INFORMATION UTILIZATION FOR NETWORK MANAGEMENT IN TRAFFIC MANAGEMENT AND CONTROL (TMC) SYSTEMS.

BY

AHMED MU'AZU

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DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE
FACULTY OF EDUCATION
AHMADU BELLO UNIVERSITY, ZARIA.

NOVEMBER 2012

DECLARATION

I here by declared that this research project has been solely conducted by me under the guidance and supervision of Professor Tijjani Abubakar of the Department of Library and Information Science, Ahmadu Bello University, Zaria. I have neither copied some one's work, nor has some one else done it for me. Writers whose work have been referred to in this project have been acknowledged.

_____ _____

Ahmed Mu'azu Date

CERTIFICATION

This project entitled Information Utilization For Network Management In Traffic Management And Control (TMC) Systems has been read and approved as meeting regulation governing the award of Masters in Information Management (MIM) of Ahmadu Bello University, Zaria.

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DEDICATION

To the entire members of my family.

ACKNOWLEDGEMENT

I acknowledge with gratitude all the financial and moral support received from the entire members of my family most especially my wife Binta as well as my friend Rufa'I Idris Kurfi for their sacrificial effort which resulted to the tremendous achievement toward completion of this programme.

I also acknowledge the entire staff of the Department of Library and Information Science particularly the academic staff for their tireless effort of imparting knowledge to me, thus include Prof. Zakari Mohammed, Dr. Ezra S. Gbaje (Dept. P.G Co-ord.), Mal. Umar B. Dan-gani, Mal. Abu Yusufu and the rest of them.

My research supervisor Prof. Tijjani Abubakar, can not be left out whose guidance and effort made this project work realized, despite his tight schedules.

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I wish to seize opportunity to acknowledge the authority of Federal Road Safety Corps (FRSC) that granted me approval to further my studies.

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ABSTRACT

This work described Information Utilization for Network management in Urban Traffic and Control (UTMC) system. It outlines the nature and content of the "Traffic Management And Control (TMC) Data Dictionary" and how it will help systems that support network management. It is aim at assessing the performance of strategic traffic routes around Sabon-Gari Zaria and to encourage the development and implementation of Urban Traffic Management and Control (UTMC) systems. It also discussed the provision of information for public dissemination through Variable Message Signs (VMS) and other media and highlight the validation process that must be gone through to ensure confidence in the data being provided. The challenges faced in creating a common link with the Traffic network for provision of journey time and other traffic information across urban areas will also be discussed. A comprehensive Route Management and Car Parking Guidance System (for off street car parks), providing driver information on available on-street signs. The core element in collating and controlling the information being supplied to the travelling public. It was recognized that a key requirement of the system was Information on road network status that will help traffic move efficiently in Sabon-Garin Zaria. The UTMC framework has been designed to meet the requirements of the road users. Thus , include: Traffic signal control; Driver information using variable message signs; Car park information systems using variable message signs.

TABLE OF CONTENT

CHAPTER TWO

LITERATURE REVIEW

CHAPTER THREE

RESEARCH METHODOLOGY

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

3G Third Generation (of mobile telephony standards)

AID Automatic Incident Detection

ANPR Automatic Number-Plate Recognition

ARS Automatic Route Setting

ATM Active Traffic Management (combination of hard-shoulder running, incident detection, variable speed limits and other measures integrated as a common system, as trialled and used in the UK)

AVI Automatic Vehicle Identification

AVL Automatic Vehicle Location

CEC Commission of the European Communities (official title of European ` Commission)

CVHS Cooperative Vehicle Highway Systems

DATEX Data Exchange

DfT Department for Transport

HGV Heavy Goods Vehicle

HMI Human-Machine Interface

HSR Hard-Shoulder Running

HS High Speed

ICT Information and Communication Technologies

IM Infrastructure Manager

IAS	Intelligent Automation System
ISA	Intelligent Speed Adaptation
ITP	Integrated Timetable Planning
ITS	Intelligent Transport Systems
R&D	Research and Development
SMS	Safety Management System
SMS	Short Message Service (mobile telephones)
TEN-T	Trans-European Network – Transport
TERN	Trans-European Road Network (= Road TEN-T)
TMP	Traffic Management Plan
TRKC	Transport Research Knowledge Centre
UTC	Urban Traffic Control
UTMC	Urban Traffic Management and Control
V2I	Vehicle to Infrastructure
V2V	Vehicle to Vehicle
VMS	Variable Message Sign
VSL	`Variable Speed Limits
WIMAX	Worldwide Interoperability for Microwave Access

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Transport is now firmly established in the political agenda, as public awareness grows of the impact of congestion on towns and cities and the people who live and work in them. Consequently, transport policies are evolving, and new ways of managing transport networks are needed to support this change cost effectively. Information utilization in the Urban Traffic Management and Control (UTMC) Technical Specification will be one way of assisting authorities to meet this need. The Technical Specification for UTMC systems can now be jointly produced by the Traffic Authority, Public Transport owners and all categories of road users, aim at encouraging the development and implementation of UTMC systems. Traffic control in urban areas principally involves traffic signal management and coordination, congestion reduction, prioritisation and improvements to public transport. To achieve this, the UTMC Technical Specification defines a framework for an "Information network". This network supports the inter-connection of a wide range of equipment which provide facilities such as traffic signal control and variable message signs (VMS). The key aspect is that all the components communicate with each other in a standard and, in computer terminology, "open" manner that is defined in the UTMC Technical Specification. It includes a Data Dictionary which defines the structure and meaning of data used in UTMC systems. Figure 1 & Fig. 1.1 shows an example UTMC system. It shows how

different equipment could be connected together using the UTMC network, where Information Utilization can be benefited by operators and other systems and services. The sole aim is to increase:

Capacity, Efficiency, Sustainability and Safety of road, and Urban transport networks.

1.1.1 HISTORICAL BACKGROUND OF SABON- GARI ZARIA

Sabon-Gari (A strangers' quarters) or literary new town in Hausa language. It is a section in Northern Nigeria and South Central Niger whose residents are not indigenous to Hausa land.

Permanent communities of strangers segregated from the indigenous population had existed in Northern Nigeria and other parts of West Africa long before the arrival of the British at around 1900. Although living segregated from the Hausa population, residents of these communities are subject to the authority of the local emir.

The establishment of British colonial rule under Frederick Lugard and the construction and new railway lines led to a large influx of laborers and traders from southern Nigeria. The immigrants, which mostly Igbo and Yoruba people, settled in new towns or Sabon Gari, as they were called by the local Hausa people. The cantonment Proclamation of 1914 institutionalized this system of residential segregation. The Sabon Gari became Native Reservations, officially reserved for employees of the government and commercial firms, and in practice inhabited by residents not indigenous to Northern Nigeria

British colonial rule in Northern Nigeria was indirect, leaving the emirs in power, albeit as part of the colonial administration. In the beginning the Sabon Gari was administrated by the emirs. This changes with the Township Ordinance of 1917, which place Sabon Gari and their residents under direct British rule. Sabon Gari residents were granted more right than those under the administration of the local emir. for example residents of Sabon Gari could send representatives to the advisory board responsible for a township, or could choose between court administering Muslim law and British law.

Sabon Gari was established in all major cities of Northern Nigeria, most notably in Kano, Kaduna and Zaria**.** One exception was Maiduguri, which never had a Sabon Gari.

A typical city or town in Northern Nigeria would consist of the old city within fortified walls and inhabited by indigenous Hausa or Fulani people. The Sabon Gari would house immigrants mostly from the southern Nigeria. Where as Tudun Wada would house people from Northern Nigeria that were not indigenous to the local area. Europeans would live in the Europeans Reservation Area, now Government Reservation Area(GRA).

Over time the initially strict residential segregation would partially break down . eventually a typical Sabon Gari would house a diversity of people from all parts of Nigeria to a lesser extent from other parts of West Africa. For example in 1939 various ethnic groups in the Sabon Gari of Kadna as follows: 27% were Hausa, 11% were Igbo, 19% were Yoruba,15% were Nupe ,and 28% were other ethnicities.

Fig. 1.1.1. below shows distribution of Road Network within Sabon-Gari, Zaria.

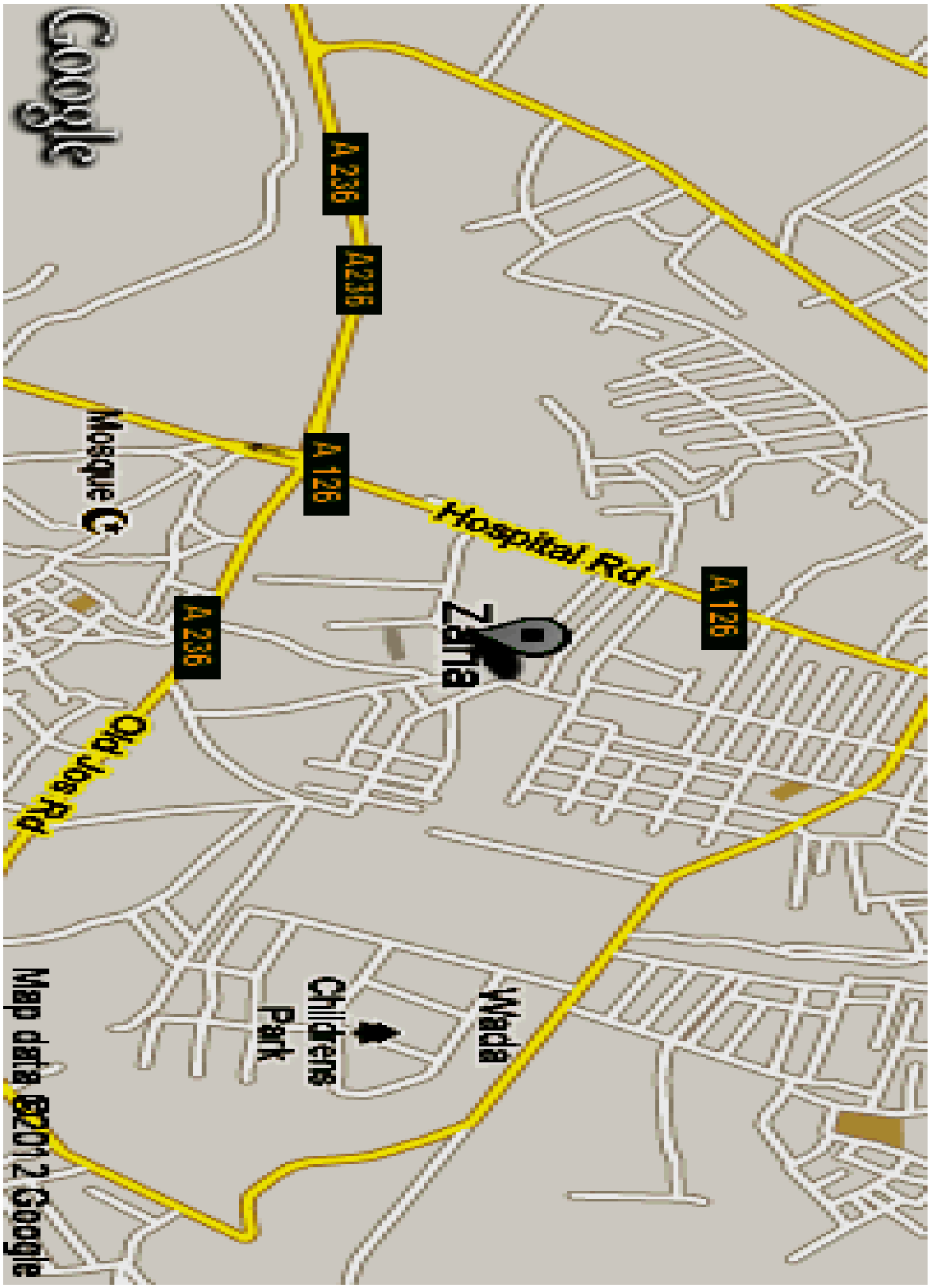

FIG. 1.1.1 ROAD NETWORK WITHIN SABON-GARI, ZARIA

1.2 STATEMENT OF PROBLEM

As the topic of the thesis, is there any problem and prospect in information utilization for network management in traffic management and control(TMC) system, if not what is the impact of information utilization for network management in traffic management and control(TMC) system towards traffic move efficiently as wells as cost-effective means of implementing traffic and transport management and control 'functions' that meet the requirements of the Road Users **.** Its' benefits is that, new functions can be added to an existing system to:

• Improve vehicles movement and safer bus stop facilities , enhance padestrian provision and reduction of accident risks

How does lack of using information affect individual road users as well as general economic growth and development of Sabon-Gari Zaria in particular and Nation as a whole.

1.3 RESEACH QUESTIONS

The study sets to answer the following research questions:

1-What type of Information is needed by Road Users in Sabon Gari, Zaria.

2-What are the sources of information for Road Users in Sabon Gari, Zaria.

3-How do the Road Users Utilize available information resources in Sabon Gari, Zaria.

4-What is the impact of using information for network management towards traffic management and control in Sabon Gari, Zaria.

5- How does lack of using information for network management affect individual road user movement in Sabon Gari, Zaria.

6- What are the problems and prospect in using information around Sabon-Gari, Zaria road network in Sabon Gari, Zaria.

1.4 OBJECTIVE OF THE STUDY

The objective of this study is to:

1- To find out what type of Information is needed by Road Users in Sabon Gari, Zaria.

2- To find out what are the sources of information for Road Users in Sabon Gari, Zaria.

3- To find out how do the Road Users Utilize available information resources in Sabon Gari, Zaria.

4- To find out what is the impact of using information for network management towards traffic management and control in Sabon Gari, Zaria.

5- To find out how does lack of using information for network management affect individual road user movement in Sabon Gari, Zaria.

6- To find out what are the problems and prospect in using information around Sabon-Gari, Zaria road network in Sabon Gari, Zaria.

1.5 SIGNIFICANCE OF THE STUDY

The research has significantly the following:

To make known to the people of Sabon-Gari particularly motorist how information utilization ca reduce traffic congestion allow smooth movement traffic

by the aid of utilization of available information resources. Also traffic management system assist in monitoring and real time response to incidences. To critically examine how lack of proper utilization of information affect road users movement. To identify problems and prospects of information utilization within Sabon-Gari Zaria road network.

1.6 SCOPE OF THE STUDY

The scope of the study cover Impact of **information utilization for traffic management** around Sabon-Gari, Zaria road network. Types of **information system** used in traffic management around Sabon-Gari, Zaria road network. Method of information dissemination used in traffic management and control system.

1.7 LIMITATIONS OF THE STUDY

The research work was limited to one Nigerian public road and road users, viz-Sabon-Gari, Zaria road network.

It was limited within the above scope in the organization because of the difficulties in information gathering.

But the little was gathered from web site, journals, books, National traffic regulation(2004), Nigerian Highway Code(2007) operational guide lines and some papers presented at the FRSC conferences and seminars.

1.8 OPERATIONAL DEFINITIONS OF TERMS

a- Information:- A product of processed data that give a meaningful results.

b- Information Utilization:- The use of knowledge or new Idea that give guidance.

c- Network Management:- Planning of computer assemblies and peripherals that are jointly together so that they can communicate, exchange and share information resources.

d- Traffic:- Movement of vehicles in a road or area Micosoft encata(2009)

e- Traffic Control:- The use road signs and obstructions in order to force road users(drivers) to slow down especially within residential areas.

f- Traffic Management:- Traffic management is the planning, monitoring and control or influencing of traffic (Andrew Graham et.al 2006)

REFERENCES

Graham A. , Keily I and Silcock P.(2006) Oscar Faber Transportation paper presentation

http://en,wikipedia.org/wiki/Sabon_Gari

CHAPTER TWO

LITERATURE REVIEW

2.0 INTRODUCTION

This chapter seeks to review literature related to this study, Information utilization for network management in urban traffic management and control (UTMC) system. The review is as follows :

2.1 - Traffic management and control (TMC)

2.2 -Urban traffic management and control (UTM)

2.3 - Information network

2.4 -Need of information network in UTMC

2.5 -Important of information network in UTMV

2.6 - The role of information in urban traffic management system

2.7 -Variable message signs(VMS)

2.8 - Variable speed limit signs(VSL)

2.9 Traffic Signs

The more extensive the information available on the operational state of a network, and how it is changing over time, the more accurate and effective any management policy can be (Winder and Brackstone 2009), through for example Variable Speed Limits (VSL) where choosing appropriate speeds and/or operational lane strategies may depend on fluctuations in traffic patterns which are not easy to discern and system effectiveness is conditional on being able to appropriately enforce speed and access. Provision of adequate data for traffic

management is particularly important in the urban context where the needs of passenger cars and freight are increasingly in conflict with those of public transport, and priority systems are required, such as Automatic Vehicle Identification and Location (AVI/AVL) and Automatic Number-plate Recognition (ANPR)(Fig. 3), in order to ensure full use can be made of traffic management and enforcement strategies. Indeed existing Automatic Incident Detection (AID) measures can be supplemented by, for example, "probe" (or "floating") vehicle systems. Additionally with Urban Traffic Control (UTC) systems becoming more flexible, traffic control strategies are now focusing on the fusion of real-time data while also addressing differing impact criteria such as emissions and noise in tandem with congestion. These strategies may increasingly be modelled in real-time through the use of simulation models, allowing proactive traffic management to be undertaken.

With an increasing number of traffic management and control techniques and products available, the place of traffic management within sustainable mobility itself is of vital importance. Indeed its use as a transport planning tool is now of increasing importance and this is the focus of research in itself. Another more recent focus is on the evaluation of traffic management measures and systems, both prior to implementation (cost-benefit and business case issues) and after implementation (actual contribution towards policy goals and lessons learned for the future).

2.1 TRAFFIC MANAGEMENT AND CONTOL (TMC)

Traffic management is the planning, monitoring and control or influencing of traffic (Winder and Brackstone 2009). It involves the allocation of infrastructure (road space or train slots on a railway network) according to strategic operational and policy goals. These include efficiency, safety, environmental, economic and equity objectives. In real terms, meeting them may encompass measures that include giving priority to buses, trains or other vehicles such as emergency services or high occupancy vehicles, increasing space available for pedestrians and cyclists, or providing shared road space. For rail, rules for market opening, network capacity allocation and pricing also, constitute policy-level strategic management. Traffic control in urban areas principally involves traffic signal management and coordination, congestion reduction, prioritisation and improvements to Public transport. For road transport, tactical traffic management involves monitoring the actual traffic situation in real-time (including volumes, speeds, incidents, etc.) and then controlling or influencing the flow using that information in order to reduce congestion, public transport priority, safety, punctuality and international traffic.

Traffic management system aims to:

• maximise the effectiveness of the use of existing infrastructure;

• ensure reliable and safe operation of transport;

• address environmental goals; and

• ensure fair allocation of infrastructure space (road space, rail slots, etc.) among competing users. It is therefore an essential element in increasing the efficiency and safety of :Transport networks and operations.

2.2 URBAN TRAFFIC MANAGEMENT AND CONTOL (UTMC)

The degree of road transport and motorization is constantly increasing. apart from undoubted advantages. It causes a heavy loading on the road network and constantly increasing demand on the traffic and safety issues. Traffic congestion on major roads in urban areas, the need to improve the balance between different transport modes, and the needs to improve safety and mitigate the impact of transport on the environment are some of the key challenges.. Traffic management and control are key tools with which to address these problems.

According to (Andrew Graham, et, al 2006) Define Urban Traffic Management System (UTMS)

"As a traffic control platform that aims to improve comprehensive urban traffic network. With easy to control graphical management interface and integration with GIS and video and monitor and management information, module design allows to connect with various traffic information interface. In addition, UTMS coordinates to the implementation of multi-faced urban traffic management strategies to further improve traffic safety, order, and efficiency, reduce air pollution and energy consumption, and lead cities into urban life standard of the 21st Century".

-UTMS SYSTEM STRUCTURE

UTMS system structure includes central platform software, protocol interface and on-site monitor equipment; through graphical operational interface of kernel management system, module communications with each sub-system are enabled.

According to ”Keep Europe moving – Sustainable mobility for our continent” (CEC, 2006), the mid-term review of the 2001 White Paper on Transport, ” there is no reason in the long run why sophisticated communication, navigation and automation should be restricted to Aircraft and not be available to land transport modes, in particular road transport”. The review expects that new technologies will provide new services to citizens and allow improved real-time management of traffic movements and infrastructure capacity use, as well as the tracing and tracking of transport flows. In addition to providing benefits for transport operators and users, new systems can provide public administrations with rapid and detailed information on infrastructure maintenance and renovation needs. Traffic management applications can increase the efficiency of networks, reduce the need to build new infrastructure, enhance driving and travelling comfort and also help to increase safety and security, as well as tackling wasteful and socially harmful transport patterns in the interests of environmental and social sustainability.

UTMS system function consists among others of :

- Traffic signal management system,

- Image monitoring system,

- Illegal and event detect system,

- Traffic data collection system,

- Traffic information guidance system,

Managing and communicating with communication module of each sub-system; easy to use with graphical interface

2.3 INFORMATION NETWORK

INFORMATION: Is a new ideas or knowledge extracted from the environment for human use with the aim of modifying behaviour, effecting changes, and enhancing efficiencies in all human endeavours (Ajemogbgun,2008). Information helps create enlightened and responsible citizen. Libraries and Internet are the gateways to information. It is a place where information is acquired, processed, repacked, preserved and disseminated.

Information is a critical resources for individual and societal emancipation and advancement. Sokari (2006) agrees that information is necessary for people to be librated the shackle of ignorance, misconception. Economic stagnation, social unrest, and political instability. Social cohesion can not be achieved without timely, curate and relevant information.

Information plays an important role in wealth creation . Information is a critical resource in today's world (Sabaratnam, 1997). Nigerians need a wide range of Information which will help reposition them to take their rightful place in the comity of nation.

NETWORK- According to American Heritage Cultural Dictionary (2002) Defines Network "As a system of computers and peripherals, such as printers, that linked together". It can consists of two or more computers connected with cables, or spread over a large geographical area and are connected by telephone lines, fibres optic cables, or radio waves. The Internet is an example of very large network. Also FOLDOC Computing Dictionary (2005) Defines Network "as a system of computers that are jointed together so that they can communicate by exchanging information and sharing resources.

INFORMATION NETWORK: Is a system of data collection by the aid of network, and evaluate network's or system performance then help the system work better and faster.

It help a system solve problems quickly when user or an automated monitoring system is used. See Fig. 2.3.1 and 2.3.2 below as an example

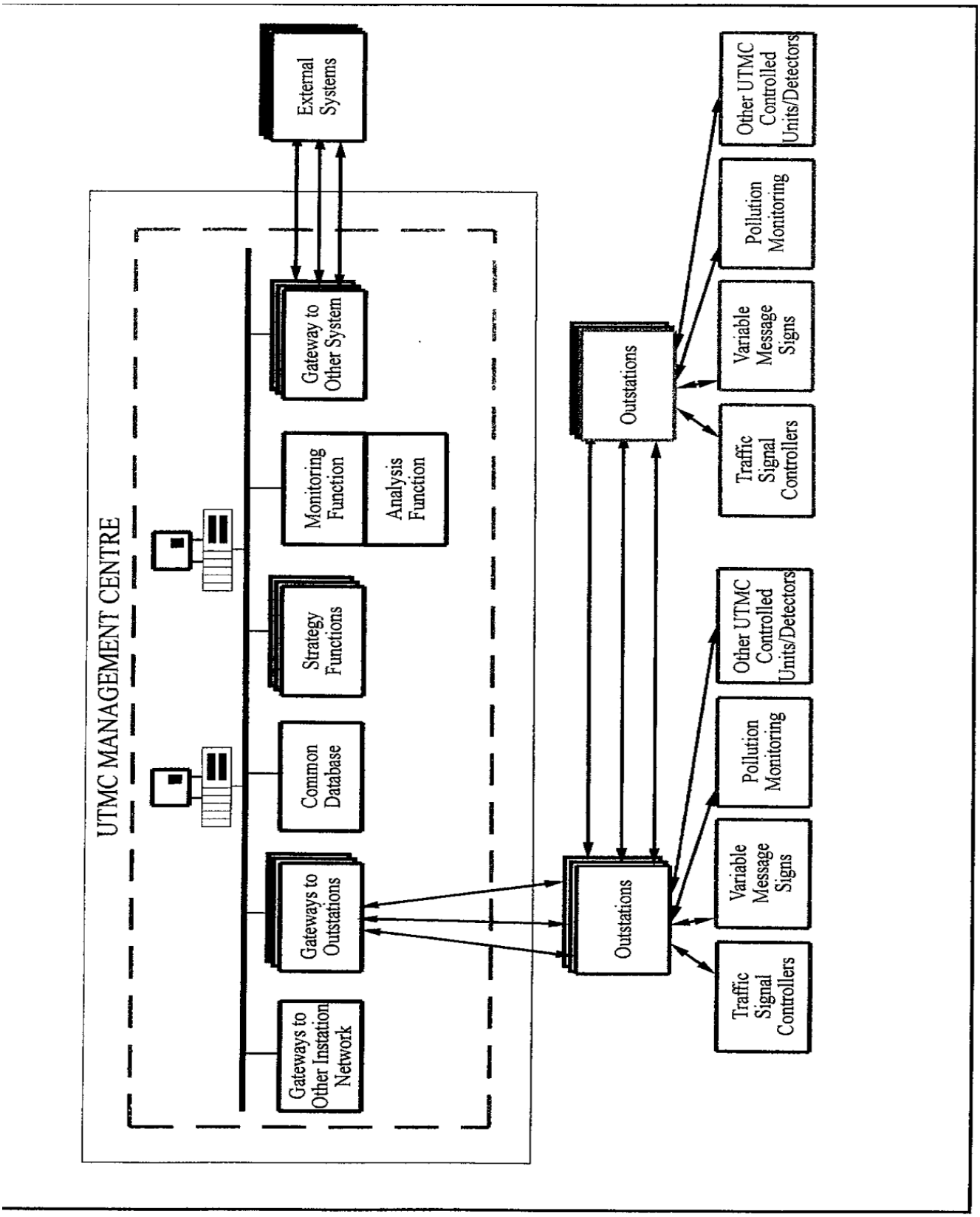
UTMC MANAGEMENT CENTRE
External Systems
Gateway to Other System
Monitoring Function
Analysis Function
Strategy Functions
Common Database
Gateways to Outstations
Gateways to Other Instation Network
Outstations
Traffic Signal Controllers
Variable Message Signs
Pollution Monitoring
Other UTMC Controlled Units/Detectors
Outstations
Traffic Signal Controllers
Variable Message Signs
Pollution Monitoring
Other UTMC Controlled Units/Detectors

FIGURE 2.3.1

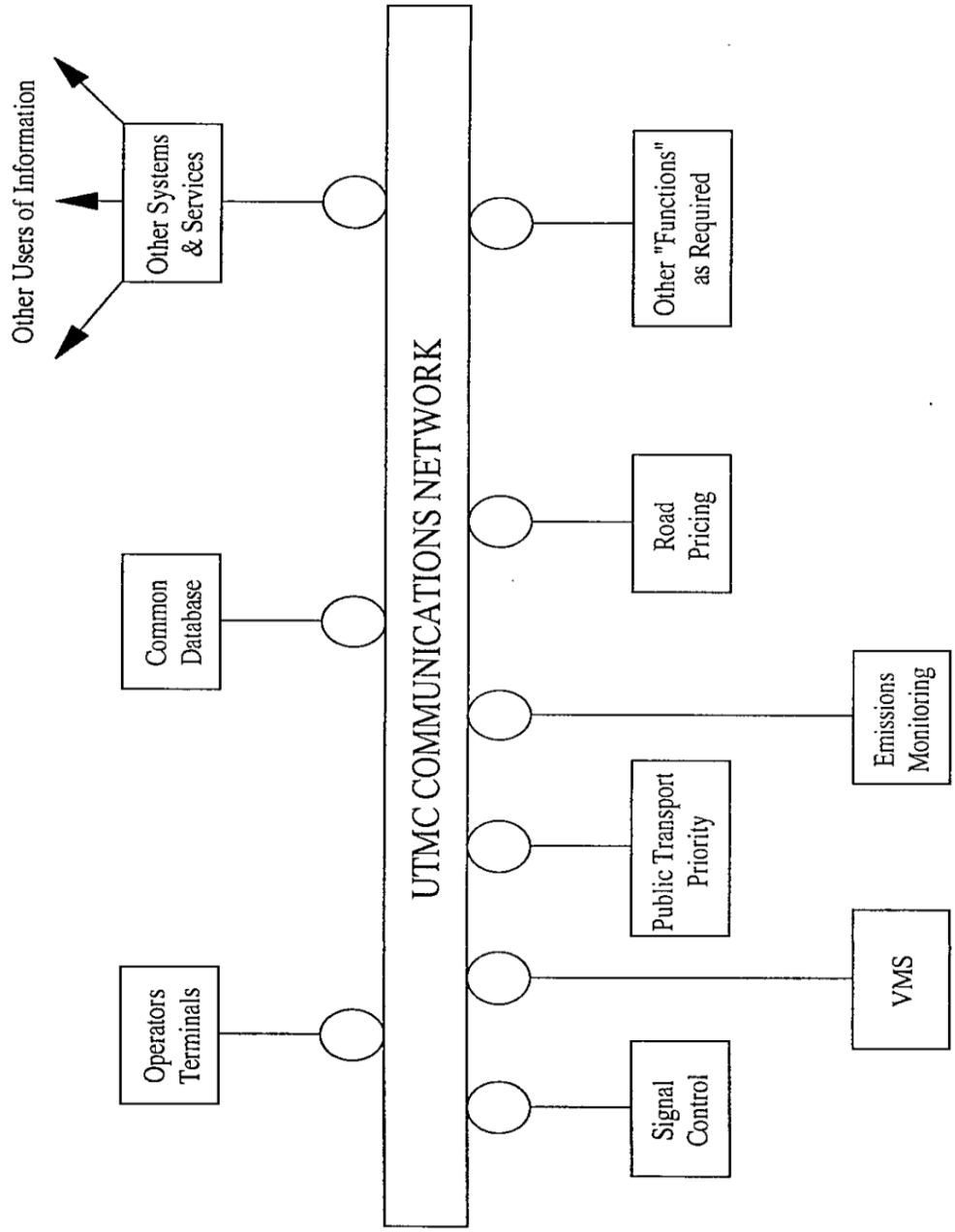
Other Users of Information
Other Systems & Services
UTMC COMMUNICATIONS NETWORK
Other "Functions" as Required
Common Database
Road Pricing
Emissions Monitoring
Public Transport Priority
Operators Terminals
VMS
Signal Control

Figure 2.3.2

2.4 NEED OF INFORMATION NETWORK IN UTMC

Any Information transmitted or collected by UTMC systems must be in response to a "user need". Key points from consultation with users of information were :measurements and predictions of journey times, incidents and congestion were attractive to almost all UTMC users ;raw data must be processed to give Information**.** As an example, users want to know traffic speeds when congestion occurs but do not want continuous raw speed data, which will almost always indicate free flow conditions; and much of the information needed for UTMC and by other users is not strictly 'real' - it has not been obtained by direct observation but is instead modelled from other much more basic data. An example of such modelled information is queue length. More 'real' information could considerably improve many UTMC functions that currently rely on modelled information, in particular traffic control strategies. To meet these user needs, a useful step is to audit all existing and potential users of information and, most importantly, all potential sources. These should include existing local authority systems, commercial systems, and public transport information systems. This will:

a) Ensure that migration from existing systems is as simple as possible; and allow for inclusion of information in the future.

b) Designing a UTMC system to cope only with information currently available could be a lost opportunity.

2.5 IMPORTANCE OF INFORMATION NETWORK IN UTMC

According (Andrew Graham, et.al 2006) to There are 54 links (and therefore 54 potential incident locations) within the test network. (See Fig.1 below) A radial 'test' network was developed which was symmetrically divided into six segments . The outer cordon represents an orbital motorway split into six junctions (labelled 1-6) an equal distance (6 km) apart. From each junction, a two lane dual carriageway (of length 3 km) leads to a signalised junction. The six signalised junctions (labelled 7-12) are 3 km apart and are located on an inner ring road (which has 1 lane in each direction). These junctions form the main bottleneck in 'normal' conditions (the signal plans used have a cycle time of 100 secs with a green split of 60 sec for the arterial route and 30 see for the ring road). The dual carriageway (length 2.8 km) then continues from the signalised junction to a central roundabout (consisting of the six junctions labelled 13-18). Symmetry enables the entire network to be assessed by only considering potential incident locations (and corresponding strategies) occurring within one segment.

However, since the network is symmetric, it is only necessary to consider the 9 different incident locations within one of the triangular segments. For each incident location, strategies were developed (which identified where to locate the VMS and which diversionary route to use). A number of physically possible diversionary routes exist. However, the nature of the network was such that a subset of realistic diversionary routes was easily identified and modelled. The small number of zones meant that the diverted packets could he accurately

assigned to their destinations via the 'obvious' diversionary routes. These strategies were run for one segment of the network and considered the 9 possible incident locations at links 61, 52, 63, 124, 122, 182, 181, 121 and 113 (see Figure 2.5.1 below).

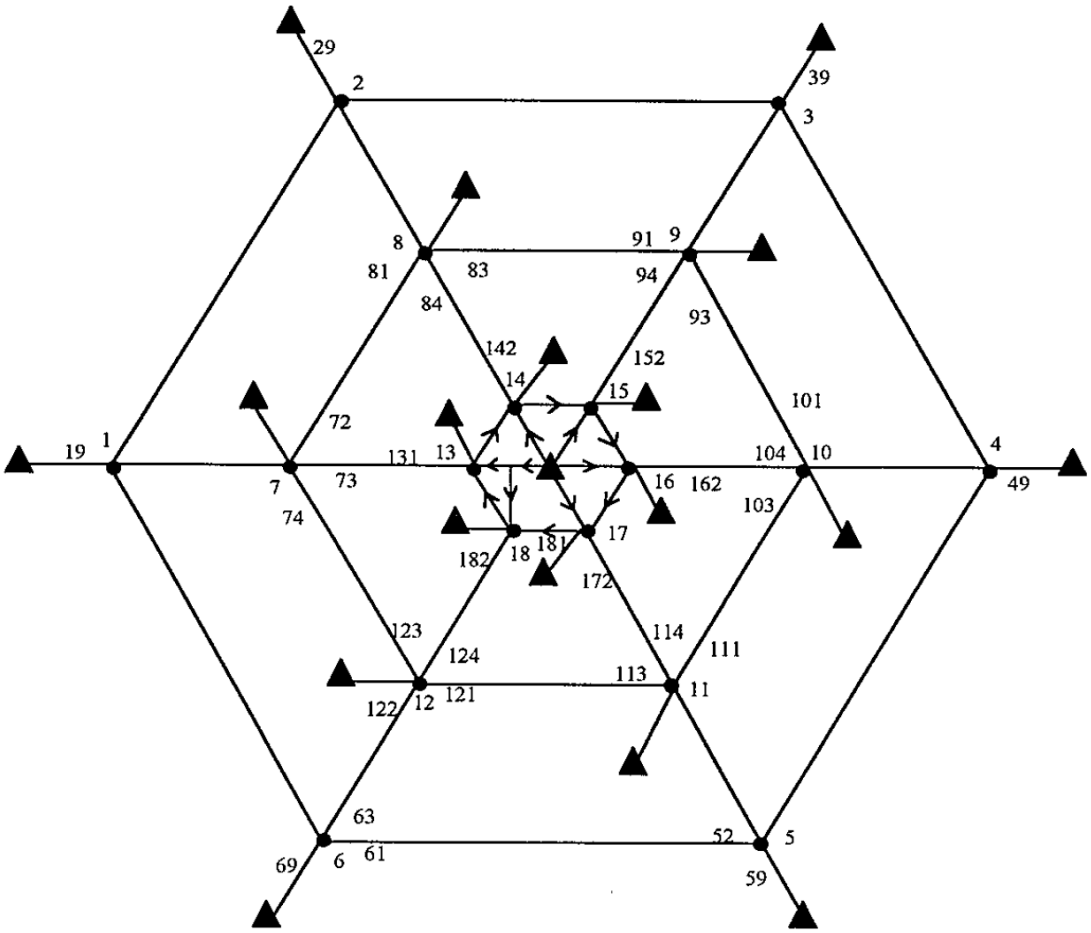

Fig. 2.5.1 CONTRAM NETWORK

There are three stages to the beneficial use of information within network management:

1. Information must be collected, from "information sources"
2. Information must be collated and processed, and then disseminated through a reformation variety of media to "" ' users"; and
3. Information users - drivers, network managers, public transport travellers and others, must gain value from the information, either through:

Improving decision making, for example choosing better routes or times of travel; or Identifying longer term problems and developing solutions.

All three of the above stages need to be in place - there is no point in collecting information if it cannot be distributed. Similarly, there is little point in collecting and distributing information that has no value to those who receive it.

2.6 The Role of Information in Urban Traffic Management and Control

To achieve the policies outlined above, first requires Information to:

Identify problems;

Formulate tactics and strategies to deal with these problems;

and Measure the success of actions taken.

Information can also have a potential value, for example :

In road works planning;

In the management of incidents;

In public transport priority and information services;

In reduction of energy and maintenance cost;

Increase in availability of traffic light system;

Offfer the option of traffic data collection;

Supply up-to date Information to the road users;

and in helping drivers choose their routes, or retime their journeys.

2.7 VARIABLE MESSAGE SIGNS(VMS)

Variable Message Signs are large electronic signs placed on the side of some roads. They display messages to warn motorists of changes in normal traffic conditions on the road ahead, such as fog, crashes, road works, congestion and road closures. These early warnings help provide a safe and efficient traffic flow(Road Users' Handbook 2012). See Fig. 3 below

Stop signs and STOP LINES

'STOP' signs and 'STOP' lines (continuous line) are used at intersections to control traffic. When you come to a stop sign you must stop completely before reaching the stop line, and as close as possible to the line. Where there is no stop line, stop before reaching, and as close as possible, to the intersection. a stop sign or a stop line means you must give way to all vehicles travelling in, entering or approaching the intersection, whether vehicles are turning left or right, or going straight ahead. You must give way to any pedestrians crossing the road into which you are turning. Giving way at a stop sign means the driver must remain stationary until it is safe for the driver to proceed. Car A must give way to car B.

(Road Users' Handbook 2012)

Give way signs and give way lines

'GIVE WAY' signs and 'GIVE WAY' lines (broken line) are used at intersections to control traffic. When you come to a give way sign you must slow down and prepare to stop if necessary. a give way sign or line means you must give way to all vehicles traveling in, entering or approaching the intersection, whether vehicles are turning left or right, or going straight ahead. You must give way to any pedestrians crossing the road into which you are turning. Giving way at a give way sign means the driver must slow down

and, if necessary, stop to avoid a collision. Car B must give way to car A. Where a STOP or give way sign has been removed, the line marked across the road has the same meaning as the sign. You must stop or give way. (Road Users' Handbook 2012)

T intersections

At T intersections the vehicle travelling on the road that ends must give way to any pedestrians crossing or vehicles travelling on the road that continues unless otherwise signposted. Car A must give way to Car B. This diagram shows a T intersection where the continuing road (which is marked with broken white lines) goes around a corner. Car B

must signal to leave the continuing road and enter the terminating road. Car B must give way to Car A. (Road Users' Handbook 2012)

Fig. 2.7.1 VARIABLE MESSAGE SIGNS(VMS)

2.8 VARIABLE SPEED LIMIT SIGNS(VSL)

These signs are placed in tunnels, on motorways and bridges. The changes in speed limits are enforceable and must be obeyed (Road Users' Handbook 2012).

FIG.2.8.1 VARAIBLE SPEED LIMIT SIGN (VSL)

SPEED CAMERAS

Speed camera support enforcement conducted by traffic authority. They are proven to change driver behaviour and reduce road trauma. There are four types of speed cameras used to encourage drivers to comply with the speed limit(Road Users' Handbook 2012) - mobile, red-light speed, fixed and point -to point. All speed cameras are regularly tested to ensure they are measuring speeds accurately and fine revenue raised from speed cameras goes directly towards improving road safety.

Mobil e speed cameras

Mobile speed cameras are moved around the road network and are used statewide, on all types of roads, at all times of day. Like police enforcement, the exact location of mobile speed camera enforcement is unpredictable.

Red-light speed (safety) cameras

Red light speed cameras are capable of detecting both red light and speeding offences and are used at high risk intersections. They improve safety by reducing crashes caused by red-light running and speeding

Fixed speed cameras

Fixed speed cameras are used at locations with a know crash history or that are identified as high risk - including black spots, school zones, tunnels and motorways.

Point-to-point cameras

Point-to-point speed cameras work by calculating a driver's average speed between two points. If the average speed is higher than the posted limit, a speeding infringement may be issued. See Fig. 5 below:

FIG.2.8.2 AUTOMATED CAMERA
Automatic Vehicle Identification and Location (AVI/AVL)
Automatic Number-plate Recognition(ANPR), and
Automatic Incident Detection(AID)

TRAFFIC SIGNS

Traffic signs warn motorist of possible dangers and provide Information. They tell road users what the rules are and what the road conditions are like.

Stock signs

They are basically an Informatory signs mount on a strategic points along the main roads. When you see any of the following signs you may be approaching animals or any other obstruction on or near the road. You must slow down or stop to avoid crashing with them. .

FIG.2.8.3

Warning Signs

Warning signs tell you that there may be dangers ahead. They are usually black on a yellow background and are mostly diamond shaped. Pictures, diagrams and symbols are used to alert you to danger.

FIG. 2.8.4

Regulatory signs

Regulatory signs tell you about laws that must be obeyed. Except for Stop, Give Way and Round about signs, most regulatory signs are rectangles. They are usually black on a white background. Sometimes they also have a colour such as red. Some parking signs are green on white. Some

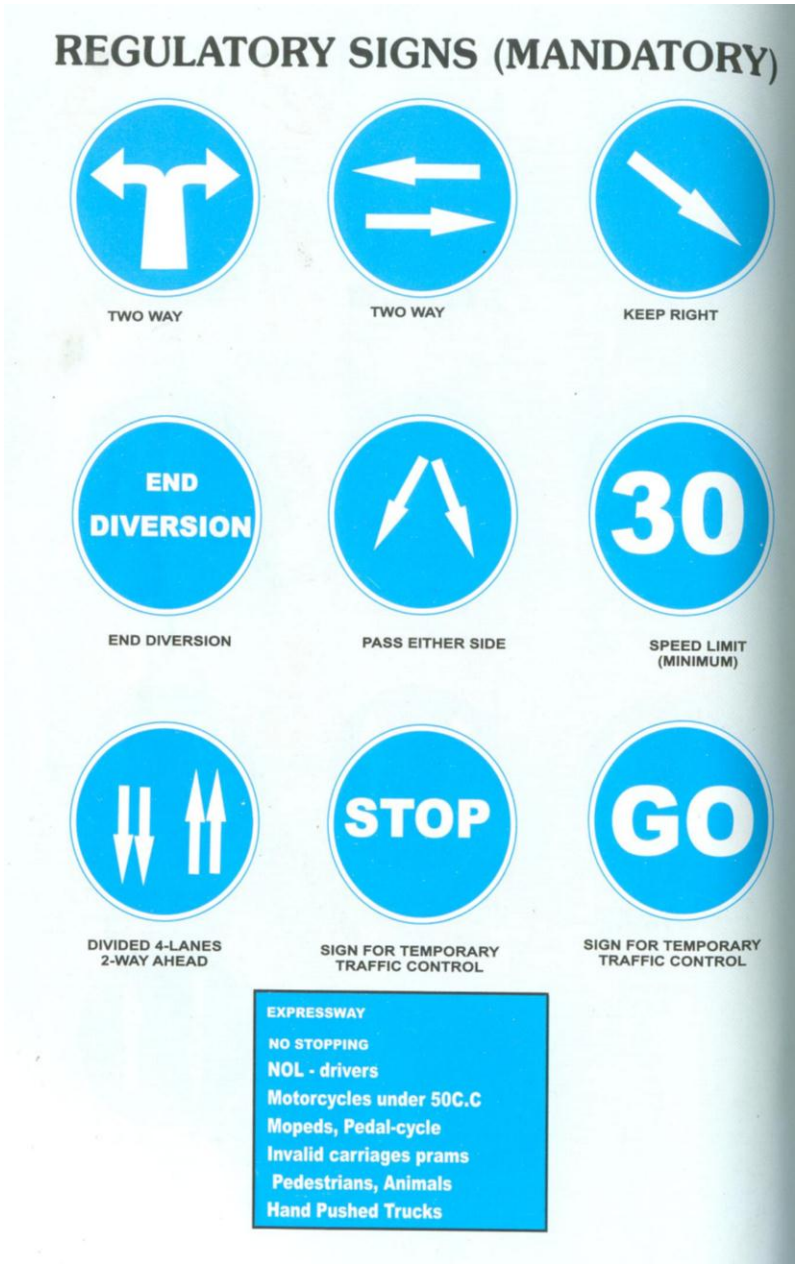

FIG. 2.8.5

REFERENCES

Ajegbomogun F.O (2008) Information availability and the extend of use in public Library, Abeokuta, Borno library archival and information science Journal7(1):65-74 American Heritage Cultural Dictionary (2002)

FOLDOC Computing Dictionary (2005)

Graham, A. , Keily I and Silcock P.(2006) Oscar Faber Transportation paper presentation

Highways Agency (2008), "Better managed motorways and more funding to tackle urban congestion", UK Highways Agency. www.highways.gov.uk/news/pressrelease.aspx?pressreleaseid=158587 • i2010 (2009).

Rivar S., Benoit a. , Michel A. Guy P and ,Smith H.A(2010). Information Technology and Organizational Transformation Roads and Maritime Services (RMS) (2012)

Road Users' Handbook website at www.rms.nsw.gov.au

Shaikh F. K., Khelil A. , Ali A. and Suri N. (xxxx) 'Reliable Congestion-Aware Information Transport in Wireless Sensor Networks', *Int. J. Communication Networks and Distributed Systems*, Vol. x, No. x, pp.xxx–xxx.

Winder A. and Brackstone A. (Egis Mobilité 2009), and Delle P. "European Transport Policy for 2010: Time to Decide",White Paper. COM (2001) 370, Brussels

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter provide details on methodology adopted in conducting the study. It is aimed at discussing the sampling and sampling techniques, and procedures used in collecting and analyzing data of this research project.

3.2 RESEARCH METHOD ADOPTED

The method adopted in this research was the method adopted in this research was survey type. Because the method investigate phenomena in its natural settings data was data was collected from sample population. 50 drivers were selected in from the population. Drivers were categorized according to the type of vehicles they drive, such as Motor cycle, Car, Bus, Truck, Private, Commercial or Official, in order to sample opinion from different source so as to represent each group fairly..

3.3 POPULATION OF THE STUDY

This is a group of people, objects or items in which the research is interested in obtaining data for analysis in order to find solution to a problem. The population of this study are the road users (motorists) i.e. Motor cycle riders, Motor vehicle drivers like private car, commercial(Bus/Car) drivers, and articulated vehicle drivers within Sabon-Gari Zaria road network.

3.4 SAMPLE AND SAMPLING TECHNIQUES

This refer to some number among population of the study, which represent the population for generating information by the researcher. A certain allocation is

being made to portion of the total population from which a sample can be drawn. In case of this study 50 drivers were chosen as a sample of the study out of the population. The techniques was stratified sampling techniques, questionnaires were labeled numbered 1-50, then distributed as follows:

a. Odd nos. to Motorcycle riders.
b. Prime nos. to articulated vehicles and trucks drivers
c. Even nos. to Car and Bus drivers.

3.5 SAMPLING TECHNIQUES

This refers to a process of selecting a number of person or object from a defined population. It is the idea or techniques of using statistics from a part or portion to provide information about the characteristics of the whole population that is being investigated. In case of this

research a stratified sampling techniques was used, as described above because it give a full and equal chance of being selected the population of the study.

3.6 METHOD OF DATA COLLECTION

There are different method of data collection, among of which are :

1- Questionnaire 2 –Interview etc

In this a questionnaire method was used as an instrument for data collection. A designed questionnaire with 14 structured items question was administered. 50 where distributed, and the respondents where road users(motorist) such as Motor cycle riders, Motor vehicle drivers like private car, commercial(Bus/Car) drivers, and articulated vehicle drivers within Sabon-Gari Zaria road network.

In this method of data collection, respondents were served with questionnaire to fill, based on their own understanding and views on a subject matter.

The items in the questionnaire were divided in to two parts :-

- Part one consist of seven(7) items which are personal data of the respondent.
- Part two consists of seven (7) items those are the research questions

See appendix 1

3.7 PROCEDURE FOR DATA ANALYSIS

In order to ensure a through analysis of the data collected for this study, data would be analyzes according to the research questions and the Information collected would be computed and presented using frequency table and percentages as well as pie-chart.

REFERENCES

Aina L.O (2002) Research in Information Science, an African Perspective-

Stirlin Hordan Publishers.(Nig.)Ltd

Catherrin D .(2002) Research Method –Delhi U.B.S

Kothari C.R.(2010) Research Methodology, Method and Technique(2nd ed.)

New Int. publishers

CHAPTER FOUR

DATA ANALYSIS AND PRESENTATION

4.0 INTRODUCTION

In this chapter, data collected from the distributed questionnaire was analyzed, interpreted and presented. A total no. of 50 questionnaires were distributed to various categories of road users.

4.1 DATA ANALYSIS

Find below are tables analyzing the findings.

4.1.1 TABLE- HAVE YOU EVER BEEN INVOLVED IN TRAFFIC CONGESTION **?**

OPINION	**FREQUENCY**	**%**
EXPERIENCED	49	98
NOT EXPERIENCED	1	02
TOTAL	**50**	100

Source Field Survey

From the above table it has been discovered that most of the respondents were involved in traffic congestion That represent 98%

DRIVERS INVOLVED IN TRAFFIC CONGESTION

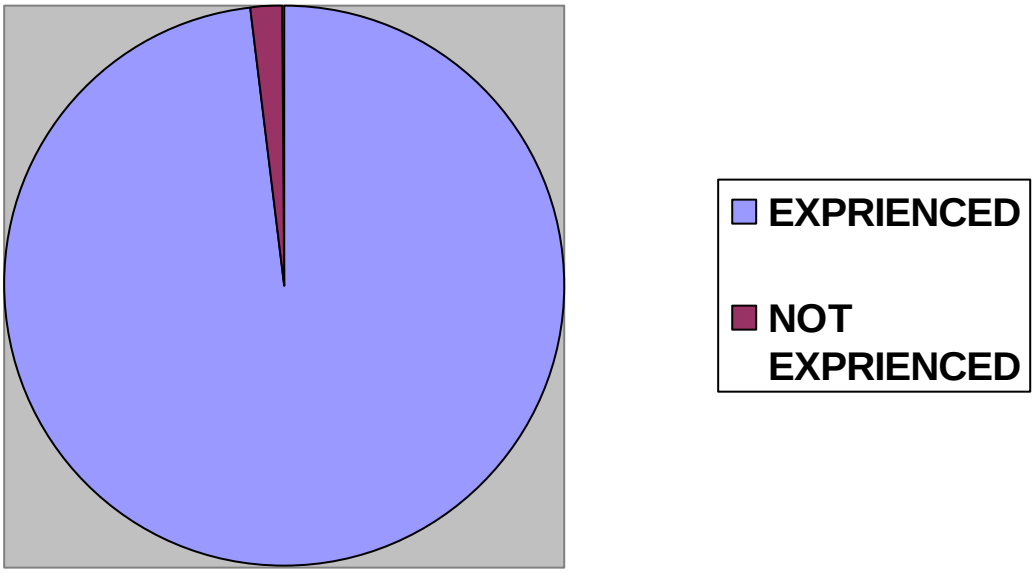

FIGURE 4.1.1

4.1.2 TABLE- What are the source of information do you use to avoid traffic congestion ?

OPINION	FREQUENCY	%
Automated traffic light, signals, warnings and information	5	10
Traffic law enforcement	17	34
Road signs for vehicle	28	56
TOTAL	**50**	100

Source Field Survey

From the above table it has been observed that most of the drivers use *Road signs* as their source of information while on the road. That represent 56%

DRIVER'S SOURCES OF INFORMATION

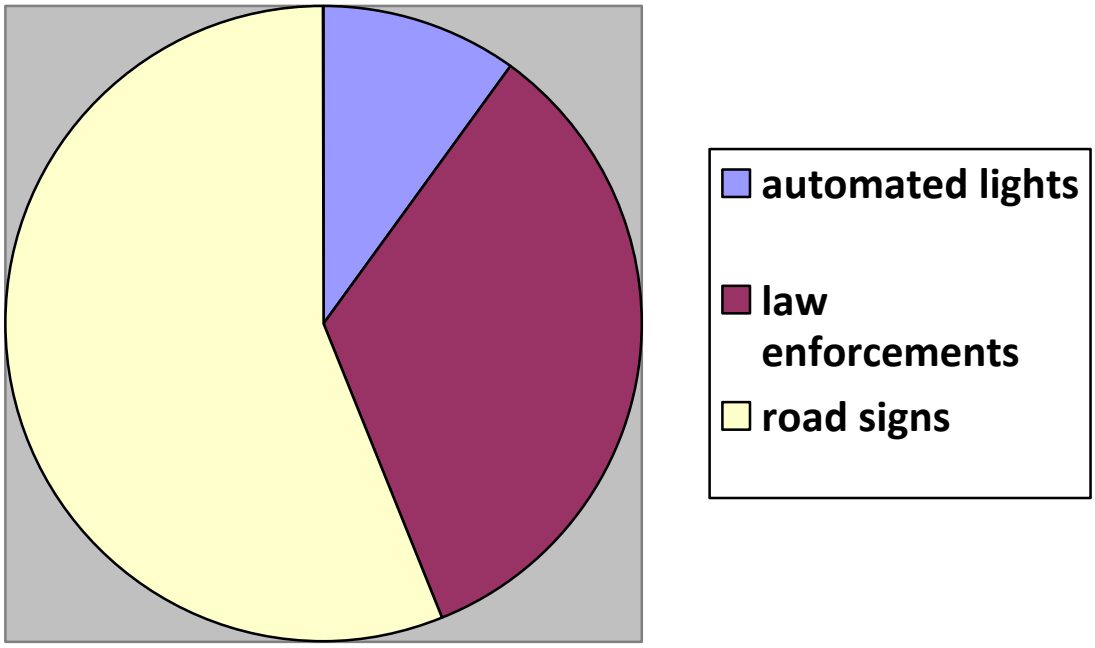

FIG. 4.1.2

4.1.3 TABLE- Do you always Utilize traffic signs along roads? a. □ Yes

b. □ No

If "Yes": How do you usually use traffic signs while driving?

i. □ Always ii □ Not Always iii. □ Not at all

OPINION	**FREQUENCY**	**%**
ALWAYS	20	40
NOT ALWAYS	26	52
NOT AT ALL	4	8
TOTAL	**50**	100

Source Field Survey

From the above table it has been observed that most of the respondents do not always use traffic signs along roads. That represent 52%

HOW OFTEN DRIVERS OBEY TRAFFIC ORDER/SIGN

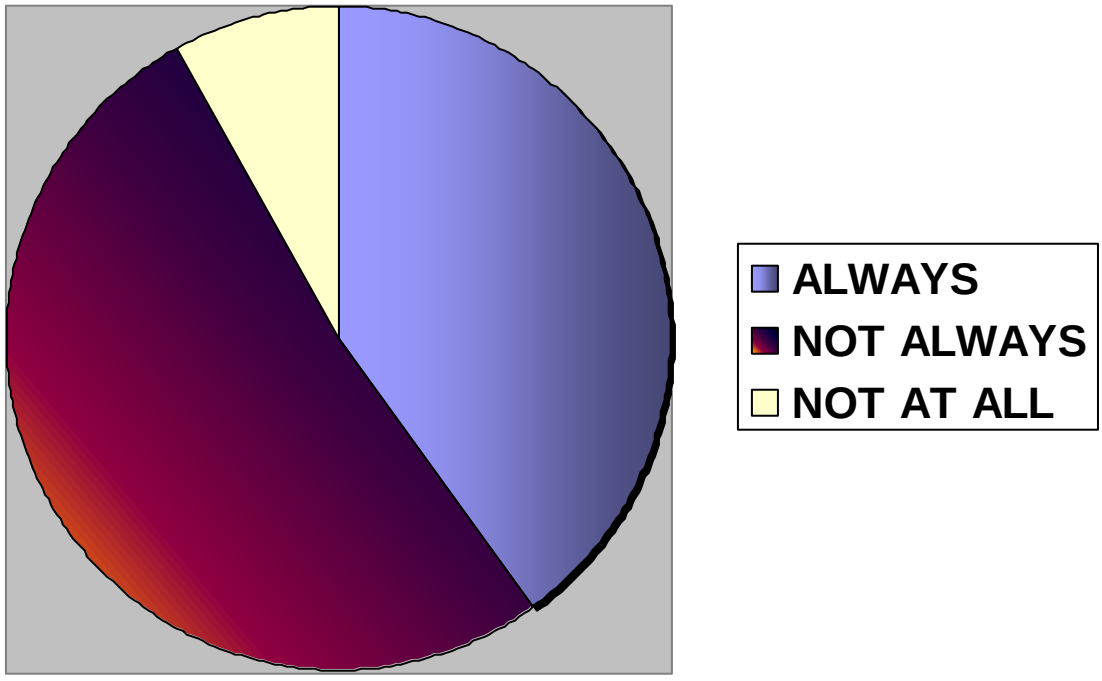

FIGURE 4.1. 3

TABLE 4.1.4 - What are the types of Information needed to reduce/control traffic congestion ?

OPINION	FREQUENCY	%
Need more traffic police and traffic control operation.	5	10
More additional traffic informatory and warning sign.	14	28
Need signal, marking and lighting, especially at intersection	24	48
Need more education/campaign for road users	7	14
TOTAL	**50**	100

Source Field Survey

From the above table it has been observed that most of the respondents suggested that Road Traffic can best be less Congested by the use of VMS(signal, lights and markings). That represent 48%

HOW TO MAKE ROADS LESS CONGESTED

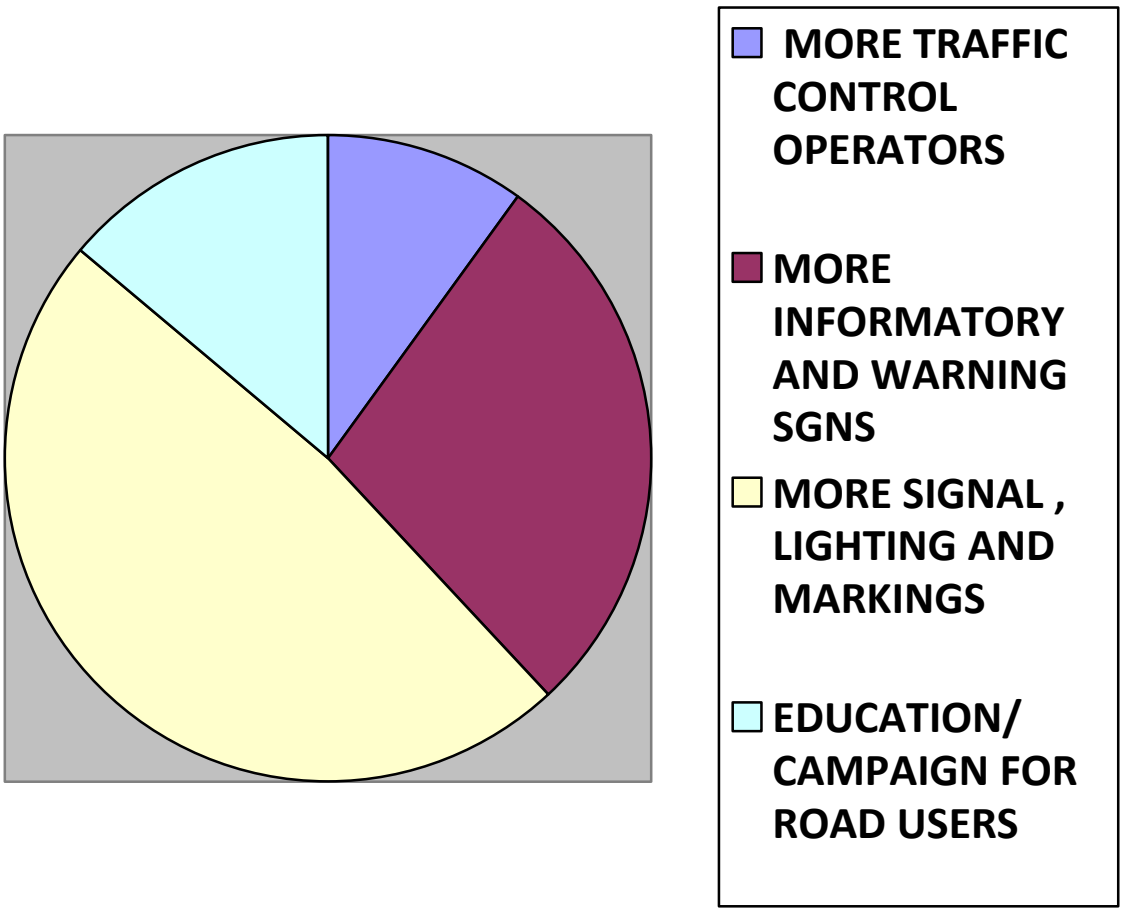

FIGURE 4.1.4

5. What is your assessment of the following means of traffic congestion control ?

(A) Table 4.1.5a Traffic law enforcement

OPINION	FREQUENCY	%
HIGLY SATISFIED	3	6
JUST SATISFIED	25	50
SATISFIED	6	12
NOT SATISFIED	16	32
TOTAL	**50**	100

Source Field Survey

From the above table it has been observed that most of the respondents are just patient with Road Traffic Law Enforcement That represent 50%

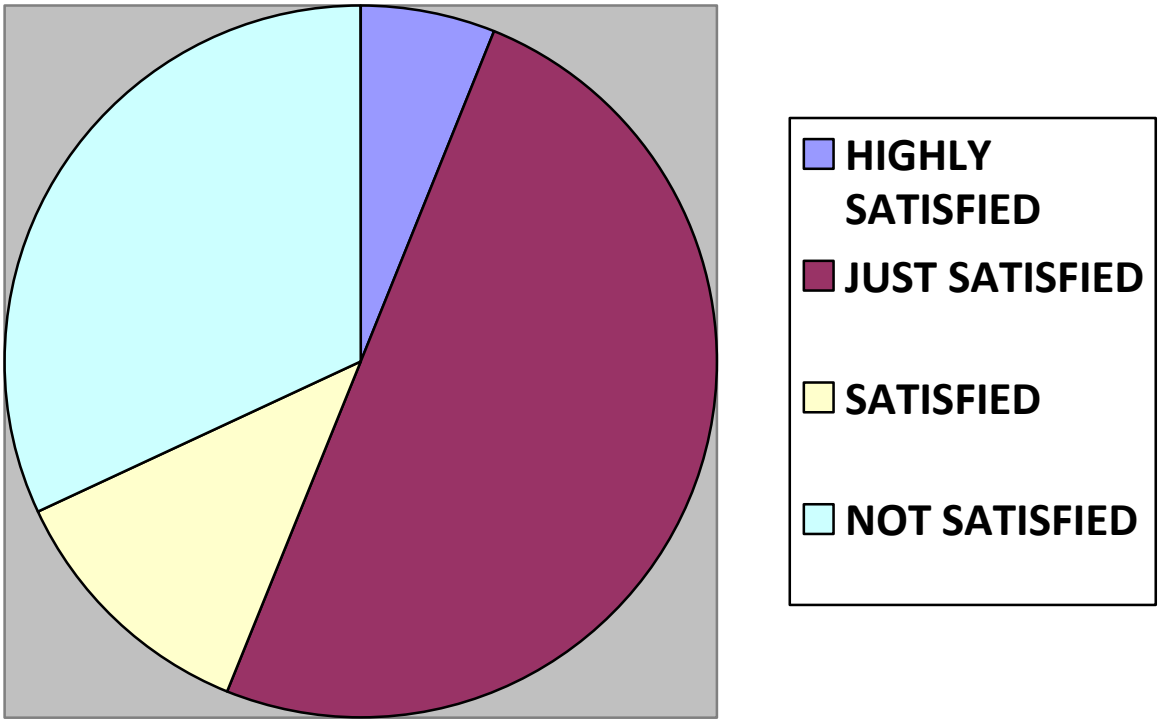

FIGURE 4.1. 5a

4.1.5b Traffic control & regulation:

OPINION	FREQUENCY	%
HIGLY SATISFIED	21	42
JUST SATISFIED	7	14
SATISFIED	9	18
NOT SATISFIED	13	26
TOTAL	**50**	100

Source Field Survey

From the above table it has been observed that most of the respondents are highly patient with Traffic control and regulations. That represent 42%

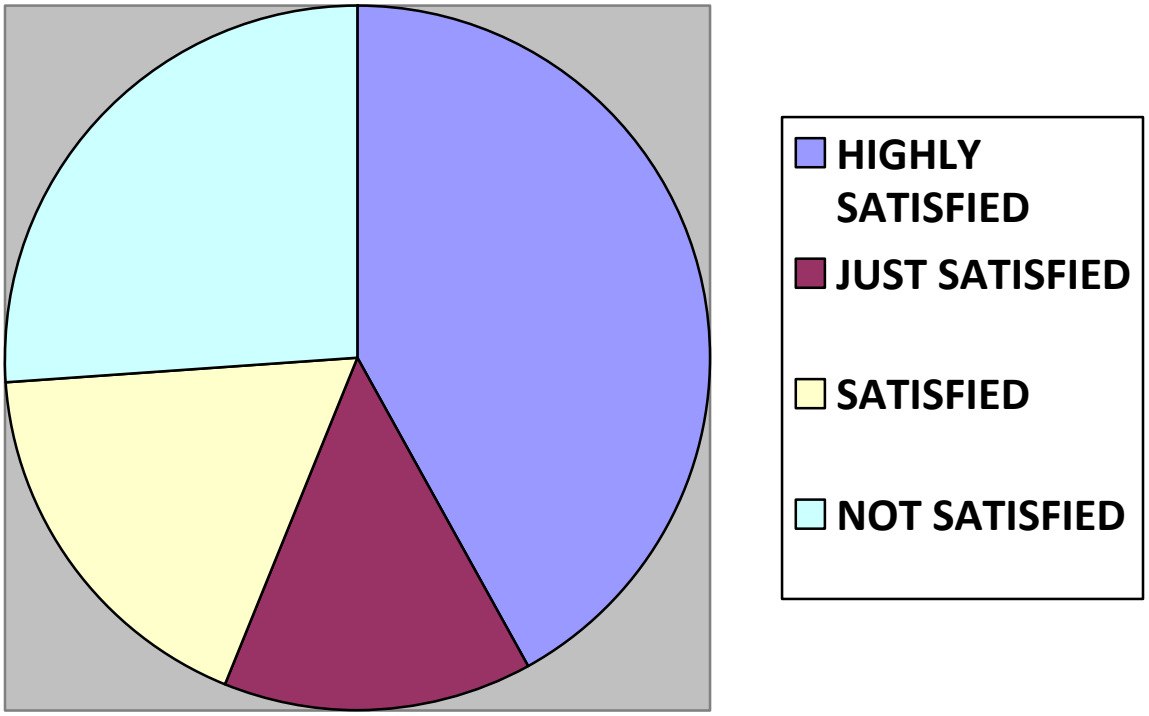

FIGURE 4.1.5b

4.1.5c Road signs for vehicle

OPINION	FREQUENCY	%
HIGLY SATISFIED	23	46
JUST SATISFIED	11	22
SATISFIED	12	24
NOT SATISFIED	14	28
TOTAL	**50**	100

Source Field Survey

From the above table it has been observed that most of the respondents are higly patienty with Road signs That represent 46%

ROAD SIGNS FOR VEHICLE

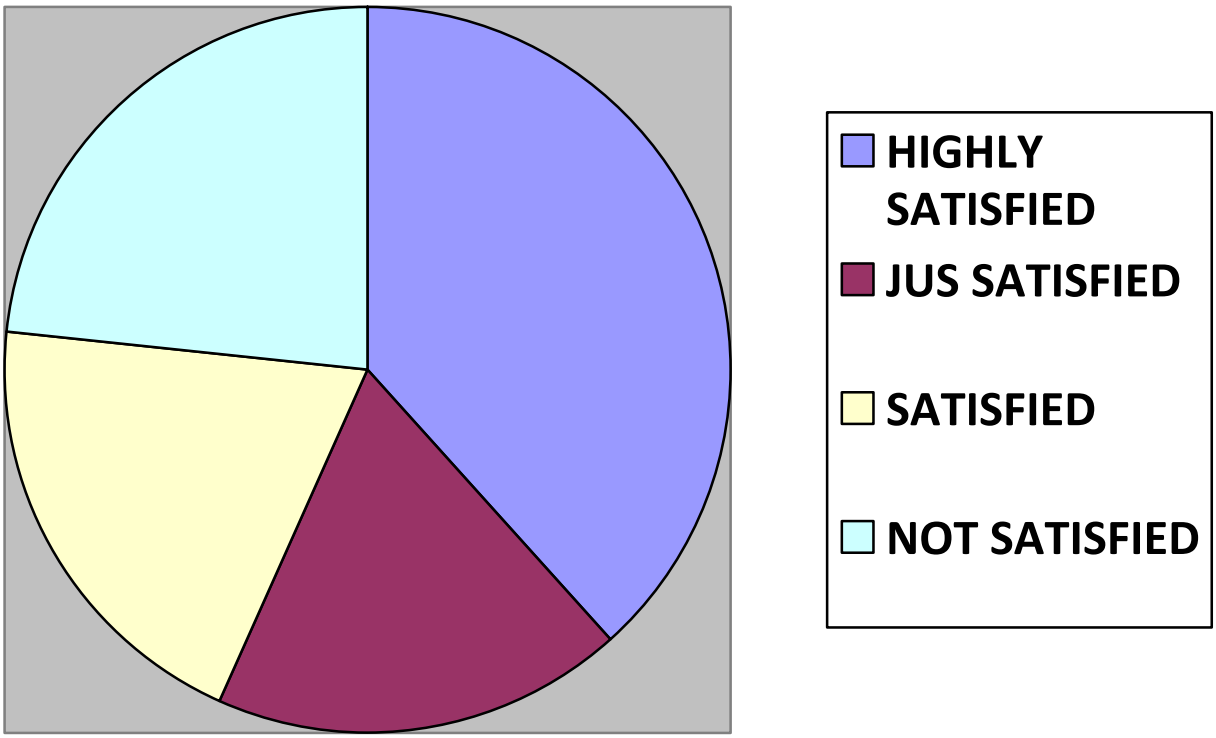

FIGURE 4.1.5c

4.1.5d Road marking, signal, lighting

OPINION	FREQUENCY	%
HIGLY SATISFIED	23	46
JUST SATISFIED	11	22
SATISFIED	12	24
NOT SATISFIED	4	8
TOTAL	**50**	100

Source Field Survey

From the above table it has been observed that most of the respondents are highly satified with VMS That represent 46%

ROAD MARKING, SIGNAL, LIGHTING

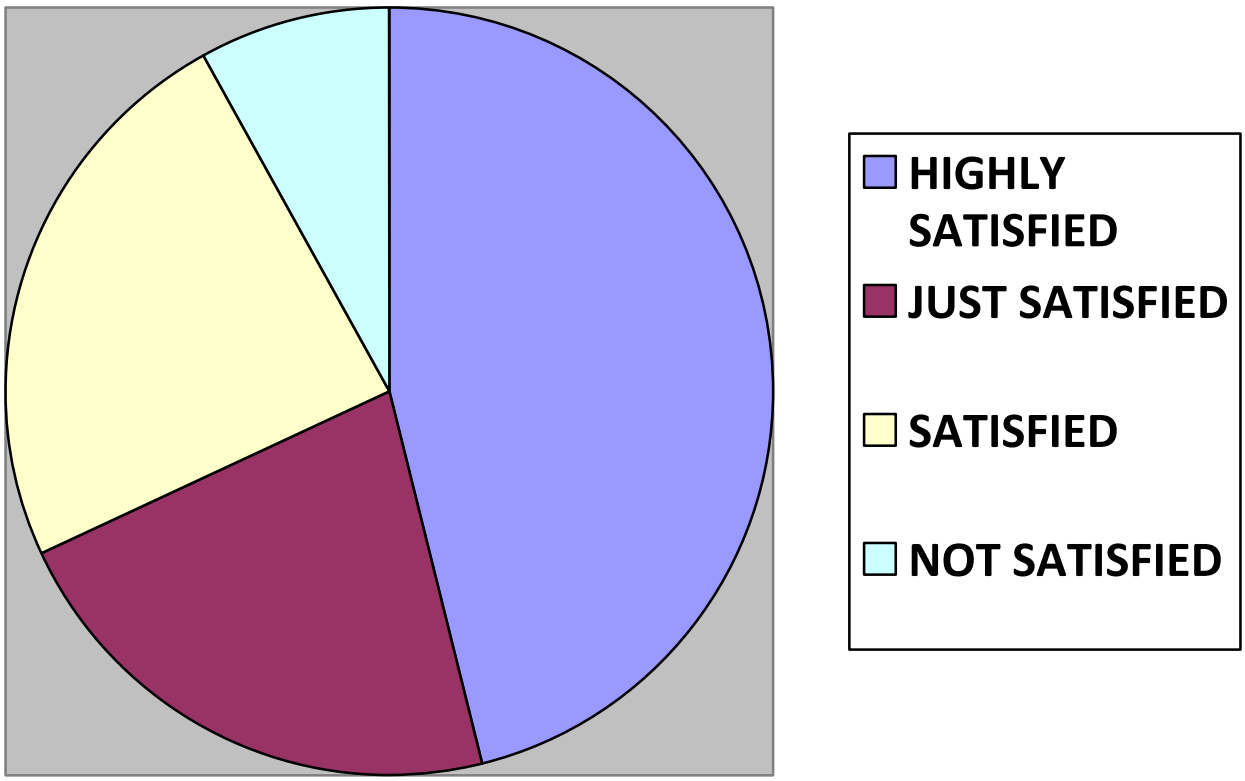

FIGURE 4.1.5d

4.1.6 TABLE- . Does lack of traffic light, signs and control cause congestion along roads ?

OPINION	FREQUENCY	%
STRONGLY AGREE	22	44
AGREE	16	32
FAIRLY AGREE	5	10
DO NOT AGREE	4	8
DO NOT KNOW	3	6
TOTAL	**50**	100

Source Field Survey

From the above table, it has been observed that most of the respondents Strongly agreed that lack of traffic light, signs and control cause congestion along roads. That represent 44%

LACK OF TRAFFIC LIGHT, SIGNS AND CONTROL CAUSE CONGESTION ALONG ROADS

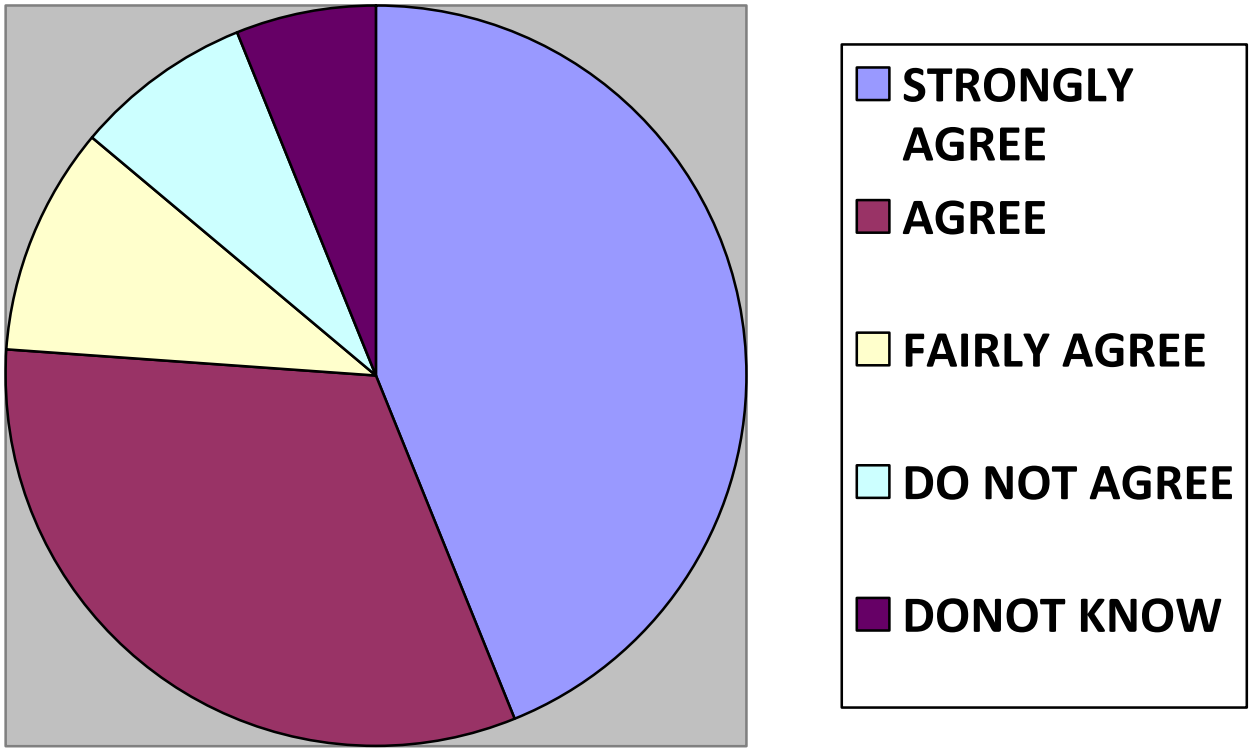

FIGURE 4.1.6

4.1.7 How does traffic congestion affect your trip ?

OPINION	FREQUENCY	%
Cause lateness	13	26
Cause Veh. Break down	17	34
Cause accident	9	18
Never affected	8	16
Do Noτ Know	3	6
TOTAL	**50**	**100**

Source Field Survey

From the above table it has been observed that most of the respondents agreed traffic congestion affect their trip by causing vehicle break down. That represent 34%

HOW DOES TRAFFIC CONGESTION AFFECT YOUR TRIP ?

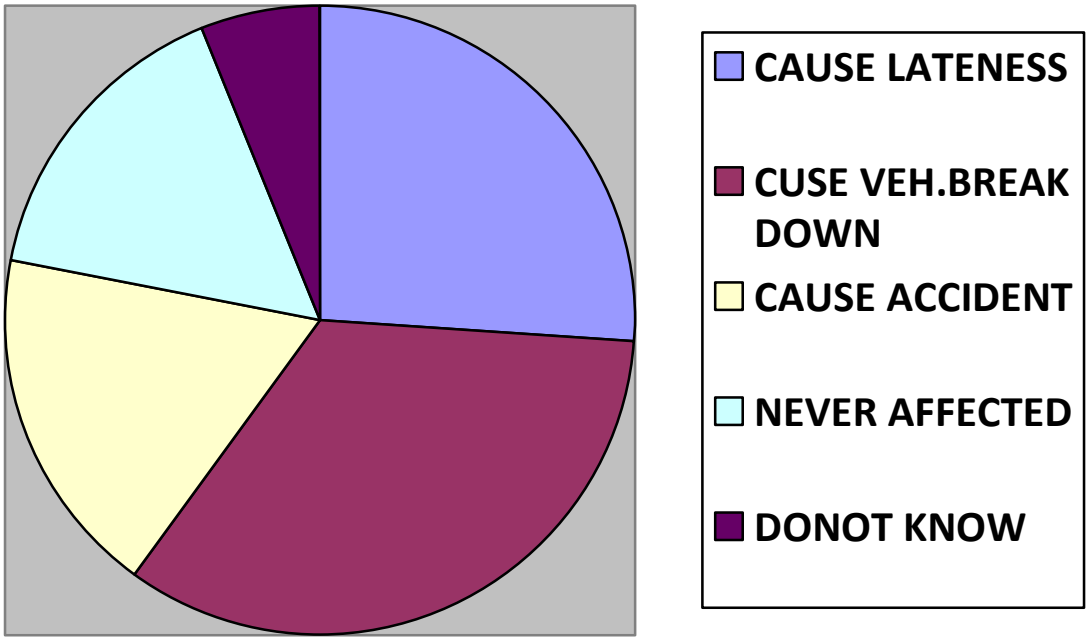

FIGURE 4.1. 7

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIOS

5.0 INTRODUCTION

In this chapter, the findings of the study will be discussed. This will be done by interpreting and explaining the data obtained from the road users. Whereas the conclusion will be drawn from the discussion of the findings then make recommendations for better road traffic management through information utilization.

5.1 SUMMARY

The study was conducted to investigate information utilization in urban traffic management and control (UTMC) system within Sabon-Gari, Zaria. Information utilization here means usage of all the available traffic signs by road users to avoid congestion, while traffic management is the reduction of congestion, creating safety and improving economic and social wellbeing. The study review the relevant literature of some concepts and the frame work, this has been done in order to lay a basis for the research. The drivers(road users) aroud Sabon-Gari, Zaria has been used as the population of the study.

Questionnaires were used as the instrument for data collection. The study discovered that:

1 - Most road users have been involved in traffic congestion,

2 –The sources of traffic information is road signs and lights.

3 Drivers don’t always use road signs (information not utilized)

4–Road users need more traffic signs and light for traffic control

5 - Drivers strongly agreed that lack of sigs, lights e.t.c. cause traffic congestion

6 – Road users appreciate that traffic signs and lights reduce traffic congestion

7 - Traffic congestion cause vehicle break down

.

5.2 CONCLUSION

The study explain the information signs available along roads within Sabon-Gari, and how they are being utilized by the road users within the same environment, From the discussion of the findings, it was clearly shown that road users don't comply with the available regulations and signs, thereby causing traffic congestions, accidents and economic lost

5.3 RECOMMENDATION

From the above mentioned findings, the following measures are recommended:

1. Reconstruct current traffic patterns;

2• Predict future network conditions, including the impact of incidents;

3• Automatically generate VMS strategies; and

4• Display information on delays and route advice to drivers when alternative Routes are available.

BIBLIOGRAPHY

Aina L.O(2002) Research in Informtion Science, an African Perspective-Stirlin Hordan Publishers.(Nig.)Ltd

Ajegbomogun F.O (2008) Information availability and the extend of use in public library, Abeokuta, Borno library, archival and Information Science Journal7(1):65-74

American Heritage Cultural Dictionary (2002).

Association for European Transport and contributors
www.transport-research.info/web/projects/transport_themes.cfm

Brown A. (1999) Traffic Management Scheme, Glasgow City Centre MII , Lennium Plan Glasgow City Council

Catherrin D.(2002) Research Method –Delhi U.B.S Commission of the European Communities (2001), "European Transport Policy for 2010: Time to Decide", White Paper. COM (2001) 370, Brussels

Commission of the European Communities (2006a), "Keep Europe moving – Sustainable mobility for our continent", Mid-term review of the European Commission's 2001 Transport White Paper. Communication from the

Commission to the Council and the European Parliament. Brussels, 22/06/2006, COM(2006) 314 final Commission of the European Communities (2007), "Towards a new culture for urban mobility", Green Paper. COM (2007) 551, Brussels

Federal Republic of Nigeria(2004),National traffic regulation, Federal Road Safety Corps(FRSC)Nigeria (2007), Nigerian Highway Code

Federal Road Safety Corps(FRSC) Nigeria (2010), Road Mirror (Research Monograph No.2)

FOLDOC Computing Dictionary (2005)

Graham A. Keily I and Silcock P.(2006) Oscar Faber Transportation paper presentation

Highways Agency (2008), "Better managed motorways and more funding to tackle Urban congestion", UK Highways Agency.

www.highways.gov.uk/news/pressrelease.aspx?pressreleaseid=158587 i2010 (2009).

http://en,wikipedia.org/wiki/Sabon_Gari

Kothari C.R.(2010) Research Methodology, Method and Technique(2nd ed.) New Int. publishers

Malcolm A. (2010) Urban And Inter-Urban Provision Of Journey Times , City Of Edinburgh Council , Andrew Reid Halcrow Group Limited Association for European Transport and contributors Manager, Southampton University Hospitals NHS

Nielsen G.(2006) Integration Or Segregation – Recommendations Of The Principles Of Urban Road Network Design For The Sustainable City, Civitas

Consultants As, Oslo OMNI (2003), Open Model for Network-wide

Heterogeneous Intersection-based Transport Management – Final Report, OMNI Project, FP526

PRISCILLA (2002), Bus Priority Strategies and Impact Scenarios Developed on a Large Urban Area – Final Year 1 and 2". PROMIT

Peden S. (2001) Traffic Demand Management In Action! Travelwise Development

Radia B. (2009)UTMC Systems : Policy Development And Review , UK Department of Transport

RBC (2007), Press Release: Reading Area Transport Information Network. Reading Borough Council.

www.reading.gov.uk/news/pressreleases/PressArticle.asp?id=SX9452-A7825870 Ribeiro A.{2010 (FCTUC)} Traffic Management and Restraint

Rivar S., Benoit a. , Michel A. Guy P and ,Smith H.A(2010).
Roads and Maritime Services (RMS) (2012) Road Users' Handboo website at **www.rms.nsw.gov.au**

Shaikh F. K., Khelil A. , Ali A. and Suri N. (xxxx) 'Reliable Congestion-Aware Information Transport in Wireless Sensor Networks', *Int. J. Communication Networks and Distributed Systems*, Vol. x, No. x, pp.xxx–xxx.

SENSOR (2004), Secondary Road Network Traffic Management Strategies, "Handbook for Data Collection, Communication and Organisation" –Final Report. SENSOR Project, FP5, Deliverable D10.1

Winder A. and Brackstone A. (2009). "European Transport Policy for 2010: Time to Decide",White Paper. COM (2001) 370, Brussels Site and

Marco Antognoli (DITS – Sapienza Università di Roma), European Communities, 2009 Commission of the European Communities (2001),

QUESTIONNAIRE

DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE
AHMADU BELLO UNIVERSITY, ZARIA.

Dear respondent,

I am a Postgraduate student of the above mentioned department. I am conducting a research on information utilization for network management in urban traffic management and control(UTMC) system.

Your objective opinion on the issue(s) raised will be highly appreciated. Any information given will be treated with high degree of confidentiality it deserves.

Yours sincerely,

Ahmed Mu'azu

APPENDIX 1

INSTRUCTION

Please answer the following questions by ticking in the appropriate box space provided against each question.

PART ONE

1.Name of Response: ……

2. Address: …….. ……

…….. ……

3. Sex: □ Male □ Female

4. Occupation:

a.□ Farmer b. □ Civil Servant c. □ Trader d. □ Student e. □ Driver of (i) □ car (ii) □ truck □ Others

5. What type drive are you ?

a.□ Private b.□ Commercial c.□ Official

6. How long have you been driving ?

a. □ Less than 1 year b.□1 year c. □ 1 - 5 years d. □Above 5 years

7. What kind of vehicle do you use mostly ?

a. □ Motorcycle b.□ Car c. □ Bus d. □ Heavy vehicle

PART TWO

1. Have you ever been involved in traffic Congestion ?

a. □ Yes b. □ No

2. What are the source of information do you use to avoid traffic congestion ?

a. □ Traffic law enforcement b. □ Road signs for vehicle c. □ Automated traffic light, signals, warnings and information

3. Do you always Utilize traffic signs along roads? a. □ Yes b. □ No

If "Yes": How do you usually use traffic signs while driving?

i. □ Always ii □ Not Always iii. □ Not at all

4.What are the type of Information needed to reduce/control traffic congestion ?

a. □ Need more traffic Law Enforcement to control operation.

b. □ Need much more education/campaign for inhabitants, particularly for school

c. □ More additional traffic information and warning sign.

d. □ Need more safe facilities such as signal, marking and lighting, especially at intersection

5. What is your assessment of the following means of traffic congestion control ?

a. Traffic law enforcement: □ Highly satisfied □ Just satisfied □ Satisfied

□ Not Satisfied

b. Traffic control & regulation: □ Highly satisfied □ Just satisfied □ Satisfied

□ Not Satisfied

c. *Road signs for vehicle*: □ Highly satisfied □ Just satisfied □ Satisfied

□ Not Satisfied

d. Road marking, signal, lighting: □ Highly satisfied □ Just satisfied □ Satisfied

□ Not Satisfied

6. Does lack of traffic light, signs and control cause congestion along roads ?

□ Strongly agreed □ Agreed □ Strongly agreed □ Do Nοτ agreed □ Do Nοτ agreed

7. How does traffic congestion affect your trip ?

□ Cause lateness □ Cause Veh. Break down □ Cause accident □ Never affected

□ Do Nοτ Know