

UNIVERSITY OF NAIROBI
SCHOOL OF COMPUTING AND INFORMATICS

**UTILIZING ICT TO REALIZE COMMUTER NEEDS IN THE NAIROBI
TRANSPORT SECTOR**

BY

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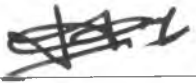
This report is submitted in partial fulfillment of the requirements for the Master of Science in Information Systems degree.

Declaration

I hereby declare that this project is of my own composition, and that it contains no material previously submitted for the award of any other degree. The work reported and done in this project has been executed by myself, except where due acknowledgement is made in the text.

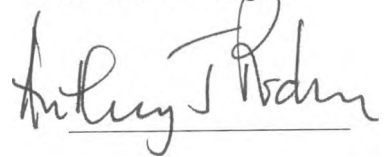
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H. O. Nyamboki.

ABSTRACT

This study covers issues (albeit in general terms) of Information Communication Technologies (ICT) as could be related to the transport sector in areas of infrastructure planning, development and management, public services, legal provisions, institutional and regulatory frameworks, safety and security, funding, gender mainstreaming, and environmental considerations, among others for purposes of examining possibilities of using it to improve socio-economic well-being of all stakeholders. The secondary aim of the study is; to create an awareness which may lead to the promotion of effective interest by stake holders in ICTs and possibly leading to the establishment of enabling frameworks to nurture the development of a safe, efficient and affordable commuter transport system, whilst keeping a leading edge of technological advancement in a rapidly changing local and global environment. The vision is to have a digitally driven and smart transport sector in Nairobi that is optimally integrated and responsive to the needs of all Nairobians. ICT, however, cannot bring about the stated benefits without proper, diligent, effective and efficient collaborative all-inclusive systems. It would work in an environment well beyond its confines yet it can be a link for harmony, growth, development, tranquillity and prosperity amongst and between multiplicities of transport sub-sectors. Basic understanding of the environment in which the ICT is to be implemented is essential and the author started with the survey of the wider Nairobi before getting into the case study for illustration. He has also drawn conclusions from the study and pointed out the proposed way forward which if implemented would contribute to the upholding of the integrity and dignity of most Nairobians.

The study report starts with the introduction stating the objectives, motivation, challenges, methods used and project justification. Next, it deals with situation analysis of the area of study in which the author examined the historical perspective, urban growth in Kenya in general, the role of local authorities in Development, the legal-institutional and regulatory frameworks as related to the transport sector and common factors that influence demand for transport.

The next section is the launch into the case study namely; *the Nairobi commuter*. Here the approach is defined. Details showing the data collection instruments, that is, the commuter survey questionnaire, discussion about the steps taken to implement the survey including establishment of sampling frame, data collection and the processing of the same are covered.

Before dealing with the results of the survey, some observations were made in the course of the surveys which have been detailed in the section that follows. The observations covered include: poor quality of transport services, inappropriate transport modal split, unexploited Regional role of the existing transport systems, lack of integration of the existing transport systems, environmental pollution, lack of vision and a number of institutional deficiencies.

The results of the Survey point to the need for an information repository thus vindicating the hypothesis of the study. However a number of challenges were noted and to address them, the author made a few recommendations for action by various authorities. These recommendations include: integration of transport sector with other developments not only in the city but in the region, establishment of transport services standards and maintenance of the same, improvement on safety and security, sustainable environmental issues and most importantly, the development/training of human resource capacities to diligently handle the issues of the city transport sector.

Finally the author designed and implemented a prototype website to show that the recommendations can be implemented in practical terms. The website took into account some needs for information (from the point of view of the commuter) pertaining to the driver, conductor, vehicle owners, operators, routes, PSV movement schedules among others. The implementation illustrates how the operations of the Public Service Vehicles could be streamlined by use of the available ICT tools thus proving the hypothesis that “if information communications technologies are integrated into the Transport sector in Nairobi, it would contribute positively to the socio-economic development of all stakeholders.”

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1. INTRODUCTION

In October 2004 the following project proposal was approved by the academic panel, the school of computing and informatics, for research by the author: **"If information communications technologies (ICTs) are integrated into the Transport sector in Nairobi, it would contribute positively to the socio-economic development of all stakeholders in the city."** (Case study: The Nairobi Commuter)

1.1 Objectives of the case study.

The Author selected for survey, "the Nairobi commuter" as one of the stakeholders (as shown in figure 1 below). At the end of the study it should be possible to provide answers to the following questions:

- 1.1.1. Whether indeed there is need for information repository (ICT) for efficient and effective transport sector operations in Nairobi,
- 1.1.2. What information do the stakeholders need and possibly for what purpose,
- 1.1.3. Can it be implemented cost-effectively, timely and within reach of the stakeholders,
- 1.1.4. Would it make tangible contribution to the intended stakeholders' socio-economic well-being,
- 1.1.5. Is the ground ripe for ICT implementation; if not, is there a way out of this undesirable situation.

The study, therefore, covers issues (albeit in general terms) of Information Communication Technologies as could be related to the transport sector in areas of infrastructure planning, development and management, public services, legal provisions, institutional and regulatory frameworks, safety and security, funding, gender mainstreaming, and environmental considerations, among others for purposes of improving socio-economic well-being of all stakeholders. The secondary aim of the study is to create an awareness, which may lead to the promotion of effective interest by stake holders in ICTs and thus enabling a framework to nurture the development of a safe, efficient and affordable commuter transport system, whilst keeping a leading edge of technological advancement in a rapidly changing local and global environment. The vision is to have a smart transport sector in Nairobi that is optimally integrated and responsive to the needs of most Nairobians. ICT however, cannot bring about the stated benefits without proper, diligent, effective and efficient collaborative all-inclusive systems. It would work in an environment well beyond its confines yet it

can be a link for harmony, growth, development, tranquility and prosperity amongst and between multiplicities of sectors.

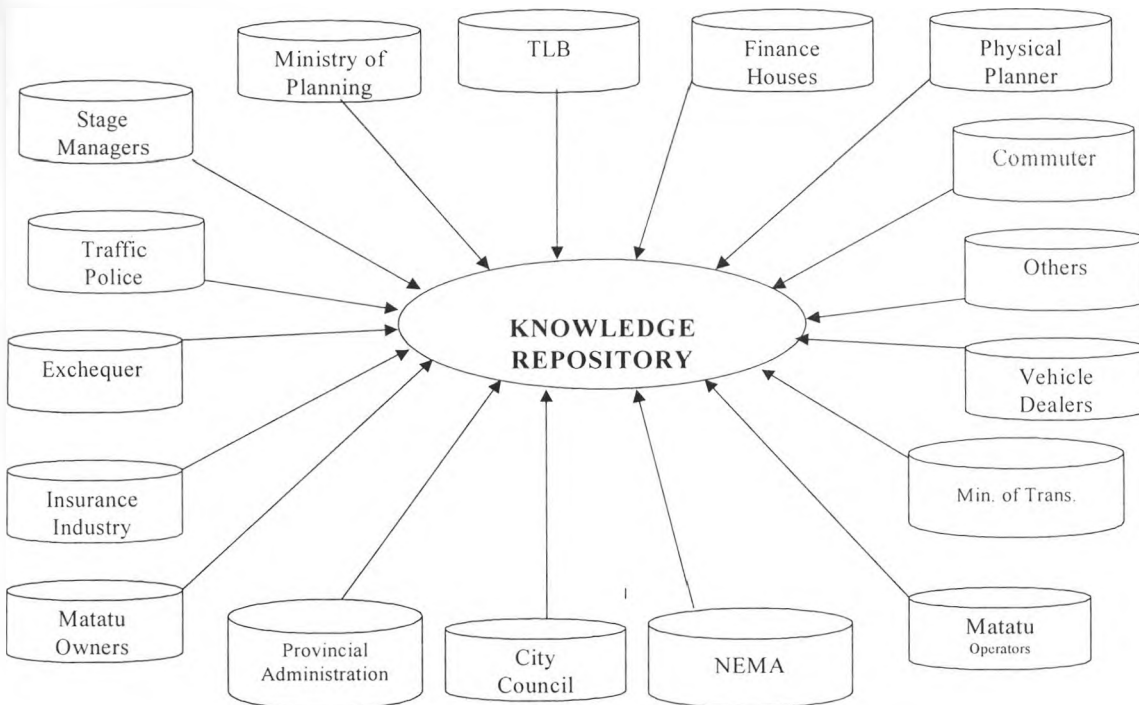
Basic understanding of the environment in which the ICT is to be implemented is essential and the author has start with the survey of the wider Nairobi environment before getting into the case study for illustration. The author has drawn conclusions from the study and pointed out the proposed way forward to uphold the integrity and dignity of most Nairobians to the honor and glory of the Creator of humans.

1.2 The targeted audience includes:

- 1.2.1 Residents in Nairobi
- 1.2.2 The central Government of the Republic of Kenya (Gok)
- 1.2.3 Development partners with Gok
- 1.2.4 The Urban Authorities in Kenya
- 1.2.5 Researchers and members of the academic community
- 1.2.6 Financiers
- 1.2.7 Insurance corporations
- 1.2.8 Auto manufacturers and dealers
- 1.2.9 Roadside kiosk owners and operators
- 1.2.10 Handcart users and fabricators
- 1.2.11 Commuters and other road users.

See Figure 1 below and please note that the list is not exhaustive.

Some Targeted audience or Stakeholders



3

Figure 1 Showing potential users of the proposed central information repository

1.3 The motivation for the study:

1.3.1 A desire for promotion of a safe, reliable, effective, well coordinated, integrated and environmental friendly Transport system.

1.3.2 An opportunity to relate the theory learned by the author to practical- real life situation in the city of Nairobi.

1.3.3 Contribute to the body of knowledge upon which others may build further knowledge.

1.3.4 To the uplifting of commuter dignity by exposing available opportunities for exploitation,

1.3.5 In partial fulfillment for the award of Master of Science Degree in information systems.

1.4 The Challenges faced during the study:

1.4.1 Limited financial resources

1.4.2 Lack of synergy across Government ministries and other stakeholders,

1.4.3 Inadequate data for Information Communication Technologies (ICT) planning;

1.4.4 Limited legal framework to deal with emerging ICT opportunities

1.4.5 Inadequate local human and capital capacity to exploit ICT/ transport sector resources;

1.5 Methods Used:

1.5.1 Literature survey

1.5.2 Face to face interviews

1.5.3 Observations

1.5.4 Questionnaires

1.5.5 Implementation of case study findings (Prototype)

1.6 Project Justification:

1.6.1 The situation is current, urgent and relevant especially at this time when the only formal Kenya Bus Company in Nairobi has collapsed leaving the Nairobi public commuter services situation in chaos.

1.6.2 Apart from the Kenya Government, nobody is possessed of both the resources and power to bring about the desired changes to this sector. The study is believed to draw the attention of the Government to this critical factor for appropriate action.

1.6.3 The globalization effects are present in Kenya and must be responded to by all interested parties. The study is intended to provoke a lively debate regarding the issues raised and an exploration of more possibilities by stakeholders in the sector.

1.7 The situation analysis

Good transport systems are an important prerequisite in facilitating national and regional integration, promoting trade, economic growth, and poverty reduction. Nairobi, being part of this region, is bound by the activities in the region, and the general understanding of regional environment is important in this study. It is important to appreciate that no one; apart from the Government (which also would ordinarily seek for internal/external partnerships) has all the resources to singularly undertake all the issues in this sector to the satisfaction of all interested parties.

The transport sector, in the context of this study, consists mainly of the following modes:

- Road transport;
- Rail transport;
- Maritime and Inland Waterways transport;
- Pipeline transport;
- Air transport; and
- Non-motorized and Intermediate Means.

Before making any entry into detailed study and subsequent observations, the author has carried a brief survey relating to Nairobi City and environs as given below:-

- The historical perspective of Nairobi
- The general urban growth characteristics in Kenya
- Reference to the non-attendance to non-motorized mode of transport; a strong feature in Nairobi
- Examined the role of Local Authorities in Kenya (and Nairobi) in respect to transport sector
- Looked at the existing legislation pertaining to this sector in Kenya in general
- Looked at factors that generally influence demand for transport.

On the basis of this Preliminary survey, the author has made some observations, which are discussed in section 3 of this paper. The essence of this survey is the need to understand and appreciate the environment of the subject matter of the study.

1.7.1 Historical Perspective

Historically, the road network in Kenya was developed as a subsidiary of the East African railways system which was meant for the transportation of bulk commodities over long distances to and from Uganda and other inland locations in the region. Roads were used as a link between the railways and the large scale farming areas. The forces of occupation, which was during colonial days, did not accord any interest to rural areas beyond their own. Therefore, the government of Kenya, after independence, undertook the following:

- It developed special purpose roads to serve specific economic activities such as tea, coffee, tourism and sugar.
- Selective bituminization of heavily trafficked trunk and primary roads and upgrading of priority earth roads to gravel standards in the late 1960's and early 1970's.
- Constructed farm-to-market rural roads under the Rural Access Roads Programmed from 1974 to 1986. The purpose of this was to provide access to social and administrative facilities, promote agricultural development and create employment opportunities.
- Improvement of low-trafficked secondary and minor roads under Minor Roads Programme from 1986 to link rural access roads to higher class roads.
- Enhancement of heavily trafficked secondary & minor roads under the Graveling, Bridging and Culverting Programme in the 1970's & 1980's.
- Introduction of public road tolls for road maintenance in 1984/85.
- Introduction of axle load controls in 1986, fuel levy and transit tolls for road maintenance in 1994 and spot improvement of non-maintainable road sections using a combination of labor and equipment under the Roads 2000 approach.

The Nairobi metropolitan growth strategy (recommendations), May 1973

Immediately after independence, Nairobi was a city with a well-planned and controlled physical development that was linked to strong economic planning and accountable/transparent governance. Although it lacked racial equality, it had growth mechanisms that worked well both regionally and internationally. It rendered effective urban services including secure, safe and clean environment.

Between 1970 and 1973, the Government of the Republic of Kenya in partnership with United Nations commissioned a study to formulate a growth plan for the City of Nairobi. The report presented a strategy for

the development of Nairobi for the next thirty years to the year 2000. It was distinguished from other plans at the time, in being comprehensive rather than piecemeal as its proposals covered the use of land, highways and public transport; addressed the needs of the city's central business area, housing programmes and employment promotion. The proposals fitted together in a logical whole.

The report gave the basis for solving the current and future City problems. It called upon the City fathers to agree on a strategic plan of the city before planning for an efficient system of roads, public transport and to avoid the haphazard spread of the city in all directions. Lack of strategy (according to the report), would not allow for orderly building of transport facilities economically and conveniently since the users of the roads and buses would be too widely scattered. The same would be true for schools, health centers and other city services and facilities. The recommendations of this report were based on population projections and economic analysis as well as related to projections for Kenya as a whole and to the development policies of the Government at the time and as would be expected in the future. The successes of the proposed policies, as believed, would lead to the growth of Nairobi in an orderly way and that the city's tasks of building the necessary infrastructure for the people of the city would thereby be easier. The authors of the report also appreciated the Government's wider role to all citizens including those in rural areas and other urban centers, as any slow-down in development of the rest of the country would increase problems such as migration to Nairobi.

Although the strategy for the growth of Nairobi was given government approval, it was never seriously implemented because of inadequate finances, lack of patriotism, necessary skills and lack of political will.

The situation run out of control and gave in to the chaos currently reigning in the city namely:

- Uncontrolled urban sprawl
- Uncoordinated and disintegrated land use
- Congested industrial and commercial centers (Westlands, Nairobi West, Old Industrial area etc)
- Lack of service standards
- Lack of friendly and efficient public transit systems to cater for non-motorized commuters, busing lanes, embarking and disembarking slots, school children and physically challenged persons
- Lack of suitable and comprehensive parking

1.7.2 Urban Growth

Urbanization in Kenya has been growing rapidly since independence but without being met with commensurate infrastructure and services. In Nairobi, Urban transport could be said to be the key means of giving expression to policy initiatives in such areas as health, education, commercial and industrial activities. Currently, Nairobi transport is facing challenges of fast growth rate of population and spatial growth, low and unstable revenue base, low and uneven income levels among the inhabitants and high rate of growth in vehicle ownership among a small but significant minority while the majority remains captive to poorly provided public transport and non-motorized means of transport.

The urban centers are also experiencing increasing health problems associated with traffic pollution in their areas due to lack of mitigating measures. As reported in the local media one or two years ago, a survey of commercial, industrial and residential areas in Nairobi showed that Total Suspended Particles levels in most of the City are above World Health Organization recommended levels. Most of the City's eastern residential areas and the City Centre are within the "hot zone" with the highest concentrations of Total Suspended Particles. It has been further reported through the media that a study carried out in Nairobi showed over 30% of diagnosed cases in health centers were related to upper respiratory tract infections.

1.7.3 Non-motorized means

Although the Government of Kenya (GoK) has stated its commitment to the promotion of non-motorized and Intermediate Means of Transport (NMIMTs) as a strategy for poverty reduction, it has not vigorously pursued this policy. Considering the critical role NMIMTs could play in the development of rural and urban transport for both passengers and goods, there is need to re-examine this mode and provide guidelines for promoting it in collaboration with other modes so that its potential can be realized.

It is estimated (from the case study) that 40% of Nairobi residents walk to their places of work while only about 4% use bicycles to reach their places of work. Bicycle traffic popularly known as "Boda Boda" is used more in the smaller towns and in rural areas where the terrain permit because it is relatively safer to use. In addition to poor and deteriorating road conditions in Nairobi, there is lack of other road infrastructural facilities like footpaths for pedestrians to make walking safer, separate lanes for cyclists or non-motorized transport modes (NMTs), fly-overs, sub-ways and bypasses to ease traffic congestion.

1.7.4 Role of local authorities

Although local authorities, ranging from the Nairobi City Council to county and urban councils, are expected to be responsible for the provision and maintenance of urban infrastructure, including roads; nearly all of

them have been experiencing critical financial constraints, poor resource management and lack of quality personnel in most specialized areas. The rest is a pathetic state of affairs.

1.7.5 Legal, institutional and regulatory frameworks

The transport sector has been affected by numerous statutes as shown in the summary below. This falls into two broad categories namely

- Overarching statutes
- Sector specific legislation.

In their operation, a number of things are readily apparent. First, many of these statutes are outdated or in need of urgent review to deal with inconsistencies that hamper the effective functioning of the institutions they create. Secondly, the State Corporations Act affects all state corporations and is a hindrance in the functioning of these key organizations.

It is encouraging to note that a number of amendments have been proposed in the state corporations sector. The Privatization Bill sets out the framework for privatization of public entities in Kenya. It will have a major impact on the efforts to involve the private sector in the transport industry.

Summary of Statutes and Regulations Governing the Transport Sector in Kenya

Description

Statutes and regulations

➤ Overarching Statutes

- The Constitution of Kenya
- The Kenya Police Act
- The Administration Police Act Cap 402
- The Way leaves Act cap 292
- The State Corporations Act
- The Environmental and Management Co-ordination Act 1999
- The Kenya Revenue Authority Act
- The Insurance Act
- The Exchequer & Audit Act, Cap 412

➤ **Rail Transport**

- The Kenya Railways Corporation Act Cap 397
- The East African Inland Water Transport Act

➤ **Pipeline Transport**

- The Petroleum (Exploration and Production) Act Cap 308

➤ **Air Transport**

- The Kenya Airports Authority Act Cap 395
- The Kenya Civil Aviation Authority (Amendments) Act 2002
- The civil Aviation Act Cap 394
- The carriage of Goods by Air Act

➤ **Shipping, Maritime and Inland Waterways Transport**

- The Kenya ports Authority (Amendment) Act
- The Carriage of goods by sea (Amendments) Act Cap 392
- The Fisheries Act Cap 478
- The Lakes and Rivers Act cap 409
- The Ferries Ordinance Act Cap 410
- The Marine Insurance (Amendments) Cap 390
- The Mtwapa Bridge Act Cap 402
- The Judicature Act Cap 8
- International Maritime Conventions

➤ **Road Transport**

- The Transport Licensing Act Cap 404
- The Kenya Roads Board Act 1999
- The Road Maintenance Levy Fund Act 1993 as amended in 1994
- The Public Roads Toll Act, Cap 407
- The Finance Bill 1997
- The Public Roads and Roads of Access Act Cap 399
- The Local Government Act Cap 265
- The traffic Act Cap 403

- The streets Adoption Act Cap406
- The Road Authority Ordinance 1961
- The Valuation for Rating Act, Cap 266
- The Rating Act Cap 267
- The Wildlife Management & Conservation Act
- The Central Road Authority Act
- The Local Authority Transfer Fund, 1999
- The Agriculture Act
- The Physical Planning Act, 1996
- The Local Authority Service Charge Act Cap 274
- The Transport Licensing Act Cap 404
- The Kenya Roads Board Act, 1999

The challenge is the lack of co-ordination and collaboration between various statues for harmony.

1.7.6 Common factors influencing demand for transport

The demand for transport infrastructure and services is influenced by changes in the population's purchasing power, cost of inputs, demographic shifts, regional and International trade patterns, strategic considerations related to nation building, National defense needs and changes in the global transport industry. The following is a review of a few of them:

➤ **The economy**

In an effort to address the country's socio-economic challenges, the GoK formulated the **Economic Recovery Strategy for Wealth and Employment Creation 2003-2007 (ERS)**. The ERS identified the transport sector as the third pillar of the Economic recovery effort, which aims at raising annual GDP growth rate from 1.1% in 2002 to 7% in 2006. During the same period, the transport sector is expected to grow at an average annual rate of 6.26%. Further, the transport industry is expected to reduce poverty levels by half by the year 2015, thus assisting in overall improvement of human welfare. A vibrant economy will positively affect all sectors including transport.

➤ **The population**

In the early years of independence, Kenya held the distinction of having the highest population growth rate in the world at 4.7% p.a. Through planned interventions such as family

planning and the HIV/AIDS pandemic, this growth rates have come down to about 2.2% p.a. and are projected to stabilize at about 2.5% p.a. by 2020. The numbers will continue to rise and by 2030, Kenya's population is projected to have grown to 62.6 million persons, with the urban areas accounting for 37.2% of this Population. By this time, Kenya will be on the verge of becoming an urbanized country. In terms of transport, this means that Kenya has to start providing the required urban transport facilities and services to capture the efficiencies inherent in modern urban centers. This is important if we are to avoid the current transport chaos evident in urban areas. It is reasonable to say that the higher the population, the higher the demand for transport services and vice versa.

➤ **Fuel consumption/cost**

Consumption levels of fuel for transport services provide a good indicator of the transport sector output. According to Mr. P. K. Lang at (Deputy Permanent Secretary) of the Ministry of transport, demand for motor spirit and light diesel, which account for almost 50% of petroleum product demand, has gradually risen over the period 1997-2004. The increase in the use of fuel oil and light diesel from 1999/2000 was primarily because of the drought during this period and the subsequent use of the fuel in electricity generation, besides increased mobility by population.

An important consideration in this rising trend in fuel consumption is the lead and Sulphur content of fuels used. This not only has implications on the health of the population but also contributes to the emission of green house gases (GHG) and negatively affects the environment.

Ideally, efficiency of vehicles in reducing GHG is expected to increase in tandem with improvements on motor vehicles technology. However, the reduction may be slowed by increased importation of second hand vehicles, and the vehicle owner's deplorable maintenance habits. It is also known that many vehicle engines are poorly tuned, leading to higher output of hydrocarbons.

Availability, affordability and efficiency pertaining to the means of transport all affect the demand for transport services.

Use of an effective and efficient public transport would discourage use of private means of transport thus positively contributing to ease of traffic congestion, cleaner environment, and lower accident levels and saving on fuels consumption at a National level.

➤ **Regionalization**

In an effort to address its socio-economic challenges and within the current globalization context, Kenya has adopted an export led strategy. In fact, the common market for Eastern and Southern Africa (COMESA) region has overtaken the European Union as Kenya's largest trading Partner. In addition to this, efforts are being made to achieve Customs Union between the three East African states of Uganda, Tanzania and Kenya. It is anticipated that Rwanda and Burundi could join this effort. The envisaged borderless region, with unrestricted movement of people and goods will create pressure on the urban centers in Kenya and consequently their transport needs.

Further, with current and anticipated regional transport arrangements, there will be a need for harmonized tariffs regulations within the context of an integrated regional Transport system. The attendant requirements for acceptable institutional systems for developing, operating and managing them will need to be addressed. Thus, regional approaches to transport investment will become crucial and the need for multiple/sectoral integration including ICT cannot be minimized.

➤ **Strategic national considerations**

There are parts of Kenya, which are currently not well served by the transport network. Therefore, in an effort to increase the level of accessibility within these areas and also to connect such parts to the wider national economy, additional transport infrastructure will need to be built. Demand for transport infrastructure services will go up. In the development of the additional network, social-economic and environmental considerations will be taken into account.

➤ **Globalization of customers and carriers**

International consumers of transport services are demanding high service levels, while operators are consolidating globally to meet needs of global customers. The design and operation of the transport system should allow high transport quality for industry. Enabled by the advent of sophisticated it's and accompanying transport logistics, global and local manufacturers are increasingly sourcing their production from multiple sources around the world. This, along with other global trends, creates a cycle of increased demand for high precision, flexible, integrated transport services that deliver not only to domestic factories but also to multiple foreign locations.

Current players include DHL, UPS, Securicor and Nation courier services. The long haulage companies such as Akamba, Coast Bus Services, BusCar, and Eldoret Express also play a part.

2. METHODOLOGY

2.1 Approach

The approach to studying the commuting population through the existing Enumeration Areas (EA's) was considered to be the best option because all the public service vehicles (PSV) emanate from or ply through the estates to pick and drop commuters. Due to inherent variability in the behaviors of PSV operators along different routes, the city stratification (explained below) enabled controlling for the diversity in the population of Nairobi, and hence provided relatively realistic situation along the routes.

2.2 Data collection instruments

A face-to-face interview approach was used in the collection of data. This was through a structured questionnaire appropriately designed for PSV commuter issues. The questionnaire was composed of 8 sections as follows:

- a) Identification information of the respondent
- b) General information on the respondent (mostly demographic)
- c) PSV operation details
- d) Particulars of the vehicle
- e) Details of the driver
- f) Details of the conductor
- g) Details of the owner of the vehicle and

2.3 The Survey

2.3.1 Recruitment and Training of the interviewers

Identification of the interviewers was based on academic and professional qualifications. Six interviewers were recruited from a group of candidates through interviews. The interviewers were trained on the issues of the survey and questionnaire. They carried out mock interviews before participating in the pre-test and the main survey fieldwork.

Pre-test and finalization of the questionnaire

The questionnaire was pre-tested in non-survey areas by the interviewers before the main survey. Each of the interviewers conducted 10 interviews resulting in 50 interviews.

2.3.2 Sampling Frame

The sample for commuters' survey was drawn from the households of Nairobi to get a representative sample. Particulars of the households were extracted from the Kenya 1999 Population and housing census Volume 1 dated January 2001 using details as obtained from the Central Bureau of Statistics, Nyayo House in Nairobi (See Appendix 11). The Enumeration Areas (EAs) created for the 1999 Population and Housing Census in Nairobi formed the sampling frame for this study. Using this, a probability sample was generated and enabled making estimates on the commuting population. The EAs formed the primary sampling unit for the survey.

2.3.3 Stratification of the city of Nairobi (adopted from Central Bureau of Statistics -CBS)

There are various reasons why stratification is applied in this sampling application:

- a) Reduce variances of sample estimates (limitation of bias)
- b) Employ different methods and procedures within the strata
- c) Use the strata as domains of estimation and
- d) Facilitation of administrative convenience.

For this case study, it was necessary to sub-stratify because of the first reason, i.e. reduction of variances, due to extensive diversity apparent in the urban population. This has the effect of raising the sampling errors and hence reducing the reliability of the estimates. With sub-strata of the population, sample allocation is made to each sub-stratum and then sample elements are drawn independently to represent the population from the sub-strata. This results in great gain in the estimates of the commuting population parameters.

It was considered that Nairobi could be clearly segmented into five distinct categories. These categories were then allocated their own clusters to facilitate sample selection from the major areas with a view to increasing the precision of the estimates based on the sample. For the purpose of the sub-stratification, Nairobi was also stratified into the following five main distinct categories:

- a) Upper class
- b) Lower upper class

- c) Middle class
- d) Lower Middle and
- e) Lower classes.

Each of the categories had particular characteristics, which have been used to classify the EAs that will comprise them. It is to be appreciated that a clear-cut and watertight criterion for classifying the areas out-rightly on the ground does not exist. However, using information related to the location of the residential areas, the infrastructure around the areas and the perceived incomes of the residents, it was possible to clearly categorize the areas into the five distinct categories as above. The ultimate aim is to develop these structures so that we reduce the potential high variances that would negatively affect our estimates.

Since there was bound to be some arbitrariness in the assignment of the five categories to the areas of Nairobi in respect to diversity, it was necessary that a standard be conceived for each of the five categories. This was also considered to be convenient since it enabled all the members of the teams that participated in the exercise to visit all these areas and form an impression of the attributes that constituted them.

We shall now look at each category in the following sections and provide examples of the residential areas that constitute them.

2.3.3.1 Upper class Sub-stratum

This category embraces the most affluent segment of the population in Nairobi. It comprises areas with homes occupying own compounds and generally having well maintained roads around them. In most cases, the homes had large compounds and one observable feature was that many of them were manned by security either hired by the owners of the homes or provided by employers. The fences were well cared for and even sometimes reinforced with electrical protection. Alarm systems were evident on some of the houses and in some cases one had to drive along a driveway to enter the homes. In certain cases these homes had swimming pools, tennis court and even basketball play ground.

Examples of these are provided below. These served as models of the areas that would constitute this category of residential areas.

- a) Runda
- b) Muthaiga
- c) Lavington
- k). Hurlingham
- l). Rossyln Lone Tree
- m). Hardy

- d) Kitisuru
- e) Loresho
- f) Spring Valley
- g) Westlands (Residential)
- h) Karen
- i) Kileleshwa
- j) Highridge
- n). Kyuna
- o). Bomas
- p). Muthangari

2.3.3.2 Lower Upper class Sub-stratum

It was found necessary to create this category to differentiate it from the former because these areas had slightly different facilities around them. Even though they would accommodate equally wealthy members of the population, the compounds were generally smaller and were lacking some of the facilities evident in the first category.

- a) South B
- b) South C
- c) Southlands
- d) Langata
- e) Woodly
- f). Donholm
- g) Fedha
- h) Ngumo
- i). Adams Arcade

2.3.3.3 Middle class Sub-stratum

The middle class covered areas where there were no large compounds and luxurious amenities as observed in the first two categories. Generally, this category had most of the population located in the East-lands of Nairobi. They had relatively higher density of population in comparison to the first two and in most cases it was observed that the structures had not maintained the design that was developed when they were originally built.

- a) Buruburu
- b) Kahawa West (Old)
- c) Kimathi Estate
- d) Harambee
- e) Kariokor Flats
- f) South Kariobangi
- g) Pioneer
- l) Ngara
- m). Koma Rock
- n). Huruma Flats
- o). Ushirika Estate
- p). Juja Road
- q). Eastleigh
- r). Pangani

- | | |
|-------------------------|--------------------|
| h) Outering Road Estate | s). Park Road |
| i) Zimmerman | t). Kariokor Flats |
| j) Umoja I | u). Kimathi Estate |
| k) Kahawa West (Old) | v) Harambee Estate |

2.3.3.4 Lower Middle class Sub-stratum

This category was largely composed of the areas that could be termed as the ‘old Nairobi’. Most of them were built during pre-independence days and were won out due to age. Most of the members of the young elite population do not prefer to live there, due to the diminished face of the properties. However, there were quite a number of estates that were built after independence that fall in this category. Most of the houses in these areas have provision for one sleeping room; otherwise bed-sitters were not an uncommon feature. The following are some of the estates that comprise this category.

- | | | |
|------------------|----------------------|--------------|
| a) Huruma | h). Ziwani | n). Mbotela |
| b) Kariobangi | i). Starehe | o). Githurai |
| c) Muthurwa | j). Shauri Moyo | |
| d) Dandora Ofafa | j)(Kunguni, Maringo) | |
| e) Mathare North | k) Jericho | |
| f) Kayole | l) Jerusalem | |
| g) Kaloleni | m). Hamza | |

2.3.3.5 Lower class Sub-stratum

It should be noted that the categories listed earlier were largely formal planned settlements. There is the last category, which is largely composed of the informal settlements. This is also largely located in the East-lands of Nairobi city. It has characteristics that distinguish it clearly from the rest of the categories. The structures are largely temporary, made of mud-wall or timber-wall with cheap roofing materials, which may be iron sheets, makuti, grass or even nylon/plastic paper or cartons. The infrastructure in these areas is relatively poor as there is no proper sanitation, no clear roads for entry and even water is not connected to the dwelling structures. The areas listed below fall in this category.

- | | |
|---------------|-------------|
| a) Mkuru Kwa | e) Njenga |
| b) Korogocho | f) Soweto |
| c) Laini Saba | g) Kamuthii |

d) Mathare Valley

It is important to note that even though the categories above have been indicated to have some particular types of infrastructure associated with them, it does not imply that other kinds of dwelling facilities do not fall within their environs. It is characteristic that, close to most of the high-income areas, there are informal settlements. However, our consideration is what would be the mean in terms of the facilities among all the residents of the areas in the categories. However, where a slum is neighboring a class, which is higher, the slum within that locality will be identified and placed in its appropriate category.

2.3.4 Sampling Issues

For the exercise to be effective and hence produce as meaningful results as possible, it was important that the teams that undertook the exercise had an orientation of the exercise in the office for a period of three days. This put into perspective the attributes that enabled the creation of the categories above. Thus in the three days, each of the above categories were visited and adequate understanding developed through discussions and feedback from the participating teams.

2.3.4.1 Filtration of Sampling

For the purpose of this study, it was observed that the upper class would be inappropriate as most of the household members were found to be nonusers of PSV transport. For this reason this category was excluded from the sample. The rest of the categories later referred to as strata, provided sample for the survey.

2.3.4.2 The sample size

The sample size is a function of the key variable in the survey and the desired precision based on the confidence level desired for the estimates of the matatu commuting population parameters. In this study, the design of the survey was the stratified cluster sample, where the strata were the socio-economic categories mentioned above.

The sample size was estimated using the following formula:

$$n = t_{\alpha}^2 pqd_{ef} / \delta^2$$

In this formula n is the desired sample size, t_{α} is the value for the abscissa of the normal distribution curve at the 95% confidence level, p is the proportion of the observed characteristic of the key variable in the survey, $q=1-p$, d_{eff} is the design effect correction factor to adjust for the clustering effect and $\delta = 5\%$.

Where $t_{\alpha} = 1.96$, $p=0.5$, $q=0.5$, and based on experience of others, $d_{eff}=1.75$

$$n = \frac{1.96 \times 1.96 \times 0.5 \times 0.5}{0.05 \times 0.05} = 384$$

To minimize the variance as a result of using cluster sampling, we applied the design effect moderator of 1.75 to the above result =672.

On the basis of these parameters, the sample size for the survey was estimated to be 670 households.

Allocation of sample

The method of proportional allocation of the sample in stratified sampling was used to allocate the sample clusters to the four strata of the survey. Each cluster was allocated an equal number of 10 households. The allocation of 10 households to the clusters resulted in 67 clusters for the entire survey.

A brief illustration of the allocation strategy applied follows:

If N be the **total number of households** in the areas of the survey and N_h **the number of households in the h-th stratum**, then if n_h is the total number of households to be allocated to

$\sum n_h = n$ Then

$$n_h = \frac{N_h}{N} n$$

the h-th stratum such that

Illustration for Strata 2

$$n = 67$$

$$N_h = 17784$$

$$N = 618678$$

$$n_h = \frac{17,784}{618,678} \times 67 = 1.9 \text{ households}$$

Therefore the Proportional Sample allocation (n_h) would be equal to 1.9 for Strata 2, 7.8 for Strata 3, 34.6 for Strata 4 and 22.7 for Strata 5 as shown in the Table below.

2.3.4.3 Sample selection

The allocation of the sample was made on the basis of the sizes of the four strata for the survey. The size of the strata is the number of households in each of the stratum. The selection of samples was done in two stages. At the first stage, the EAs were selected from those existing in each of the stratum. The selection was done using the probability proportional to size. At the second stage from each cluster, households were selected systematically for interview. Systematic sampling method provided a random sample and hence representative of the population. As a consequence the following distribution of the sample was made:

Category	Stratum Household Population	Proportionate (EAs) Sample Allocation	Adjusted Sample Allocation
Second Upper	17784	1.9	8
Middle	72910	7.8	15
Lower Middle	318873	34.6	25
Lower	209111	22.7	19
Total	618678	67.0	67

Table 1 Distribution of the Sample by Strata

The adjusted ample allocation was made arbitrarily more so to balance the exercise.

2.3.4.4 Selection of the Clusters

Within each stratum the n_c allocated clusters were selected from the existing N_c clusters using the Probability Proportional to Size Method (PPS). The selection process was implemented using the excel spreadsheet. The list of the selected clusters, which indicates their administrative boundaries, is provided below.

No.	STRATUM	DIVISION	LOC.	SUB LOC.	EA NAME	EA CODE	No. HSEHOLD	POPUL.	
Stratum 2 Lower									
1	2	Westlands	Kitisuru	Kyuna	Kibangare	101060202003	164	504	
2	2	Westlands	Highridge	Highridge	Highridge	101060303019	154	575	
3	2	Westlands	Highridge	Highridge	Highridge	101060303039	183	680	
4	2	Westlands	Kilimani	Kilimani	Kilimani	101060501005	179	677	
5	2	Westlands	Kilimani	Kilimani	Kilimani	101060501026	92	256	
6	2	Westlands	Kilimani	Kilimani	Silver Springs	101060501048	86	263	
7	2	Westlands	Kilimani	a	Kileleshw	Githunguri	101060502013	78	285
8	2	Westlands	Kilimani	a	Kileleshw	Dikdik	101060502041	134	481

Stratum 3 Lower

1	3	Central	Ngara	Ngara West	Ngara West Buru Buru	101010502015	168	543
2	3	Makadara	Makadara Mukuru	Harambee Nairobi	Ph.Iv Nairobi	101020202023	111	592
3	3	Makadara	Nyayo	South	South 'B'	101020502007	106	414
4	3	Kasarani	Githurai	Githurai	Zimmerman Kenyatta	101030401061	149	547
5	3	Kasarani	Kasarani	Mwiki	Farm	101030701008	42	114
6	3	Kasarani	Kasarani	Kasarani Mukuru	Kasarani	101030702046	91	269
7	3	Embakasi	Mukuru Kwa Njen	Kwa Njenga	Mukuru Kwa Njenga	101040201024	253	1237
8	3	Embakasi	Umoja	Umoja	Market	101040301103	820	3501
9	3	Embakasi	Kayole	Komarock	Komarock	101040402020	131	757
10	3	Embakasi	Ruai	Ruai	Bondeni	101040801018	70	195
11	3	Westlands	Parklands Kenyatta/	Valley Golf	K.A.R.I.	101060102028	130	497
12	3	Dagoretti	Golf C Mugumoi	Course Mugumoi	Golf Course	101070602014	157	614
13	3	Kibera	ni Nairobi	ni Nairobi	Gikomba Madaraka	101080401017	357	779
14	3	Kibera	West Nairobi	West	Estate	101080501019	179	667
15	3	Kibera	West	South 'C'	K.P.A.	101080502033	89	382

Table 2 Selected enumeration areas for the

SELECTED ENUMERATION AREAS FOR THE COMMUTER SURVEY

Stratum 4 Lower

No.	Strata	Division	Location	Sub Location	EA Name	EA Code	No. of Hse Hold	Pop.
1	4	Central	Mathare	Mabatini	Mabatini	101010302017	579	2021
2	4	Central	Huruma	Huruma	Huruma	101010402011	378	1028
3	4	Central	Huruma	Huruma	Huruma	101010402065	1297	3864
4	4	Makadara	Makadara	Hamza	Martin Luther	101020201019	179	55
5	4	Makadara	Maringo	Ofafa Maringo	Ofafa I	101020302035	113	45
6	4	Kasarani	Kariobangi	Kariobangi North	Gitathuru	101030101061	130	39
7	4	Kasarani	Korogocho	Gitathuru	Ngunyumu Village	101030201039	175	59
8	4	Kasarani	Githurai	Githurai	Githurai	101030401046	81	23
9	4	Kasarani	Ruaraka	Mathare North	Mathare North	101030503034	253	72
10	4	Kasarani	Roysambu Mukuru K	Njathaini	Ngomongo }	101030603010	138	37
11	4	Embakasi	Njenga	Mukuru Kwa Njenga	Mukuru Kwa Njenga	101040201046	260	63
12	4	Embakasi	Umoja	Savannah	Muthaiga	101040302010	98	23
13	4	Embakasi	Kayole	Kayole	Kayole	101040401024	278	87
14	4	Embakasi	Kayole	Kayole	Kayole	101040401057	267	78
15	4	Embakasi	Dandora	Dandora 'A'	Dandora Phase I	101040601049	173	48
16	4	Embakasi	Dandora	Dandora 'B'	Phase Iii	101040602039	58	17
17	4	Embakasi	Dandora Eastleigh	Dandora 'B'	Phase Iv	101040602198	61	23
18	4	Pumwani	North Eastleigh	Airbase	Section Ii	101050101045	211	94
19	4	Pumwani	South	Eastleigh South	Eastleigh South	101050201011	563	1722
20	4	Pumwani	Bahati Westland	Kimathi	Kimathi	101050401027	305	86
21	4	s	Kangemi Westland	Gichagi	Rift Valley	101060401011	333	1089
22	4	s	Kangemi Uthiru/Ruthmi	Kangemi	Muchagucha	101060403058	318	96
23	4	Dagoretti	tu	Ruthimitu	Gachui }	101070301012	118	41
24	4	Dagoretti	Riruta	Riruta	Riruta Satelite	101070501060	400	1241

Table 3 Selected EAs

Table 3a Selected EA's

SELECTED ENUMERATION AREAS FOR THE COMMUTER SURVEY

Stratum 5 Lower

1	5	Central	Mathare	Mathare	Village 3 'A'	101010301015	655	1650
2	5	Central	Mathare	Mlango Kubwa	Mlango Kubwa	101010303017	485	1281
3	5	Makadara	Viwandani	Landi Mawe	Kaiyaba	101020401022	161	454
4	5	Makadara	Viwandani	Viwandani	Donholm	101020402033	380	881
5	5	Kasarani	Kariobangi	Baba Dogo	Baba Dogo I	101030102067	214	616
6	5	Kasarani	Korogocho	Nyayo	High-Ridge	101030202050	167	715
7	5	Kasarani	Kasarani	Mwiki	Mac./Mwiki	101030701024	99	326
8	5	Embakasi	Mukuru Kwa Njen	Imara Daima	Kwa Reuben	101040202046	287	776
9	5	Pumwani	Eastleigh South	Eastleigh South	Eastleigh South	101050201043	111	315
10	5	Pumwani	Kamukunji	Shauri Moyo	Upper Hill	101050501010	112	397
11	5	Dagoretti	Kawangware	Kawangware	Precious Blood	101070401010	107	306
12	5	Dagoretti	Kawangware	Kawangware	Centre/Ciuguini	101070401099	158	474
13	5	Dagoretti	Kawangware	Gatina	Kamitha	101070402057	114	260
14	5	Dagoretti	Riruta	Ngando	Key West 'B'	101070502019	193	606
15	5	Kibera	Kibera	Makina	Karanja	101080102036	158	499
16	5	Kibera	Kibera	Silanga	Silanga	101080103014	902	2401
17	5	Kibera	Laini Saba	Laini Saba	Laini Saba	101080601005	722	1956
18	5	Kibera	Laini Saba	Nyayo Highrise	Kibera	101080602012	207	527
19	5	Kibera	Sera Ngombe	Gatwikira	Gatwikira	101080701045	132	365

2.3.4.5 Selection of the Households for Interview

In each selected cluster, the allocated number of households was selected systematically, with a random start. Selection of the households was done at the office and the sample was assigned to the interviewers at the time of the field exercise. Strictly, there were no allowances for replacement of non-responding households. However, vacant structures after the listing was completed were replaced on consultation with the principal researcher. The list of the households selected for the sample appears in Table 2&3.

2.3.4.6 Field Data Collection

Data collection in the selected EAs was done immediately after the pre-test of the data collection tools. The teams visited the selected EAs in groups of 2 people and as such there were three teams. The collection of data lasted 10 days.

Three supervisors oversaw the field exercise and ensured the correct EAs were covered in the survey. They also edited the questionnaires on a daily basis to ensure there were no errors.

2.3.5 Data processing

The uniqueness of the survey required appropriate arrangements to be put in place so that it would be possible to make available the results within the shortest time possible once the data collection was completed.

Relying on experience by others showed that data entry parallel to the data collection would result in faster completion of the survey report. Also it would enable detection of any problems early during the data collection. The data processing and entry took four weeks.

The data capture was done in CSPRO. This is dedicated software to data entry for survey and census data. It enabled enforcing the appropriate controls to avoid invalid data entries.

2.3.6 Weighting of the Sample

The sample based on the selected EAs was not self-weighted and, therefore, it was necessary to weight the data to enable estimation of population parameters. The sampling scheme adopted above is probabilistic and as a result it yielded data that was representative of the population. The selection probabilities used in the estimation of the population parameters were used to expand the results of the sample to the population. The inverse of the selection probabilities gave the design weights for the EAs and the households.

2.3.7 Data Cleaning and Validation

The cleaning and validation processes were done during data entry process. While data cleaning was a continuous process even during report writing, efforts will be made to identify any invalid values within the data so that they are sorted out early enough.

2.3.8 Plan

The urgency of the project required that the analytical plan be drawn clearly at the design stage of the data collection tools. This enabled the analysis program to be developed early enough so that the writing of the report could start immediately the cleaning and validation was completed. In this respect it was planned that the syntax for the production of the tables was established to be satisfactory.

3. OBSERVATIONS MADE DURING SURVEY.

The following observations were made in the course of this study and it is believed that they will have implications in the quest to exploit ICT in the sector:

3.1 Poor Quality of Transport Services

Weak public and private institutions and low levels of investment characterize the transport sector in Nairobi. It operates in a physical environment of high levels of risk and socio-political context of extreme poverty. Overcrowded and inefficient public transport, with poor safety and security records, and unreliable service operations were found to be quite common. The Public Transport providers (PTP) are business rather than public service oriented. The Government does not provide any incentives to mitigate the high operating costs incurred by the operators. If this trend continues, the transport sector development would become unsustainable from economic, social and environmental points of view.

It was also noted that most PTPs had no operational schedule, their fares were erratic and expensive, caused air/noise pollution, had no provision to serve late and early commuters.

3.2 Inappropriate Modal Split

Due to its comparative advantage in terms of speed, cost, flexibility, and accessibility; road transport has emerged as the most popular mode of transport in Nairobi. Reflecting this popularity and increased realization of the Significance of road transport for development and poverty reduction in Nairobi, road development has continued to receive major attention of the successive governments since 1963. As a result, road transport has become the principal mode for both passenger and freight traffic. Please note that this positive remark relative to other modes of transport and does not in any way credit the authorities with efficiency and effectiveness in this sector. The following Challenges do exist:

- There are inadequate coherent strategies for development and operation of the sector e.g. poor transfer facilities for matatu passengers that are passing through CBD, utilization of small matatus is an inefficient way of using the limited urban infrastructure. Introduction of large modes of passenger carriage such as trams and high carrying capacity buses would be better.

- There is inadequate funding for capital, operations and maintenance. The Government would do better by introducing incentives in this sector targeting at enhancing quality of service.
- Institutional inertia brought about by lack of adequate human resource development and management.
- Lacking is adequate management and planning systems, appropriate information system back ups, adequate supervision of road construction and maintenance
- High road accident rate compared to motorization levels, lack of enforcement of traffic regulations, ineffective penalties, weak enforcement institutions, poor state of vehicle maintenance, and weak driver licensing mechanisms among others.
- Congestion of the roads and of the public service vehicles
- Environmental Pollution
- Inadequate incorporation of weather/climate information in planning and operations

3.3 Unexploited Regional Role of the Transport System:

Kenya has been pursuing efforts aimed at regional integration. Its development and economic recovery strategy is intended to be export led. However, Nairobi has not developed its transport system to fully exploit its strategic geographical and commercial location in the region.

3.4 Transport System Not Fully Integrated:

Integrated transport systems have become a major issue in modern sustainable transport development, and this is particularly significant for Nairobi given her resource constraints. Reflecting a fundamental change in the traditional way of looking at transport of passengers and freight, a mode is increasingly considered only as a link in the chain from the origin to ultimate destination. In Nairobi, each mode of transport operates largely on its own without any initiative to establish efficient logistic chains between origin and destination involving different modes as necessary. For example, there is no linkage between globe cinema matatu terminus and the railway station/machakos terminus. There is also no linkage between the various bus terminuses including those that deliver long distance passengers from upcountry. Thus, an integrated system allowing for provision of a seamless transport service would be crucial for any gains in a competitive environment.

3.5 Urban Environmental Pollution

Although the total number of vehicles in Nairobi is not large relative to the human population, the city suffers from a high level of ambient air pollution due to vehicular emissions, and is one of the worst environmental problems affecting the city. This is due to poor and inadequate road system, high traffic density, poor traffic system, poor maintenance of private and commercial vehicles, lack of proper monitoring strategies, policies and weak enforcement of laws, rules, and regulations. Other environmental issues include noise pollution and poor transport infrastructure construction and maintenance practices amongst others.

3.6 Lack of an Urban Transport Policy

Kenya has no urban transport policy yet. As such, there is no clear decision as to which modes of transport and facilities the Nairobi city should encourage. Urban transport received little attention as investment went more into infrastructure development for inter-urban linkages and for opening up links to rural growth centers. The Metropolitan Growth Strategy for Nairobi formulated in 1973 with a plan period of 30 years, was never fully implemented. Currently, the City of Nairobi, like most other urban centers, lacks an urban development strategy that would serve as a focus for urban transport development.

3.7 Institutional Deficiencies

Institutions in the transport sector in general, have weak and ineffective structures. Lack of capacity and shortage of resources seriously undermine their capability for good corporate governance, sound policy making and public service management. This results in loss-making state enterprises (Nyayo bus Company), lack of adequate and appropriate investments in transport infrastructure, corruption, deterioration in the institutions of law and order, a poor safety and security record, amongst others.

Transport sub-sector development is largely sectoral in approach with little coordination amongst the relevant institutions. Inter-modal priority, essential for efficient resource use, avoiding duplication and minimizing resource wastage is hardly found in practice. Instead, non-economic factors such as political and unethical business considerations (Cartels) get prominence in many instances in connection with inter-modal as well as intra-modal transport resource appropriation in Nairobi. There are also serious deficiencies in the current planning approach adopted by different agencies, with very little or no cognizance of Stakeholders' views.

3.8 Lack of a Vision for the Transport Sector

A vision sets the direction for development and guides the formulation of policy measures and strategies to attain stated public policy objectives. As a consequence, development efforts have resulted in situations such as sectoral imbalance leading to inefficient utilization of scarce resources, adverse environmental impacts, development of systems having little focus on any regional role, etc. A vision is therefore, needed for development of a long-term balanced and integrated system, which can address the present deficiencies and at the same time meet future requirements. Actions in transport development cannot deliver the social benefits without a vision and accompanying broad strategies.

4. THE RESULTS OF THE SURVEY

Commuter information need.

The following are the results of the survey of the Nairobi Commuter case study. The author has followed the structure of the commuter questionnaire in this report (see Appendix). Please note that the data produced is subject to various ways of manipulation to obtain different results. The author has engaged a few of these to test the stated hypothesis.

4.1 information needs by commuters on vehicle particulars

4.1.1 Based on Age Categories (Yrs)

The survey results indicated an average of 88.7% information need in both male and female respondents in the selected sample size. Age category 50-54 years had the highest need for information pertaining to make of the vehicle, number plate and name of the Insurance company and policy details. This information requirement may be attributed to the need to know the legality of the vehicle in the transportation service. The lower age cluster 15-19 years demonstrated a high need of vehicle information pertaining to Insurance, policy number, capacity, route number and destination. This may be attributed to the fact that the young teenagers are interested legal and destination details. Their major concern was which vehicles would pass by which route and capacity because they travel in cliques and are interested in linking up other teens within their social frame works.

VEHICLE PARTICULARS													
Age in Years	Make	No plate	Name of Ins	Validity of Ins	Policy No	Cap	Colour	Route No	Terminus	Dest.	Park- Loc.	Psv No	Mean %
15 - 19	85.7	85.7	92.9	100.0	100.0	100.0	85.7	100.0	100.0	100.0	71.4	85.7	92.3
20 - 24	80.5	90.9	80.5	85.7	75.3	84.4	71.4	97.4	90.9	93.5	54.5	75.3	81.7
25 - 29	82.6	94.6	82.6	89.1	69.6	92.4	83.7	96.7	94.6	94.6	67.4	71.7	85.0
30 - 34	88.4	96.5	89.5	91.9	77.9	90.7	80.2	97.7	94.2	94.2	68.6	81.4	87.6
35 - 39	84.8	97.5	89.9	89.9	82.3	93.7	83.5	97.5	93.7	93.7	75.9	82.3	88.7
40 - 44	93.8	95.1	92.6	92.6	82.7	93.8	87.7	96.3	91.4	92.6	77.8	77.8	89.5
45 - 49	95.2	98.4	96.8	98.4	90.3	98.4	93.5	100.0	98.4	98.4	91.9	95.2	96.2
50 - 54	100.0	100.0	97.1	97.1	97.1	100.0	97.1	100.0	100.0	100.0	91.4	94.3	97.9
55 +	88.9	94.4	88.9	94.4	83.3	94.4	88.9	100.0	100.0	100.0	88.9	88.9	92.6
Total	88.1	95.4	89.0	91.7	80.9	92.8	84.2	97.8	94.5	95.0	73.7	81.3	88.7

Table 4 Vehicle particulars

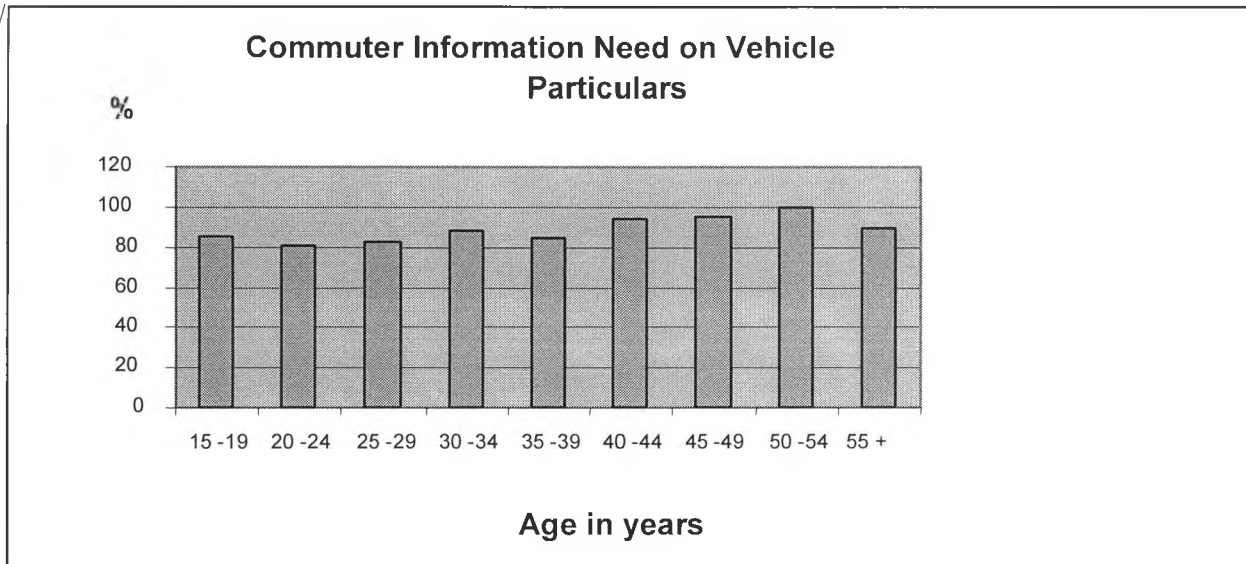


Figure 2 Commuter Information Needs on Vehicle Particulars

4.1.2 Results based on education

The illiterate or non-educated category demonstrates a high need for information on make of the vehicle, route, terminus, and destination and parking location. The interest deduced here is that they needed to know where the vehicles would ply to possibly due to the fact that they were less well informed on city transport matters. They indicated that their need was to know how to travel within they city. This was followed by Secondary level of education who demonstrated too high information need on insurance name, validity of insurance and policy number. This may be attributed to the quest to know the legality of the vehicle transport service.

VEHICLE PARTICULARS													
Level of Education	Make	No plate	Name of Ins	Validity of Ins	Policy No	Cap.	Color	Rte No	Terminus	Dest.	Park loc	Psv No	Mean %
None	91.7	91.7	58.3	83.3	58.3	83.3	83.3	100.0	100.0	100.0	83.3	91.7	85.4
Primary	87.0	94.8	82.6	89.6	74.8	89.6	80.0	96.5	93.9	94.8	70.4	78.3	86.0
Secondary	88.9	95.5	91.7	92.7	83.1	93.3	83.4	98.1	94.3	94.6	72.6	81.5	89.1
Post Secondary	86.4	96.1	91.3	92.2	83.5	96.1	91.3	98.1	95.1	96.1	79.6	82.5	90.7
Total	88.1	95.4	89.0	91.7	80.9	92.8	84.2	97.8	94.5	95.0	73.7	81.3	88.7

Figure 3 Vehicle Particulars

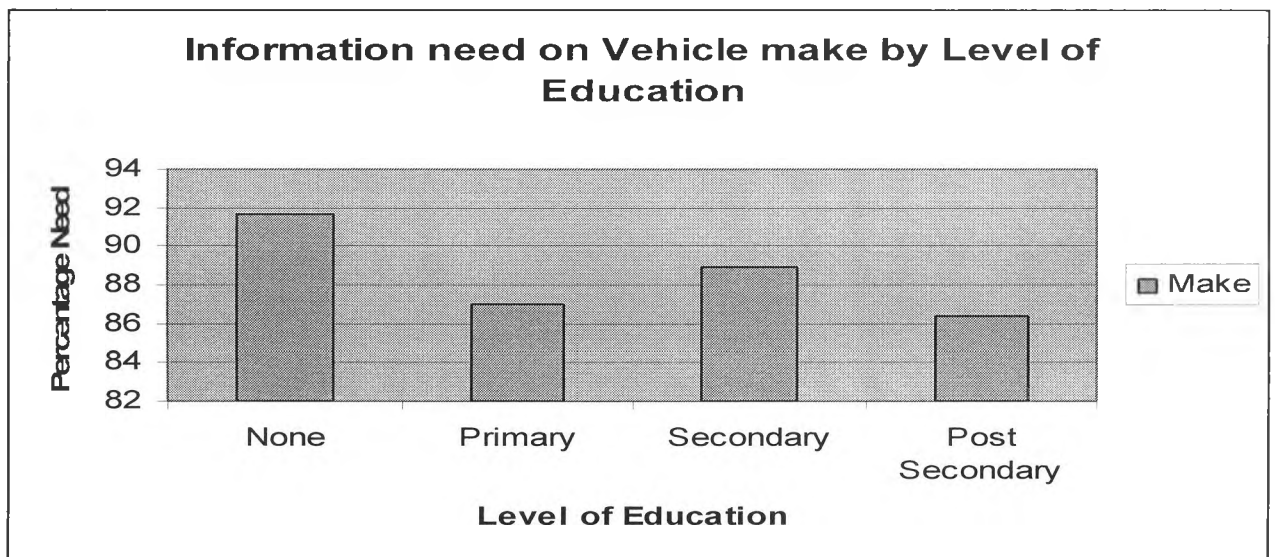


Figure 4 Information needs by level of education on Vehicle make

4.1.3 Based on Marital Status

The survey of need to know results indicated that the widowed (92.6%) and married (89.3%) respondents had a high need to commuter vehicle information. The widowed respondents were more inclined to knowing their transport route, terminus and destination.

VEHICLE PARTICULARS

	Make	No plate	Name of Ins	Validity of Ins	Policy No	Capacity	Color	Route No	Terminus	Destination	Park-location	PSV No	MEAN %
Married	86.1	95.2	89.4	92.3	83.7	91.3	80.3	98.1	95.7	97.1	64.4	82.2	88.0
	89.6	95.1	88.0	91.3	79.3	93.5	86.4	97.7	94.2	94.2	80.3	81.6	89.3
and/Separate	83.3	100.0	100.0	94.4	72.2	94.4	88.9	94.4	83.3	83.3	61.1	66.7	85.2
ed	88.9	100.0	88.9	88.9	88.9	100.0	88.9	100.0	100.0	100.0	88.9	77.8	92.6
	88.1	95.4	89.0	91.7	80.9	92.8	84.2	97.8	94.5	95.0	73.7	81.3	88.7

Table 5 Vehicle Particulars

4.1.4 Based on Occupation

The respondents in the formal employment sector (at 92.6%) and the retired (91.7%) in this survey demonstrated a high need for information on vehicle particular as compared to other categories. This may be attributed to the need for information with an eye for investment or a gauge for measuring efficiency, road safety/legality which could be of a lesser concern for the younger categories.

VEHICLE PARTICULARS

Occupation	Make	No plate	Name of Ins	Validity of Ins	Policy No	Capacity	Colors	Route No	Terminus	Destination	Park-location	PSV No	MEAN %
Working (formal)	92.4	96.4	92.4	94.8	86.4	96.0	90.4	98.8	96.0	97.2	84.4	85.6	92.6
Working (Informal)	83.4	91.7	83.4	86.6	73.2	87.3	84.1	96.8	94.3	93.6	66.2	74.5	84.6
Retired	100.0	100.0	100.0	100.0	66.7	100.0	100.0	100.0	100.0	100.0	66.7	66.7	91.7
Homemaker	86.4	97.7	84.1	88.6	77.3	90.9	61.4	95.5	100.0	100.0	70.5	86.4	86.6
Student	73.3	96.7	80.0	93.3	80.0	93.3	76.7	100.0	90.0	96.7	60.0	70.0	84.2
Teacher	95.7	97.8	97.8	97.8	84.8	97.8	82.6	97.8	89.1	89.1	63.0	82.6	89.7
Entrepreneur	71.4	100.0	92.9	78.6	71.4	85.7	64.3	92.9	78.6	71.4	42.9	85.7	78.0
	88.1	95.4	89.0	91.7	80.9	92.8	84.2	97.8	94.5	95.0	73.7	81.3	88.7

Table 6 Vehicle particulars

Information Need of PSV Particulars by Occupation

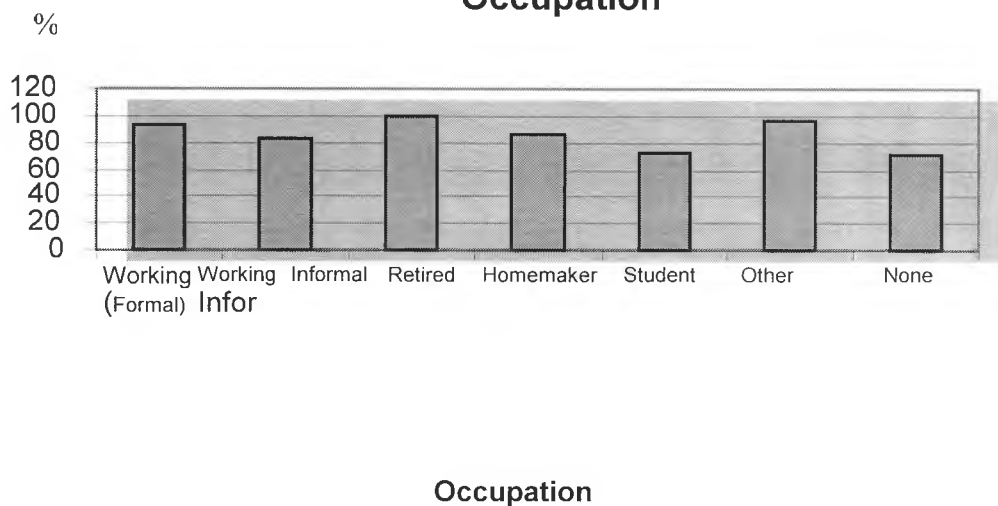


Figure 5 Information needs of PSV particulars by occupation

4.1.5 Based on mode of Transport

The survey results as shown demonstrate that respondents with private cars have the highest (at 93.5%) need for information on commuter vehicle particulars. This may be attributed to the fact that commuter vehicles are an alternative mode of transport since running private vehicles is becoming expensive hence the need to know about vehicles plying through the respondents area of interest or residence. Another category is that of the walking respondents (at 91.7%) who have shown particular interest in the route of the commuting vehicle.

VEHICLE PARTICULARS

MODE OF TRANSPORT	Make	No plate	Name of Ins	Validity of Ins	Policy No	Capacity	Colors	Route No	Terminu s	Destin ation	Park locatio n	PSV No	MEAN %
Walking	90.9	95.5	100.0	100.0	90.9	95.5	86.4	100.0	95.5	95.5	59.1	90.9	91.7
Bicycle	100.0	100.0	80.0	80.0	80.0	80.0	100.0	100.0	60.0	60.0	40.0	40.0	76.7
Matatu	89.5	96.2	88.8	92.4	80.7	93.3	83.5	98.1	94.7	95.0	73.5	80.0	88.8
KBS	82.1	96.4	75.0	75.0	60.7	75.0	71.4	89.3	89.3	92.9	71.4	78.6	79.8
Private car	82.8	93.8	95.3	95.3	89.1	98.4	95.3	98.4	96.9	98.4	85.9	92.2	93.5
Train	60.0	60.0	80.0	80.0	80.0	80.0	60.0	100.0	100.0	100.0	60.0	80.0	78.3
Other	0.0	0.0	0.0	0.0	0.0	100.0	0.0	100.0	100.0	100.0	0.0	0.0	33.3
Total	88.1	95.4	89.0	91.7	80.9	92.8	84.2	97.8	94.5	95.0	73.7	81.3	88.7

Table 7 Vehicle particulars based on mode

4.2 Information need by commuters on driver particulars

4.2.1 Based on Gender

The survey results demonstrated that there was higher information need by male respondents (at 91.7%) than female respondent (at 86.2%). This may imply that there is high information need in both sexes but male respondents are more interested in driver particulars than female respondents though the male sample is 440 to females 330.

DRIVER PARTICULARS

Sex	Name	Sex	ID. No	Yrs of driving	accidents	Criminal History	Psv No.	D Cert	Photo	Mean %
	%	%	%	%	%	%	%	%	%	
Male	92.1	85.2	82.8	95.1	95.6	95.4	83.1	97.5	98.1	91.7
Female	89.9	76.4	77.5	87.1	89.9	89.5	80.3	90.4	94.9	86.2
Total	91.4	82.4	81.1	92.5	93.8	93.4	82.2	95.2	97.1	89.9

Table 8 Driver information Particulars based on Gender

4.2.2 Based on Age Categorization

The highest information quest on driver particulars lies in the age 45-49 yrs (at 97.5%) and 50-54 yrs (at 96.5%) this can be attributed to the fact that the upper ages are more mature and their focus on driver particulars is to ensure the driver has adequate experience and probably ascertain that he has least or no accident incidents in his work history. This could be the safety concern approach to information need. The trend shows an increase in information need from the young to older generation and this could mean that the higher the level of maturity the higher the need for information on the driver based on the safety concern approach.

DRIVER PARTICULARS

Age in Years	name	Sex	ID. No	Yrs of driving	Accidents	Criminal History	PSV No.	Cert	Photo	Mean %
	%	%	%	%	%	%	%	%	%	%
15 - 19	71.4	71.4	57.1	71.4	71.4	78.6	71.4	78.6	71.4	71.4
20 - 24	84.4	75.3	75.3	89.6	88.3	83.1	77.9	89.6	94.8	84.3
25 - 29	90.2	75.0	72.8	91.3	93.5	92.4	71.7	94.6	97.8	86.6
30 - 34	89.5	83.7	81.4	90.7	93.0	94.2	82.6	95.3	96.5	89.7
35 - 39	92.4	83.5	82.3	94.9	97.5	98.7	86.1	98.7	100.0	92.7
40 - 44	95.1	85.2	77.8	92.6	95.1	93.8	80.2	96.3	97.5	90.4
45 - 49	98.4	93.5	98.4	96.8	96.8	100.0	95.2	98.4	100.0	97.5
50 - 54	97.1	82.9	94.3	100.0	100.0	100.0	94.3	100.0	100.0	96.5
55 +	94.4	94.4	88.9	94.4	94.4	88.9	83.3	94.4	94.4	92.0
Total	91.4	82.4	81.1	92.5	93.8	93.4	82.2	95.2	97.1	89.9

Table 9 Driver Particulars based on Age Categorization

4.2.3 Based on Level of Education

The survey results were classified in four levels of education namely: the illiterate, primary, secondary, and post secondary levels of education. The results indicated that post secondary or elite had high information need on the driver particulars especially in driver's years of experience, driver's number of accidents and driver's criminal record history.

DRIVER PARTICULARS

Level of Education	Name	Sex	ID. No	Yrs of driving	Accidents	Criminal History	PSV No.	Cert.	Photo	Mean %
	%	%	%	%	%	%	%	%	%	%
None	91.7	91.7	91.7	91.7	83.3	75.0	66.7	91.7	100.0	87.0
Primary	94.8	81.7	83.5	92.2	93.0	93.0	84.3	95.7	98.3	90.7
Secondary	90.8	79.9	79.3	92.0	94.6	94.6	81.2	94.9	96.2	89.3
Post Secondary	89.3	89.3	82.5	94.2	93.2	92.2	84.5	96.1	98.1	91.0
Total	91.4	82.4	81.1	92.5	93.8	93.4	82.2	95.2	97.1	89.9

Table 10 Driver Particulars based on level of Education

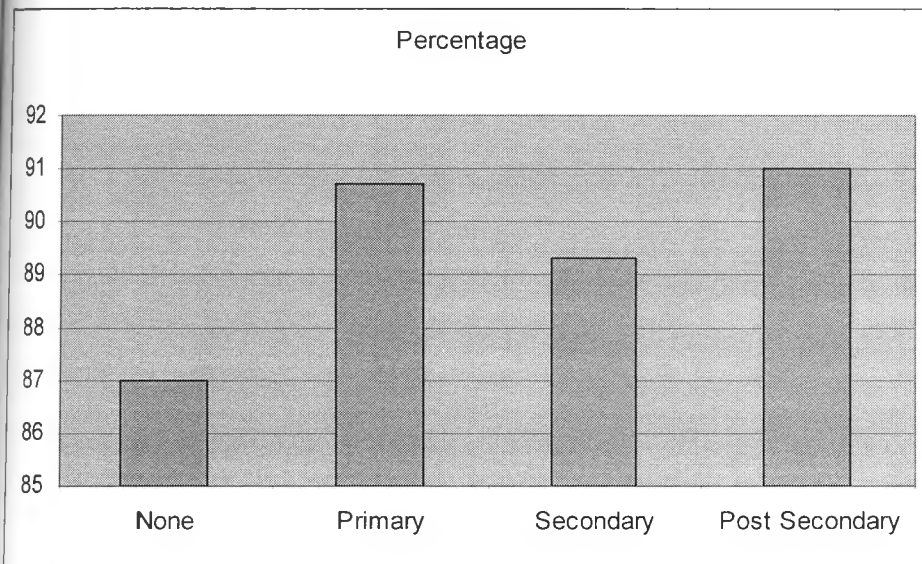


Figure 6 Information need by education on driver particulars.

4.2.4 Based on Marital Status

The widowed need for information (at 92.6%) and married respondents (at 90.8%) in this survey constituted the highest need to access information on the driver particulars.

However the divorced and never married respondents demonstrated an almost equal need for information on driver particulars at 88%.

DRIVER PARTICULARS

Marital Status	Name	Sex	ID .No	Yrs of driving	Accidents	Criminal History	PSV No.	Cert.	Photo	Mean %
	%	%	%	%	%	%	%	%	%	
Never Married	88.9	81.3	79.8	91.3	92.3	91.3	82.7	92.8	95.2	88.4
Married	92.2	82.2	82.5	93.5	94.8	94.8	82.2	97.1	98.1	90.8
Divorced/ Separate	100.0	88.9	66.7	88.9	94.4	88.9	77.8	94.4	100.0	88.9
Widowed	100.0	100.0	88.9	88.9	88.9	100.0	77.8	88.9	100.0	92.6
Total	91.4	82.4	81.1	92.5	93.8	93.4	82.2	95.2	97.1	89.9

Table 11 Driver Particulars

4.2.5 Based on Occupation

The formal employed respondents (at 93.3%) and retired respondents (at 92.6%) -Indicated a high need for access to information on the driver as pertains to driver name, sex, driving license, accident history, criminal record and driver's photo. This is attributed to the fact that this category represents the mature class of respondents who could need information for knowledge on the mode of transport or for the safety concern on public service vehicle selected by them as a means of transport.

DRIVER PARTICULARS

Occupation	Name	Sex	ID. No	Yrs of driving	Accidents	Criminal History	Psv No.	Cert.	Photo	Mean %
	%	%	%	%	%	%	%	%	%	
Working (Formal)	94.0	86.0	86.8	94.8	96.4	96.4	88.4	98.4	98.4	93.3
Working (Informal)	87.3	81.5	75.2	92.4	93.6	93.0	77.1	94.9	97.5	88.0
Retired	100.0	100.0	66.7	100.0	100.0	100.0	66.7	100.0	100.0	92.6
Homemaker	95.5	70.5	90.9	86.4	93.2	90.9	81.8	90.9	95.5	88.4
Student	73.3	66.7	56.7	80.0	70.0	73.3	63.3	76.7	83.3	71.5
Other	97.8	89.1	84.8	97.8	97.8	97.8	84.8	97.8	97.8	94.0
None	92.9	71.4	57.1	78.6	85.7	78.6	64.3	85.7	100.0	79.4
Total	91.4	82.4	81.1	92.5	93.8	93.4	82.2	95.2	97.1	89.9

Table 12 Driver particulars

4.2.6 Mode of Transport

From the survey results it has been observed that private car owners (respondents need for access at 93.6%) and the walking respondents (at 93.4%) have the highest quest for Information need on the driver particulars. This may be attributed to the private car owners for the need to know the drivers details as a cautious measure as possible or interested passenger or as road users in the areas being plied focusing on the driver's details as road users in the case of accidents involving them or their acquaintances.

.DRIVER PARTICULARS

Mode of Transport	Name	Sex	ID. No	Yrs of driving	Accidents	Criminal History	PSV No.	Cert.	Photo	Mean %
	%	%	%	%	%	%	%	%	%	
Walking	95.5	81.8	86.4	100.0	100.0	95.5	86.4	100.0	95.5	93.4
Bicycle	100.0	40.0	40.0	100.0	100.0	100.0	40.0	100.0	100.0	80.0
Matatu	92.8	83.5	81.4	92.6	93.8	93.1	82.1	95.0	97.1	90.2
KBS	71.4	60.7	75.0	82.1	85.7	89.3	71.4	85.7	96.4	79.8
Private car	92.2	89.1	85.9	95.3	96.9	95.3	90.6	98.4	98.4	93.6
Train	60.0	60.0	60.0	60.0	60.0	100.0	80.0	100.0	80.0	73.3
Other	0.0	100.0	0.0	100.0	100.0	100.0	0.0	100.0	100.0	66.7
Total	91.4	82.4	81.1	92.5	93.8	93.4	82.2	95.2	97.1	89.9

Table 13 Driver Particulars

4.3 Information need by commuters on conductor particulars

4.3.1 Based on Gender

The Survey results indicate a high need for conductor information in both male and female respondents. It will be observed that there are high percentage for need to access of information of the name, sex, accidents, criminal, and photograph of the conductor in both male and female. This need to know has been attributed to the historical conductor behavior towards the commuters. Hence the need to know the conductor's general information including details of his conduct and criminal record.

CONDUCTOR PARTICULARS

Sex	Name	Sex	ID No.	DL No.	Yrs of service	Accidents	Criminal Record	Psv No.	Cert. of good conduct	Photo	Mean %
	%	%	%	%	%	%	%	%	%	%	
Male	91.3	67.2	82.0	37.2	36.6	56.6	93.7	77.3	96.7	93.4	81.3
Female	89.9	71.3	80.3	40.4	40.4	52.2	89.3	82.6	92.1	92.1	81.2
Total	90.8	68.6	81.4	38.2	37.9	55.1	92.3	79.0	95.2	93.0	81.3

Table 14 Conductor Particulars

4.3.2 Based on the level of Education

The survey results based on Education showed that the Primary and Post Secondary levels of education respondents topped in 'the need for information' on conductor particulars. It will be noted that the illiterate tended to have high information need on basics such as name, gender but least concerned in detailed information such as the conductor's certificate of good conduct, criminal record and years of experience.

CONDUCTOR PARTICULARS

Level of Education	Name	sex	ID No.	DL. No.	Yrs of service	Accidents	Criminal Rec	Psv No.	Cert. of good conduct	Photo	Mean %
	%	%	%	%	%	%	%	%	%	%	
None	100.0	91.7	91.7	41.7	41.7	41.7	75.0	66.7	83.3	91.7	80.6
Primary	93.0	76.5	85.2	43.5	42.6	53.9	91.3	80.0	97.4	95.7	84.3
Secondary	89.2	62.4	79.9	34.7	33.4	55.7	93.9	80.9	94.6	91.7	79.6
Post Secondary	92.2	75.7	80.6	42.7	45.6	56.3	90.3	73.8	96.1	94.2	83.1
Total	90.8	68.6	81.4	38.2	37.9	55.1	92.3	79.0	95.2	93.0	81.3

Table 15 Conductor particulars

4.3.3 Based on Marital Status

The never married respondents top in the need for information on the conductor especially on conductor ID, years of experience, criminal record and PSV number. This could be attributed by their past experience with conductor's behavior. The widowed were second highest on need to have conductor information especially name, gender certificate of good conduct and photograph. This could be attributed to their need to know who is handling them and to the security concern.

CONDUCTOR PARTICULARS

Marital Status	Name	Sex	ID No.	ID.	Yrs of service	accidents	criminal Record	PSV No.	Cert. of good conduct	Photo	Mean %
	%	%	%	%	%	%	%	%	%	%	
Never Married	88.5	74.5	80.8	53.4	52.4	62.0	92.8	82.7	95.2	91.8	86.0
Married	91.6	63.8	82.5	29.4	29.4	51.5	92.2	77.0	94.8	93.2	78.4
Divorced/Separation	100.0	66.7	66.7	22.2	22.2	50.0	94.4	72.2	100.0	100.0	77.2
Widowed	100.0	100.0	88.9	22.2	22.2	33.3	77.8	77.8	100.0	100.0	80.2
Total	90.8	68.6	81.4	38.2	37.9	55.1	92.3	79.0	95.2	93.0	81.3

Table 16 Conductor Particulars

4.3.4 Based on Occupation

The formal and retired have the highest information quest for information on the conductor the possible reason being they are a mature group of the age classification and could have been are concerned on the level service by the conductors.

CONDUCTOR PARTICULARS											
Occupation	Name	Sex	Route No.	ID.	yrs of service	accidents	criminal Record	psv No.	cert. of good conduct	Photo	Mean %
	% (Infor. Need)	%	%	%	%	%	%	%	%	%	
Working (Formal)	93.6	65.6	85.2	35.6	34.4	60.8	94.0	86.0	97.2	96.0	83.2
Working (Informal)	86.0	70.7	76.4	38.9	40.1	51.0	92.4	71.3	96.2	86.6	78.8
Retired	100.0	100.0	66.7	33.3	33.3	33.3	100.0	66.7	100.0	100.0	81.5
Homemaker	93.2	75.0	93.2	40.9	40.9	50.0	86.4	84.1	88.6	97.7	83.3
Student	76.7	66.7	60.0	50.0	56.7	53.3	76.7	70.0	80.0	83.3	74.8
Other (Specify)	97.8	71.7	84.8	32.6	32.6	47.8	97.8	69.6	97.8	97.8	81.2
None	92.9	64.3	71.4	64.3	42.9	50.0	92.9	78.6	92.9	100.0	83.3
Total	90.8	68.6	81.4	38.2	37.9	55.1	92.3	79.0	95.2	93.0	81.3

Table 17 Conductor Particulars

CONDUCTOR PARTICULARS											
Mode of Transport	Conductor Name	Conductor sex	Route No.	ID.	yrs of service	accidents	criminal Record	PSV No.	Cert. of Good Conduct	Photo	Mean
	%	%	%	%	%	%	%	%	%	%	
Walking	100.0	81.8	86.4	36.4	40.9	50.0	95.5	86.4	95.5	95.5	85.4
Bicycle	80.0	40.0	40.0	20.0	20.0	40.0	100.0	40.0	100.0	100.0	64.4
Matatu	91.9	69.0	81.6	37.9	37.2	56.1	91.9	80.7	95.0	93.6	81.6
KBS	71.4	46.4	78.6	39.3	35.7	39.3	89.3	64.3	89.3	82.1	70.6
Private car	93.8	71.9	85.9	40.6	40.6	57.8	93.8	76.6	98.4	95.3	83.9
Train	60.0	80.0	60.0	60.0	80.0	80.0	100.0	80.0	100.0	80.0	86.7
Other	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	100.0	0.0	33.3
Total	90.8	68.6	81.4	38.2	37.9	55.1	92.3	79.0	95.2	93.0	81.3

Table 18 Conductor Particulars

4.4 Information needs by commuters on owner particulars

4.4.1 Based on gender

The male have a higher quest for information on the owner of the public service commuter vehicle.

4.4.2Based on Age in years

The age category 45-54 demonstrated the highest need for access to information on the owner of public service vehicle than other categories. This could be attributed to their need to have general information on transport. This could be due to their maturity and the level of responsibility.

4.4.3Based on the level of education

The secondary and post secondary category of respondents showed the highest need to access information on the owner of the public service vehicle. This can be attributed to the need to choose a reliable transport based on the owners ability to provide safe, efficient and reliable transport.

4.4.4Based on Marital Status

The divorced and never married dominate the need for information on the owner of the public service vehicle.

OWNER PARTICULARS

Sex	name	sex	Id No.	Driving license	Yrs of Driving	Acc.	criminal Rec.	Post Add.	Physical Add.	Occ.	No. Vehicle	Photo	Mean
	%	%	%	%	%	%	%	%	%	%	%	%	
Male	91.5	57.7	69.7	31.1	29.8	49.2	82.2	86.6	88.5	61.5	71.3	73.5	66.1
Female	84.3	53.9	65.2	37.1	34.3	43.8	79.2	78.7	82.0	52.2	61.8	60.7	61.1
Total	89.2	56.4	68.2	33.1	31.3	47.4	81.3	84.0	86.4	58.5	68.2	69.3	64.4
15 - 19	71.4	71.4	50.0	57.1	64.3	64.3	71.4	57.1	57.1	50.0	64.3	71.4	62.5
20 - 24	75.3	54.5	49.4	44.2	40.3	45.5	74.0	75.3	76.6	54.5	55.8	53.2	58.2
25 - 29	83.7	62.0	58.7	34.8	31.5	34.8	76.1	82.6	85.9	58.7	63.0	64.1	61.3
30 - 34	90.7	59.3	68.6	34.9	33.7	43.0	79.1	81.4	84.9	57.0	65.1	65.1	63.6
35 - 39	91.1	55.7	73.4	31.6	31.6	45.6	83.5	89.9	92.4	62.0	70.9	74.7	66.9
40 - 44	93.8	53.1	69.1	19.8	17.3	40.7	80.2	84.0	86.4	51.9	59.3	61.7	59.8
45 - 49	100.0	54.8	83.9	29.0	29.0	69.4	93.5	95.2	98.4	71.0	90.3	90.3	75.4
50 - 54	100.0	42.9	91.4	28.6	28.6	74.3	100.0	97.1	91.4	65.7	88.6	91.4	75.0
55 +	94.4	61.1	83.3	38.9	27.8	38.9	72.2	72.2	83.3	44.4	77.8	77.8	64.4
	89.2	56.4	68.2	33.1	31.3	47.4	81.3	84.0	86.4	58.5	68.2	69.3	64.4
None	100.0	75.0	83.3	50.0	33.3	33.3	50.0	75.0	83.3	33.3	66.7	58.3	61.8
Primary	88.7	56.5	64.3	29.6	28.7	36.5	74.8	76.5	80.0	56.5	55.7	57.4	58.8
Secondary	89.5	54.8	69.7	30.9	28.7	50.0	85.4	87.6	89.5	58.9	73.2	73.2	66.0
Post Secondary	87.4	59.2	66.0	41.7	41.7	53.4	79.6	82.5	84.5	62.1	67.0	71.8	66.4
	89.2	56.4	68.2	33.1	31.3	47.4	81.3	84.0	86.4	58.5	68.2	69.3	64.4
Never Married	84.1	61.1	64.9	41.3	38.5	47.1	84.6	79.8	83.2	60.6	66.8	67.3	64.9
Married	91.6	53.1	71.2	28.2	27.2	48.5	79.3	86.4	88.0	55.3	68.9	70.6	64.0
Divorced/Separate	100.0	55.6	50.0	16.7	16.7	38.9	83.3	94.4	88.9	77.8	66.7	66.7	63.0
Widowed	100.0	66.7	77.8	44.4	33.3	33.3	66.7	77.8	100.0	77.8	77.8	77.8	69.4
	89.2	56.4	68.2	33.1	31.3	47.4	81.3	84.0	86.4	58.5	68.2	69.3	64.4
Working (Formal)	93.2	56.8	78.4	32.4	31.6	56.4	86.0	90.0	90.4	60.0	74.4	75.6	68.8
Working (Informal)	84.1	62.4	59.9	36.3	34.4	42.0	74.5	80.9	83.4	60.5	63.1	65.0	62.2
Retired	100.0	66.7	66.7	33.3	33.3	33.3	100.0	66.7	100.0	66.7	66.7	66.7	66.7
Homemaker	90.9	54.5	70.5	31.8	27.3	29.5	75.0	72.7	79.5	36.4	52.3	50.0	55.9
Student	66.7	53.3	40.0	40.0	43.3	43.3	73.3	73.3	76.7	46.7	63.3	60.0	56.7
Other	97.8	37.0	60.9	19.6	15.2	41.3	91.3	84.8	87.0	71.7	71.7	78.3	63.0
None	85.7	57.1	57.1	42.9	28.6	35.7	71.4	71.4	85.7	57.1	64.3	57.1	59.5
	89.2	56.4	68.2	33.1	31.3	47.4	81.3	84.0	86.4	58.5	68.2	69.3	64.4
Walking	86.4	50.0	59.1	27.3	27.3	31.8	77.3	59.1	72.7	31.8	40.9	40.9	50.4
Bicycle	100.0	40.0	40.0	40.0	40.0	40.0	80.0	100.0	100.0	100.0	60.0	60.0	66.7
Matatu	89.5	60.1	69.0	32.7	30.8	48.0	82.1	85.0	87.4	60.1	70.2	70.6	65.5
KBS	78.6	35.7	67.9	28.6	25.0	32.1	71.4	85.7	82.1	42.9	57.1	60.7	55.7
Private car	93.8	43.8	70.3	39.1	37.5	56.3	81.3	85.9	87.5	62.5	71.9	76.6	67.2
Train	60.0	60.0	60.0	40.0	40.0	60.0	80.0	60.0	60.0	40.0	40.0	40.0	53.3
Other	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	100.0	0.0	100.0	100.0	58.3
	89.2	56.4	68.2	33.1	31.3	47.4	81.3	84.0	86.4	58.5	68.2	69.3	64.4

Table 19 Owner Particulars

NEEDS BY COMMUTERS ON VEHICLE ACCIDENT PARTICULARS

RECORD OF PREVIOUS ACCIDENTS

	Rate of accident	Date of Accidents	Time of Accident	Nature of accident	No passengers	Female deaths	Male deaths	Female serious Injured	Males serious Injured	Details of dead	Details of injured	Mean
Male	91.3	91.3	88.3	92.3	89.9	86.6	84.7	83.9	83.9	73.0	73.2	85.3
Female	86.5	86.0	78.7	86.0	84.8	82.6	80.9	80.3	80.3	66.9	68.0	80.1
	89.7	89.5	85.1	90.3	88.2	85.3	83.5	82.7	82.7	71.0	71.5	83.6
15 - 19	64.3	57.1	50.0	64.3	64.3	71.4	71.4	71.4	71.4	57.1	57.1	63.6
20 - 24	83.1	79.2	75.3	80.5	79.2	77.9	77.9	75.3	75.3	64.9	64.9	75.8
25 - 29	88.0	88.0	80.4	88.0	85.9	78.3	73.9	73.9	73.9	57.6	58.7	77.0
30 - 34	87.2	88.4	82.6	88.4	86.0	83.7	80.2	77.9	77.9	66.3	67.4	80.5
35 - 39	89.9	91.1	86.1	92.4	87.3	88.6	87.3	87.3	87.3	75.9	75.9	86.3
40 - 44	95.1	95.1	92.6	96.3	95.1	87.7	85.2	85.2	85.2	74.1	75.3	87.9
45 - 49	98.4	98.4	98.4	98.4	96.8	96.8	96.8	96.8	96.8	87.1	87.1	95.6
50 - 54	97.1	100.0	94.3	100.0	100.0	94.3	94.3	94.3	94.3	82.9	82.9	94.0
55 +	88.9	88.9	88.9	88.9	88.9	88.9	88.9	88.9	88.9	83.3	83.3	87.9
	89.7	89.5	85.1	90.3	88.2	85.3	83.5	82.7	82.7	71.0	71.5	83.6
None	91.7	91.7	91.7	91.7	83.3	91.7	91.7	83.3	83.3	75.0	75.0	86.4
Primary	88.7	89.6	84.3	89.6	87.8	82.6	80.0	79.1	79.1	66.1	65.2	81.1
Secondary	90.8	91.1	86.0	91.7	89.5	86.3	84.1	83.8	83.8	73.6	74.8	85.0
Post Secondary	87.4	84.5	82.5	86.4	85.4	84.5	84.5	83.5	83.5	68.0	68.0	81.6
	89.7	89.5	85.1	90.3	88.2	85.3	83.5	82.7	82.7	71.0	71.5	83.6
Never Married	89.9	87.5	80.8	88.0	87.0	84.6	84.1	83.2	83.2	62.5	63.5	81.3
Married	89.0	90.3	87.4	91.3	88.7	85.4	83.2	82.5	82.5	76.7	77.0	84.9
Divorced/Separate	94.4	94.4	94.4	94.4	88.9	83.3	77.8	77.8	77.8	72.2	72.2	84.3
Widowed	100.0	100.0	88.9	100.0	100.0	100.0	88.9	88.9	88.9	66.7	66.7	89.9
	89.7	89.5	85.1	90.3	88.2	85.3	83.5	82.7	82.7	71.0	71.5	83.6
Working (Formal)	91.2	92.0	89.2	92.4	90.8	89.2	87.2	86.8	86.8	77.2	77.2	87.3
Working (Informal)	86.0	87.3	82.2	87.9	84.1	79.6	78.3	76.4	76.4	66.2	66.2	79.2
Retired	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Homemaker	90.9	86.4	75.0	88.6	88.6	84.1	81.8	81.8	81.8	70.5	70.5	81.8
Student	83.3	73.3	66.7	80.0	76.7	76.7	76.7	76.7	76.7	56.7	60.0	73.0
Other (Specify)	97.8	97.8	97.8	97.8	95.7	91.3	87.0	87.0	87.0	65.2	65.2	88.1
None	85.7	85.7	71.4	78.6	85.7	78.6	78.6	78.6	78.6	57.1	71.4	77.3
	89.7	89.5	85.1	90.3	88.2	85.3	83.5	82.7	82.7	71.0	71.5	83.6
Walking	90.9	90.9	86.4	90.9	90.9	81.8	81.8	81.8	81.8	40.9	40.9	78.1
Bicycle	100.0	100.0	100.0	80.0	80.0	80.0	60.0	60.0	60.0	60.0	60.0	76.4
Matatu	90.2	90.0	85.7	90.5	88.3	85.4	83.1	82.6	82.6	72.6	73.3	84.0
KBS	78.6	82.1	71.4	85.7	85.7	78.6	78.6	75.0	75.0	71.4	71.4	77.6
Private car	92.2	92.2	89.1	93.8	90.6	89.1	90.6	90.6	90.6	71.9	73.4	87.6
Train	80.0	60.0	60.0	60.0	80.0	80.0	80.0	60.0	60.0	60.0	40.0	65.5
Other (Specify)	0.0	0.0	0.0	100.0	0.0	100.0	100.0	100.0	100.0	100.0	100.0	63.6
	89.7	89.5	85.1	90.3	88.2	85.3	83.5	82.7	82.7	71.0	71.5	83.6

Table 20 Record of previous Accidents

The Table above on information need on accident history of the vehicle by the respondents interviewed show high interest on nature of accident and rate of accidents associated with the particular vehicle.

4.5 Demographic distribution analysis

4.5.1 Distribution of Age by Sex

The sample size distribution of the male respondents as shown in Fig.6 represents a normal curve with most of the respondents falling in class 35-39 years with 72 respondents. The female sample distribution graph as shown is rather skewed to the left and has most of the respondents falling in age 25-29 years with 56 respondents. The total male population size constitutes 65% of the sample size while the female constitutes 35% of the sample size.

Distribution of Age by Sex

Age group		Sex				Total	
		Male		Female		Count	Percent
		Count	Percent	Count	Percent		
15 - 19	4	0.9	11	4.8	15	2.2	
20 - 24	53	12.0	45	19.6	98	14.6	
25 - 29	62	14.1	56	24.3	118	17.6	
30 - 34	68	15.5	39	17.0	107	16.0	
35 - 39	72	16.4	30	13.0	102	15.2	
40 - 44	68	15.5	23	10.0	91	13.6	
45 - 49	59	13.4	12	5.2	71	10.6	
50 - 54	37	8.4	5	2.2	42	6.3	
55 +	17	3.9	9	3.9	26	3.9	
Total	440	100.0	230	100.0	670	100.0	

Table 21 Distribution of Age by Sex

Fig.6. Sample Distribution of the Male

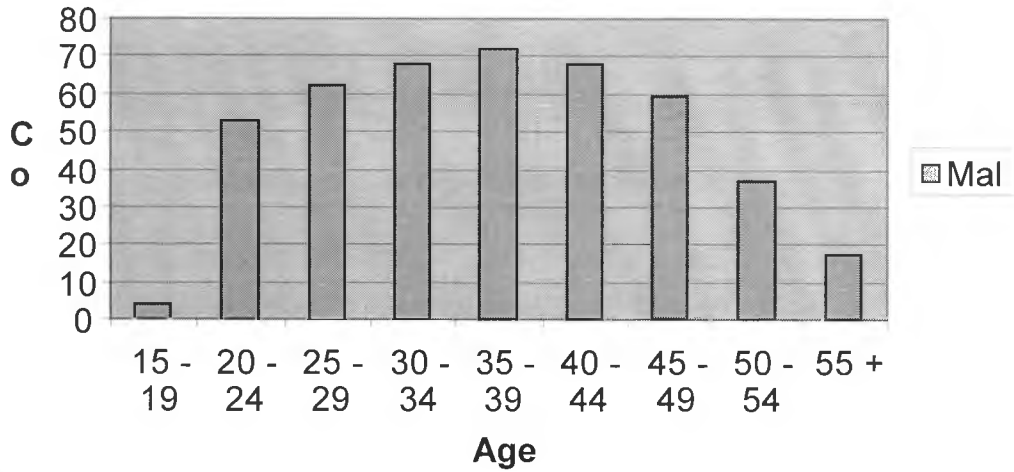


Figure 7 Distribution of Age by Sex (male)

Fig.7 Sample Distribution of Female

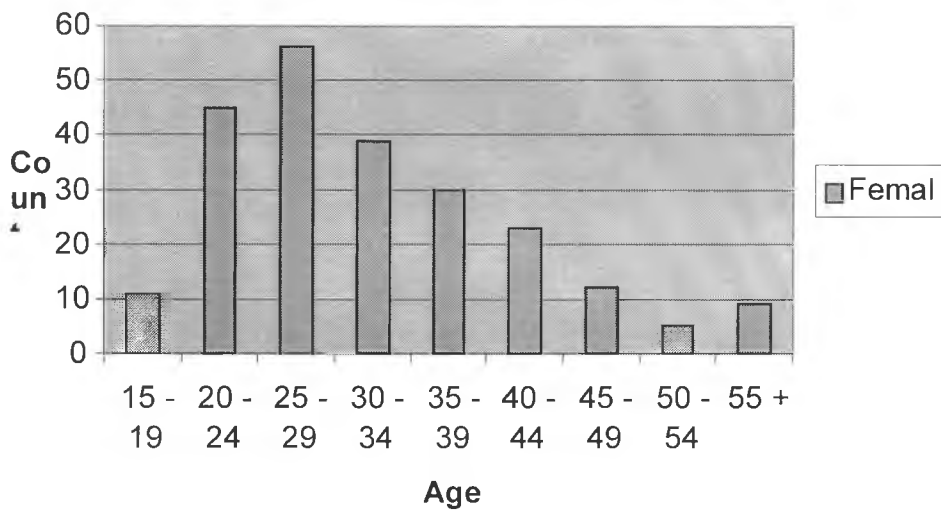


Figure 8 Distribution of Age by Sex (female)

Fig 8. Distribution of Age

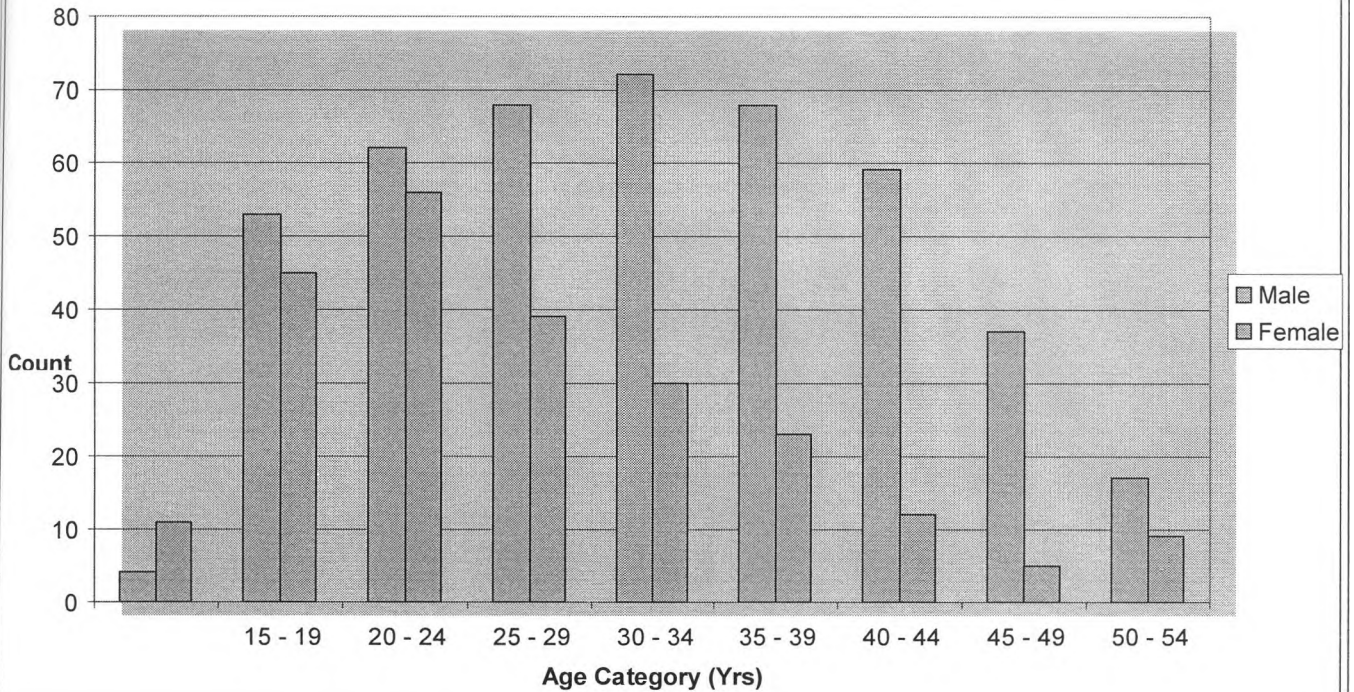
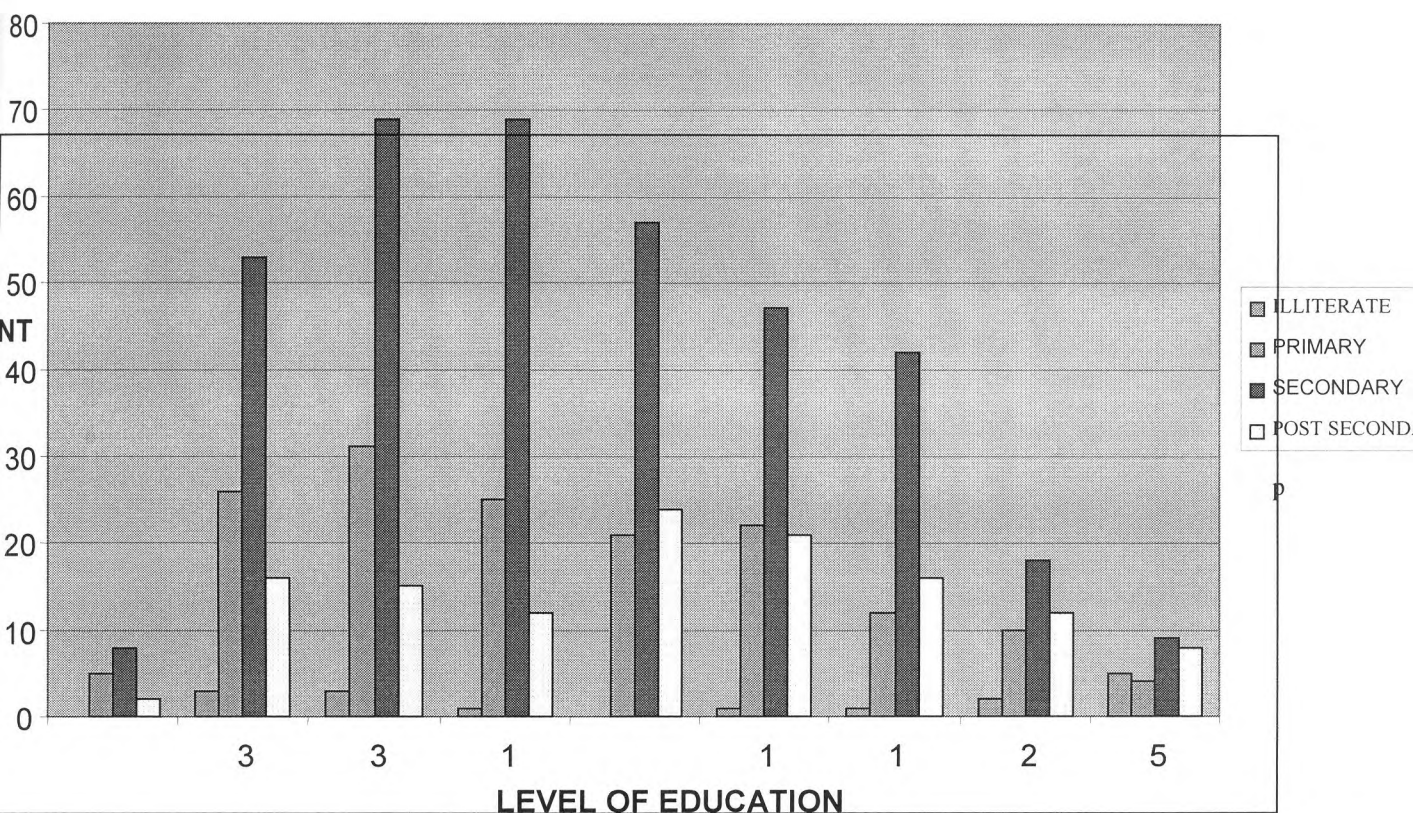


Figure 9 Age distribution

4.5.2 Distribution of Level of Education Based on Age Categories

The survey results based on the level of education indicated that of those interviewed, there were few illiterates generally and none in the age group of 15-19 years and at 35-39 years. Majority of the respondents lie in the Secondary level of education and the curve is skewed slightly to the left and most of the respondents are in ages 25-29 and 30-34 age categories. The post secondary distribution represented normal curve distribution; we could conclude that most of the sample size (98%) was above primary level of education constituting 654 respondents in the sample size of 670 respondents.

Fig.9 DISTRIBUTION OF LEVEL OF EDUCATION BY AGE



Distribution of Education by Age

Age Group	EDUCAT								Total	
	None		Primary		Secondary		Post Secondary		Count	%
	Count	%	Count	%	Count	%	Count	%		
19			5	3.2	8	2.2	2	1.6	15	2.2
24	3	18.8	26	16.7	53	14.2	16	12.7	98	14.6
29	3	18.8	31	19.9	69	18.5	15	11.9	118	17.6
34	1	6.3	25	16.0	69	18.5	12	9.5	107	16.0
39			21	13.5	57	15.3	24	19.0	102	15.2
44	1	6.3	22	14.1	47	12.6	21	16.7	91	13.6
49	1	6.3	12	7.7	42	11.3	16	12.7	71	10.6
54	2	12.5	10	6.4	18	4.8	12	9.5	42	6.3
	5	31.3	4	2.6	9	2.4	8	6.3	26	3.9
	16	100.0	156	100.0	372	100.0	126	100.0	670	100.0

Table 22 Distribution of Education by Age

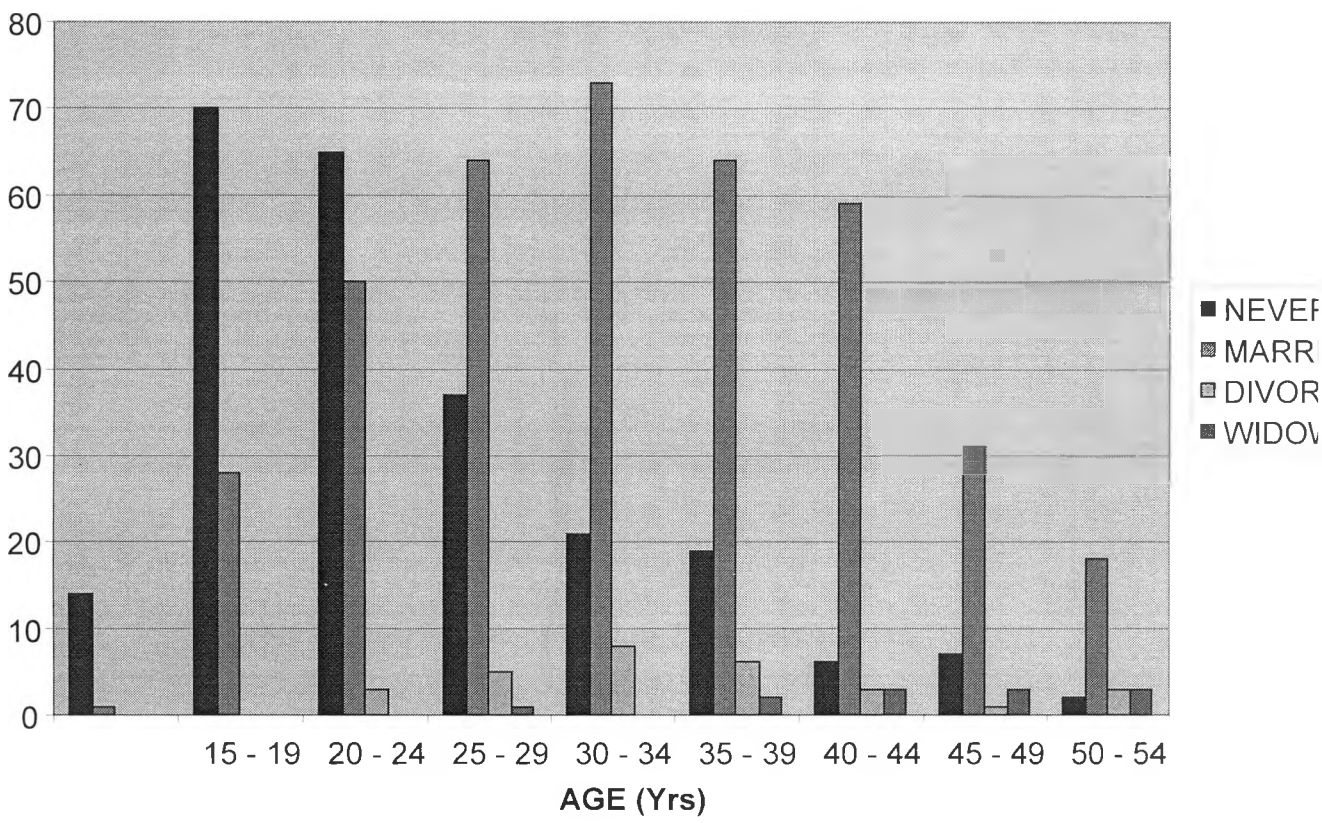
4.5.3 Distribution of Marital Status by Age

From Table 24 below, it can be seen that the highest groups of respondents were the married respondents at 58% of the sample size of 670 respondents. The second largest group was that of the unmarried/ never married at 38% of the sample size of respondents.

	MARITAL								Total	
	Never Married		Married		Divorced/Separate		Widowed		Count	%
	Count	%	Count	%	Count	%	Count	%		
15 - 19	14	5.8	1	0.3					15	2.2
20 - 24	70	29.0	28	7.2					98	14.6
25 - 29	65	27.0	50	12.9	3	10.3			118	17.6
30 - 34	37	15.4	64	16.5	5	17.2	1	8.3	107	16.0
35 - 39	21	8.7	73	18.8	8	27.6			102	15.2
40 - 44	19	7.9	64	16.5	6	20.7	2	16.7	91	13.6
45 - 49	6	2.5	59	15.2	3	10.3	3	25.0	71	10.6
50 - 54	7	2.9	31	8.0	1	3.4	3	25.0	42	6.3
55 +	2	0.8	18	4.6	3	10.3	3	25.0	26	3.9
Total	241	100.0	388	100.0	29	100.0	12	100.0	670	100.0

Table 23 Distribution of Marital Status by Age

JNT



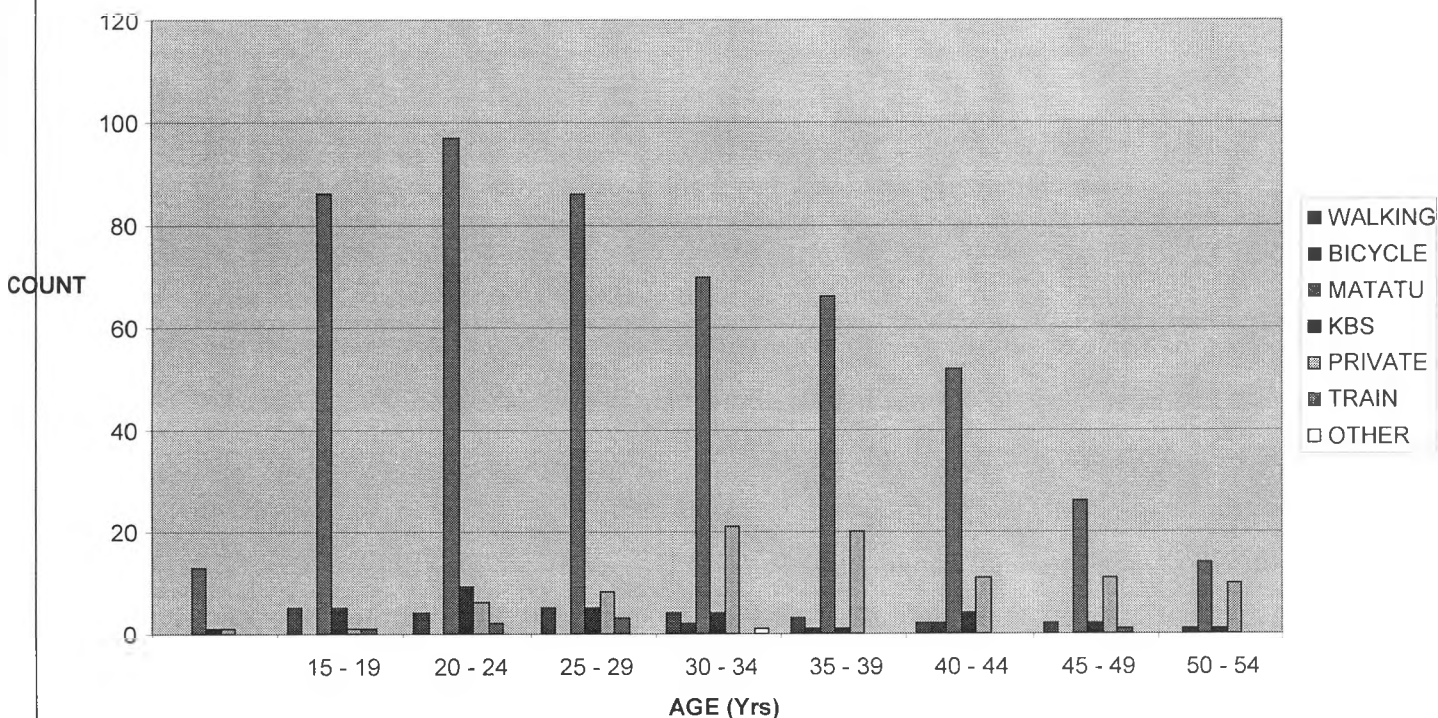
4.5.4 Distribution of Mode of Transport Used by Age

The most used mode of transport is the matatu by 76% of the respondents. The matatu could be seen to be the main transportation mode for most Nairobi residents as it provides for most of the routes. The least used mode of transport depicted by the table below here is the train and bicycle. The most probable reason would be that train as a mode of transport serves only certain routes and its coverage in Nairobi area is poor and operates on fixed schedules hence not able to meet the flexible needs of the commuter who probably could not fit in that schedule. The bicycle as a mode of transport restricted to men, and is not conducive in rainy season's lack of road safety and could be venerable in insecure areas. The walking class is higher because most people find transport to be expensive.

Age Group	TYPE OF TRANSPORT USED														Total	
	Walking		Bicycle		Matatu		KBS		Private car		Train		Other(Specify)		Count	%
	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%		
15 - 19					13	2.5	1	3.1	1	1.1					15	2.2
20 - 24	5	20.0			86	16.9	5	15.6	1	1.1	1	14.3			98	14.6
25 - 29	4	16.0			97	19.0	9	28.1	6	6.7	2	28.6			118	17.6
30 - 34	5	20.0			86	16.9	5	15.6	8	9.0	3	42.9			107	16.0
35 - 39	4	16.0	2	33.3	70	13.7	4	12.5	21	23.6			1	100.0	102	15.2
40 - 44	3	12.0	1	16.7	66	12.9	1	3.1	20	22.5					91	13.6
45 - 49	2	8.0	2	33.3	52	10.2	4	12.5	11	12.4					71	10.6
50 - 54	2	8.0			26	5.1	2	6.3	11	12.4	1	14.3			42	6.3
55 +			1	16.7	14	2.7	1	3.1	10	11.2					26	3.9
Total	25	100.0	6	100.0	510	100.0	32	100.0	89	100.0	7	100.0	1	100.0	670	100.0

Table 24 Distribution of Type of Transport Used by Age

Fig. 11 DISTRIBUTION OF TRANSPORT MODE BY AGE



4.6 Others

4.6.1 Distribution of Amount of Fare Paid by Mode of Transport

It will be assumed that respondents in the mode of transport by bicycle and paid fare are those referred to as Boda Boda or non-motorized and intermediate means of transport. The matatu mode of transport has the highest respondents paying fare at twenty and thirty shillings. However those respondents who indicated that they never paid any fare are likely to be staff in the respective mode of transport or possibly the owners of the transport mode.

TYPE OF TRANSPORT USED														Total	
Walking		Bicycle		Matatu		KBS		Private car		Train		Other(Specify)		Cou nt	%
Cou nt	%	Count	%	Count	%	Count	%	Count	%	Count	%	Count	%		
1	2.1	1	2.1	3	6.4			40	85.1	1	2.1	1	2.1	47	100.0
										1	100.0			1	100.0
				1	100.0									1	100.0
14	4.2	1	0.3	267	80.9	14	4.2	31	9.4	3	0.9			330	100.0
				1	100.0									1	100.0
8	4.2	3	1.6	146	76.8	18	9.5	13	6.8	2	1.1			190	100.0
2	2.4			79	92.9			4	4.7					85	100.0
				11	91.7			1	8.3					12	100.0
				2	100.0									2	100.0
		1	100.0											1	100.0
25	3.7	6	0.9	510	76.1	32	4.8	89	13.3	7	1.0	1	0.1	670	100.0

Table 25 Amount paid for fare by mode of transport used

4.6.2 Mode of Transport by Satisfaction

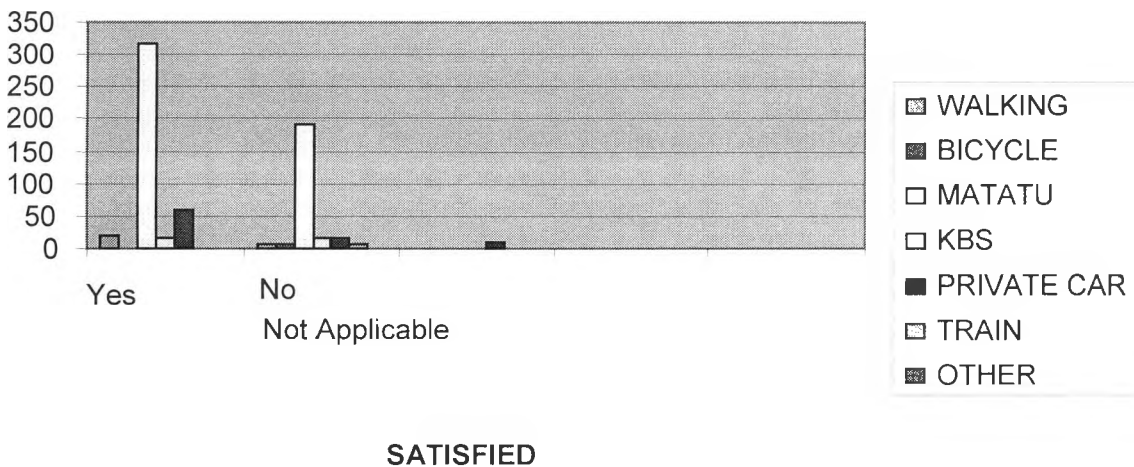
The intention of this table is to show the level of satisfaction attained in each mode of transport by the commuters. It has been observed that 61% of the commuters are satisfied with the entire modes of transport and 39% of the Nairobi commuters are not satisfied. The matatu transport in relation to other modes of transport has the highest satisfaction at 76%. Like wise Matatu commuters are also the highest in number in expression of dissatisfaction. This is due to the high number of users. Using the table 27 below we can conclude that matatu is the most used and preferred mode of transport by the Nairobi commuters.

Type of transport used	SATISFIED						Total	
	Yes		No		Not Applicable		Count	Percent
	Count	Percent	Count	Percent	Count	Percent		
Walking	19	4.6	6	2.5			25	3.7
Bicycle	1	0.2	5	2.0			6	0.9
Matatu	317	76.6	192	78.7	1	8.3	510	76.1
KBS	15	3.6	17	7.0			32	4.8
Private car	60	14.5	18	7.4	11	91.7	89	13.3
Train	1	0.2	6	2.5			7	1.0
Other(Specify)	1	0.2					1	0.1
Total	414	100.0	244	100.0	12	100.0	670	100.0

Table 26 Mode of transport by satisfaction

pictorial representation of the above table is show below.

Fig.12 SATISFACTION BY MODE OF TRANSPORT



4.6.3 Mode of Transport by Current Occupation

The results of the survey by table 27 below indicate that the highest commuters are the working persons in the formal sector. Another depiction is that matatu mode of transport is the most preferred or used mode in all occupation types at 76% of the total population. The personal vehicles and KBS modes of transport follow respectively.

Type of transport used	OCCUPATION														Total	
	Working (Formal)		Working (Informal)		Retired		Homemaker		Student		Other(Specify)		None		Cou nt	%
	Cou nt	%	Cou nt	%	Cou nt	%	Cou nt	%	Count	%	Cou nt	%	Count	%		
Walking	7	2.4	16	8.4							2	2.8			25	3.7
Bicycle	1	0.3	4	2.1							1	1.4			6	0.9
Matatu	205	70.7	154	81.1	3	60.0	51	87.9	26	81.3	48	67.6	23	95.8	510	76.1
KBS	10	3.4	13	6.8	1	20.0	5	8.6	2	6.3			1	4.2	32	4.8
Private car	64	22.1	1	0.5	1	20.0	1	1.7	3	9.4	19	26.8			89	13.3
Train	2	0.7	2	1.1			1	1.7	1	3.1	1	1.4			7	1.0
Other(Specify)	1	0.3													1	0.1
Total	290	100.0	190	100.0	5	100.0	58	100.0	32	100.0	71	100.0	24	100.0	670	100.0

Table 27 Mode of transport by current occupation

4.7 Reasons for Lack of Satisfaction by mode of Transport

The Table below depicts that High fare (at 84.3%) is the main reason for lack of satisfaction compared to other reasons. This will probably be to the high fuel costs transferred to the commuter and being that the economy is still wallowing in poverty. The next highest reason for lack of satisfaction is misconduct of crew at 20%.

Type of transport used	Misconduct		High fare		Noisy		Break traffic rules		Poor roads		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Walking			4	80.0	1	20.0					5	100.0
Bicycle			5	100.0							5	100.0
Matatu	14	8.4	146	87.4	2	1.2	4	2.4	1	0.6	167	100.0
KBS			11	100.0							11	100.0
Private car	6	50.0	2	16.7			4	33.3			12	100.0
Train			4	100.0							4	100.0
Total	20	9.8	172	84.3	3	1.5	8	3.9	1	0.5	204	100.0

Table 28 Reasons for lack of satisfaction by mode of transport

5. CONCLUSIONS

This exercise has been interesting and revealing to the author in the sense that the results so far obtained strongly point to the need for access to a centralized information repository. For example, in figure 5, the need for information from those interviewed was over 80%. The trend in all the results as reflected in all the tables strongly points to the need for the establishment of a central repository. It was not evident to the author, at the onset of the study, the deep rooted weakness in almost all transport systems. This became evident in the course of the study. These weaknesses have been highlighted in chapter 3 above.

The questions posed in the introduction can be answered in the affirmative:

- 5.1. Is there need for access to some centre of information repository (ICT) for efficient and effective transport sector in Nairobi? This has already been answered in the first paragraph above. The challenges of realization of this hypothesis remain paramount.
- 5.2. If the information above is needed, what kind of information do the stakeholders need and possibly for what purpose? The need for information will vary from one user to the other depending on the purposes. In our study we had categories based on age, gender, education and occupation. They all invariably expressed need for information but for different purposes. It is suspected, for example that the youth expressed desire to know the registration number plate as it would give away the condition of the PSV, (the newer the vehicle the more popular it would be with the youth). The older interviewees showed interest in information pertaining to accidents and criminal records.
- 5.3. Can it be implemented cost-effectively, timely and within reach of the stakeholders?
If the Government resolves to facilitate, nothing is impossible. The private sector has demonstrated its willingness to participate. Of necessity it will take time to implement the recommendations stipulated in chapter 6 of this study. This is because it would require putting together a number of resources including finances and manpower which could be scarce and relatively out of reach of the stakeholders. However interim measures are strongly recommended as a start to hold and turn the deterioration tide.
In chapter 7, the author has implemented the recommended system and it worked. It is possible to implement the recommendations in this study subject to availability of resources. The benefits are obvious as indicated in (d) below. It's also cost effective in the sense that the stake holders will have access to valuable information for timely decision making.
- 5.4. Is the ground ripe for ICT implementation; if not, is there a way out of this undesirable situation?
Unfortunately the study has discovered that the ground is not quite ready. But something could be done about it, and this is covered in chapter 6 below.

The approach in the response to the above question could also be broken into four sub-sections namely: -

- 5.4.1. The need to integrate transport with other development agendas.
- 5.4.2. Enhancement of the transport level of services qualitatively.
- 5.4.3. Enhancement of the transport safety and security
- 5.4.4. Introduction of measures for sustainable utilization of the environment.

Yet ICT is an adhesive of all these fragmented pieces of the transport industry. It could integrate and harmonize relationships in the transport sector. It could also facilitate the increase in socio-economic benefits to all stakeholders which include:

- 5.4.5. Contribution to decongestion of the traffic due to schedule regulation via electronic media.
- 5.4.6. General rise of economic productivity through timeliness of schedules and general information about industry.
- 5.4.7. Comfortable ride of controllable traffic.
- 5.4.8. Improved revenue collection by the exchequer.
- 5.4.9. Enhanced travel safety.
- 5.4.10 Because of orderliness, the sector will be attractive to strategic investors

5.5 The other issues which require attention at this level is whether the motivating factors as stipulated at the introduction have been realized in this study.

- 5.5.1 The desire for promotion of safe, reliable, effective, well coordinated, integrated and environmental friendly Transport system. - The study has revealed that there is enormous room for improvement in order to achieve the stated desire. The author has penned down a few recommendations which if pursued for implementation would surely upgrade the public transport service levels. The desire as expressed was noble and aimed at benefiting all Nairobian.
- 5.5.2 An opportunity to relate the theory learned to practical- real life situation in the city of Nairobi. - The study has enabled the author to put into effect in the market place the research methods learned in classroom. The application of web design and database

interfacing to implement the commuter system made the author use his skills in design and analysis of systems.

- 5.5.3 Contribute to the body of knowledge upon which others may build further knowledge. – During this study, it came to the author's knowledge that a number of researchers were in the market trying to gather information relating to what is ailing the public transport sector in Nairobi. Among these included a research team spearheaded by KIPRA and the Japan International Cooperation Agency (JICA) in collaboration with Ministries of Roads and Public Works and Local Government. The Ministry of Transport has since 2004 been carrying out studies into the transport sector. Indeed there is very little literature in the Libraries touching on this vital sector of the Kenyan economy. This small contribution by the author goes some way in providing a basis for further research as recommended in chapter 6 below.
- 5.5.4 To the uplifting of commuter dignity by exposing available opportunities for exploitation for the benefit of all. – The problems as highlighted pertaining to lack of adequate attention to the non-motorized means of transport, the emphasis by service providers on business rather than public service orientation, the weaknesses by Government in bringing 'sanity' in the operations in this sector etcetera , all point to the deplorable levels of commuter dignity. The improvement of these conditions as recommended in chapter 6 would mean an improvement in dignity of the commuter.
- 5.5.5 In partial fulfillment for the award of Master of Science Degree in information systems.

6. RECOMMENDATIONS

The study clearly shows that the transport policy paths so far followed by the GoK, the City council of Nairobi, and other stakeholders have been unable to yield sustained gains. There is need to develop sustainable systems that synergizes all transport issues for the benefit of the citizens of the Nairobi city and the region at large. This study has been very broad and opens avenues for further study in more specific areas in preparation for the establishment of a more efficient and effective national transport systems. In order to respond to the challenges and issues arising out of the existing status of the transport sector, it is proposed that the authorities address a number of imperatives (which may also form a basis for further research):

6.1 Integrate transport with development

6.1.1 National Development Priorities:

Transport planning should support appropriate strategies, such as national development, land-use planning and efficiency, establishing transport infrastructure and services linking industrial centers, production zones and markets to induce robust socio-economic activity and growth. Preliminary studies (in progress as at the time of writing this report) by JICA in collaboration with ministries of roads and public works and Local Government indicate that in Nairobi there are 52 missing links in the road network. For example there is no direct link between Westlands through Kileleshwa to Ngong road and to Otiende estate through Kibera. A link between these areas would not only save on fuel consumption but also address the issues of traffic congestion, faster mobility and therefore saving of vital resources.

6.1.2 Basic Needs of the Citizenry:

In accordance with the objectives of Kenyan national reconstruction and development policies, wealth, employment creation and industrialization programmes would be aligned to meet basic mobility needs of the population and regional clients. In reality, this is not happening and therefore a move by the authorities to actualize this dream is encouraged. Example is the provision of facilities for Non-motorized means of commuting, provision of bridges, stage shelters and security. The dignity of the citizen does not appear to be at the center of the implementation of the above stated policies in Nairobi.

6.1.3 Broaden Local Participation in the Transport Sector:

To identify and encourage ownership and participation of the transport systems by private sector in job creation, efficient service delivery and transparent bidding processes. Using an appropriate combination of equipment and labor, build transport infrastructure that can increase job opportunities for the poor, and mobility of all. For example the GoK could limit access of small matatus into the Central Business District - CBD and allow operators with mass transport capabilities to traverse the CBD and link passengers to various designated termini. This would however call for restructuring of the road networks and provision of physical facilities for parking and turnarounds. If such were available, it would be possible to attract private investors in this area and thus provide this vital service.

6.1.4 Respond to Regional and Global Integration:

Transport provides the most appropriate mechanism for integrating Nairobi to the national economic activities with regional and global systems. Nairobi lies at a strategic geographical and commercial position and provides opportunities for applying the transport system to fully and appropriately harness this position as well as deal with emerging threats in the global transport industry. Some positive deliberate and precise measures must be put in place. Again, only the Government has the means to influence this.

6.1.5 Respond to Market Needs of Transport

The goal is to move towards a situation where passenger and freight transport demands can be optimally satisfied through the transport choices available. This demands flexible transport systems and planning processes, which can respond to market requirements, while providing quality, reliability, safety, security and speed in transporting passengers and freight. This requires that infrastructure be tailored to the needs of transport operators and end users while reducing costs and enhancing capacity utilization. Proposals should identify appropriate levels of service for defined customer groups and minimize costs associated with meeting those requirements. For example, introduce and expand railway services with appropriate dropping and picking stations, introduce luxury buses targeting middle class commuters thus decongesting the city with private cars, introduce time tables for public passenger transport vehicles etcetera. This would also include construction of bypasses, ring roads, links, walk paths, train lines, cycling lanes and mkokoteni lanes.

6.1.6 Respond to Transport Investment Needs:

Given the long-term nature of investments in transport infrastructure as a base for supporting investment decisions in other sectors, the Nairobi city council must commit itself to developing and maintaining optimal transport infrastructure that facilitates investment citywide. The Central Government has a big part to play before inviting the private sector's participation.

6.1.7 Respond to Modal Integration demands:

Transport policy must provide a vision shared by all stakeholders, backed by coordinated and integrated planning and decision-making. Inter-modal co-ordination, co-operation and sharing of information should be encouraged in both infrastructure provision and transport operations to maximize customer satisfaction, reduce costs, and maximize social and economic returns. For example, there should be an intra-matatu termini link, linking between the matatu termini and long distance bus termini and also between these and the railway stations. For this purpose, appropriate Gok departments, the Nairobi city authorities, private sector, and users must be involved in the decision-making processes.

6.2 To enhance transport services and quality

6.2.1 Ensure commuter Protection:

While appreciating the need to fully involve the private sector in providing transport services, an environment must be created in which the commuter is protected. It is expected that the transport system will strive to cater for the transport needs of persons with special needs. These include the physically challenged, women, children including school going children, and the sick amongst others.

6.2.2 Ensure Fair Competition:

There is need to address current levels of competition, the platforms on which such competition occurs, the sufficiency or insufficiency of competition, the presence of any monopolies, cartels and policies necessary to regulate them while optimizing competition without prejudice to the parties involved. Example is the licensing of the *city hoppa* and the *Bus track* to monopolize the CBD routes to the detriment of minibuses operators. The

transport system must take into account emerging competition models in the sector and apply the same to the benefit of investors and commuters alike.

6.2.3 Integrate information and communication technologies:

It is now acknowledged worldwide that information systems play a critical role in development. The transport sector should, in earnest adopt convenient information and communication systems that allow inter-modal and inter-sectoral information exchange to facilitate efficiency and effectiveness in the sector. This should go a long way to enhance linkages both locally and internationally to enable Nairobi to exchange information for transport purposes. It would also enable industry to move towards “Just-in-Time” (JIT) processes by increasing demand for high-precision transport and logistics. Similarly, ICT’s allow operators to offer information that is more precise to operators and customers, thereby raising quality of service levels. This will attract the investors into the industry.

6.2.4 Remove Impediments to Non-Motorized and Intermediate Means of Transport - NMIMT:

Current transport policies in the City have seemed to favor motorized transport facilities and services at the expense of non-motorized transport and have seemed to deny the poor and disadvantaged benefits inherent in incorporating NMIMT’s in the development of transport sector. This has especially contributed to continued marginalization of NMIMT users.

6.3 Enhance transport safety and security

This is a Central Government Docket. Institutions should be identified that will be responsible for ensuring development of a safe and secure transport system responsive to commuter and service provider needs. In addition, these institutions should determine the safety and security standards and how these would be delivered, audited and enhanced.

6.4 Sustainable utilizations of the environment

Transport sector is a major user of environmental resources such as land, non-renewable fuels and air, with numerous impacts e.g. noise and air pollution, which contribute to environmental exhaustion and negatively impacting on the health of the residents. The City authorities should ensure that transport is environmentally compliant and should therefore implement mitigation measures. A number of treaties at regional and global levels point to restrictions on such pollution and environmental

degradation. The GoK and the Nairobi City Council should facilitate movements towards benchmarks by setting out measures to meet minimum requirements of these treaties and conventions. In addition, they should provide opportunity for exploiting mechanisms under these treaties for developing a clearer transport system not only in Nairobi but also in other parts of the country.

6.4.1 Urban Land Use Planning:

There are clear linkages between land use, demography and transport. It is therefore necessary that these be considered together for their effective and efficient utilization. Transport systems so developed should facilitate a quality living and working environment for all, including persons with special needs.

6.4.2 Weather and Climate Information Utilization:

All transport modes are sensitive to extreme weather conditions such as high temperatures, humidity, mist, fog and rain. Extreme values of these parameters are known to slow down transportation, affect transport vehicle navigation apart from compromising transport safety and security thus increasing the costs of operation and maintenance of transport system. Timely, accurate and reliable provision of early warning risk information on potential meteorological hazards will be useful in mitigating potential risks or vulnerability to the transport sector.

6.5 Development of human resource capacities

There is need to ensure that human resource development responds to the envisaged challenges of inter-modernism, infusion of new technologies in the transport system and improved consumer service levels. Required skills and technologies should be identified and methods for achieving those needed in the future, such as training and education through industry training institutions be developed. In this area, only the government can set the pace of development by for example providing incentives to the private sector and the learners.

Of all the resources, the human resource is the most valuable and this must be demonstrated by the attention attached to it.

7. THE MATATU SYSTEM (matatu.com)

The case study was implemented using web pages as the front end interface and access as the underlying Data Base Management System.

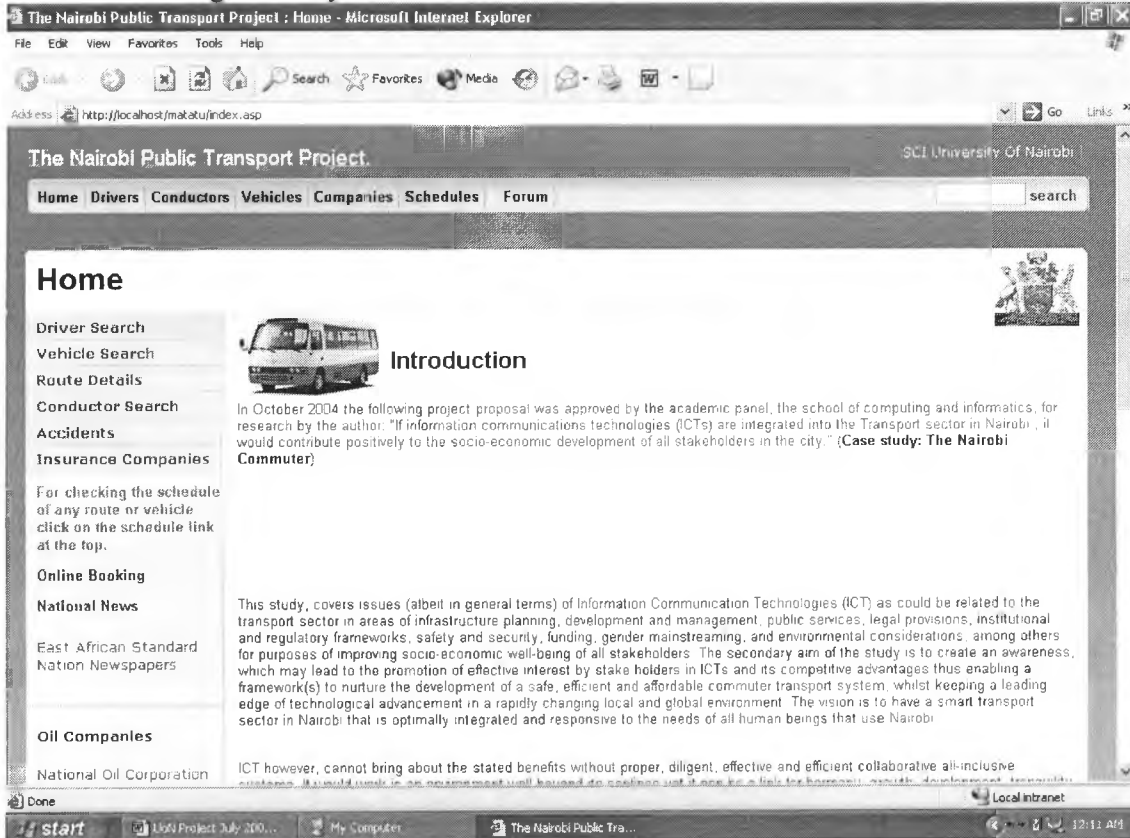


Figure 10 The Home Page.

The home page includes an overview of the system and a few instructions on the system use. It provides links to the other related pages.

The Nairobi Public Transport Project - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://localhost/matatu/drivers.asp

The Nairobi Public Transport Project. SCL University Of Nairobi

Home Drivers Conductors Vehicles Companies Schedules Forum search

Drivers

Driver Search
Vehicle Search
Route Details
Conductor Search
Accidents
Insurance Companies
Online Booking
National News
Oil Companies

Drivers Details

Name	licence Number	Years At work	PSV number	Number Plate	goodcon	Route Plying	Company
MULWA	115	4	503	KAB 600W	YES	100	NAIROBI HOPPA
NYAGA	116	10	506	KAD 750R	YES	134	NAIROBI HOPPA
MUNGALA	117	6	514	KAH 540E	YES	120	NAIROBI HOPPA
KINOTI	118	5	516	KAG 095F	YES	124	NAIROBI HOPPA
OSMAN	119	7	518	KAD 520H	YES	134	GATE WAY
MUNGUTI	120	8	523	KAK 670L	YES	120	GATE WAY
KEGA	121	4	525	KAR 200P	YES	124	GATE WAY
GWORO	122	9	526	KAE 500M	YES	146	GATE WAY
GACHANJA	123	12	529	KAN 650Y	YES	120	CITI LINK
OMONDI	124	11	530	KAN 642U	YES	124	CITI LINK

Next Last

http://localhost/matatu/drivers.asp Local intranet

Figure 11 the Drivers Page

The Nairobi Public Transport Project - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://localhost/matatu/conductors.asp

The Nairobi Public Transport Project. SCL University Of Nairobi

Home Drivers Conductors Vehicles Companies Schedules Forum search

Conductors

Driver Search
Vehicle Search
Route Details
Conductor Search
Accidents
Insurance Companies
Online Booking
National News
Oil Companies

Details

Name	sex	Driving licence	Years worked	PSV number	Vehicle	Route no	Company
MULATI	MALE	181	1	586	KAR 864I	120	KENYA BUS SERVICES
WAMBUI	FEMALE	182	2	587	KAM 518P	126	KENYA BUS SERVICES
AKELLO	FEMALE	183	2	589	KAP 450R	124	KENYA BUS SERVICES
MUGENDI	MALE	184	4	590	KAL 067J	146	KENYA BUS SERVICES
KANGANGI	MALE	145	4	503	KAB 600W	100	NAIROBI HOPPA
MBOCHE	MALE	146	4	506	KAD 750R	134	NAIROBI HOPPA
KIRUNJA	MALE	147	6	514	KAH 540E	120	NAIROBI HOPPA
MULINGE	MALE	148	2	516	KAG 895F	124	NAIROBI HOPPA
NYAWIRA	FEMALE	149	7	518	KAD 520H	134	GATE WAY
RASHID	MALE	150	1	523	KAK 670L	120	GATE WAY

Next Last

http://localhost/matatu/conductors.asp Local intranet

Figure 12 the Conductors Page

The Nairobi Public Transport Project - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://localhost/matatu/vehiclesdetails.asp

The Nairobi Public Transport Project

Home Drivers Conductors Vehicles Companies Schedules Forum

Vehicles Currently Available

Driver Search
Vehicle Search
Route Details
Conductor Search
Accidents
Insurance Companies
Online Booking National News
East African Standard Nation Newspapers
Oil Companies
National Oil Corporation
Shell Oils
Total Kenya.
Aggip Oils
Kenol/Kobil

Make	Number Plate	Year Of Manufacture	Insurance	Validity	Vehicle colour	Route destination	PSV Number	Company Name
NISSAN	KAD 520H	2003	NONE	NO	WHITE	EMBAKASI	518	GATE WAY
ISUZU	KAK 670L	2001	NONE	NO	WHITE	RUIRU	528	GATE WAY
TOYOTA	KAR 200P	2003	NONE	NO	WHITE	LIMURU	525	GATE WAY
TATA	KAE 500M	2005	NONE	NO	WHITE	KANGEMI	526	GATE WAY
ISUZU MANYANGA	KAD 750R	2005	ICEA	NO	BLUE	EMBAKASI	506	NAIROBI HOPPA
ROSA	KAH 540E	2004	ALICO	YES	WHITE	RUIRU	514	NAIROBI HOPPA
TOYOTA	KAG 895F	2003	UNITED INSURANCE	NO	BROWN	LIMURU	516	NAIROBI HOPPA
ISUZU	KAD 750R	2000	UNITED	NO	GREEN	EMBAKASI	506	NAIROBI HOPPA
MISTU	KAH 540F	2001	ICEA	NO	GREEN	RUIRU	515	NAIROBI HOPPA

Done

start

Local intranet

Figure 13 Vehicles Available Page

The Nairobi Public Transport Project - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Address http://localhost/matatu/companies.asp

The Nairobi Public Transport Project.

Home Drivers Conductors Vehicles Companies Schedules Forum

Companies

Driver Search
Vehicle Search
Route Details
Conductor Search
Accidents
Insurance Companies
Online Booking
National News
East African Standard Nation Newspapers
Oil Companies
National Oil Corporation
Shell Oils
Total Kenya.
Aggip Oils
Kenol/Kobil

Details

Name	Code	Date Of Registration
KENYA BUS SERVICES	930	2/11/1985
NAIROBI HOPPA	110	11/11/2004
GATE WAY	100	10/11/2004
CITY LINK	350	1/1/2005
CITY EXPRESS	201	2/10/2003
ROY	150	5/1/1996
SWIFTY TRANSPORT	600	5/1/2005
HIGHWAY COACHES	750	4/15/2001
BEST NISSAN TRANSPORTERS	650	3/2/2003
KERUBO DELUXE	550	4/10/1999

Local intranet

start

Local intranet

Figure 14 Companies Page

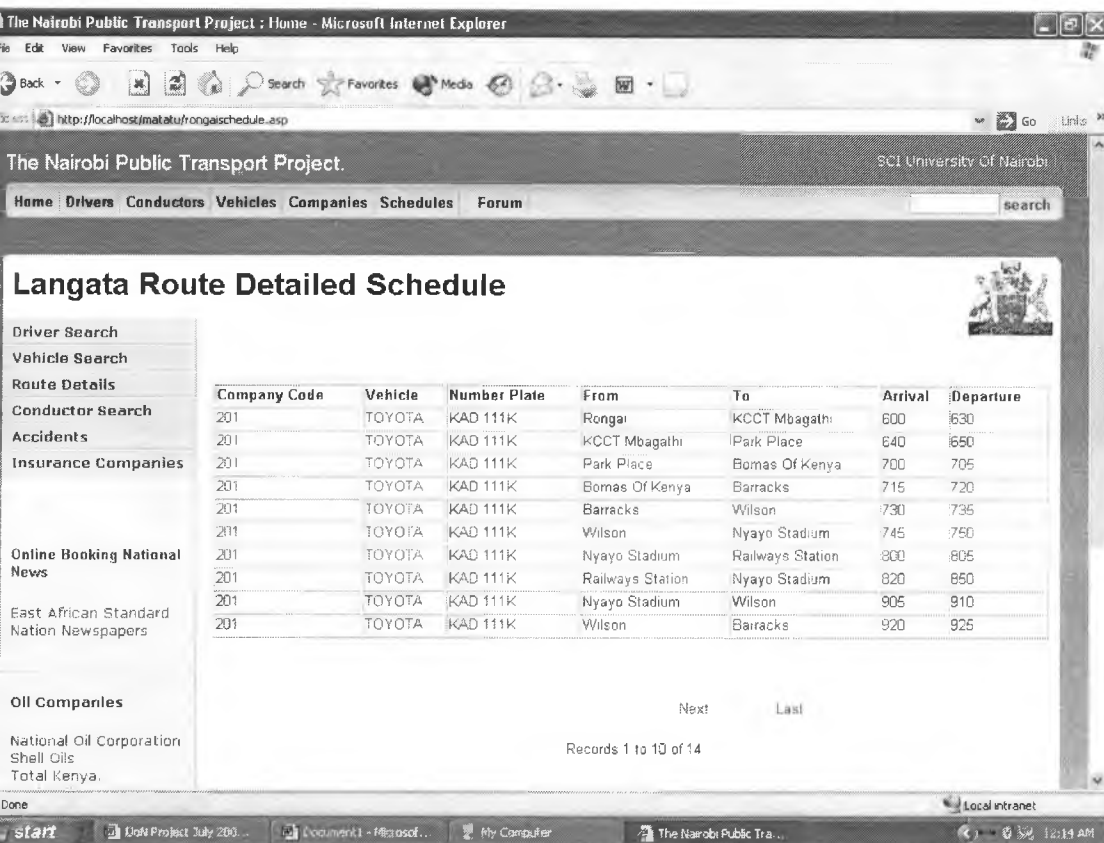


Figure 15 Vehicle Schedule Page

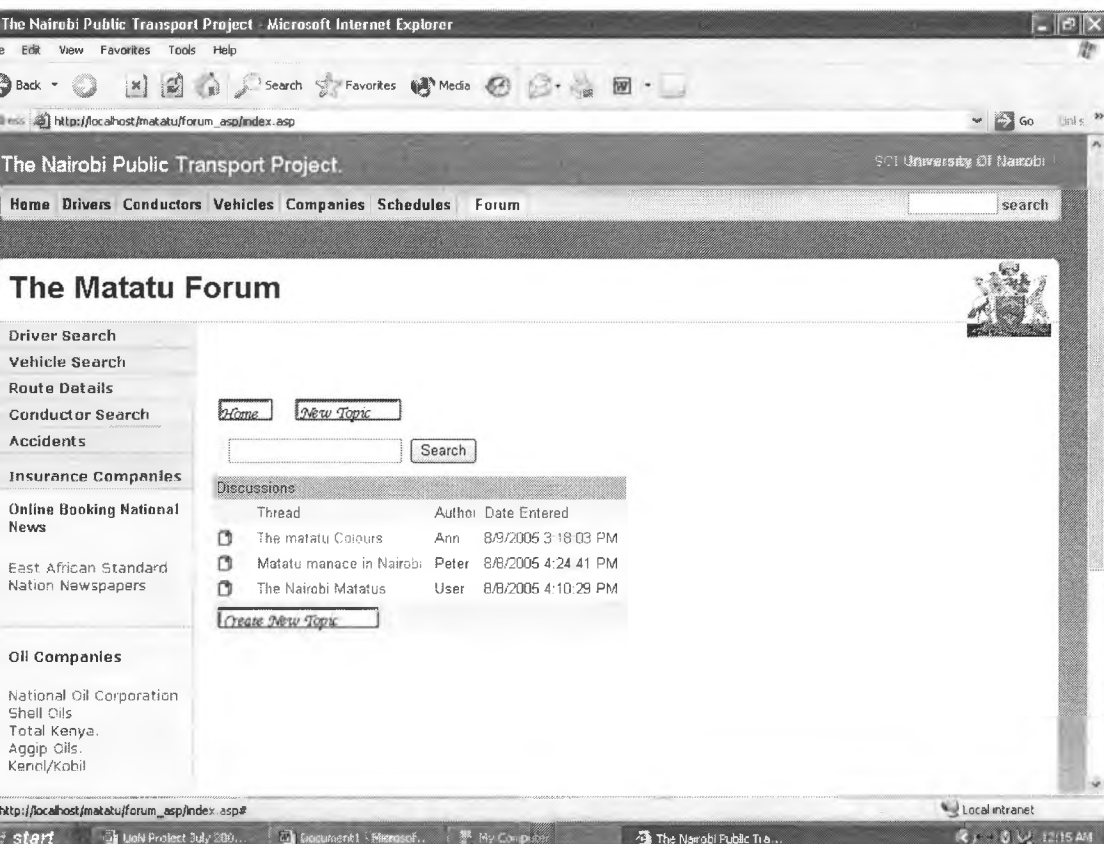


Figure 16 the Matatu Forum Page

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cap 409

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Date: 07/05/2005

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<15/Rendered/PDF/multi0page.pdf>

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Bureau of Statistics

APPENDIX

The survey tools used in the study.

**COMMUTER SURVEY
QUESTIONNAIRE**

IDENTIFICATION PARTICULARS

Stratum Number E.A. Name E.A. Number Estate of residence Household Number

GENERAL INFORMATION

1. Respondent Name 2. Sex
1=Male
2=Fem

3. Age in years 4. Level of education Marital Status 5. Current occupation

6. Mode of transport mainly used by the household members within Nairobi
1=Walking
2=Bicycle
3=Matatu/Minibus
4=Bus
5=Private Car
6=Train
7=Other (specify)

7. Number of males in the household 8. Number of females in the household

9. Number of males utilizing matatu transport in household 10. Number of females utilizing matatu transport in household

11. Number of times travels by public means to town in a week one way 12. Fare paid for each trip to town one way in Kshs

13. Are you satisfied with this mode of transport
1=Yes
2=No

14. If no in 13 what is the main reason _____

PSV OPERATION DETAILS

It has been proposed that a centre should be set up for storage of information on matatu transport in the city. Before the centre can be set up, information is required on the needs of the commuters. Kindly indicate your information needs in the following sections.

15. What is the route number of your estate
16. Which types of Matatu operate on this route - 1Nissan, 2 Mini Bus, 3 Both
17. If Both in 16 Which one do you prefer
18. Would you at any one time like to access information on the Matatu transport you use
- 1=Yes
2=No

If yes in 18 indicate the type of information you would require in the following sections

Figure 17 the Questionier form 1.

PARTICULARS OF THE VEHICLE

In Each of the Questions Below, the Response is 1=Yes (if information needed and 2=No if not needed)

19. Make of the vehicle
20. Number plate
21. Year of manufacture
22. Name of Insurance company
23. Validity of insurance cover
24. Insurance Policy Number
25. License Passenger Capacity of the vehicle
26. Color of the vehicle
27. Route Operation number
28. Route origin (Terminus)
29. Route Destination
30. Location vehicle usually parked after duty
31. PSV Number

A - Driver

32. Name of driver	<input type="text"/>	33. Sex	<input type="text"/>	34. National Identification number of the driver	<input type="text"/>	35. Driving License Number	<input type="text"/>	36. Number of years of driving	<input type="text"/>	37. Accident history of driver	<input type="text"/>
38. Criminal Record of driver	<input type="text"/>	39. PSV Number	<input type="text"/>	40. Presence of certificate of good conduct	<input type="text"/>	41. Display of drivers photo	<input type="text"/>				

B - Conductor

42. Name of conductor	<input type="text"/>	43. Sex	<input type="text"/>	44. National Identification number of the conductor	<input type="text"/>	45. Driving License Number (If any)	<input type="text"/>	46. Number of years of driving	<input type="text"/>	47. Accident history of the conductor	<input type="text"/>
48. Criminal Record of conductor	<input type="text"/>	49. PSV Number	<input type="text"/>	50. Presence of certificate of good conduct	<input type="text"/>	51. Display of conductor photo	<input type="text"/>				

Figure 18 the Questionier form 2

C - Owner of the matatu

52. Name of owner	<input type="text"/>	53. Sex	<input type="text"/>	54. National Identification number of the owner	<input type="text"/>	55. Driving License Number (If any)	<input type="text"/>
58. Criminal Record of owner	<input type="text"/>	59. Postal address of the owner	<input type="text"/>	60. Physical address of the owner	<input type="text"/>	61. Occupation of the owner	

RECORD OF PREVIOUS ACCIDENT

64. Route of accident	<input type="text"/>	65. Date of Accident	<input type="text"/>	66. Time of Accident	<input type="text"/>	67. Nature of accident	<input type="text"/>
70. Number of Deaths occurred male	<input type="text"/>	71. Number of females with serious injuries	<input type="text"/>	72. Number of males with serious injuries	<input type="text"/>	73. Particulars of the deaths passengers	<input type="text"/>

56. Number of years of driving

57. Accident history of the owner

62. Number of PSV vehicles owned

63. Route Numbers operated

TS by FIRM

68. Number of passengers at time of accident

69. Number of Deaths occurred female

74. Particulars of the seriously injured s

Codes for variables

Marital Status

1=Never married
2=Married
3=Divorced/Separated
4=Widowed

Current Occupation

1=Working (Formal) 2=Working
(Informal)
3=Retired 4=Homemaker
5=Student 6=Other (Specify
7=None

Figure 19 the Questionier for