THE IMPACT OF MASS TRANSIT SYSTEM AS IT AFFECTS URBANIZATION FROM ASABA TO AWKA

BY

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SUBMITTED TO
DEPARTMENT OF CIVIL ENGINEERING
FACULTY OF ENGINEERING
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A PROJECT SUBMITTED IN PARTIAL FUFILLMENT OF THE REQUIREMENT FOR THE AWARD OF BACHELOR DEGREE IN ENGINNERING

SUPERVISOR: ENGR.MRS B.A NJOTEA

MAY, 2023.

CERTIFICATION

This is to certify that I, Samuel Precious Chidimma with registration number 2017224010 personally carried out this project till completion for the award of Bachelor's degree in Engineering (B.Eng.), department of Civil Engineering, Nnamdi Azikiwe University Awka. This work to the best of my knowledge has not been to any form submitted for same purpose in the field of Civil Engineering.

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APPROVAL

This research work "Effect of mass transit as it affects urbanization" is an authentic academic work undertaken by Precious Chidimma Samuel has been assessed and approved by the department of Civil engineering, Nnamdi Azikiwe University, Awka Anambra state.

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DEDICATION

This project is dedicated to God Almighty whom his infinite grace and mercy has accompanied me to the successful completion of this project. I equally dedicate this work to my beloved family, friends, and everyone who served as a real source of inspiration towards my academic pursuit.

ACKNOWLEGDEMENT

This work was made possible first by the divine assistance of God Almighty, the giver of life. His protection and guidance are immeasurably appreciated, and his guidance and protection throughout my stay in Nnamdi Azikiwe University.

I am extremely thankful to my parents (Apostle & Rev (Mrs.) Samuel) and my siblings (Emma, Ruth, Joshua) whose constant prayers and love kept me going.

My thanks, also goes to my supervisor Engr.B. A Njotea for her time and guidance in the accomplishment of this project

Special thanks to the Head of Department of Civil Engineering, Eng. Dr C.A. Ezeagu His guidance and assistance remain outstanding.

I will also like to extend my heartfelt appreciation to all my lecturers who taught me (academic and non-academic staff) of the department of civil engineering, I say thank you.

I want to thank all my dear friends as well as Chidinma Akunwa, Vivian Ihuefo, Chinelo John, Desire John, Dominic George, Eng. Patrick Ibeh, Mr. Chinedu Okoye, Damilola Adebisi, Emmanuel Anakor, Kenechukwu Uzobuike, Richard, OS girls, for their help and direction and who always cheered me up when I felt like crying. To late Miss Ebube, this was all for you because I want you to be proud of me up there.

To my family, friends, cousins and well-wishers. I appreciate the love received throughout my years here. God bless you all.

ABSTRACT

Mass transit has a significant impact on urbanization, affecting the growth and development of cities in numerous ways. One of the main benefits of mass transit is its ability to provide efficient and reliable transportation for large numbers of people, reducing traffic congestion and air pollution. This, in turn, can encourage more people to live and work in urban areas, leading to increased population density and economic activity. Mass transit systems also have the potential to shape the physical layout of cities, influencing the location and design of buildings, public spaces, and other urban infrastructure. In some cases, mass transit can serve as a catalyst for urban revitalization, sparking investment and development in previously neglected areas. However, the impact of mass transit on urbanization is not uniformly positive. Some critics argue that mass transit systems can be expensive to build and maintain, and may not always be cost-effective or sustainable in the long term. Additionally, the construction of mass transit infrastructure can sometimes displace local communities and disrupt the social fabric of neighborhoods. Overall, the impact of mass transit on urbanization is complex and multifaceted, and depends on a variety of factors including local demographics, land use patterns, and transportation policies. As cities continue to grow and evolve, the role of mass transit in shaping urban development is likely to remain a subject of ongoing debate and research.

TABLE OF CONTENT

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Transport is important for the survival of modern society and without it; there would be no life in the city (Onokala, 2001). As an essential service in urban centres, transport enables people, firms and other organizations to carry out their activities at sites selected for these purposes in separate locations in the cities. Transport provides a key to the understanding and operation of many other systems at many different scales and is an epitome of the complex relationships between social and political activities and the level of economic development (Buchannan, 1969; Hoyle and Smith, 1992).

Transportation is important in physical and economic development of towns and cities all over the world. Transportation is described as an essential ingredient in the economic life of every nation, the engine that drives the growth and development of people and countries. **Mass transit**, also called "**mass transportation"**, or "**public transportation"**, the movement of people within urban areas using group travel technologies such as buses and trains. The essential feature of mass transportation is that many people are carried in the same vehicle (e.g., buses) or collection of attached vehicles (trains). This makes it possible to move people in the same travel corridor with greater efficiency, which can lead to lower costs to carry each person or because many shares, the costs people the opportunity to spend more money to provide better service, or both. Mass transit systems may be owned by private, profit-making companies or by governments or quasi-government agencies that may not operate for profit. Whether public or private, many mass transportation services are subsidized because they cannot cover all their costs from fares charged to their riders. Such subsidies assure the availability of mass transit, which contributes to making cities efficient and desirable places in which to live. The importance of mass transportation in supporting urban life differs among cities, depending largely on the role played by its chief competitor, the private automobile. People travel to meet their needs for subsistence (to go to work, to acquire food and essential services), for personal development (to go to school and cultural facilities), and for entertainment (to participate in or watch sporting events, to visit friends). The need for travel is a derived need, because people rarely travel for the sake of travel itself; they travel to meet the primary needs of daily life. Mobility is an essential

feature of urban life, for it defines the ability to participate in modern society. Mass transportation, which is the movement of large number of people, goods and services, is inevitable for the socio-economic and cultural integration of nations. For this reason, the issue of mass transportation has attracted the attention of several administrations in Nigeria. In January 1989, the Federal government launched the mass transit program to enhance the transportation system in the country. Nevertheless, attempts at evolving a meaningful mass transportation system in Nigeria have been elusive. A number of problems have plagued the nation's transport industry including general inadequacy of mass transit facilities relative to demand, inefficiency in the management and running of public transport corporations and the absence of an effective maintenance culture (Adetunji M.A, 2013). Mass Transit is a live wire for national development regardless of a nation industrial capacity, population or technological development. It gives expressions to policy initiative in areas like health, education, employment, etc., and in the absence of it, these facilities would be inaccessible. The principal motive of mass transit is the movement of many passengers in one vehicle at a time from one place to the other which brings about development. For the purpose of this paper, mass transit will be viewed as any transportation system which can transport a large number of passengers (from forty and above) at a time in one vehicle and for which operations are regulated by time schedule, fixed routes and stops. From this classification, mass transit systems therefore include road transit, the commuter rail system of transit, and riverine waterways (e.g., passenger ferries) among others. Whatever the mode and means of mass transportation, there is need for the development of an effective maintenance culture so as to ensure safety, regularity, comprehensiveness and the continued operation of the mass transit facilities and system. Metropolitan cities in the recent time have grown to the point where they threaten to strangle the transportation that made them possible. Up to the 1970s in Nigeria, it was relatively easy to move from one part of the city to the other (Ikya, 1993). Within a period of two decades or so, urban transportation dramatized into chaotic, complex and almost intractable nature such that most cities almost reached a level of relative immobility.

In Nigeria of today, every urban Centre is confronted with transportation challenges that seem to grow worse as these areas continue to grow. In this article, challenges of urban transportation in Nigeria are examined. The importance of transport in the functioning of urban Centre,

urbanization and attending transport problems are critically examined as prelude to the understanding of issues in urban transportation challenges in Nigeria. Public transportation systems provide the most efficient means of moving large number of people especially in density populated urban centres. In addition to the well-being of its users, public transport plays a vital role in the productivity of cities, which in turn has a direct bearing on the national economies (World Bank, 2001; Lyndon and Todd, 2006). Public transportation by definition connotes the act or the means of conveying large number of people "en masse" as opposed to conveyance in individual vehicles carrying very few people at a time. In other words, public transport or mass transit is a system in, which a greater number of people are, moved at a time along principal corridors Ogbazi (1992). the suggested measures for better urban transportation in the country conclude the article. (Solanke, 2007). The city of today is very complex. It is made up of living, functioning and interacting parts. It covers large expanse of land and accommodates varied activities. In order to allow the necessary functional inter-relationships among the different land uses in urban areas, cities are served with transport facilities. Transport systems are the veins and arteries of urban areas; linking together social areas and functional zones. Intra-urban transportation in particular functions to integrate various parts of the city: work, school, recreation etc., into a unified whole. The urban centres as we know today are therefore not possible until transport allows the movement of people and goods that make them function. There are overwhelming evidences to show that cities of today depend on transport for efficiency. For instance, food items and raw materials must be conveyed to the different land use types where they are needed. Food items are moved to residential areas, and raw materials to industrial land-use. Waste generated must be collected and removed. To pay for the food and manufactured materials, people must work. Manufactured goods produced must be distributed. The urban residents must be on the move constantly in order to make urban activities and functions among others possible; and this movement is allowed by a mechanism- Transport. Transport therefore remains a non-negotiable instrument of city development and functioning.

Rapid transit is an important form of mass transit system such as subways and surface light rail systems, designed for commuting inter-city or intra-city. Mass transit may be based on fixed route system such as subway trains, metros or non-fixed route system such as buses. It is potentially more economical, eco-friendly and less time consuming. In addition, it is the most competent way of reducing the ever-growing traffic congestion of the developing city. Mass

transit has the advantage of smaller rights of way and developing lesser amount of infrastructure required for highways and roads.

1.2 Statement of the Research Problem.

The relationship between transportation and urban property values has been the focus of many studies (for example, Dewees, 1976; Damm et al, 1980; Wolf, 1992; Singh, 2005). Some of the earlier studies returned positive relationship between transport and property values while others showed negative relationship. For instance, in a study on the relationship between rail travel cost and residential property values, a replacement of streetcar with subway increased site rent at a location that is perpendicular to the facility within a one-third mile walk to the station (Dewees, 1976); and there was positive influence of permanent transportation improvements on land values (Wolf, 1992). It was established that there was statistically significant relationship between distance of a parcel of land to the nearest Metro station and land price (Damm, Lerner-Lam, and Young, 1980), while there was evidence that residential property prices decrease immediately around the transport investment or station value uplift through changes in land values (Singh, 2005). The urban areas all over the world offer a number of advantages in terms of concentration of people followed by demand for commercial properties and transportation. The use of roads leads to a study of urban areas in relation to land uses, especially commercial properties. It is against this background that this study was conceived.

1.3 Aim and Objectives of the Research

The aim of this research is to analyze the impact of mass transit system on urbanization from Asaba to Awka, while the specific objectives are to:

a. Analyze the impact of mass transit system on urbanization in the study area;

b. Examine the spatial pattern and trend mass transit system have on urbanization in the study area;

c. Determine the relationships between mass transit system and urbanization in the study area;

d. Determine the contributions of mass transit system on urbanization in the study area;

e. Design a model mass transit system from Asaba to Awka in relation to the explanatory variables.

1.4 Justification of Research

The research project on the effect of a mass transit system on urbanization is justified for several reasons; Urbanization is a global phenomenon, mass transit systems can impact urbanization, lack of research in the area, policy implications.

The research project on the effect of mass transit systems on urbanization is justified due to the global nature of urbanization, the potential impact of mass transit systems on urban development, the lack of research in the area, and the potential policy implications of the findings.

1.5 Scope of the Study

The study focused on the effect of mass transit system as it affects urbanization and the design of a mass transit model system from the study area (Asaba to Awka).

1.6 Limitations of the Study

Analyzing the impact of mass transit on urbanization in specific cities like Asaba and Awka can be challenging due to several limitations. Some potential limitations encountered when studying this topic included availability of data. Accurate and up-to-date data on the impact of mass transit on urbanization was limited or not readily available for Asaba and Awka. This made it difficult to assess the specific effects and draw meaningful conclusions.

Another major limitation encountered was the timeframe. Studying the impact of mass transit on urbanization requires a long-term perspective. Urbanization is a gradual process that takes place over many years, and its effects may not be immediately apparent. Short-term studies like mine may not capture the full extent of the impact or may fail to account for other factors that influence urbanization trends.

Also, Urbanization patterns and impacts can vary significantly between cities and regions. Asaba and Awka have unique characteristics, such as their geographic location, demographic profile, and existing transportation infrastructure. Generalizing findings from other locations or assuming similar impacts may not accurately reflect the situation in these specific cities.

Other limitations encountered include future developments, impact of fuel price increase and uncertainty in transport fare pricing.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This research contributes to several strands of literature. First, it adds to the work on the determinants of urban growth or urbanization. Despite the central role of internal transportation in theoretical models of cities, the empirical literature has mostly ignored urban mass transportation. It has instead emphasized dynamic agglomeration effects (Glaeser, Kallal, Scheinkman, and Schleifer, 1992, Henderson, Kuncoro, and Turner, 1995), the presence of human capital (Glaeser and Saiz, 2004), and climate and other amenities (Rappaport, 2007). We believe that this neglect of transportation variables, results from a lack of data about urban mass transportation infrastructure and a lack of clear predictions regarding the effect of the level of transportation infrastructure on subsequent city growth, and the difficulty of dealing with the possible simultaneous determination of population growth and transportation infrastructure in cities — the three main innovations of this paper. Taking the advice of Lucas (1988) seriously, it may be in cities that economic growth is best studied. Hence, this research is also related to the very large cross-country growth literature precipitated by Barro's (1991) landmark work. As will become clear below, our estimations resemble cross-country growth regressions. However, cross-country regressions are afflicted by fundamental data and country heterogeneity problems, which are much less important in the context of metropolitan areas within a country. Furthermore, growth regressions are also plagued by endogeneity problems which are often extremely hard to deal with in a cross-country setting (Acemoglu, Johnson, and Robinson, 2001, Durlauf, Johnson, and Temple, 2005). Fundamental data and country heterogeneity problems, which are much less important in the context of metropolitan areas within a country. Furthermore, growth regressions are also plagued by endogeneity problems which are often extremely hard to deal with in a cross-country setting (Acemoglu, Johnson, and Robinson, 2001, Durlauf, Johnson, and Temple, 2005). There is a substantial empirical literature that investigates

various aspects of the monocentric and multicentric model. Much of it is concerned with land use and land prices within cities, an issue not directly related to our work. Only a small a number of papers look at the relationship between transportation costs or infrastructure and the spatial distribution of population. With a (mostly) static perspective, Brueckner (1990) attempts to fit some aspects of the urbanization patterns in developing countries with the fundamental quantities of theoretical urban models, including commuting costs. More recently, Kopecky and Suen (2006) pursued a structural approach to examine the suburbanization of us cities. In what is probably the most closely related paper to our own, Baum-Snow (2007) uses instrumental variables estimation to investigate the effect of the interstate highway system on suburbanization.

Put differently, Baum Snow (2007) is concerned with the effects of transportation infrastructure on the distribution of population with in cities while we look at the distribution of population across cities, a complementary inquiry.

Finally, Burchfield, Overman, Puga, and Turner (2006) consider road infrastructure as a possible determinant of urban sprawl in us cities between 1976 and 1992.

We look at the effects of public transit on urban growth and thus complement the small literature interested in the effects of public transportation on cities. Baum-Snow and Kahn (2000) assess the effects of large transit projects on ridership and house prices at a small spatial scale. To our knowledge, our analysis is the first that looks at the effects of public transportation in a cross-city context. Glaeser, Kahn, and Rappaport (2008) emphasize the importance of public transportation in the location decision of the poor. Despite a very different approach, we find results consistent with theirs.

2.2 Mass transit

Mass transportation, which is the movement of large number of people, goods and services, is inevitable for the socio-economic and cultural integration of nations. For this reason, the issue of mass transportation has attracted the attention of several administrations in Nigeria. In January 1989, the Federal government launched the mass transit program to enhance the transportation system in the country. Nevertheless, attempts at evolving a meaningful mass transportation system in Nigeria have been elusive. A number of problems have plagued the nation's transport industry including general inadequacy of mass transit facilities relative to demand, inefficiency

in the management and running of public transport corporations and the absence of an effective maintenance culture (Adetunji M.A, 2013). Mass Transit is a live wire for national development regardless of a nation industrial capacity, population or technological development. It gives expressions to policy initiative in areas like health, education, employment, etc., and in the absence of it, these facilities would be inaccessible. Road network consists of large number of interwoven roads exhibiting many patterns ranging from star-like to grid-like with irregular patterns becoming recognized (Zang and Lund University, 2004). It consists of large amounts of roads that interweave with each other to exhibit a pattern. Patterns are defined as characteristics and properties found in repeated and regular manner within one object, or between a number of objects with such repetition in the form of shape, density, distribution, linkages, connection or orientation. These occur among the same kind of objects or different kinds of objects or within an object, or between objects repeated with sufficient regularity. Such repeated properties may be shape, orientation, connectedness, density or distribution. The frequency of such patterns enables development of prototypical views of geographical processes (Mackaness and Edwards, 2002). The route network is a set of nodes representing spatial locations and displays topological and geometric variations, while topology itself refers to the arrangement and connectivity of nodes and links of a network (Wyatt, 1997). The route network consists of primary and secondary roads known as arterial and minor roads respectively. Arterial roads are moderate or high-capacity roads that are below highway level of service, carrying large volumes of traffic between areas in urban centres and designed for traffic between neighborhoods. They have intersections with collector and local streets, and commercial areas such as shopping centres, petrol stations and other businesses are located along such roads. In addition, arterial roads link up to expressways and freeways with inter-changes (Wikipedia contributors, 2008).

2.3 Mass transport situation

Urban mass transportation physically takes place on land, waterways and in the air. Private automobiles, walking, bicycles, motorcycles, tricycles, buses and coaches characterize the movement on land. The rail system comprises of surface rail, tram, metro lines, subways and underground. The inland waterways are made up of the lagoons, creeks, ports and sometimes the lakes on which both ferries and hovercrafts are the major vehicles for mobility within the cities. City transport by air is usually by helicopter and, in mountainous areas, by overhead cables. The

seaports serve as the interface between the land and the sea. The above forms of vehicular movement as well as pedestrianization are function of trip purpose, spatial distribution and location of the places of residence of the people, the level of technological development in the city and the region, the size and characteristics of the population. The type of transport system that is used is dependent largely on the level of technological development of the people and the society; how the people perceive the quality of life they want, the organizational structure of the city and the available work force for transport management. Irrespective of the transport system adopted, the reality is that the use of transport systems and modes is associated with one form of challenges or the other. It is indeed the management of these challenges that constitute herculean task for transport scholars and researchers. In what follows, the challenges of urban transportation are presented with reference to Nigeria.

2.4 Challenges of mass transportation

The transportation system in urban centres of Nigeria is beset with numerous challenges. Generally, the analysis of Nigeria's transport system revealed a sector suffering from warped or defective developmental approach (Badejo, 2011). There is evidence of skewed modal development tilted in favor of road transportation to the disadvantage of other means of transportation. Demonstrating its predominance, road transportation accounts for about 90% of both freight and passenger transport in Nigeria; in a sharp contrast to its natural advantage of being good for short to medium distance freight haulage. Recent times, road transport is almost solely responsible for the carriage of bulk goods throughout the length and breadth of the country. Whereas goods arriving by water are economically cheap to be transported from the port by rail or inland waterways, the ports, except in the case of Port Harcourt and Apapa ports have neither rail nor waterways connection leaving road as the only option. This obviously constitutes improper use of the road and unfortunately has translated into a huge national burden; affecting smooth flow of traffic in urban centres. Briefly, the urban transport challenges in Nigeria today include traffic congestion, parking problems, accidents and environmental pollution. In some major cities, vehicles are seen crawling on the roads especially in both the morning and evening peak periods. This amounts to daily loss of time and energy in our various urban centres. In most cities, majority of the urban populace depend on public transport for their mobility needs; This is dominated by the private sector operating such vehicles as taxi; para-transit mini buses, fare

paying passenger carrying private cars (also known as 'kabukabu') and motorcycles (two wheel) and three-wheeled motorcycles operated in most urban centres. In most cities, demands for parking far outweigh available supply. According to Kombs (1988), inadequate parking space accounts for 34% of parking problems in Asaba and Awka. Noise pollution is also a noticeable feature in urban centres. According to Musisi-Nkambwe (1986) transport accounts for 50% of unwanted sounds in the city and create irritation, dissatisfaction and disturbance to urban residents. Behind these challenges are some basic factors. Population and spatial forms of the city are growing at fast rate creating a greater demand for transport infrastructure and services. For instance, Nigeria's urban population has been growing at an annual rate of about 12% (Badejo, 2011), thrice more than the overall growth rate (3.4%) of the nation. While cities keep attracting droves of population from the peripheries, the cities, in turn are bursting at the seams. On spatial forms, the example of two metropolitan cities, Ibadan and Lagos in Nigeria elucidates the realities of horizontal motion of cities.

Problems of Nigerian Transport Development

There are numerous and weighty difficulties in Nigerian transport development. These include:

With every emerging mobility problem, man is faced with the responsibility of getting a solution. Unfortunately, with the technical ability to solve such problems well in place, the modern cities are confronted by a transportation problem more complex than ever before and despite all the methods of movement, the problem in cities is how to move (Daniels and Werals, 1980). With the worsening poor macro-economic climate in Nigeria coupled with deteriorating rate of transport infrastructures, erratic energy (fuel) supply, dwindling petroleum resources, the future is glimpsed at with great uncertainty. The current concern relates to the under-listed problems:

1.Balanced Transportation - efficient mix of private and public

2.Transportation System Management (TSM)

3.Demand Management

4. Public Transport - Rail, Bus.

5. Road construction and improvement

6. Parking and loading management

7. Pedestrianization and bicycle, bicycle use, other non-motorized transport and commercial motorcycling.

8. Demographic factor.

9. Resource utilization issue – energy

10.Technology issue - Telephone, Fax, Electronic Mail, Electronic fund transfer.

11.Socio-economic and cultural issue

12.Environmental issue

13.Poor public transportation financing

2.5 Advantages of mass transit to communities

Where the automobile is a major competitor to mass, the use of transit has declined, reducing revenues available to pay the costs of these systems and services, and—in a setting where government subsidies are essential for sustaining mass transit—political support has eroded as well. As more people rely on the automobile, their interest in directing public resources to improving the highway system dominates their concern for subsidizing transit.

For those who can use the automobile for quick and reliable transportation, this trend simply represents the evolution of urban transport from collective riding to individual riding, from the economies of sharing a relatively high-speed service in a corridor where travel patterns are similar or the same, to the privacy of one's own "steel cocoon," which can go anywhere, anytime, without the need to coordinate travel plans with the schedule and routes of a transit operator attempting to serve large groups of people. The automobile has captured a large share (more than 95 percent by 1983) of urban trips in the United States, and only in some cities of more than two million people, does the mass transportation share reach or exceed 10 percent of the trips.

If the automobile provides superior service for the majority of riders, why not let the market operate without government intervention, perhaps leading to the demise of transit, while this has happened in some medium-size and small American cities, mass transportation can be important for a number of reasons.

First, some portion of the urban travel market is made up of people who cannot use the automobile to travel because they are handicapped, elderly, or too young to drive. Some people cannot afford to own and operate a car, and the young, the old, and the handicapped often fall into this category. If these people are to have the mobility essential for subsistence and satisfaction in their lives, some form of public transportation is necessary.

Second, transit provides a community with a way to move potentially large numbers of people while consuming fewer resources. A single bus, if it is full (50 to 80 passengers), can carry as many people as 50 or 60 cars, which normally operate with fewer than 2 occupants. The bus requires less street space, equivalent to 2 or 3 automobiles, and, when it is full, it requires much less energy to move each person. Because emissions from internal-combustion engines are proportional to fuel consumption, a full bus will produce less pollution per person-trip than an automobile. Finally, because professional drivers operate them, buses have a lower accident rate than automobiles. Electric rail transit trains produce even less air pollution and are far safer per person-trip than either automobiles or buses. Transit, when it is well utilized, then, produces important benefits for the community: air-quality improvements, less land consumption than an auto-dependent transportation system, lower energy requirements, and lower accident costs. A single lane of an urban freeway may carry 5,000 persons per hour. A light rail transit line (electric trolley cars) on a separate guideway taking the same space as the highway lane might carry as many as 14,000 persons per hour. High-quality mass transportation serving dense employment and shopping areas, such as the central business district of a city or the downtown area of a suburban community, can help ensure the economic success of those areas by making it easier and less costly for large numbers of workers and shoppers to enter and leave. A successful transit system also reduces the need for downtown parking, making land available for uses that are more productive. Thus, public transportation provides support for particular land development patterns, such as downtowns, and higher-density employment, educational, cultural, and retail activity centres. According to Aderamo (2003), road network constitutes an important element in urban development as roads provide accessibility required by different land uses and the proper functioning of such urban areas depends on efficient transport network, which is a backbone to their very existence. The analysis of the road network involves the recognition of the patterns and qualities of the roads. Zacks and Tversky (2001) examined the idea of events as

objects and argued that patterns themselves are objects bounded in space, organized hierarchically, and recognizable by a set of distinctive qualities. The qualities can be emphasized through the process of abstraction and symbolization, by which pattern is viewed as complexes of primitive objects and relationship between the primitives. This gives the shape, extent, orientation, density, topology and configuration as their intrinsic properties. Topology, according to Xie and Levinson (2006), is an arrangement and connectivity of nodes and links of measuring the spatial structure while configuration refers to collection of objects that comprise the pattern of road networks. In computing density, the network indicator approach was used to partition road network into different parts in reasonable way before the roads inside each part were extracted and the density calculated using indirectly related parameters. This results in number of connections to describe density differences in road networks. The parameter records how many roads connect to each road in a network. For two roads with the same length, the ones in the dense area will connect to more roads than that in a sparse area, and the connection differences will indicate the density differences to some extent; this is by number of connections to show the differences in density among a network (Zhang, 2004). According to Inforain online (2008), road density can also be calculated as the total length of all known roads divided by the total land area in a road network. Many techniques had earlier been used in analyzing road network patterns (Mackaness and Beard, 1993; Mackaness, 1995; Thomson and Richardson, 1995; Mackaness and Edwards, 2002; Jiang and Claramunt, 2004; and, Jiang and Harrie, 2004) namely, connectivity, shortest path spanning tree, and minimum cost spanning tree from graph theory to facilitate structural analysis and road selection in the road networks. Another approach based on perceptual grouping was equally used to group road segments according to continuation principle by ordering and selecting strokes into which the roads are segmented (Thomson and Richardson, 1995). Modern techniques introduced for the explanation of the effects of accessibility on property values range from geographically weighted regression technique, multinomial logit models, to geo-spatial analysis adopting the Geographical Information Systems (GIS).

2.6 Urbanization

According to Dickey (1975); Balchin, Kieve, and Bull (1991); urban road transportation system is one of the important factors responsible for shaping the urban centres, based on the assumption that consumers rationally choose a form of transportation, according to their social and spatial

position within the urban market. They opined that the urban road transportation system acts as basic component of urban areas' social, economic and physical structure it plays an essential role in the determination of the scale, nature and form of urban areas. Urban areas naturally develop at nodal points in the transport network and areas with good transport access to other areas have relative advantage over locations with poorer transport facilities. The locations with relative advantages are found where different transport routes converge and a general improvement of transport facilities will increase the size of population, whose effective demand can be tapped and therefore increase the amount of specialization and exchange that takes place (Lean and Goodall, 1977).

Transportation is the conveyance of goods and people over land, across water, and through the air. It is also the movement of people and goods from one place to another by land (by road, rail, human porterage, motorized and non-motorized vehicles), across water (ship, canoe, boat, etc.) and through the air (helicopter, light and heavy aircraft, etc.). One thing is clear, transportation or transport involves the movement of people, goods and services from origin to destination either by road, air, sea, rail, human porterage, animals, pipeline and even telecommunication or combination of these modes to bring inter-modal essence of final movements of such goods, people or services (Wikipedia contributors, 2008). The importance of transportation cannot be over-emphasized. Transportation centrally affects the relationship between physical space and society, and changes in transportation affect the organization of human activity in urban and regional space. It structures the built environment, spurs urban growth, as well as orders relationships among cities in a national urban system (Yago, 1983). In a study on urban transportation issues in both India and North America, Singh (2005) stated that due to increases in population brought about by both natural increase and migration from rural areas and smaller towns, availability of motorized transport, increases in household income, and increases in commercial and industrial activities have added to transport demand. The expected effect on residential and commercial property markets was positive, but the range of impacts vary from marginal to over 100% in the commercial sector from the North American evidence. In another study on UK, Singh (2005) found that the impact of road transport was positive particularly regarding capital increase in residential property values. However, the study put less emphasis on exact values, and some of the observed increase may be due to optimism of the markets rather than actual effects. Similarly, there is also some evidence that residential property prices might

decrease immediately around the transport investment or station. Value increase was determined in the study in a narrow way and mainly through changes in property and land values whereas wider range of measures ought to have been used. The measures should have included changes in accessibility, ownership patterns for land and property, site consolidations, numbers of transactions and yields as well as composite measures such as density of development. In terms of connection between transportation and supply of land, transportation changes extend the supply of urban land for settlement and urban expansions were promoted through transportation advances in addition to evolution of national urban system. As one mode of transportation reached technological limits in extending urban space another takes its place (Berry and Garrison, 1958; Isard, 1960; Berry and Horton, 1970; Pred, 1974), and changes in urban physical structure are linked with transportation technology (Richardson, 1972). According to Dickey (1975); Balchin, Kieve, and Bull (1991); urban road transportation system is one of the important factors responsible for shaping the urban centres, based on the assumption that consumers rationally choose a form of transportation, according to their social and spatial position within the urban market. They opined that the urban road transportation system acts as basic component of urban areas' social, economic and physical structure it plays an essential role in the determination of the scale, nature and form of urban areas. Urban areas naturally develop at nodal points in the transport network and areas with good transport access to other areas have relative advantage over locations with poorer transport facilities. The locations with relative advantages are found where different transport routes converge and a general improvement of transport facilities will increase the size of population, whose effective demand can be tapped and therefore increase the amount of specialization and exchange that takes place (Lean and Goodall, 1977). In respect of transportation, accessibility and property value, Washington, D.C.'s Metro rail system encouraged more downtown development than would otherwise have occurred with the metro rail converging downtown from all directions; thus, concluding that market for office and other space within a business centre is to build more off-road transit facilities to serve it (Downs, 1992).

2.7 Urbanization process

Urbanization refers to a process of concentration of the population in large numbers in an urban Centre and transformation of the society involving migration and economic changes. According

to Oyesiku (2002), it is essentially a settlement process, in which a new set of settlement pattern emerges as a result of shift in sectorial economy and changes in intra-sectorial composition of the economy. Urban centres are known to have been in existence for several thousand years, though their sizes were relatively small and varied spatially. The world population was first estimated in 1650 to be about 500million people; rose to 1.1billion in 1850 and 2.5billion in 1950. Between 1950 and 1980, the population increased to 4.5billion and by the turn of the beginning of the last century there were estimated 6.25billion people on the world (Oyesiku, 2002). Two important remarkable changes are noticed in the above world population growth pattern. The first is the increasing rate of urban population growth and the second is the increasing rate in the number and sizes of cities. As shown in Table 1, in 1950, 29.1% of world population was estimated to live in urban centres, this rose to 42.7% in 1990, 52.0% in 2010 and to reach 57.7% by 2020. By implication, the world population estimated at 6.3billion in the year 2000 had an urban population of about 3billion people. Furthermore, available evidence revealed that while the world population increased by about 69% between 1970 and year 2000, urban population increased by 115% (Oyesiku, 2002).

2.8 Urbanization in Nigeria

In Nigeria, urbanization has a long history. Historical perspective reveals that extensive urban development in Nigeria is a feature of 19th and 20th centuries. In other words, extensive urban development predates the advent of colonization. The Hausa-Fulani Empire of the Northern Nigeria for instance had some large cities, which served as administrative and religions centres of the emirate. According to Mabogunje (1968), Kano had a population of about 30,000 around 1855, while Zaria had a population of about 45,000 in 1925. Other noticeable cities in the 19th century in the Northern Nigeria include Yauri, Gumel, Katsina and Sokoto whose growth and development was attributed to trade and administration. In the Southern part of the country, urban development began in the 18th century and is associated with the founding and growth of the Oyo and Benin Empires. As far back as 1857, Hinder, a missionary, estimated the population of Ibadan to be 100,000. Abeokuta 60,000, Ogbomosho, 50,000, Ilorin 70,000 and Isonyin 24000. Trading, marketing and administration were major factors responsible for growth and development of these cities. The second half of the 20th century witnessed rapid rate of urbanization. The introduction of wheeled transportation, particularly Railway and road;

categorization of settlement into hierarchical order of township and introduction of monetized economy and consequently production of cash crops and exploitation of mineral resources which led to the development of 'islands' of economic and administrative concentration such as Lagos, Ibadan, Kaduna, Jos and Enugu (Oyesiku, 1998). Other two important factors that can be linked with growth and development of cities in the country are: (I) continuous geopolitical restructuring, through creation of states and local governments and (ii) the industrialization process between 1960 and 1975, which was based on import substitution strategies and consumer market for imported goods and services. The increasing level of concentration of people in urban Centre's of Nigeria is summarized in Table 2. Nigeria was 10.2% urbanized between 1952 and 1954. This increased to 19.2% in 1963 and jumped to 42% in 2002. Estimation also suggests further increase to 68% by 2020. The case of Lagos is particularly unique. It has one of the fastest growth rates in the world (between 5 and 8 percent per annum) and has become one of the 15 largest agglomerations in the world. In fact, it is expected to be the third most populous city in the world by 2015 (World Bank, 2003). An important inference from the pattern and level of urbanization in Nigeria is that the rate of urban growth remains one of the highest in the world; and the rate of urbanization far outstrips the pace of economic development. The increase in the rate of urbanization and the growth in the number of cities are not as alarming as the scaring and unsatisfactory situation in the cities. The alarming situation of urban transportation in the wake of ever-increasing growth and level of concentration of cities in the country is of great concern and discussed next(Ogunsanya, 1986).

In Nigeria, Aderamo (2003) used graph theoretic analysis in studying the growth of intra-urban network in Ilorin. The study found various indices of network development for the periods 1963, 1973, 1982 and 1988 tracing the growth of the intra-urban network of the town between 1963 and 1988. The study also found relationship between road development and expansion of city, and significant effect on transportation planning and property development. Also, in Nigeria, the method was used to determine degree of accessibility and connectivity of nodal points within a road network using a university community as case study (Oni, 2007a), and similarly in the analysis of accessibility and connectivity in the road network of a metropolitan area also in Nigeria (Oni, 2007b). These works, which were carried out on regional basis, succeeded in determining the degree of accessibility and connectivity of nodal points in the road network of the study areas but they did not relate the degree and levels of such accessibility and connectivity

to property values. The important issue is to determine how such accessibility and connectivity relate to property values instead of mere deductions that certain roads are better accessible as posited in the studies. Apart from this, existing literature in Nigeria have not considered road transport in relation to commercial property values. This study therefore intends to fill the gap by applying the graph theoretic approach in analyzing road network and determining the effects and relationship between its explanatory components of accessibility, connectivity, density of road, density of traffic, level of road service, and values of commercial properties in Ikeja. Contemporary land market theory established that differential firm's access to business activity clusters elicit significant effects on commercial land market as exemplified in firms valuing main and secondary centres accessibility in the urban areas (Sivitanidou, 1996). In a study on land value determinants in medium density residential neighborhoods of metropolitan Lagos, Oduwaye (2004) found that access roads, good drainage, electricity, public water supply and telephone are essential and where facilities are adequately available, land values will be high. He stated that road network is one of the factors that influence property values and established that improvement in transportation facilities especially roads brought about improved accessibility. Using the Spearman's correlation analysis, he found that there was correlation coefficient of 0.177 for transport improvement at 0.01 level of significance. These aforementioned works only showed the relationship between growth in transport development and improvements in accessibility. However, the study did not empirically determine degrees and levels of accessibility and connectivity of each nodal point within the studied network. In addition, it also did not consider the effects of demand, supply and location on commercial property values. Urbanization requires coordination and geographical concentration of specialized economic activities, with such coordination between urban centres, and concentration of population within regions advanced or retarded by changes in transportation and communication technology. Preliminary concentrations of such population in urban centres are made possible by inter-regional transportation followed by population dispersals as centralized economic activities spill over into broader metropolitan regions through further intra-urban transportation developments (Pred, 1974). Changes in transportation affect organization of human activity in urban and regional space, structuring the built-environment, spurring urban growth, ordering the relationships amongst cities in a national urban system; as one mode of transportation reached its technological limits in extending urban space and another takes its place (Yago, 1983). A study

on changes in relative values along routes perpendicular to particular streets, through simulation of door-to-door access costs before and after construction of a subway discovered that there was an increase in rent gradient near the subway stations. The study differed from many other studies by modeling price effects around a subway station rather than the distance to the Central Business District (CBD). The higher the price paid for land, the more the capital applied to it, thereby increasing its productivity and intensity of use and consequently its value (Dewees, 1976). The relationship between accessibility, property values and land use patterns were the pre-occupation of earliest theorists. The theories indicate that travel costs were traded off against rents and accessibility in more complicated phenomena that require treatment that is more sophisticated. Increase in accessibility leads to reduction in relative transport costs of a site directly through transport subsidy or indirectly through public transport investment and its manifestation. This was proved in increased demand that triggered land and property values, intensity of land use, and values with substantial changes (Henneberry, 1998). In correlating location values of shops with accessibility index, however, Wyatt (1999) used expert system heuristics to select comparable properties from a database with questions asked about the subject property. He adjusted the values of the comparable to account for differences between them and the subject property, and similarly for values of comparable to account for physical differences. The result was displayed on Value Maps after the values have been reconciled for differences except those attributable to location. It was concluded that configuration of route network and impedance for traversal along the routes affect accessibility and locational value using network model with implication for transport planning and its effects on property values. According to Kivell (1993), in a mono-centric urban area, the Centre that attracts highest values and rents is where transport facilities maximize labor availability, customer flow and proximate linkages, while rent is the charge that owner of a relatively accessible site can impose because of saving in transport costs which the use of the land makes possible. The better the transport network the less the friction and the higher will be the rent, which is the payment to overcome the friction of space. One of the fundamental relationships in the study of transportation and its linkage with land use (Meyer and Miller, 1984). Land use generates traffic carried by transport and land use-transportation system exists in socio-economic environment while change in road network stimulates change in land use. This leads to altering of flows on roads and consequently land values. Land use-transportation model attempts to relate the different levels of accessibility

provided by the transport system to changes in land use in terms of population and employment growth and consequently, the multiplier effects in the value of the land use (McLoughlin, 1973). Urban road transportation system consists of socio-economic environment with close relationship to land use and land value. The provision of transportation and development of land have taken many forms with research ranging from site-specific studies of impact of a transportation facility on property values to regional studies of the impact of changes in transportation accessibility on density of land development (Meyer and Miller, 1984; Sexana,1989). Dunse, Brown, and Fraser (2002) studied Fort Worth/Dallas and tested the effects on property value of physical characteristics, national market conditions, local market conditions, interest rates and location variables. Four measures were tested which are distance to CBD, distance to airport, distance to nearest major road, and access to rail network. The major findings indicate that local market conditions, physical characteristics and location of the property are primary sources of value or industrial property. However, the location variable and distance to the CBD were not significant. The study left confusion on the role of location, partly because of the variation in the definition of location variables and partly because of the study area as definitions were not clearly set within the core of a traditional mono-centric city. In addition to the aforementioned studies, Colwell and Munneke (1997) examined the spatial pattern of vacant industrial land prices in Chicago. He found that prices have negative concave relationship with distance from the CBD, and that the airport had a significant positive effect but only within three miles radius with price varying in relation to spatial sectors of the city. Grimley et al (2004) in a study commissioned by the Scottish Executive aimed at developing a methodology by which land value uplift can be captured around improved transportation facilities. The key factors considered in the study included treatment of time in five yearly gaps in assessing land value change, accessibility changes, and distance from the station interchange with catchments areas between 800 and 1000 meters, shorter for businesses and commercial activities and longer for residential activities. The purpose was to understand complexity of linkages between transport investment and property markets so that the transport related factors could be isolated from all other factors (e.g., Economic and housing cycles, inward investment, local economic factors etc.). Thompson and Gillen (2001) used geographical data to improve valuation outcomes in reviewing major contemporary issues in real estate valuation. They argued that spatial nature of real estate data allows the development of specialized models that increase the likelihood for

better predictions in real estate valuation. Similarly, Du (2007) used Geographically Weighted Regression (GWR) model that addresses issue of spatial effects in studying the relationship between transport accessibility and increases in land value in Tyne and Wear. The study embodied spatial coordinates with set of local estimates into regression model using weighted least squares process that link weights to distance of observation and location of the regression point and found relationship between transport accessibility and land value varies over space. The study carried out for Dallas-Fort Worth region of Texas on property valuations for single-family dwelling and commercial units considered the relationship between residential land prices and location choices with general accessibility indices adopted. The study also considered household residential location choices using combination of Hedonic models to assess the importance of access on property valuations controlling for improvement attributes and size of land parcel. It found that relationship between transport accessibility and land value varies over space (Du, 2007). Srour, Kockelman, and Dunn (2001) used the multinomial logit model to derive log-sum measures of accessibility and impact of access on location choices in Texas, USA. The study controlled for household demographics using three specifications of access measures of job accessibility (a proxy for work and other opportunities), access to park space (a proxy for availability of outdoor recreational activities), and access to retail jobs (a proxy for shopping opportunities). It found that job accessibility positively impacts residential land values in statistically and economically significant ways. Pickett and Perrett (1984) in a study on the effect of Tyne and Wear Metro concluded that existing urban areas showed remarkable increase in land value when new routes are opened and area that is already served by rail routes showed only small increase in land value when another route is added. The study found that new routes shift values rather than increasing aggregate land value and new routes actually increase land value in the centre at the expense of periphery. In respect of properties in districts through which a rail line passed with the objective of determining whether improved accessibility due to public transport investment in the area had effect on residential property values. The study found an average of about two percent increase in values of properties located near the Metro stations. Following the opening of Victoria Line in London in 1969 a study was carried out to determine the effects of the Line on property values. It was estimated that values in the catchments area of the Line increased between one and five percent compared to properties outside the catchment area relative to general price increases of over ten percent per annum during the study period.

Another study on impact of Lindenwold High Speed Line on residential property values in Philadelphia equally confirmed that there was positive impact of the line on values of residential properties using sales data obtained for the corridor through which the line passed (Allen and Boyce, 1974). The overall implication of these studies is that accessibility to a mode of transport directly affects values of residential properties. The T-IMPROVE method although provides important empirical assessment has not proved to be a predictive tool. Apart from this, the earlier studies have focused on impact that single rapid transit system has on residential property values. Many of them focused on studies carried out overseas while few studies were carried out on the impact of road network on commercial property values in Nigeria. Even the few studies carried out in Nigeria (for example, Omoogun 2006; Olayiwola, Adeleye, and Oduwaye, 2005) do not provide in-depth analysis on road transport network, location attributes, demand and supply and impact on commercial property values, rather they made sparse references to availability of transport and accessibility as determinants. This study will therefore fill this gap by relating the impact of arterial road network in the presence of location attribute, accessibility, demand for and supply of commercial properties to commercial property values in Ikeja, Nigeria. It will also bring out a model that would be useful in predicting the commercial property values in the study area.

2.9 Transportation and Accessibility

According to Makri and Folkesson (2007), accessibility is a slippery notion and one of those common terms that everyone uses until faced with problem of defining and measuring it. The import of this statement is that accessibility is a daily use amongst people of various backgrounds and inclinations giving way too many definitions. In transportation, accessibility refers to ease of reaching destinations. People in places that are highly accessible would reach many other activities or destinations quickly and people in inaccessible places can reach many fewer places in the same amount of time, so that nearer or less expensive places are weighted more than farther or more expensive places. Accessibility, in general terms, describes degree to which a system is usable by as many people as possible. It is the degree of ease with which to reach certain locations from other locations and viewed as the ability to access functionality and possible benefit. In transportation, accessibility refers to ease of reaching destinations with people in places that are highly accessible reaching many other activities or destinations quickly,

while people in inaccessible places can reach fewer places in the same amount of time (Wikipedia contributors, 2008). Accessibility as a property of location and may be grouped into general and special accessibility. According to Harvey (1999), general accessibility refers to nearness to rail termini, bus stations and motorways transport facilities, labor, customers and service facilities such as banks and post office, and special accessibility exists when complimentary uses are in close proximity to each other. In this case, the net economic cost of movement will be lower in terms of distance, time and convenience in addition to greater comparative advantages given greater accessibility of a location (Balchin et al, 2000). Handy and Niemeier (1997) identified "place accessibility" which is derived from patterns of land use. Place accessibility implies spatial distribution of potential destinations, magnitude, quality and character of activities found there. It is derived from transportation system in terms of distance, time taken, and cost of reaching each destination by different modes of transport. According to Kwan (1998), measures of place accessibility normally consist of two elements: a transportation (or resistance or impedance) element and an activity (or motivation or attraction or utility) element. The transportation element comprises the travel distance, time, or cost for one or more modes of transport, while the activity element comprises the amount and location of various activities. A number of studies have been carried out on the significance of accessibility. Banister and Berechman (2005) stated that possible explanation for small and variable impact of urban rail investment is "ubiquitous" accessibility found in urban areas with little impact on overall accessibility and additional infrastructure where network is already well developed. However, Cervero (1998), and Cervero and Wu (1998) concluded that accessibility increasingly shapes metropolitan location decisions and it is people's desire for location advantages and real estate developers' awareness of those desires that give rise to urban form. They state further that under conditions of ubiquitous accessibility, monumental transport improvements have little effect on location (Wegner, 1995:159). It has generally been agreed in earlier studies (Haig, 1926; Alonso, 1960; McQuaid and Grieg, 2003) that accessibility has important roles to play in the determination of property values but the studies failed to recognize the part played by road network that primarily delivers the accessibility. Few of the studies established the relationship that exists between property value and pattern of road network. These studies on land and property values in relation to accessibility centred mainly on transportation and transportation schemes. They neglected the fact that it is not only movements of people by rail, sea, inland

waterways, air, and roads alone that matter but also how patterns and modes of movements affect demand for activity centres and consequently values of properties. McQuaid and Grieg (2003) opined that little is known about the real links between transport and economic development with policy supported by anecdote, ignoring displacement and expectations of the links rather than firm evidence. The implication is that while there is understanding of the effects of transportation on economic and physical developments such understanding is based on mere theory without empirical or scientific analysis to give firm evidence, especially as it relates to values of commercial properties. Classical urban location and rent theory by Alonso (1964) states that rents decline outwards from the Central Business District (CBD) to set off the declining revenue generation-capacity and higher costs such as cost of movements. The layout of a metropolis is determined by a principle termed minimization of costs of friction and land uses are able to derive advantage in terms of revenue generation from sites that are most accessible to customers (Haig, 1926). This theory relates distance to rental value. In other words, those land uses that are close to the Central Business Districts tend to generate higher revenue than locations farther away, and implies that lower cost of movements will result in higher land and property values. The theory explains causes of different land values within an urban area and suggests that value depends on economic rent, while rent depends on location, location on convenience, and convenience on nearness. It concluded that value depends on nearness. In a mono-centric urban area, the centre is where transport facilities maximize labor availability, customer flow and proximate linkages that attracts highest values and rents (Kivell, 1993). The classical Von Thunen's agriculture land use model states that market forces largely allocate supply of sites among alternative uses within urban area, and rent differentials are reflected among homogeneous sites. This is explained by rising transport costs and differentiation among sites and arises because quality factors are determinants of economic rent. According to the urban location theory, lower transport costs will result in higher land and property values. Similarly, the Ricardian theory states that rent differentials arise because of differences in use capacity, and urban sites vary in rent and value because of use capacity as well as location. This conclusion is based on theoretical parameters limiting the relationship to an individual piece of transport infrastructure in a mono-centric city ignoring the operations of several transport modes and isolating the impact, that pattern of road network might have on the values of commercial properties. Muth (1961) and Wingo (1961) based their studies on the Alonso's (1960) model.

They found that market equilibrium results in spatial equilibrium and firms or households have no incentive to change location because profits and other objectives are maximized. This results in optimization of output and maximization of city efficiency. The city as a productive unit result in structure of land uses that reflect institutional arrangements including zoning ordinances, network of road and transportation system. The location of firms and households within the structure depends upon competitive bidding for specific sites, with rent differentials resulting in maximum utilization or highest and best use. Some works by Kivell (1993), McQuaid and Grieg (2003), focused mainly on movements of people, goods and services with reasons proffered for such movements in terms of inter-linkage of various modes of transportation, accessibility in terms of distance, urban rent, highest and best use, friction and their impacts on land use and property values. Soot (1974) established the impacts and relationships between movements and residential land use and value in United States of America; while Omoogun (2006) noted that accessibility has great impact on property values and properties located at the point where two or more roads meet command greater value than those located off the nodal points or major roads. This assertion, however, lacks empiricism and the conclusion based on intuition, which this study will resolve. In a study of the effects of improvements in transportation on accessibility and land value in San Francisco Bay Area, Wendt (1958) concluded that areas that grew most rapidly in terms of value of land and improvements were those opened up because of transportation improvements. The study concluded that San Francisco showed 1.3 per cent increase in assessed value of land and improvements, Marin County opened up by Golden Gate Bridge experienced 162.4 per cent and with the advent of San Francisco-Oakland Bay Bridge, Contra Costa County witnessed 141.7 per cent increases in assessed land values due to increased accessibility over the same period. Alonso (1964) argued that individuals not only choose residential locations in order to maximize the sum of rent and transportation costs but maximize the size of the site with rent, accessibility, and size of the site, being three considerations in location decision. Consequent upon this, Goldberg (1970) investigated the relationship between mass transportation and urbanization. He tested the hypothesis that general improvement in transportation results in declined economic rents and found that a 10-percent increase in population density leads to 2.3 per cent decline in per capita land values. He went further to state that transportation improvement has effect of bringing new land into an urban area. This is evident in increasing aggregate land values in a growing urban region with land and property

values much more rapidly increasing in the central areas than in any other area as congestion in the area has the effect of shrinking the size of central areas, diminishing competition, and putting great pressure on prices. Analysis of the effects of metro station on residential property values in Washington, D.C. estimated hedonic price equation in which average property value for each area is the dependent variable. Dummy for the area less than one-quarter mile from the station was amongst the independent variables, the study revealed significant relationship between the opening of metro stations and residential property values in the study area (Grass, 1992). In other words, these studies have set out to express relationship between transportation and physical and economic development as noticeable in the effects on property values. According to Srour, et al (2001), Wachs and Kumagi (1973), Leake and Huzayyin (1979), and Niemeier (1997) rents paid to purchase land may make great sense as measure of access, which is capitalized into its value with accessibility essentially inferred from the value. Accessibility indices ranged from simple minimum travel-time to measures of cumulative opportunities within specified distance or time thresholds to maximum utility measures. Access to transit confers profound benefits on values of commercial properties and increased number of customers leading to differential firm's access to business activities that cluster and thereby eliciting significant effects on commercial land markets. The consequence is property value per unit land becoming a function of both property specific traits and effects of its location attributes. The property traits consist of building attributes (age, area per floor, elevator, parking, et cetera) and location attributes of main and secondary business centre accessibility and a set of location traits, which consists of local service and transportation access, location prestige, worker amenities and land supply constraints. According to Sivitanidou (1996), Centre accessibility is measured as distance to each Centre with transportation access measured as distance to the closest major airport and freeway. In estimating the impact of transit routes on commercial property values, hedonic price model was used with sets of attributes, which include distance to traffic and estimated coefficient on the variable in a study on Washington, D.C. The benefits of transit on commercial property values in the study area was derived with key findings including distance to the closest Metro Station entering the model with negative sign. It found that the shorter the distance between a commercial property and the Metro Station, the higher the value of property, with commercial property value affected by proximity of transit (Hickling L.B. Inc. and KPMG Peat Marwick, 2002). A study was carried out on the city of Milwaukee to determine the relationship between

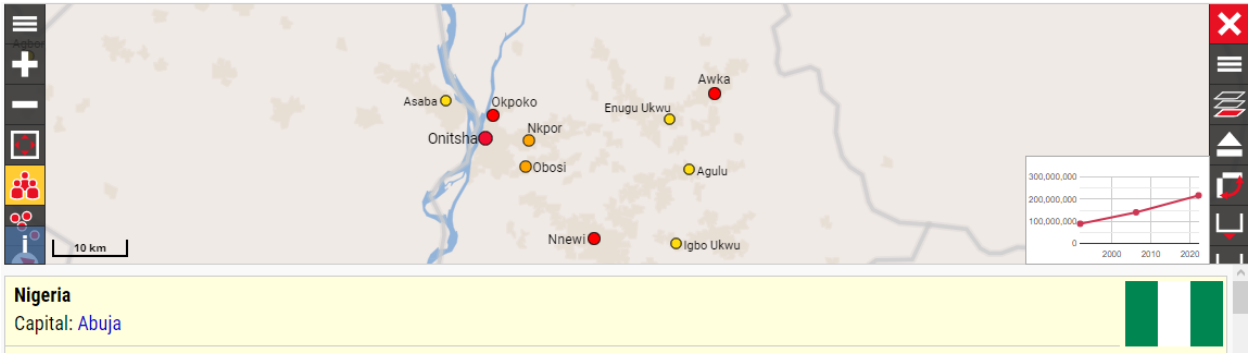
land sale prices and distance to Central Business District (CBD) using regression of distance to shopping Centre, traffic level on main street, area population, median income, amenities, and area dummies. The findings explained substantial portion of variations in commercial land value and indicate significance of associated coefficients and substantial distance (Downing, 1973). In this study, the empirical evidence supports hypothesis that greater accessibility to transportation increases land values. In Nigeria, much of earlier works on accessibility and property values state that properties sited far away from major streets have poor degrees of accessibility and command low values Omoogun, (2006). This assertion is based on mere intuition without any empirical investigation. In another study, Olayiwola et al (2005) attempted to explain the relationship between various land value determinants in metropolitan Lagos, using factor analysis and principal component techniques. They found that factors such as accessibility, rent, transport improvement, quality of neighborhoods, infrastructural facilities, and government regulations, have high level of co-variation. The score on the relationship between accessibility and transport improvement shows the highest positive association with a figure of 0.87 meaning that improvement in transportation facilities, especially roads bring about improved accessibility. Also, the relationship between transport and rent shows very high degree of positive relationship (0.732), quality of environment and zoning regulation (0.731) and, accessibility and rent (0.719) recorded very high degree of positive relationship. The implication is that improvement in transportation and accessibility bring about higher rents and the factors are basic to influence residential land values. This study appeared better in empiricism than that of Omoogun (2006) as it attempted to consider a number of factors exogenous to property in determining their relationship with rent. Many of the studies relate to urban residential areas carried out in many parts of the world.

CHAPTER THREE

MATERIALS AND METHODS

This chapter analyzes the various methods used in carrying out this research work. Various methods were found appropriate to this particular research work and were adopted. The methods are shown below.

Study area



The study was conducted from Awka city to Asaba considering the mass transit systems available in these cities. The selected areas are due to the availability of collecting the required data and mass transit that allow intensive observation, easy to access information and to minimize cost. In addition to that, based on the 2012 Nigeria Population and Housing Census shows that these areas (Awka and Asaba), Awka is the capital city of Anambra State, Nigeria. The city was declared capital on 21 August 1991, after the creation of Anambra and Enugu state, which moved the capital from Enugu to Awka (an administrative centre since pre.-colonial times). The city has an estimated population of 301,657 as of the 2006 Nigerian census, and over 2.5 million as of a 2018 estimate.

Asaba is the capital city of Delta State, Nigeria. It is located at the western bank of the Niger River, in the Oshimili South Local Government Area. Asaba had a population of 149,603 as at the 2006 census, and a metropolitan population of over half a million people.

Study population

Population refers to all members, groups, or elements that the researcher wants to gain information from, represent and draw conclusion for the study (Vans 1990). Due to the nature of this study, the study population includes pedestrians, motorists, vehicle passengers, and passengers of on-road public transport (mainly buses and trams). Because they are the key informants.

Study sample

According to Webster (1985), a sample is defined as a finite part of a statistical population whose properties are studied for gaining information about the whole. It can also be defined as a set of

respondents or people selected from a larger population for the purpose of a survey. When it is possible, the researcher would prefer to study the whole population in which he/she is interested. However, it is difficult to do so in this study because the population of interest is large, diverse, and scattered over a large geographic area as well as time consuming and expensive. A sample size is the unit of inquiry selected from the target population. The researcher used the proportionate stratification approach in which the sample size of stratum is proportionate to the population size of the stratum.

Sampling Procedure

The researcher used purposive sampling to select 26 respondents who were obtained from the studied the mass transit companies, motorist. Purposive sampling technique is selected because it is less expensive and quick for selecting a sample. Through this sampling technique, the researcher got the respondents who were able to deliver the required data. However, the major weakness of this method is bias, because the researcher selected only the sample, he believed enriched with the needed information.

3.1 Methods of data collection and sources of data

Sources of data in a general sense are of two types; the primary sources and the secondary source. Both of these sources were adopted in this work.

3.1.1 Primary sources

The primary sources of data are the materials or information collected at first hand (by the user or paid agent) especially from original sources and for the user's intention. Such data are usually gotten through interviews, questionnaires, surveys, planned experimental observation or recording of official transactions, among others.

Kothari (2004) defined primary data as those collected afresh for the first time and therefore happen to be original in character. Research can be conducted without secondary data; however, a research based on only secondary data is not much reliable and may have biases because human beings have already manipulated it. In this proposed study, the primary data was expected to be derived from the answers of respondents given in in-depth interview and researcher has administered questionnaires.

In-Depth Interview

In-depth interview is a qualitative research method, which involves conducting intensive individual interviews with a small number of informants to explore their perspectives on a particular idea, program, or situation (Boyce and Neale, 2006). The main reason for the researcher to adopt an in-depth interview method is that it provides a much more detailed information than other data collection methods, such as surveys. In addition, the choice of interview method in this study is based on its usefulness for getting the story behind informant's experiences, its relevance to illiterate informants and the loophole for the researcher to probe deeper into the given situation. In addition to that, in-depth interview provides more comfortable atmosphere for collecting information because people may feel more relaxed having a conversation with the researcher about the program as opposed to filling out a survey. The purpose of utilizing interviews as data collection instrument is because of its naturalness, spontaneity, flexibility and the control over the environment. This method will be employed in order to allow informants to freely express themselves and able explore in detail the topic under investigation.

Researcher-administered Questionnaire.

There are different types of questionnaires in research but under this study, the researcher-administered questionnaire was adopted. All questions were closed ended and were administered by the researcher. Researcher-administered questionnaire was used because of its advantages, as it is covers large number of respondents in a short time, ensures the completion of questionnaires and is simple to analyze as compared with qualitative methods like in-depth interview. This argument concurs with Kothari (2008) who states that "structured questionnaires are simple to administer and relatively inexpensive to analyze". Under this study the original questionnaire was designed in English and administered in Kiswahili before the answers being translated back to English for recording.

But for this particular work, a few of the above listed sources were adopted. One of them is the questionnaire. A questionnaire may be said to be a written interview prepared, which is presented to a respondent. For this particular work structured questionnaire were used. The questionnaires were grafted after much consultation from both published books and the internet. However, questionnaires were developed and distributed to civil engineers, police officer, road safety

officer's motorists, passengers and others that were deemed fit. The researchers considered the use of questionnaire as an effective source of getting facts and opinions since the study requires same to enhance the usefulness and reliability of the information gathered.

The second source of information adopted was by interviews. Some of the civil engineers, road safety officers, police officers that were met during the course of this research were interviewed.

3.1.2 Secondary source.

Secondary sources of data are obtained second hand from published or recorded sources. Such information is usually used for a purpose different from that of the agency that initially collected and published them. According to Kothari (2008), secondary data means data which is already available. It involves data which have already been collected and analyzed by someone else. The reason for using secondary data in this study are that they are cost-effective way of acquiring a broad understanding of research questions and useful in designing primary research as well as in providing a baseline with which to compare primary data results. Additionally, the reviewing of secondary data helps to set the background of the problem, formulation of problem statement, research questions and gap of knowledge. In this study secondary data was derived from the findings in published documents and literatures related to the research problem with ICT.

Furthermore, in this proposed study, review of secondary data was applied as a supplementary data collection method and it includes previous researches related to the study topic. Therefore, these documents are intended to supplement the information obtained from the primary sources. Neuman, (2000) and Mouton (2001) noted that the importance of undertaking desk review in any research study is that it is based on the assumption that researchers learn from existing knowledge and build on what other researchers have already done on a similar or related problem.

3.2 Design of a model mass transit system from Asaba to Awka using a bus as the mode of transportation.

Designing a mass transit system from Asaba to Awka would involve several key considerations, such as the population density of the areas served, the existing transportation infrastructure, the potential ridership, and the budget available for the project. Here are some general steps that could be taken to design such a system:

1. Conduct a feasibility study: A comprehensive feasibility study should be conducted to evaluate the viability of the proposed mass transit system. This study should consider the population density of the areas served, the transportation demands, the potential ridership, and the available transportation infrastructure.

2. Determine the mode of transportation: Based on the feasibility study, the appropriate mode of transportation should be determined. Depending on the distance between Asaba and Awka, the options could include rail, bus, or a combination of both.

3. Determine the route and stops: Once the mode of transportation is determined, the next step is to determine the route and the stops along the way. The route should be designed to serve the most densely populated areas and to connect major activity centres such as schools, hospitals, and commercial areas.

4. Design the stations: The stations along the route should be designed to provide safe, convenient, and accessible access to the mass transit system. The design should include features such as ticketing booths, waiting areas, restrooms, and information displays.

5. Determine the frequency of service: The frequency of service should be determined based on the transportation demands of the area. The frequency should be sufficient to meet the needs of the ridership, but not so frequent that it becomes inefficient.

6. Determine the fare structure: The fare structure should be designed to be affordable for the target ridership while also covering the operating costs of the system. The fare structure should be simple and easy to understand.

7. Develop a marketing plan: A marketing plan should be developed to promote the benefits of the mass transit system and to encourage ridership. The plan should include advertising, public relations, and community outreach.

8. Develop an operations plan: An operations plan should be developed to ensure the efficient operation of the mass transit system. The plan should include the scheduling of vehicles, the maintenance of the vehicles, and the training of personnel.

By following these steps, a mass transit system from Asaba to Awka, can be designed and implemented to provide safe, efficient, and affordable transportation for the people of the area.

3.3 Data Analysis

Statistics package for social science (SPSS) computer program was used to analyze data that collected through questionnaires, preliminary analysis of information was carried out through in-depth interviews that were done during the fieldwork. Such preliminary analysis has been suggested to be useful for improving questions during the fieldwork (Gibbs, 2002). However, the large part of analysis was done after the field work. Interpretation of qualitative data involved organizing information into units, synthesizing, and searched for meaningful patterns and finally gained an understanding. Frequencies and percentages were used to summarize the collected data. In the process of analysis, relationships or differences supporting or conflicting with original or new hypotheses is to be subjected to the statistical tests of significance to determine validity that data can be said to indicate in any conclusion (Kothari, 2004). Summary statistics including tables were used to present findings.

In this context, data obtained secondarily are from road traffic crash record from Federal Road Safety Corps and the police. Secondly, the Accident investigation report of FRSC and that of police formed part of the secondary sources of data in this study. Thirdly, information gotten from textbooks and those from the internet falls into this category of secondary data. These different sources of data were made use of in this study.

3.3.1 Method of data collection

The preceding section briefly introduce methods adopted in collecting the data for this work. This section discusses the methods in detail. As it was stated earlier, one of the sources of data is questionnaire. With the aim of gathering enough fact and for easy co-operation, the questionnaire drafted was structured. With the help of colleague, they were circulated appropriately.

A total of twenty-six (26) questionnaires were sent out and 26 was returned representing a response rate of 100%, due to the questionnaires were shared, filed and return immediately.

Other method includes-

- Literature search
- Personal communication/ interview

Literature search

The research work takes cognizance of the works conducted by past researchers. The intensive literature search was accomplished by collecting information related directly or indirectly to this subject. Thorough search for relevant information was carried out using published textbooks, online articles and published and unpublished articles.

Personal communication / interview

This is a common method of collecting data in social surveys even though it usually introduces various sources of error and bias. This mode of data collection was employed, bearing in mind the various relevant conditions that should be considered when using this mode of data collection.

Various persons were contacted and interviewed during the course of this research work. These include people living around the areas, Federal Road Safety Corps, police, motorists, mass transit companies and passengers.

3.4 Method of data analysis

The model for data analysis is helping to acquire knowledge from the collected data. The Model makes it possible to identify relationships between variables and understands how variables, working on their own and influences an overall system and examine each component of data provided.

3.5 Design of a Mass Transit model

The type of model mostly used for network design is an evaluation model in which an origin-destination (OD) matrix is assigned to a network and with which all kinds of evaluation characteristics are calculated. Such an evaluation model enables a systematic comparison between alternative network designs. Although the use of evaluation models must be considered as a major improvement to the quality of the planning process, the disadvantage remains that only a few alternatives can be compared because of the effort involved. Also, these alternatives will often be biased towards the existing network and the implicit ideas of the planner, although in some cases this might be considered as an advantage. The disadvantage of a limited number of alternatives, however, does not apply to models which design a network as well as evaluate it.

These so-called optimization models use operations research techniques to find a feasible network. The name optimization model is misleading, however, because most models do not find an optimum solution and even then it is questionable whether an optimum of a model, which is a mathematical description of reality, will be an optimum in reality. Therefore, the importance of these models does not derive from the fact that they find a (near) optimum solution, but rather that they help to find new and feasible alternatives. Despite the advantage of generating new alternatives, the use of these optimization models is very limited. This limited use can be explained by several reasons, one of them being the overall lack of experience in using models in public transport studies, but when we take a close look at the optimization models which have been developed, some other reasons can be found.

3.6 Optimization models

In the last two decades all kinds of optimization models for the design of public transport networks have been developed. These models can roughly be divided into six categories:

1. Analytical models (e.g., Holroyd , Kocur and Hendrickson). These models use simplified networks to derive optimum relations for parameters of the public transport system, for instance headway and route-spacing.

2. Models determining which links should be used to construct routes for a public transport network (e.g., Billheimer and Gray , Rea).

3. Models determining routes without considering the frequencies of the routes (e.g., Pierick and Wiegand , Simonis).

4. Models assigning frequencies to a given set of routes(e.g., Scheele , Furth and Wilson , Hagberg and Hasselstrom).

5. Models determining routes in a first and assigning frequencies in a second stage (e.g., Lampkin and Saalmans , Dubois et al).

6. Models determining routes and frequencies simultaneously (Hasselstrom).

The first two categories determine neither routes nor frequencies and are therefore unsuited for the problem we have formulated. The third and fourth categories solve only part of our problem, either routes or frequencies. Actually, there are only two categories of models suited to our design problem, categories 5 and 6.

3.6.1 Determining Routes and Assigning Frequencies Separately

The models of category 5 solve the network design problem in two stages. In the first stage the routes of the network are determined. The objective is to transport a maximum number of passengers given a fixed OD-matrix. In this stage Lampkin and Saalmans (2011) consider trips without transfers, while Dubois et al. (2012) consider all trips. In the second stage frequencies are assigned to the generated set of routes. The objective is to minimize the total travel time given the OD-matrix and the available number of vehicles. In the calculation of the travel time Dubois et al. (2012) introduced the possibility of walking instead of using public transport. All the methods used are clearly heuristic, but those of Dubois et al. (2012) are more sophisticated. The major disadvantage of these models, however, is the fact that they solve the problem of routes and frequencies separately, while there is a distinct relation between these two components of the public transport system. Moreover, a fixed OD-matrix is used, so the relation between supply and demand for public transport services is not taken into account.

3.6.2. Determining Routes and Assigning Frequencies Simultaneously

The model developed by Hasselstrom (2013) does not have these disadvantages. It solves the problem in three stages. First, the model considers a link network and eliminates links seldom or never used by passengers (compare the models of category 2). The result is a concentrated network which is used in the second stage to generate a large set of possible routes. Finally, the route of the network is selected by assigning frequencies using linear programming. The objective is to maximize the number of transfers saved by changing from a link network (transfers at every node) to a public transport network (transfers only at intersections). Instead of a known OD-matrix, Hasselstrom (2013) suggests the use of a desire matrix (i.e., an OD-matrix for the situation in which an ideal public transport system exists) in order to lessen the bias towards the network with which the OD-matrix is determined. The disadvantage of the model is that although routes and frequencies are determined simultaneously, two different optimization problems are formulated.

3.7 Optimization problems

The main objective is to design a network which can fulfil the demand for public transport as well as possible. It is obvious that this objective cannot be used in an optimization model, as it is unclear what is meant by "as well as possible." Does a network qualify as "good" if it offers services which can compete with other modes, or if it is especially suited to the needs of people who cannot travel otherwise? The decision on what is meant by "as well as possible" is a political one, however, and should not be made within an optimization model. An objective suited to an optimization model and for both interpretations of "as well as possible" is maximizing the number of passengers, given a certain budget. It is a well-known fact that transfers negatively affect the number of passengers. Recent research in the Netherlands shows a penalty of 6 minutes, not including the waiting time at the transfer point (Van der Waard et al.). Therefore, maximizing the number of passengers is more or less equivalent to minimizing transfers, especially in middle-sized cities such as those in the Netherlands. Although minimizing transfers is a commonly used objective (Hasselstrom), it is preferable to maximize the number of direct trips. The objective of maximizing direct trips makes it possible to use a description in which the demand for public services depends on the quality of the services offered, while the objective of minimizing transfers requires a fixed OD-matrix. Therefore, we choose to maximize the number of direct trips. The major constraint of the problem is the available budget. Since there is a strong relation between the available budget and the number of vehicles that can be put into operation, the optimization problem can be formulated as follows: Maximize the number of direct trips given a certain fleet size. A special aspect of the public transport system is the use of different vehicle types (e.g., bus). As the vehicle type influences both generalized costs and total costs, this aspect will also be included in the optimization model. Of course, it is possible that, by maximizing the number of direct trips, networks may be developed which offer very poor transfer facilities, resulting in far fewer passengers than the highest number desirable. Therefore, additional constraints, such as a maximum number of routes or a minimum frequency, may be necessary. The decision as to which constraints must be imposed depends on the characteristics of the demand pattern and the specific network.

3.8 Design of the mass transit model from Asaba to Awka.

The disparities between the capabilities of optimization models in the design process and the practical situation combined with the need to improve the design process are the reasons for developing a new model. If a model is to be used as a tool in the design process, it should fulfil the following requirements:

1. It should be suited for several design problems ranging from short-term analyses to long-term decisions, e.g., assigning frequencies, designing part of a network and designing a complete network.

2. It should be easily accessible and understandable for the user (i.e., the planner). The model presented in this paper is an attempt to serve as such a model. It is suited for use on a personal computer and special attention is given to the interactive design process. Moreover, the optimization model will be included in a software package for the design of public transport networks. This package will also contain a model for the determination of an OD-matrix, an evaluation, model and interactive programs to arrange the necessary input. Activities for which the package can be used are as follows:

1. choosing routes

2. Evaluating a network,

3. Assigning frequencies,

For activities 2 and 3 the optimization model can be used. The optimization process is structured to be simple and understandable. To design a mass transit system model from Awka to Asaba, we would need to consider several factors such as distance, population density, traffic flow, and the demand for transportation between these cities. Based on these factors, the following is a proposed model for the mass transit system:

Route:

The proposed route for the mass transit system would be from Ifite Awka to Asaba with the following possible stops:

- Amawbia

- Awkuzu

- Umunya

- Ogbunike

- Nkpor

- Onitsha

- Delta

The route would cover a distance of approximately 50 kilometers and would take approximately 1 hour and 30 minutes to complete, depending on traffic.

Frequency:

The frequency of the mass transit system would depend on the demand for transportation between the cities and the capacity of the vehicles used. Generally, a frequency of every 30 minutes during peak hours and every hour during off-peak hours would be reasonable.

Vehicles:

The vehicles used for the mass transit system would depend on the demand and the capacity required. A bus with a seating capacity of 30-50 passengers would be suitable for this route.

Ticketing:

The mass transit system should have an efficient ticketing system to ensure a seamless process for passengers. An electronic ticketing system would be appropriate, which would allow passengers to purchase tickets through mobile devices or at designated ticketing points.

In conclusion, the proposed mass transit system model from Awka to Asaba would provide a convenient and efficient means of transportation for commuters. The route would cover major towns and cities between the two cities, and the frequency of the system would be adjusted based on demand. The proposed system would contribute to reducing traffic congestion and improving transportation services in the region.

CHAPTER FOUR

4.1 PRESENTATION OF DATA

This Chapter presents an analysis of the data collected from questionnaires administered to mass transit users, transport companies and drivers. For this purpose, the Chapter is structured into seven sections, namely, preliminary survey details; analysis of arterial road network including graph theoretic analysis, characteristics of the arterial road network, and analysis of accessibility and connectivity degrees in the road network. This is in addition to the analysis of commercial property values and spatial pattern of the properties. The Chapter also deals with presentation of results, which begins with description of the participants' bio-data. The hypotheses formulated for this study guided the arrangement of the tables. Each hypothesis focuses on the variables identified (patterns of arterial roads as independent variables and

commercial property as dependent or criterion variable). A summary of the main findings follows each hypothesis and in addition and where relevant, selected findings from the personal data collected are used to inform and contrast the findings.

4.1.1 Preliminary Survey Details

Data was collected between the months of April and May 2023. The administration of questionnaires on the effect of mass transit system as it affects urbanization was carried out personally, while four field assistants were involved in collecting data from occupiers of commercial properties. The various responses were analyzed between August and December 2008 with the aid of statistical software (SPSS).

4.1.2 Recruiting and Interviewing Participants

I selected my research participants based on a sequential referral technique, selecting mass transit system users, drivers and transport companies (from Awka to Asaba). As Weiss (1994) suggested, people who are content-matter experts in the area of study or were witnesses to the event are often the best people to provide information, because they are the most informed on the subject. This structure yielded a pool of potential participants who could inform the study based on their experiences, their knowledge of transport and procedures, and their established economic development planning strategies, using road infrastructure as the cornerstone of the study. Four different types of participants were identified, with (26) total participants:

• Awka and Asaba business stakeholders whose business success is directly or indirectly affected by the mass transit system.

• Awka and Asaba business stakeholders who travelled to and fro for work.

• Awka and Asaba transport companies who uses the road on a daily basis.

In quantitative research, the percentage of the total number of available participants is used to predetermine the sample size. The main purpose of conducting interviews is to find out what is in and on the subjects' minds and to gather their stories (Patton, 2015). I conducted person-to-person interviews to elicit information from selected road users from Awka to Asaba.Seidman (2013) and Bogdan and Biklen (2011) discussed techniques the researcher can use when interviewing participants. According to Seidman, (2013), the researcher should listen carefully for every word participant are saying. Listening carefully gives the researcher the opportunity to ask follow-up questions for clarification. Asking follow-up questions demonstrates that the researcher is actively listening. Singleton and Straits (2010) asserted the

need for the researcher to maintain communication with a participant during an interview to gain full understanding of the study's purpose.

4.2 Data Analysis

Data analysis is the process of making sense out of the data (Merriam, 2014). This involves consolidating, reducing, and interpreting information from the interviews and Content and inductive techniques are two common data analysis techniques in qualitative study. Content analysis involves content of interviews, participants' responses, observations, and field notes taken during interviews. I chose to employ the constant comparative method of data analysis proposed by Glaser and Strauss (2012). I identified segments of information from the questionnaire and observations that were similar and responsive to the study research questions.

4.3 Presentation and Interpretation

RESEARCH QUESTION 1

Majority of the population in Awka and Asaba use mass transit systems frequently in their daily commute.

From the Reponses gotten from the questionnaire "Majority of the population in Awka and Asaba use mass transit systems frequently (e.g. trains, buses, subways, trams) in their daily commute". 79.2 %went for strongly agrees 16.7%went for agree, 4.1 % went for disagree. These shows that Majority of the population in Awka and Asaba use mass transit systems frequently in their daily commute.

RESEARCH QUESTION 2

The availability of mass transit systems affects the development of urban areas.

From the Reponses gotten from the questionnaire "The availability of mass transit systems affects the development of urban areas**.**" 54.2 %went for strongly agrees 37.5%went for agree, 4.15 % went for disagree, and 4.15 % went for strongly disagree. These shows that the availability of mass transit systems affects the development of urban areas**.**

RESEARCH QUESTION 3

There are benefits of having a mass transit system in a city or urban area.

From the Reponses gotten from the questionnaire “There are benefits of having a mass transit system in a city or urban area.” 66.7 %went for strongly agrees 33.3%went for agree. These shows that there are benefits of having a mass transit system in a city or urban area.

RESEARCH QUESTION 4

A well-designed mass transit system can reduce traffic congestion in urban areas.

From the Reponses gotten from the questionnaire “A well-designed mass transit system can reduce traffic congestion in urban areas.” 75 %went for strongly agrees 20.8%went for agree, 4.2% went for disagree. These shows that a well-designed mass transit system can reduce traffic congestion in urban areas.

RESEARCH QUESTION 5

The development of mass transit systems should be a priority for urban planners.

From the Reponses gotten from the questionnaire “The development of mass transit systems should be a priority for urban planners.” 62.5 %went for strongly agrees 33.3%went for agree, 4.1 % went for disagree. These shows that the development of mass transit systems should be a priority for urban planners.

RESEARCH QUESTION 6

You satisfied with the mass transit system in your city or urban area.

From the Reponses gotten from the questionnaire “You satisfied with the mass transit system in your city or urban area.” 79.2 %went for **NO**, 16.7%went for **YES**. These shows that 75 of the road users from Awka to Asaba are not satisfied with the mass transit system in your city or urban area.

RESEARCH QUESTION 7

Investment in mass transit system, specifically road networks affects urbanization.

The responses on how investment in transportation infrastructure affects social change.” 62.5 %went for strongly agrees 33.3%went for agree, 4.1 % went for disagree. Therefore, majority of the respondents believe that Investment in mass transit system, specifically road networks affects urbanization.

RESEARCH QUESTION 8

Facilitation of infrastructure development and transformation of sociocultural norm affects urban mass transit and economic development.

The results from the questionnaire also linked facilitation of infrastructure development (schools, hospitals, trading clusters, etc.), and transformation of sociocultural norms to urban mass transit and economic development." 72.5 %went for strongly agrees 23.3%went for agree, 4.1 % went for disagree. Facilitation of infrastructure development and transformation of sociocultural norm to urban mass transit and economic development.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

This Chapter presents an analysis of the data collected from questionnaires
administered For this purpose, the Chapter is structured into seven sections, namely, preliminary survey details; analysis of The Chapter also deals with presentation of results, which begins with a summary of the main findings follows each hypothesis and in addition and where relevant, selected findings from the personal data collected are used to inform and contrast the findings.

5.1 CONCLUSIONS

From the Reponses gotten from the first question "Majority of the population in Awka and Asaba use mass transit systems frequently in their daily commute". 79.2 %went for strongly agrees 16.7%when for agree, 4.1 % when for disagree. These shows that Majority of the population in Awka and Asaba use mass transit systems frequently in their daily commute.

From the Reponses gotten from the second question “The availability of mass transit systems affects the development of urban areas**.**” 54.2 %went for strongly agrees 37.5%when for agree, 4.15 % when for disagree, and 4.15 % went for strongly disagree. These shows that the availability of mass transit systems affects the development of urban areas**.**

From the Reponses gotten from the third question “There are benefits of having a mass transit system in a city or urban area.” 66.7 %went for strongly agrees 33.3%when for agree. These shows that there are benefits of having a mass transit system in a city or urban area.

From the Reponses gotten from the fourth question “A well-designed mass transit system can reduce traffic congestion in urban areas.” 75 %went for strongly agrees 20.8%when for agree, 4.2% when for disagree. These shows that a well-designed mass transit system can reduce traffic congestion in urban areas.

From the Reponses gotten from the fifth question “The development of mass transit systems should be a priority for urban planners.” 62.5 %went for strongly agrees 33.3%when for agree, 4.1 % when for disagree. These shows that the development of mass transit systems should be a priority for urban planners.

From the Reponses gotten from the sixth question “You satisfied with the mass transit system in your city or urban area.” 79.2 %went for **NO**, 16.7%when for **YES**. These shows that 75 of the road users from Awka to Asaba are not satisfied with the mass transit system in your city or urban area.

From the Reponses gotten from the seventh question how “investment in transportation infrastructure affects social change.” 62.5 %went for strongly agrees 33.3%when for agree, 4.1 % when for disagree. Therefore, majority of the respondents believe that Investment in mass transit system, specifically road networks, the affects urbanization.

The results From the Reponses gotten from the seventh question “facilitation of infrastructure development (schools, hospitals, trading clusters, etc.), and transformation of sociocultural norms” to urban mass transit and economic development.” 72.5 %went for strongly agrees 23.3%when for agree, 4.1 % when for disagree. Facilitation of infrastructure development and transformation of sociocultural norm to urban mass transit and economic development.

5.2 RECOMMENDATION

Different transport modes either individually or collectively have contributed to the development of the nation. For Nigeria to have a sustainable transportation system, certain fundamental issues need to be addressed.

1. The need for continuous investment in transport sector

2. More involvement of the private sector - guided privatization

3. Need to evolve a dynamic transport policy and its effective administration.

4. Need for appropriate integrated multi-modality

5. Balance in transport and environment development.

6. Transport and land use planning consciousness.

7. Increased capacity building in transportation

8. Efficient and coordinated institutional arrangement

9. Concerted effort should be made to integrate both rural and urban road network in Nigeria.

10. Transport development and consequences should be accorded the right priority for a system to evolve.

11. Successful solutions have been based on awareness of the necessity to protect the city, not only among decision makers and citizens but also among businessmen and other interest groups.
12. Well planned and coordinated measures step-by-step are necessary for solving the traffic and environmental problems in cities.

13. Car traffic can only be restricted if there are acceptable alternatives; pro-environmental public transport service, has contributed to reduce car trips - even in cities where there is a high car ownership.

14. Good aesthetic design of street closures, pedestrian streets, stops etc. e.g. by tree planting are important to improve the city environment

15. Continuous follow-up studies and environmental impact assessment are necessary to correct and also extend the measures undertaken.

16. Future steps for making cities more livable and adaptable to sustainable development will be directed to reduce car dependency through more comprehensive land use and traffic planning and offering alternative transport opportunities. Telematics can play a role in giving advanced information on transport alternatives and on existing traffic conditions. Future urban transport will witness improved urban land use revitalization and the expansion of public transport under improved management and computer facilities which will lead to economic development and urbanization.

17. Mass Transit systems have a significant economic impact on urbanization. They can contribute to economic growth and development by providing improved access to employment, education and other opportunities. By reducing transportation costs and increasing the efficiency of travel, mass transit can also help to stimulate business activity and investment in urban areas.

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APPENDIX

Majority of the population in Awka and Asaba use mass transit systems frequently in their daily commute.				

The availability of mass transit systems affects the development of urban areas.				
There are benefits of having a mass transit system in a city or urban area				
A well-designed mass transit system can reduce traffic congestion in urban areas				
The development of mass transit systems should be a priority for urban planners				
Are you satisfied with the mass transit system in your city or urban area				
Investment in mass transit system, specifically road network affects urbanization				
Facilitation of infrastructure development and transformation of sociocultural norm affects urban mass transit and economic development				