICT tools in road accident reduction; evaluates the availability of ICT tools in road accident reduction; and examines the challenges impeding the effective use of ICT tools in road accident reduction, with focus on Federal Road Safety Corps (FRSC), Abeokuta, Ogun State.

### **Methodology**

The study employed descriptive research design. The survey method was used to receive responses from targeted respondents as pertaining to the objectives of the study. The target population of the study consist staffs of FRSC Abeokuta, Ogun State. The total population size at the period of study, as retrieved from the Personnel Department of the study was 127 FRSC staff in Abeokuta, Ogun State. Due to ease of accessibility and ease of receiving responses from the study population, the entire population of 127 will be engaged for the study. This study employed primary source of data collection through the administering of a well structured questionnaire, employing 5 Likert scale of Strongly Agree, Agree, Strongly Disagree, Disagree, and Undecided to receive responses from the respondents in line with the research objectives. The questionnaire was used to elicit information which intends to provide answers to the research questions. The items on the instrument were drawn from the key variable of the study after review of numerous related literatures. Data retrieved were analyzed using simple percentage, and presented in tables. The reliability test was conducted using Cronbach's Alpha test, with result of 0.84, which shows that questions raised in the instrument are reliable to achieve the objectives of the study.

### **Presentation of Results**

**Table I: No. of Retrieved Responses**

<b>Distributed Questionnaires</b>	<b>Distributed Questionnaires (%)</b>	<b>No. of Returned Questionnaire</b>	<b>Returned Questionnaire (%)</b>
127	100%	100	78.7%

Table I shows that 100 FRSC staff in Abeokuta, Ogun State responded to the questionnaire distributed, and returned them. This represents 78.7% response rate from the total population of 127.



**Table II: Causes of Road Accident N=100**

Causes of Road Accident	Agree	Disagree	Undecided
Negligence and poor level of concentration by motorists and cyclists is the major cause of road accident	75(75%)	20(20%)	5(5%)
Making and receiving telephone calls while driving/ridding is majorly attributed as the cause of road accident	68(68%)	25(25%)	7(7%)
Poor maintenance of motor vehicle/ motorcycle significantly contributes to road accident	72 (72%)	26(26%)	2(2%)
Alcoholism and hard drug consumption by road user is the most common factor leading to road accident	55(55%)	40(40%)	5(5%)
Lack of attention and respect for traffic signals is a significant cause of road accident	50(50%)	43(43%)	7(7%)
Over speeding of road users is a primary cause of road accident	71(71%)	23(23%)	6(6%)
Poor Condition of roads and poor road maintenance is a major factor leading to road accident	62(62%)	30(30%)	8(8%)

Table II shows the responses of FRSC officials, Abeokuta on causes of road accidents. From the responses, 75% of respondents agree that Negligence and poor level of concentration by motorists and cyclists contributed to road accident; 68% agreed to telephone conversations; poor maintenance of vehicle/motorcycle received 72%; alcoholism and hard drug consumption had 55% contribution; while negligence and disrespect for traffic signals contributed 50%; over speeding, 71%; and poor road condition and maintenance received 62%, as a contributory factor to road accident in Abeokuta, Ogun State.

**Table III: Perceived benefits of ICT tools in Road Accident Reduction N=100**

Perceived Benefits of ICT	Agree	Disagree	Undecided
ICT use in road transport monitoring and management significantly contributes to coordinated, safer, smarter, and better informed use of transport networks	69(69%)	21(21%)	10(10%)
The electronic traffic sign of Variable Message Signs (VMS) which warns, guides and inform motorists of traffic situation is a crucial ICT tool in accident reduction	67(67%)	26(26%)	7(7%)
Traffic Light control systems is an advantageous ICT tool in guiding motorists and pedestrians in driving, walking, and reducing traffic congestion and accidents	60(60%)	23(23%)	17(17%)
Speed Cameras provide major contributions in information gathering of eloping criminals, managing traffic flow, and speed monitoring towards accident reduction	69(69%)	22(22%)	9(9%)
CCTV video camera device significantly contributes to ease of surveillance, record keeping, and monitoring of road activities in reducing events of road accident	75(75%)	20(20%)	5(5%)

Table III described FRSC staff perceptions of the benefits of ICT use in reducing road accident. 69% of the officers agreed that ICT contributes to better coordination, information, safety and smartness in the use of transport networks; 67% of these officers agreed that VMS is a crucial ICT tool in ensuring road accident reduction; 60% agreed to the



effectiveness of traffic light control systems reducing the event of road accidents; speed camera were also perceived as veritable ICT tools in accident reduction at 69% agree response rate; and CCTV video camera device had 75% agree response.

**Table IV: Availability of ICT tools in Road Accident reduction N=100**

Available ICT enhancing facilities	Agree	Disagree	Undecided
The electronic traffic sign of Variable Message Signs (VMS) ICT facilities are available in Abeokuta, Ogun State.	12(12%)	68(68%)	20(20%)
Traffic Light control systems are available in strategic locations within Abeokuta, Ogun State.	56(56%)	42(42%)	2(2%)
Speed Cameras are functionally available in Abeokuta, Ogun State.	13(13%)	75(75%)	12(12%)
CCTV video camera device for road surveillance are installed in Abeokuta, Ogun State.	35(35%)	57(57%)	8(8%)

Table IV reveals responses on Availability of ICT tools in Road Accident reduction. Significant numbers of respondents demonstrated the inadequacy of these tools towards road accident reduction in Abeokuta, Ogun State. 68% of FRSC officials in Abeokuta disagree with the availability of VMS; 75% disagree with Speed camera availability; and 57% of respondents disagree with availability of CCTV video camera. However, 56% of the respondents agree to the availability of Traffic Light control systems in strategic locations.

**Table V: Challenges impeding the effective use of ICT Tools in Road Accident reduction N= 100**

Challenges impeding the effective use of ICT Tools	Agree	Disagree	Undecided
Inadequacy of infrastructure and road users' database serve as an impediment to the effective use of ICT tools towards accident reduction in Abeokuta, Ogun State.	72(72%)	22(22%)	6(6%)
Poor database on Geographical Information System of locations in Abeokuta is a major challenge to the use of ICT tools in road accident reduction.	65(65%)	24(24%)	11(11%)
Inadequate training and retraining programs of FRSC officials in Abeokuta on the use of ICT traffic tools significantly affect the use of ICT tools in accident reduction negatively	71(71%)	23(23%)	6(6%)
Inadequate Power supply in the effective use of ICT traffic tools is one of the majors limiting the actualization of road accident reduction in Abeokuta, Ogun State.	73(73%)	18(18%)	9(9%)
Poor maintenance culture of ICT traffic tools is a challenge to the use of ICT traffic tools in road accident reduction in Abeokuta, Ogun State.	67(67%)	22(22%)	11(11%)

Table V presents responses of FRSC officials in Abeokuta, Ogun State on the challenges impeding the effective use of ICT tools in accident reduction in Abeokuta, Ogun State. 72% of the respondents agree to the inadequacy of infrastructure and road users database; 65% agree to the statement of poor database on Geographical Information System of locations in Abeokuta; 71% agree on inadequate training and retraining programs of FRSC officials in Abeokuta on the use of ICT traffic tools; while 73% of respondents submitted that inadequate Power supply limited effective use of ICT traffic tools; and 67% of these officials agree to poor maintenance culture of ICT traffic tools.



## **Discussion of Findings**

The findings of the study are discussed in paragraphs as related to the research objectives.

The first research question for this study examined the major causes of road accidents in Abeokuta, Ogun state. Respondents demonstrated that negligence and poor level of concentration; poor maintenance culture among motorists and cyclists; and overspeeding significantly contributed to road accidents in Abeokuta, Ogun State. Other factors such as telephone conversation; alcoholism and hard drug consumption; poor attention and disrespect of traffic signals; as well as poor road condition and maintenance also contributed to events of road accident in the study area. Studies conducted by Etim (2023); Agi and Jackreece (2018); and Oyesiku, (2012) agreed to these causes part of the challenges combating FRSC in Nigeria.

Reacting to the second research question of the study, respondents significantly agreed that ICT use in road transport monitoring and management contributes to coordination, safety, smartness, and informed application of transport networks. Respondent further express that ICT facilities such as CCTV, Speed Cameras, Variable Message Signs, and Traffic Light control systems provides advantageous effects to motorists and pedestrians. Etim (2023) attested to the applicability of ICT tools in road accident reduction when he said that “Revelations obtained from the study showed that, the FRSC in Bayelsa State had initiated the enforcement of full compliance of speed limiting devices by commercial drivers, introduction of traffic lights, and ensured daily awareness campaigns on different motor parks.”

Responses relating to the availability of ICT facilities in Abeokuta, Ogun State suggest that significant number of ICT traffic equipments were unavailability within the area. ICT device of Traffic light was the only facility agreed to have been present in the study location. ICT traffic tools like VMS, Speed Cameras, and CCTV were poorly available with the study location.

The final research question of the study revealed the challenges impeding the effective use of ICT tools in road accident reduction in Abeokuta, Ogun State. The major challenges according to the respondents include inadequacy of infrastructure and road users’ database; inadequate training and retraining programs of FRSC staff on the use of ICT traffic tools; and poor level of power supply. Some factors agreed to have challenged the effective use of ICT traffic tools in road accident reduction were poor database on geographical information system of locations in Abeokuta; and poor maintenance culture of ICT traffic tools.

## **Conclusion and Recommendations**

Protection of lives and properties has since the inception of mankind, and technological innovation, been a major goal and collective responsibilities of government and the society.

Technological development and innovations in the several aspects of human existence with the aim of easiness and time efficiency in operations consequential upon globalization, has also transited into the development experienced in transportation, be it, air, sea, or land. Land/road transportation being the focus of this study has enjoyed technological innovations ranging from the presence of carts, bicycles, motorcycles, to cars. The use of these road innovations has been managed and regulated by government through the introduction of institutions, as FRSC in the case of Nigeria since 1988, and technology regulatory measures, as CCTV, Speed cameras, speed limit devices, VMS.

In the case of Abeokuta, Ogun state, Nigeria, use of these road hazard and road accident reduction technologies by the institution of FRSC has been ineffective due to the poor availability and knowledge of the use of these ICT traffic facilities. Thus, towards ensuring the effective and efficient applicability experience of these ICT tools and accident contributory factors, with the aim of actualizing significant reduction in accident rate in this study area, the study recommends

1. The need for urgent legislations aimed at strengthening existing traffic laws, and incorporating vehicle/motorcycle seizure, arrest, and detention of traffic offenders in cases of gross misconduct.



2. Government should ensure the provision and buffing up of ICT traffic tools such as CCTV cameras, VMS, Traffic Light control systems, and Speed cameras.
3. The need for training and retraining programs for FRSC officials in Abeokuta, Ogun State on the use effective use of ICT traffic facilities.
4. Also, geographical information of locations within Abeokuta should be adequately incorporated into the FRSC database for easy monitoring and tracking of road users.
5. Alternative modes of power supply such as solar should be engaged to reduce the frequency of power outage and poor functioning of ICT traffic tools.
6. Adequate maintenance of ICT traffic tools should be encouraged through periodic repair and replacement of old mechanical components.

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