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ASSESSMENT OF MANAGEMENT INFORMATION SYSTEMS IN ROAD TRAFFIC MANAGEMENT IN NIGERIA

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ABSTRACT

The study investigated the use of management information systems in road traffic management in Nigeria. The population of the study was three hundred (300) motorists in Owerri, Imo State. To accomplish this task, two hypotheses were formulated. The Technology Acceptance Model was used to determine the level of acceptance of the Management Information Systems, while the Average Index Technique was used to test the two hypotheses. The results obtained showed that : (a) the adoption of Management Information Systems will improve road traffic management in Nigeria ; (b) road users appreciate the essence of Management Information Systems on Nigerian roads. Based on these findings, it was recommended that Management Information Systems should form a major component of traffic management in Nigeria.

KEYWORDS: *Management Information Systems, traffic management, Intelligent transportation system, congestion, delay, Information technology.*

INTRODUCTION

Traffic control and management remain challenges in densely populated cities and towns worldwide. Efficient use of existing roadway capacities, harmonized traffic flows, emission-related traffic control, the prioritization of public transport means and the focus on pedestrian safety are some of the government's approaches to better manage urban mobility (SWARCO, 2012). While many developing and developed countries have made concerted efforts to reduce road traffic congestion, Nigeria seems not to move forward. Indeed, in spite of the existence of adequate traffic laws and regulations to curb the spate of increasing rate of traffic offences and violations on the highways in the country, thousands of motorists are apprehended daily and sanctioned for various traffic offences on the roads. Traffic offences are major causes of road congestion on Nigerian roads. Unfortunately, hundreds of innocent souls are also lost due to the accidents brought about by traffic offences and violations on the highways. Regrettably, despite many innocent souls being lost daily through road traffic management failures, the impact is not recognized by successive federal and the state governments to initiate wide ranging policies that could reduce the trend in Nigeria. Since transportation is a necessity in the rapid growth and development of the economy, attention should be placed on the major activities and methods of operation of this sector as it leads to massive increase and growth in all other sectors.

This study tends to access the possibilities of combining the roles and activities of Management Information System to help curb the growing rate of Transport Management problems and issues. It addresses the new and reliable modes of incorporating information technology into traffic management.

Management Information System and Traffic Management

Management Information System (MIS) provides information that is needed to manage organizations efficiently and effectively. An MIS is a system or process that provides the information necessary to manage an organization effectively. MIS involves three primary resources; people, technology and information or decision making whereas the loss of any one of these resources will lead to a deficient relay of information. MIS are distinct from other information systems in that they are used to analyze operational activities in an organization. This term is also used to refer to the group of information management methods tied to the automation or support of human decision-making. (Wikipedia.com, 2012) MIS and the information it generates are generally considered essential components of prudent and reasonable business decisions. Traffic management involves directing vehicular and pedestrian traffic around a construction zone, accident or other road disruption, thus ensuring the safety of emergency response teams and the general public.

Traffic Controls, are procedures, devices, and communication systems that help vehicles and vessels to safely share the same roads, rails, waterways, or air space. Traffic control establishes a set of rules and instructions that drivers, pilots, train drivers, and ship captains rely on to avoid collisions and other hazards. Safe travel for pedestrians is an additional goal in highway traffic control. Management Information Systems are to help provide the necessary information needed to ensure a proper working Traffic Control system. Traffic control systems include signs, lights and other devices that communicate specific directions, warnings, or requirements to users of those means of transport.

STATEMENT OF THE PROBLEM

The way and manner motorists and people alike use the roads leave much to be desired. Vehicle drivers take delight in driving on wrong lanes and even abuse the right of way rules, thereby creating conflict in the use of traffic, course delay and sometimes accident. This has lead to enormous congestion on our roads particularly in the cities. As such, this study would examine the necessity for Management Information Systems on Nigerian roads. Similarly, when people from the developed countries where the Management Information Systems are in place visit Nigeria or come to do business in Nigeria, their first threat is the state of Nigerian roads due to the absence of necessary technologies.
It is therefore, time to address the issue.

SIGNIFICANCE OF THE STUDY

Man has moved from primitive age to information technology age. Computerized Management Information Systems is the fundamental and the bedrock for increase in Information Technology (IT). Because of the importance of the information technology (IT) age, measures are taken to evolve all sectors of the economy into Information Technology compliant sectors. The transportation sector is not left out, because an increase in the use of MIS has greater advantages than the natural use of tools applied during the Industrial Age. Therefore, this study is relevant to bring into the limelight the MIS tools and equipment necessary in enhancing Traffic management and Transportation as a whole.

STATEMENT OF HYPOTHESES

The hypotheses of this study are as follows:

Ho1: The adoption of Management Information Systems in transport does not improve road traffic management in Nigeria.

Ho2: Road users do not appreciate the essence of Management Information Systems on Nigerian roads.

REVIEW OF RELATED LITERATURE

Road traffic management started in the United Kingdom, in 1918, where the first ever road markings were seen. This was the use of white paint as center markings. During the 1920s the rise of painted lines on UK roads grew dramatically but it was not until 1926 that official guidelines of where and how white lines should be used, were introduced (McBride, 2010). The first official rules of the road were published in the UK in 1931 and the publication was called The Highway Code, which was called the UK drivers 'manual".

Traffic management is a major concern in cities around the world. The conventional traffic problem has been cast as a mismatch situation between supply and demand. We argue that this formulation is incomplete in that it admits solutions that ignore the impact on citizens all together, and hence unsustainable in the long run. In response, we propose a new formulation of the traffic management problem and outline focus areas while solving them for cities in developed and emerging geographies (Srivastava, 2010). The historical and socio-economic backgrounds of cities vary from country to country. Issues on transportation are some of the concerns of city administrators, engineers, and planners. Highly populated cities and municipalities are confronted with serious transport problems.

The traffic of a city impacts all aspects of its citizens' economic and personal activities. At a general level, the traffic problem is understood as a situation of mismatch between supply (i.e., roads and their capacity) and demands (i.e., travel needs). Whenever this mismatch increases, the city administrators have tried to balance it by creating infrastructures (e.g., new roads, expanding capacity) or policy changes (e.g., banning traffic movement during major games).

For over thirty years, traffic information has been provided to help motorists make en-route decisions. The development of Intelligent Transportation Systems (ITS) and Advanced Traffic Management Systems (ATMS) have begun to improve transportation through the use of technology reference. Along the same lines system like Intelligent Vehicle Highway Systems (IVHS), acquire, analyze, communicate, and present information to assist surface transportation travelers in moving from a starting location (origin) to their desired destination. Data from IVHS can now be utilized as information for en-route assistance as well as collection of traffic data. Information Technology is beginning to recognize the importance of post-trip information dissemination by providing information on the location and availability of parking, density of traffic on a particular route etc. Real-time information can be accurately provided to motorists through Intelligent Parking Systems (IPS) to reduce congestion in or near parking areas, insufficient utilization of the available parking space stock, road congestion caused by space-searching traffic, access problems and safety hazards caused by illegal parking and environmental strains (Michelle, 2003)

Evidence of increasing traffic congestion abound in all major Nigeria cities with high probability of getting worse because of the incapability of providing the roadway capacity correspondingly with increasing traffic growth. The factors responsible for complex traffic situations management in Nigeria and the growth pattern in the country can readily justify the adoption of ITS for Nigeria.

Effectiveness of Traffic Congestion Management Policies in Nigeria

Various traffic congestion management strategies have been tried in Nigeria. According to Ogunsanya (1984), these have been catalogued to include:

(i) Decentralization of offices to reduce central oriented movement
(ii) Construction of new roads and expansion of existing ones
(iii) Construction of flyover at congested road junctions
(iv) Use of Helicopter to detect congested road for quick ground response action
(v) Banning freight vehicle at daytime on specific routes
(vi) Use of mobile courts to effect immediate punishment on misbehavior by road

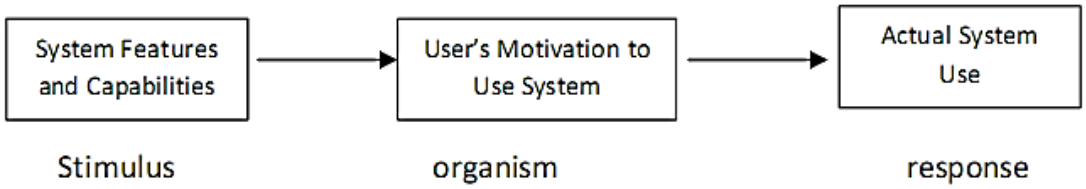
It has been noted that none of the above enumerated, hardly survive the year of their introduction because the Nigerian drivers easily develop ways of blocking their effectiveness. The case of the old and even number traffic movement restraint was a good example. By the second year of the method, Nigerian Families owned second cars and registered the other alternate number (odd now, if old even or vice versa); thereby allowing the use of their cars every day. Obviously, the observed flaw in the above enumerated techniques to adequately meet the objective of urban traffic congestion management is not limited to Nigeria. It is equally true for the developed nations, hence scholars and researchers instead tended to conduct studies that focus on the use of technological advancement in traffic management. Information Technology (IT) has transformed many industries, from education to health care to government, and is now in the early stages of transforming transportation systems. While many think improving a country's transportation system solely means building new roads or repairing aging infrastructures, the future of transportation lies not only in concrete and steel, but also increasingly in using IT. IT enables elements within the transportation system—vehicles, roads, traffic lights, message signs, etc.—to become intelligent by embedding them with microchips and sensors and empowering them to communicate with each other through wireless technologies. In the leading nations in the world, ITS brings significant improvement in transportation system performance, including reduced congestion and increased safety and traveler convenience (Stephen, 2010).

TECHNOLOGY ACCEPTANCE MODELS (TAM)

The Technology Acceptance Model (TAM) propounded by Chuttur (2009) is appropriate in this study as it would be applied in determining the ability of road users to accept these new technologies as a necessity to enhancing comfort and safety and ensuring a reduction in travel times. Although many models have been proposed to explain and predict the use of a system, the Technology Acceptance Model has been the only one which has captured attention of the Information Systems community. Thus, it is essential for anyone willing to study user acceptance of technology to have an understanding of the Technology Acceptance Model.

Davis (1985) proposed that system use is a response that can be explained or predicted by user motivation, which, in turn, is directly influenced by an external stimulus consisting of the actual system's features and capabilities as shown in figure 1.

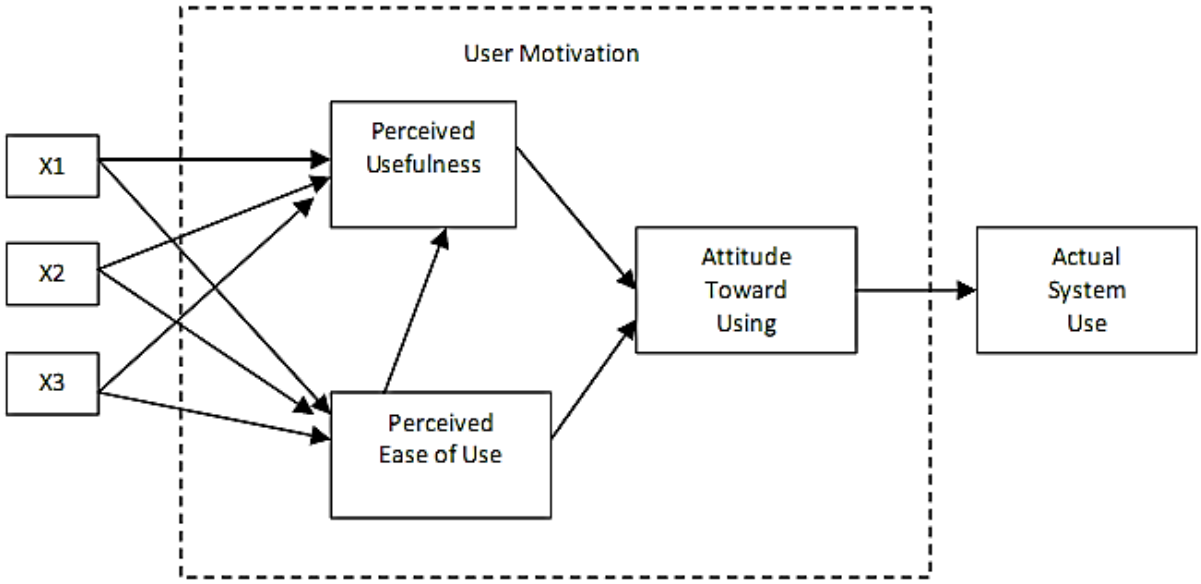
Figure 1: Conceptual model for Technology Acceptance



Source: Davis, (1985)

By relying on prior work by Fishbein and Ajzen (1980), who formulated the Theory of Reasoned Action, and other related research studies, Davis further refined his conceptual model to propose the Technology Acceptance Model as shown in Figure 2.

Figure 2: Original Technology Acceptance Model



Source: Davis F. 1986, P. 24

In this proposal, Davis (1985) suggested that users' motivation can be explained by three factors: Perceived Ease of Use, Perceived Usefulness, and Attitude toward using the system. He hypothesized that the attitude of a user toward a system was a major determinant of whether the user will actually use or reject the system. The attitude of the user, in turn, was considered to be influenced by two major beliefs: perceived usefulness and perceived ease of use, with perceived ease of use having a direct influence on perceived usefulness. Finally, both these beliefs were hypothesized to be directly influenced by the system design characteristics, represented by Xr, X2 and, X3 in Figure 2.

THE ROLE OF MANAGEMENT INFORMATION SYSTEMS IN TRAFFIC MANAGEMENT

Management cannot plan, deploy, and control resources without essential information. The road traffic agencies, together with the Ministry of Finance, also need such

information to judge whether the road traffic agencies is using resources efficiently and providing road users with value-for-money. A comprehensive Management Information System (MIS) normally consists of a computerized road management system (for planning, programming, budgeting and preparation of road works).

ROAD MANAGEMENT SYSTEMS

The management information system used by the average road agency consists of a set of established and documented procedures that generate and evaluate alternative ways of operating, maintaining, improving, and extending the road network. It will generally show the condition of the road network and its use (traffic volumes and loading), and can be used to explore the impact of management interventions on current and future service levels. It can also be used to generate information on the physical and financial performance of the road network. The management information system provides a framework for making decisions on a number of issues usually handled by different divisions within the road agency. They include decisions on:

a) Carrying out routine and periodic maintenance of gravel roads, paved roads, and bridges.
b) Rehabilitating pavements and bridges.
c) Upgrading gravel roads to paved standard.
d) Improving the geometric characteristics, or capacity, of roads.
e) Setting charges for the use of roads and bridges.

Each of the above activities are interdependent with regard to the road agency's budget constraint.

NEW TRENDS AROUND TRAFFIC

Traditionally, traffic management has been funded only by city governments and they had no framework to access citizen's information related to travel. Both are changing. Given the importance of traffic to citizen's daily lives, traffic information is being provided as a value-added service by businesses (e.g., radio stations, mobile phone operators) and citizens (and businesses) are willing to pay directly or indirectly. Furthermore, technology is enabling citizen's traffic demands to be available on a more regular basis than previously possible using demographic surveys.

The main reasons for incorporating Information Management Systems in Traffic management include;

a) make travel comfortable and convenient
b) detect and respond to incidents and accidents on the network and minimize their impacts on traffic
c) provide comprehensive traffic and travel information through a range of channels
d) work with relevant third parties to deliver a first class service to the travelling public within the network
e) encourage the use of the sustainable modes of transport
f) improve the effectiveness of the country's existing strategic road network
g) reduce times across the network
h) influence travel patterns
i) Reduce car park search times within town centres.

Innovation is the successful exploitation of new ideas in general and the process of making improvements by introducing something new in particular.

INTELLIGENT TRANSPORTATION SYSTEM

Intelligent Transport Systems (ITS) are advanced applications which, without embodying intelligence as such, aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks.**(**Wikipedia, 2012)

Reasons for Intelligent Transport Systems

Interest in ITS comes from the problems caused by traffic congestion and a synergy of new information technology for simulation, real-time control, and communications networks. Traffic congestion has been increasing worldwide as a result of increased motorization, urbanization, population growth, and changes in population density. Congestion reduces efficiency of transportation infrastructure and increases travel time, air pollution, and fuel consumption.

INTELLIGENT TRANSPORT TECHNOLOGIES

Intelligent transport systems vary in technologies applied, from basic management systems such as car navigation; traffic signal control systems; container management systems; variable message signs; automatic number plate recognition or speed cameras to monitor applications, such as security CCTV systems; and to more advanced applications that integrate live data and feedback from a number of other sources, such as parking guidance and information systems; weather information; bridge deicing systems; and the like. Additionally, predictive techniques are being developed to allow advanced modeling and comparison with historical baseline data. Some of these technologies are described in the following sub-sections.

a) Wireless communications

Various forms of wireless communications technologies have been proposed for intelligent transportation systems. Radio modem communication on UHF and VHF frequencies are widely used for short and long range communication within ITS.

b) Computational technologies

Recent advances in vehicle electronics have led to a move toward fewer, more capable computer processors on a vehicle. A typical vehicle in the early 2000s would have between 20 and 100 individual networked microcontroller/Programmable logic controller modules with non-real-time operating systems. The current trend is toward fewer, more costly microprocessor modules with hardware memory management and Real-Time Operating Systems. The new embedded system platforms allow for more sophisticated software applications to be implemented, including model-based process control, artificial intelligence, and ubiquitous computing. Perhaps the most important of these for Intelligent Transportation Systems is artificial intelligence.

c) Floating car data/floating cellular data

"Floating car" or "probe" data collection is a set of relatively low-cost methods for obtaining travel time and speed data for vehicles traveling along streets, highways, freeways, and other transportation routes. Broadly speaking, three methods have been used to obtain the raw data:

i. **Triangulation Method.** In developed countries a high proportion of cars contain one or more mobile phones. The phones periodically transmit their presence information to the mobile phone network, even when no voice connection is established. In the mid-2000s, attempts were made to use mobile phones as anonymous traffic probes. As a car moves, so does the signal of any mobile phones that are inside the vehicle. By measuring and analyzing network data using triangulation, pattern matching or cell-sector statistics (in an anonymous format), the data was converted into traffic flow information. With more congestion, there are more cars, more phones, and thus, more probes. In metropolitan areas, the distance between antennas is shorter and in theory accuracy increases. An advantage of this method is that no infrastructure needs to be built along the road; only the mobile phone network is leveraged. But in practice the triangulation method can be complicated, especially in areas where the same mobile phone towers serve two or more parallel routes (such as a freeway with a frontage road, a freeway and a commuter rail line, two or more parallel streets, or a street that is also a bus line). By the early 2010s, the popularity of the triangulation method was declining.

ii. **Vehicle Re-Identification.** Vehicle re-identification methods require sets of detectors mounted along the road. In this technique, a unique serial number for a device in the vehicle is detected at one location and then detected again (re-identified) further down the road. Travel times and speed are calculated by comparing the time at which a specific device is detected by pairs of sensors. This can be done using the MAC (Machine Access Control) addresses from Bluetooth devices, or using the RFID serial numbers from Electronic Toll Collection (ETC) transponders (also called "toll tags").

iii. **GPS Based Methods.** An increasing number of vehicles are equipped with in-vehicle GPS (satellite navigation) systems that have two-way communication with a traffic data provider. Position readings from these vehicles are used to compute vehicle speeds. Modern methods may not use dedicated hardware but instead Smart phone based solutions using so called Telematic 2.0 approaches.

Floating car data technology provides advantages over other methods of traffic measurement:

i. Less expensive than sensors or cameras
ii. More coverage (potentially including all locations and streets)
iii. Faster to set up and less maintenance
iv. Works in all weather conditions, including heavy rain

Variable Message Signs

A variable-message sign is an electronic traffic sign often used on roadways to give travelers information about special events. Such signs warn of traffic congestion, accidents, incidents, roadwork zones, or speed limits on a specific highway segment. In urban areas, VMS are used within parking guidance and information systems to guide drivers to available car parking spaces. They may also ask vehicles to take alternative routes, limit travel speed, warn of duration and location of the incidents or just inform of the traffic conditions. A complete message on a panel generally includes a problem statement indicating incident, roadwork, stalled vehicle etc.; a location statement indicating where the incident is located; an effect statement indicating lane closure, delay, etc. and an action statement giving suggestion what to do traffic conditions ahead. These signs are also used for AMBER Alert and Silver Alert messages. In some places, VMS are set up with permanent, semi-static displays indicating predicted travel times to important traffic destinations such as major cities or interchanges along the route of a highway.

Sensing Technologies

Technological advances in telecommunications and information technology, coupled with state-of-the-art microchip, RFID (Radio Frequency Identification), and inexpensive intelligent beacon sensing technologies have enhanced the technical capabilities that will facilitate motorist safety benefits for intelligent transportation systems globally. Sensing systems for ITS are vehicle- and infrastructure-based networked systems, i.e., intelligent vehicle technologies. Infrastructure sensors are indestructible (such as in-road reflectors) devices that are installed or embedded in the road or surrounding the road (e.g., on buildings, posts, and signs), as required, and may be manually disseminated during preventive road construction maintenance or by sensor injection machinery for rapid deployment. Vehicle-sensing systems include deployment of infrastructure-to-vehicle and vehicle-to-infrastructure electronic beacons for identification communications and may also employ video automatic number plate recognition or vehicle magnetic signature detection technologies at desired intervals to increase sustained monitoring of vehicles operating in critical zones.

Inductive Loop Detection

Inductive loops can be placed in a roadbed to detect vehicles as they pass through the loop's magnetic field. The simplest detectors simply count the number of vehicles during a unit of time (typically 60 seconds in the United States) that pass over the loop, while more sophisticated sensors estimate the speed, length, and weight of vehicles and the distance between them. Loops can be placed in a single lane or across multiple lanes, and they work with very slow or stopped vehicles as well as vehicles moving at high-speed.

Video Vehicle Detection

Traffic flow measurement and automatic incident detection using video cameras, is another form of vehicle detection. Since video detection systems such as those used in automatic number plate recognition do not involve installing any components directly into the road surface or roadbed, this type of system is known as a "non-intrusive" method of traffic detection. Video from black-and-white or color cameras is fed into processors that analyze the changing characteristics of the video image as vehicles pass. The cameras are typically mounted on poles or structures above or adjacent to the

roadway. Most video detection systems require some initial configuration to "teach" the processor the baseline background image. This usually involves inputting known measurements such as the distance between lane lines or the height of the camera above the roadway. A single video detection processor can detect traffic simultaneously from one to eight cameras, depending on the brand and model. The typical output from a video detection system is lane-by-lane vehicle speeds, counts, and lane occupancy readings. Some systems provide additional outputs including gap, headway, stopped-vehicle detection, and wrong-way vehicle alarms.

Bluetooth Detection

Bluetooth is an accurate and inexpensive way to measure travel time and make origin/destination analysis. Bluetooth is a wireless standard used to communicate between electronic devices like mobile/smart phones, headsets, navigation systems, computers etc. Bluetooth road sensors are able to detect Bluetooth MAC addresses from Bluetooth devices in passing vehicles. If these sensors are interconnected they are able to calculate travel time and provide data for origin/destination matrices. Compared to other traffic measurement technologies, Bluetooth measurement has some significant advantages:

- Inexpensive per measurement point.
- Inexpensive on physical installation compared to other technologies
- No roadside maintenance needed
- Quick and easy configuration and calibration of complete solution
  Bluetooth detection uses similar techniques to other traffic measurement technology, and will be as accurate as these other systems.

Dynamic Traffic Light Sequence

Intelligent RFID (Radio-Frequency Identification) traffic control has been developed for dynamic traffic light sequence. It circumvents or avoids problems that usually arise with systems that use image processing and beam interruption techniques. RFID technology with appropriate algorithm and database were applied to a multi- vehicle, multi-lane and multi-road junction area to provide an efficient time management scheme. A dynamic time schedule was worked out for the passage of each column. The simulation has shown that, the dynamic sequence algorithm has the ability to intelligently adjust itself even with the presence of some extreme cases. The real time operation of the system is the ability to emulate the judgment of a traffic police officer on duty, by considering the number of vehicles in each column and the routing proprieties.

Benefits of Intelligent Transportation Systems

Applying information technology to a country's transportation network delivers five key classes of benefits by:

1) Increasing driver and pedestrian safety,
2) Improving the operational performance of the transportation network, particularly by reducing congestion,
3) Enhancing personal mobility and convenience,
4) Delivering environmental benefits, and
5) Boosting productivity and expanding economic and employment growth.

METHODOLOGY

This study was carried out in Owerri, Imo State, Nigeria. It made use of secondary and primary data. However, primary data were used in the analysis. The Technology Acceptance Model was used to determine the level of acceptance of the Management Information Systems earlier discussed in this study. Questionnaires were served on 300 respondents who were motorists out of which 220 respondents answered and returned their questionnaires. Motorists were selected because they were the people to whom the management information systems were mainly meant for. To identify the acceptance of Management Information Systems in traffic management, the Average Index Method containing 13 sets of questions with seven categories of scale was applied. The data were analyzed by using the Average Index Technique (Al-Hammad et al., 1996) shown thus:

Average Index = $\frac{\sum a_i x_i}{N}$

Where a_i = *constant expressing the weight to each response (1-7)*

X_i = *Frequency of the response*

N = Number of respondents

The hypothesis will be REJECTED where the computed value of the Average Index falls above the calculated mean value of the categories of scale table but it will be ACCEPTED where the value of the Average index falls below the mean mark of the categories of scale table.

DISCUSSION OF RESULT

Tables 1 and 2 represent the total average index, whereas the mean mark as calculated from the categories of scale is found to be within **3.50 – 4.49. Considerable differences were observed among the samples.**

Table 1: Testing of Ho1: the adoption of Management Information System in transport does not improve road traffic management in Nigeria

	Extremely Likely	Quite Likely	Slightly Likely	Neither	Slightly Unlikely	Quite Unlikely	Extremely Unlikely	Average Index
Question 8	160	50	0	0	0	10	0	6.55
Question 9	70	120	30	0	0	0	0	6.18
Question 10	100	100	10	10	0	0	0	6.32
Question 11	60	80	50	10	10	10	0	5.64
Question 12	90	70	30	10	0	10	10	5.77
Question 13	50	50	40	0	60	10	10	4.82
					Total Average Index = 5.88			

The data in table 1 shows that, with an Average Index of 5.88, which is higher than the mean index, the hypothesis is rejected.

Table 2: Testing of Ho2, Road users do not appreciate the essence of Management Information Systems

	Extremely Likely	Quite Likely	Slightly Likely	Neither	Slightly Unlikely	Quite Unlikely	Extremely Unlikely	Average Index
Question 1	80	110	30	0	0	0	0	6.23
Question 2	100	80	20	0	0	0	10	6.00
Question 3	90	100	20	0	0	0	10	6.09
Question 4	100	110	10	0	0	0	0	6.41
Question 5	100	100	10	0	10	0	0	6.27
Question 6	70	90	50	10	0	0	0	6.00
Question 7	60	80	20	0	20	40	0	5.18
					Total Average Index = 6.03			

The data in table 2 shows that, with an Average Index of 6.03, which is higher than the mean index, the hypothesis is rejected.

This study has therefore proved a positive impact in the implementation of Management Information Systems in curbing the growing problems of traffic congestion in Nigeria. There will also be a positive level of acceptance among road users in the use of Management Information Systems in the management of traffic in the Nigerian Transport Sector. It is obvious that the effective implementation of Management Information Systems in the transportation sector will lead to elimination of the problems of traffic congestion and also help to enhance safety and shorter travel times to all road users.

CONCLUSION

It is a fact that the various Management Information Systems are already in application in many developed societies of the world and they have proved to meet the desired needs. Going by the Nigerian experience, this study has shown that the people are yeaning for a paradigm shift in the way and manner things are being done especially with regard to traffic management and operations. This has been demonstrated by the result of the tested hypotheses of this study. Moreover, since the world is becoming a global village, and the level of interactions among people of diverse nations in different countries has grown astronomically, one would not be left in doubts that people should use the road where ever the find themselves without encumbrances where management information system is in place.

RECOMMENDATIONS

Based on the findings and the conclusions drawn, the following recommendations are made;

a) Management Information Systems in the form of Intelligent Transport systems and Advanced Traffic Management Systems could be adopted in Nigeria as it will lead to a high level reduction in traffic congestion in Nigerian cities.
b) Road users are readily available to accept the implementation of these new technologies because it will lead to an increase in travel safety, check negligence or improper conduct on the part of road users and a general reduction in travel times.

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