PROPOSED KTSTA BUS TERMINAL
(ORGANIZING SPACES TO ACCOMMODATE FUNCTION)

BY

ABUBAKAR ALIYU
UG10/ARCH/2040

MAY, 2015

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SUBMMITTED TO THE

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KANO UNIVERSITY OF SCIENCE AND TECHNOLOGY

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DECLARATION

I, ABUBAKAR ALIYU with registration number UG10/ARCH/2040 am a student in the Department of Architecture. I declare that this work including all the finding and research is to be done by me, under the supervision of Arc. Kashim bn yakub.

ABUBAKAR ALIYU ..... 25/MAY/2015 .....

Name of student

Sign and date

CERTIFICATION

This research project has been prepared in accordance with guidelines 2014 governing the preparation and presentation of projects in the department of Architecture, and therefore it has been read and approved by the following personnel as meeting the requirement for the award of B.sc. Degree in Architecture in Kano University of Science and Technology, Wudil, Kano State.

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DEDICATION

This project is dedicated to my beloved family who offered me unconditional love, care, concern, prayer and support throughout the course of this project. May Allah (SWT) guide and protect them Ameen.

ACKNOWLEDGEMENT

Praise be to Allah the most beneficent the most merciful, for giving me the courage and ability of undertaken this training exercise from the beginning to the end successfully. May the peace be upon his messenger Muhammad (SAW).

I'm greatly indebted to my erudite supervisor and also my highly esteemed level coordinator Arc Kashim bn Yakub for his indispensable support and guidance that culminated into this works and my success generally in the university. His brotherly advices and suggestion were made in the true spirit of supervision; his open mindedness and unselfishness were brought to bear in this thesis. Sir without the above mentioned and others too numerous to mention this thesis could not have been a real success. Thank you may Allah reward and bless you and your family, ameen.

I also wish to acknowledge the effort of our distinguish lecturers for been always there for us to support and guide us to the right direction.

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And lastly my appreciation goes to many peoples who have contributed and meant a lot to me whose names are too numerous to be mentioned in this context.

ABSTRACT

The gateway into any city is the circulation terminals where humans, vehicles and goods interact usually in large numbers all year round. This interaction may be harmonious or chaotic depending on how well organized the activities in the terminals are. Being the gateway into the city such terminals should speak well of the cities they serve.

Bus terminals being what they are, it handles a large number of humans and vehicles that are to transit. Such humans, goods, and vehicles are usually heterogeneous in nature and require diverse services. The diverse requirements usually lead to a chaotic interaction which only proper organization help to ameliorate.

This project seeks to develop a modern KTSTA modern bus terminal, taking into consideration the mode of organization and circulation of the commuters and their conveyors in order to achieve harmonious movement in clear and easily identifiable direction which is the main activity in the terminal. An efficient and safe mode of organization and circulation to achieve will go a long way to enhance the efficiency of the terminals which are not just gateways into the city but more to play a prominent role in directing and distributing the activities of the cities they serve.

The study has been successfully carried out through the researches made on related publication and text, direct visit to the motor park. Oral interview conducted with passengers and official concern. Hence the design proposal has taken care of passenger's welfare, Administrative head office, operation depot and workshop department etc. this will however, render the service of KTSTA being patronized by people from all social class. And that means an enduring mass transport services which is safe, reliable, comfortable and efficient.

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INTRODUCTION

1.1 BACKROUND OF THE STUDY

Transportation is one of the oldest forms of communication known to man, which involves the continuous relocation and distribution of goods, humans, and services from one place to another. It involved as a complete system when man was still a wanderer with all the elements of the system in a place i.e. the need to relocate from one particular point of destination in the process of relocating goods and services from one place to another. These early forms were basically on foot with man as the vehicle. The route required needed not be so defined; neither did his destination as he wandered. Transportation then was based on instincts and necessity and traffic was sparse. (Everet and Wolfgang, 1978).

As man's existence developed from wandering into communities and then cities, so he continue to re-invent this very important aspect of city life, which holds in place and continues to nourish the human community. These developments were from man's basic movement as a wanderer to the human portal system, and to the use of beasts of burden.

These could be laced with charts or caravans, and the use of boats and ships through waterways. These forms were further revolutionized by technological advancement into more sophisticated forms of transportation vehicles, which depended on human efforts (e.g bicycle) or use fuel (e.g. trains, buses, ocean liners, planes). The mode of movement became more diverse and specific, movement became swifter, the density of objects to be moved became much more than ever before and the need for movement more critical. The routes as a necessity became more defined and developed to be wearing to accommodate the heavier traffic and form of vehicles. The points of origins and destinations too became more defined to meet the needs of the users.

In the present day, world transportation has become much more specialized to meet the various demands of its patrons. The most favored mode being the road transport system. Reasons are not fetched, Man being a terrestrial animal, the road winds from his door step to his destination and even if other forms are to be used, he still gets to them by road. In essence the landform of

transportation affords him interconnectivity between the other forms of transportation. (Gerald, 1995).

In Nigeria, advancements from human portal/beasts of burden forms came with the coming of the Europeans to this part of the world. First to be developed across the country was the rail system. In 1930s there was a mass importation of automobiles, which actually became more prominent in the 1970s and began to take over from the rail system as it became more flexible and profitable to its investors. More roads were to the existing stock on the part of government in the 1970s and 1980s to encourage the industry. Terminals became more prominent, though they were not more developed than motor parks. (Gerald, 1995).

Private investors also came into the sector being cheaper to invest in than the rail form of transportation such as the Mid-west/Ames Line later to be known as Bendel Line, Ekendedilichuku, Chidi Ebere etc. The federal government in 1978 launched the Federal Urban Mass Transit Program and the state and local government were encouraged to follow suit. The flexibility and importance of road transport has by far surpassed other forms of transportation in Nigeria to the extent that virtually everything in Nigeria moves by road as the most efficient and cheapest form of transportation. Throughout history, the economic wealth and military power of a people or a nation have been closely tied to efficient methods of road transportation, because it provides access to natural resources and promotes trades .(Richard M Adler ,1987).

1.2 STATEMENT OF PROBLEMS

The terminal is the transport parastatal under ministry of works, housing and transport. The administration, operation (were bus operation can take place) and maintenance facilities are in different places. This result in hardship of staffs and drivers. The general circulation problems, vehicular and pedestrian, poor services, lack of waiting facilities, few toilets, insecurities, lack of proper drainage which result to hardship to passengers and the staff.

The object of proposing of KTSTA bus terminal is to upgrade it to an efficient standard, to make it more adaptive to its function, and to establishing a chaos free circulation pattern inside and outside the terminal.

1.3 AIM OF THE PROJECT

The aim of this project is to design a KTSTA bus terminal that will be efficient in planning and space organization.

1.4 OBJECTIVE OF THE PROJECT

1. To study an existing terminal so as to improve the circulation and space organization of the users in the terminal.
2. Attempt to apply the principle of traffic control in the design.
3. To designed a proposed a bus terminal that will be efficient in planning and space organization.

1.5 SCOPE OF THE STUDY

The scope of any study is determined by many factors which include population, geographical location, and landmass of an area. The scope of this research is limited to Katsina state which is located on latitude 11° 30 and 13N and longitude 7^{0} and 9^{0} in north western Nigeria. It has a land mass of about 23,560km^2 and a population of 5,801,584 which is based on the 2006 census (Illeoje 2004). The studies of this project will be reviewed in an attempt to consider the used of space in KTSTA bus terminal. This project shall limit itself to the provision of modern bus terminal that tend to provide accessibility to all its potential users.

1.6 SIGNIFICANCE OF THE PROJECT

The success of any project especially one with an economic undertone must carry with it economic and social benefit besides the architectural significance. This proposal has the following economic and social advantages:

1. It will act as source of generating revenue to the authority, enhance and utilized the land value within it by providing rental shops and spaces. It will also create an avenue for job creation and develops the commercial activities in the metropolitan.
2. It will also improve the aesthetic outlook and the social activities of the city.

In general, the significance of this project rest on the fact that it would be used for proper solution hindering the success of the services of KTSTA, using architecture as a medium and means of communication.

CHAPTER TWO

2. I HISTORICAL REVIEW

During the early stage of development, transportation was quite modest without any side or consequential effect. It was either on foot, on animal back or drawn charts. But over the years, through advancements in technology and thoughtful innovations, mechanical and electrical means have emerged, thereby coming along with problems associated with these discoveries. To this advantage man has been able to transverse longer distances and carries heavier loads without sacrificing his comfort through discoveries over time. These discoveries led to the invention of bicycles, motorcar, train, the ship, airplane and other modes of transportation with the unprecedented advancements in technological innovations in transportation system. Alongside these came the problem of congestion within the urban centers leading to unnecessary delays and consequential lowering of the economic growth rate. Also there were problems of pollution, noise and fumes, thereby reducing the quality of life within the urban environment. In order to improve and restore the quality of life, it is imperative to have a well planned transportation system with good supporting facilities within urban centers as well as between them. (Everett, and wolfgang 1978).

Transportation as existed today got its origin from the wheel, which once invented, its knowledge spread rapidly throughout the Mediterranean and Asian world. Wheeled vehicles made the movement of goods much easier. The earliest known examples of wheels are from Mesopotamia from about 3500 to 3000 BC. The cart or wagon, pulled by humans or animals, was the first wheeled vehicle. Today, animal drawn chariot. A faster version of the cart, became an important instrument of warfare because it could over power enemy soldiers quickly. The chariot appeared in Mesopotamia around 2000 BC and its use later spread to Egypt, Persia, Greece, Rome, and other ancient civilization.

While the invention of the wheel was important to the development of transportation in Europe and Asia, the wheel was unknown to the ancient civilization of north and South America. Progress in the development of transport has been function of invention with nearly all centering on the wheel. This progress which began with a crude timid form of transportation on wheel has over the years metamorphosed into high technologically improved and development in all aspect

of human endeavor. Because of the high correlation between the urban growth and the increase in demand for transportation within cities, the development of transportation system should not be treated in isolation but in relation to the urban growth. (Buchanan, 1958).

In the earlier stages, which can be described as the age of 'foot mobile', walking was the dominant transportation. This is made possible because the oldest cities were compacted, densely populated settlement whose sizes were conditioned by convenient walking distances of the resident while their supply hinterland depended largely on the distances that could easily be covered by horses and wheel carts. This era lasted till the end of the 18th century in the economical advanced countries of the world. (Buchanan, 1958).

Gradually, a transition to the second stage i.e the mass transit stage began by the early 19th century. This was possible due to the rapid growth in the population of cities because of the advanced industrialization. Longer distances became possible as the means of urban transportation improved with the development of railways, and later buses. The residential, industrial and commercial suburbs proliferated around the older and the bigger cities as communication was facilitated by faster, cheaper and more comfortable modes of transportation. This stage lasted till the Second World War in Europe and America and to some extent, parts of West Africa, and Nigerian cities in particular, where buses and Para transits vehicles are the dominant mass transit modes (Onakomaiya, 1993).

The third stage which was tagged the age of the automobile started after the Second World War. It witnessed the use of automobile as the dominant urban mode of transportation with related influence on the rapid expansion of cities and regions.

However, it is saddening to report that the developing nation or the third world nations are yet to make any appreciable breakthrough in technology, hence their heavy dependence on advance countries, which have been allowing some unfavorable consequences. The position of the third world country has created an exploitative tendency Lon the part of the advanced countries who now produce this transit means at their own whims and hence have turned this third world nation as a dumping ground for their low quality and second rate vehicles. Thus, business relation between the industrialized nations and their less developed counterparts in this respect is lopsided as well as detrimental to the development of the countries.

But since there is growing needs of transit in the developing countries for example, Nigeria in which the demand for transit facilities exacerbated by high cost of motorcars, the low per capital income of the people and the increasing separation of residence from work places as urban expansion progresses. This made it imperative on Nigerian government to adopt measures that will stem the tide of immobility and poverty to emulate the chaotic transit situation, which led to the introduction of the urban mass transit programmed.

2.2 QUALITIES OF TRANSPORT SERVICES

Each nation requires a comprehensive and efficient transport system to move goods and people within its national boundaries. For the transport of goods, the services should have the qualities of speed, safety, adequacy, frequency, regularity, responsibility and acceptable cost. For the transport of people, the additional quality of comport is required. All these qualities are important to the user in determining what form or method of transportation is most suitable. The relative values of the qualities may change from movement to movement and from place to place. The constant problem is the selection of the qualities, which are more important than others in each particular distance.

Speed

In the transport of goods, speed in transit has the following advantages:

1. Shorter transit time to reduce the amount of deterioration between production and consumption of perishable foods.
2. Speed reduces the financial cost attached to goods in transit. The money value of goods represents an investment bearing interest charges or claims of profit, and the locking up of the investment for the duration of the transport delays the investment being converted to other uses.
3. Investment on transport facilities is put to greater use within the defined period.
4. Fast transport services may reduce or totally avoid the necessity to provide storage facilities near consumers because demand for goods may be met directly from the producer without any significant delay.

Safety

Adequate provision must be made not only for protection of persons and property carried on the transport system, but also for the persons and properties of others. The goods must be protected against deterioration theft pilferage fire and the action of the elements of weather (especially for the carriage of persons). Highest possible safety standards should be adhered to and strictly enforced.

Capacity

The transport facility must have capacity adequate for all reasonable demands. For goods the facilities must be related to the maximum demand at any time. Seasonality impose a peak demand on the transport system, and the movement at such times requires a quantum of facilities greater than that required to handle traffic at other times of the year. For passenger transport, total carrying capacity must be related also to maximum demand at any one time. There are the peak hours each day in cities and towns to be coped with.

Frequency

Except for movements by pipelines and conveyors, transport is not continuous. The movements are regular or irregular spread, and the interval of time between the movements may be long or short. In relation to goods transport, frequency of movement has the following advantages:

1. It reduces the necessity to accumulate goods in storage before and after storage.
2. In a two or more phased transport service, loss of time at storage points where journey is broken is less.
3. The dispatch of goods required unexpectedly but urgently can be expedited.
4. The number of places where stocks are held can be reduced provided that the frequency of transport services can meet the demand of buyers.

For people, frequency of transport service means less waiting time and the possibility of a greater amount of travel within a limited time when a journey is to be made in two or more stages.

Regularity

Regularity of transport service means that the movements are either at evenly spaced intervals or at known times. Modern life turns largely on the clock, and the certainty that transport facilities will be available at specific intervals or at specific times, enable people to organize their personal movements and activities accordingly.

Responsibility

People who employ others to carry themselves or their goods expect safe carriage or compensation for loss or injury caused by act of omission of the transport undertaking. Responsibility in this regard is a desirable quality in a transport service but may be conditioned by the legal liability of the undertaking and its financial ability to meet a proper claim for compensation.

Comfort

The physical and mental fragility of human beings makes personal comfort an essential quality in the transport of people. Physical comport involves suitable sitting ventilation, temperature control, refreshment and sleeping of accommodation of overnight journeys. Enjoyment of travel is related also to culmination of conditions, which bring various phobias into operation, and provision of means of viewing the passing scene.

Acceptable cost

The cost of transport must be reasonable to attract traffic, and any reduction in the real cost will be reflected in greater demand. With lower transport costs, personal travel will increase, because is limited mostly by the amount that people can afford for such purpose. (William Hay, 1977).

2.3 MODES OF TRANSPORTATION

A mode of transport is a technological solution that used a fundamentally different vehicle, infrastructure and operations. The transport of a person or cargo may be by one or more modes, the latter called intermodal transport. Each mode has its advantages and disadvantages, and will be chosen for a trip depending on the nature of the purpose, cargo and destination. While there is transport in air, water, animal powered, human powered, rail and land transportation.

2.3.1 Road transport

It is a mode of land transportation besides air and water transportation system. This mode of transportation enjoined the most popularity mainly due to its flexibility and adaptability to can be extended of influence or too expensive, such as air transportation or less comfortable and time consuming as in the case of rail transportation in Nigeria. Although rail transport has now received adequate attention by the Nigerian Government. Its use is still limited, as it does not offer door to door services like the road transportation.

Some factors may be attributed to the reason of this popularity enjoined by the road transport, thus:

1. Road are open to use by everyone except in rare cases, hence the cost of construction and maintenance is not borne by single individuals or organizations but in most cases transferred to great number of users in tolls.
2. The low initial cost of vehicle and its availability in carrying sizes enable numerous private individual own motor vehicles in any size.
3. Motor vehicle can be operated at reasonable degree of safety than any other means of transportation with the operation requiring no available great skill or training.
4. It is relatively a cheaper mode of transport in terms of combines cost and quality services afforded than other modes of transport thereby enjoying the favor of the masses.
5. Vehicles, for instance buses are entirely flexible and can be redeployed as circumstances change where as other mode of transport like rail cannot.

The fastest growing and needs of road transport over the other mode of transport was further facilitated by the economic and social benefit yield to the general human and growth. Therefore, it will be an injustice to this form of transport to conclude this topic without enumerating these benefit it yields. It plays an important role in the society that becomes an evitable sector to the human and animal survival.

2.3.2 Road transport in Nigeria

Nigeria has 194,394 km of roads (Iboaya, 2000). Most Nigerians travel by bus or taxi both between and within cities. During the 1970s and 1980s federal and state governments built and upgraded numerous expressways and trans-regional trunk roads. State government also upgraded smaller roads, which helped open rural areas to develop. However, by the mid-1990s lack of investment had left most of the roads to deteriorate (CIA World Fact book, 2009). Nigeria has the largest road network in west Africa and the second largest south of the Sahara, with roughly 108,000 kilometers of surfaced roads in 1990 (railwayfrica.com, 2009). However they are poorly maintained and are often cited as a cause for the countries high rate of traffic facilities. In 2004 Nigeria's Federal Roads Maintenance Agency (FERMA) began to patch the 32,000-kilometer federal roads network, and in 2005 FERMA initiated a more substantial rehabilitation. The rainy season and poor equipment pose challenges to road maintenance (Central intelligence agency CIA World Fact book, 2009). However, some animal such as horses, donkeys, oxen or even humans are still use as means of transportation in Nigeria.

2.4 COMPONENTS OF ROAD TRANSPORT SYSTEM

Transportation system is said to be efficient if the service it renders possess special qualities occasioned by the adequacy and availability of a number of factors that make up the transport system.

It comprises of four factors or components, this component though technical include:

- Motor vehicle
- Motive power
- Road way
- Terminals or control system.

These components are interwoven and combined to gives transportation system it is capability and unity (Williams Hay, 1977). Thus:

Having capacity depends in parts on size and the speed of the vehicle. Size and the capacity of the vehicle determine the needed motive power (and vice versa). The bearing capacity and stability of the vehicle are related to the size and the load, road way and a number of vehicle per

hour (route capacity) is the function of a number of paths (lanes, trucks and the channels) in the road ways and the system of operation control (rules, signals, switching arrangement and the communications).

The motor vehicle is a mobile conveyance. The transportation industry cannot function as a system without a vehicle, but the vehicle can be used without other components. However, there is a need for proper roads and regular servicing.

A motor vehicle could be a bicycle, motor cycle, motor car, bus, truck, railway, engine, airplane, ship etc. however, this thesis is limiting itself to the use of cars, minibuses and the buses as the common mode of vehicles. In each of this case of vehicles types most commonly used in the country, generalization shall me made for the largest size so as to accommodate other types.

For the car/minibus type, they are mostly used during the day both as inter-city vehicle (minibuses) and intra-city vehicles. The cars which are about 4.8 meters in length, 1.8 meter wide and 1.35 meter high. It seats by design 6 passengers and a driver. The minibus which seats 10 passengers is about 4.5 meters in length, 1.8 meters wide and 1.8 meters high, though a larger one are also used with higher carrying capacities of 18 and above sitter capacity.

For the bus type, most commonly used in Nigeria, especially for long night journeys are the Volvo and Mercedes Benz types, which are about 12 meters in length, 2.5 meters wide and 3.15 meters high. They seats 52 passengers comfortably.

2.5 THE STATE AND DEVELOPMENT OF BUS TERMINAL IN NIGERIA:

Since the establishment of the federal urban mass transit the year 1988, there was comparatively little toward the development of bus terminal among the mass transit infrastructure. (Bolade,1988) reported that there was only a strategic interstate terminal development built in Lagos, Onitsha, Abuja and Kaduna by the federal mass transit authority (FUMTA).

However these terminals and other terminals developed by the state transport authority nationwide were handicapped in terms of adequate facilities expected of a well used designed terminal. The anomalies can be attributed to:

1. Priority Afforded buses among the road transport components by the federal government in all of its mass transit programs.

2.The fact that the federal urban mass transit programme was a child of circumstance. Introduce a lesson the worsening transport crisis in Nigeria prior to 1988, which tend to turn the country into the stage of immobility, thereby crippling the nation transport sector.

The general consequences of the above factors on the bus terminal in Nigeria are not farfetched these among other things is the conversion of existing structures into terminals that consist of mainly offices and stores, with other activities of bus station taking place in an open available bar spaces.

BUS TERMINAL

Bus terminal is a structure where city or intercity buses stop to pick up and drop off passengers. It is larger than a bus stop which is usually a place on a road side, where buses can stop. It may be intended as a terminal station for a number of routes, or as a transfer station where the routes continue. (Wikipedia 2015).

Bus terminal complex consist of the main bus terminal, ticket booking cubicles, restaurant, shops, arrival and departure areas, both with baggage lounge and baggage offices and water closets, terminal management office and national union of road transport workers office with lateral space for renting. The bus terminal provides both unloading and loading bays. The design includes two separate wings for arrival and departure lounges, connected through a huge height circular atrium. Curve in concourse design employed helps match a larger surface area to a smaller human scale.

BUS TERMINAL TYPES

Over the past decades, bus services have evolved into several operational categories and the characteristic of bus terminal types. The types that exist are:

Airport city bus terminal

This type is usually primarily for the transportation of an airline passengers from an urban center to the major airport it serves. It is usually located in the urban center accessible by local system taxis.

Urban suburban terminal: -This is a type of terminal facilities which may be located within the down core of the control business district as a passenger's collection and distribution center a rapid transit feeder station. It is characterized by a diversified bus route structure and high turnover of commuters by bus type operations. An important consideration is bus accessibility. Separation of access by "flyovers", tunnels and exclusive bus lanes on adjoining of other traffic flow.

Suburban inter-state bus terminal: - These are normally located at the outskirt of the city center to avoid traffic congestion and heavy investment associated with central city and or airport terminal facilities. The terminal is usually located to inter-state highways connecting with major cities or regions and in many instances serves the increasing outlaying urban sprawl areas. Over the years, this terminal type has serve "commuters" type function where workers in the central city parked their cars and ride buses to work in the city center. Hence, it is often called "park and ride terminal".

2.6 CIRCULATION IN BUS TERMINAL

Organization of space describes the influence of the spatial environment TO the health, the mind and the behavior of humans in and around the environment. Bus terminals being what they are, handles a large number of humans and vehicles that are on transit. Humans, goods and vehicles are usually heterogeneous in nature and require diverse services. The diverse requirement usually leads to a chaotic interaction which only proper organization help to ameliorate.

In order to achieve harmonious movement in clear and easily identifiable direction in the terminal, the following concept should be organized.

- Circulation concept
- Zoning concept
- Traffic flow

- Vehicle flow.

CIRCULATION CONCEPT

As a terminal this is the most critical factor of planning. The circulation concept is such as to allow for easy and unhindered access of pedestrians to the nucleus of the terminal i.e. to use the pedestrian traffic as the denominator of planning. Around this nucleus the vehicular traffic can perform the function properly and interaction between the two should be reduced as much as possible to the loading dock. Segregation between the pedestrian and vehicular traffic is a very important consideration in the planning of such a facility.

The circulation pattern would also seek to limit passengers and casual users to certain area for security reasons and easy management of the facility.

ZONING CONCEPT

The zoning concept is strongly determined by the circulation consideration of the terminal. The entire site is zoned into three major areas.

- The nucleus – this should be free from vehicular traffic.
- The nucleus periphery – this could cater for vehicular traffic and loading docks.
- The auxiliary periphery – this would cater for auxiliary and support facilities of the terminal.

This zoning pattern is to allow for easy identification of restricted areas and to ensure that there are no loose ends within the terminal which are easily put to misuse.

TRAFFIC FLOW

Passengers arrive the terminal mainly by bus from the city core, by a private car or via the bus stop provided in front of the terminal. He walks in through the pedestrian course way to the terminal building. At the core of the terminal building is the passenger waiting, which serves to organize other facilities. The passengers picks up his ticket on arrival and immediately hands over his luggage before going over to the waiting hall. The ticket acts as his pass to the loading concourse, which also indicates which bus the ticket is for; the seat number is also indicated on the ticket. On arrival, the passenger moves from the concourse to the waiting hall while their

baggage is discharged to the baggage collection room from where the passenger picks them up with his ticket.

If arrival is at the odd hours of the morning or waiting time is much, a more comfortable refresh is provided for, flanked with concessional areas where the passenger could do some shopping. Exit for the passengers is by the same pedestrian course way to the bus stop.

VEHICLE FLOW

On a typical bus routine, they come into the terminal in the morning picking up their ticket as they do so. The ticket would specify which route the vehicle intended to go on and time of arrival. They then move on to their respective hold points till they are called to the loading docks to pick up passengers during which the driver could fuel his vehicle. After loading, they depart through the exit gate dropping the tickets which indicates their exits.

On arrival from a journey the vehicle picks up a ticket and goes for checks within the workshop complex, washes and refuels the vehicle before coming to the hold point.

CHAPTER THREE

3.1 METHODLOGY

One of the major methods used in gathering data is the use of case study. Case study serves as an important instruction for systematic research procedure, thus an in-depth study of some bus terminal and other related transportation facilities were conducted to identify administration structural system and general functional layout. Other methods used include literature review, interview with personal concerned verbal discussion with individual or groups direction or indirectly affected by each of the building under consideration as well as the authors' observation at various location of the building. For this project, three existing bus terminals were studied, they are:

3.1.1 CASE STUDY ONE: KATSINA STATE TRANSPORT BUS TERMINAL

3.1.1.1 Location

The terminal comprises of three unit, the administration unit, operation and workshop department and they located at: Administration located at ministry of works housing and transport along GRA road, kofar durbi. Operation located at kofar yandaka along Batsari road and Workshop department located at kofar guga along Jibia road katsina state.

3.1.1.2 General assessment of the terminal

Most of the structures in this terminal are rectangular in shape, the walls are made of 225mm sand creed block wall and the finishes in the offices are 300mmx300mm ceramic tiles and the use of coal tar to some parking spaces.

Observation from the case study

Plate: 3.1 Vehicles and passengers are expose to weather due to the absence of canopies.

(Source: author field work)

Plate: 3.2 Lack of proper drainage in the terminal.

(Source: author field work)

Plate 3.3 The sole entry and exit which result to traffic jam.

(Source: author field work)

Plate 3.4 Indiscriminate parking of vehicles by staff.

(Source; author field work.)

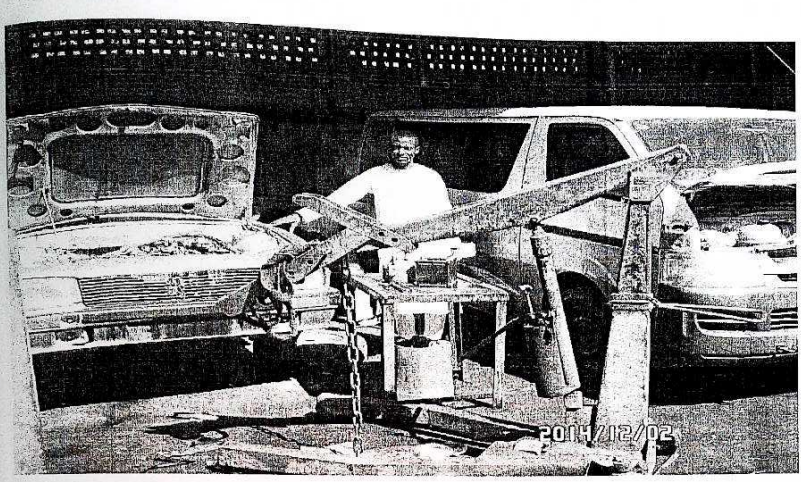


Plate: 3.5 the workshop of the terminal

(source: author field work)

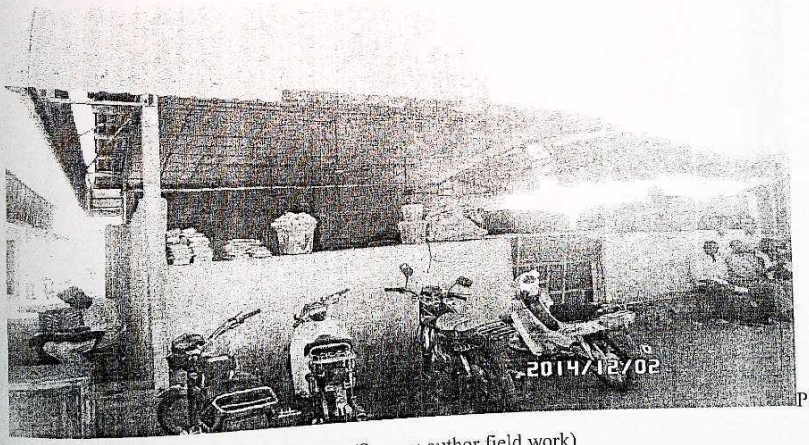


Plate: 3.6 showing temporary waiting hall. (Source; author field work)

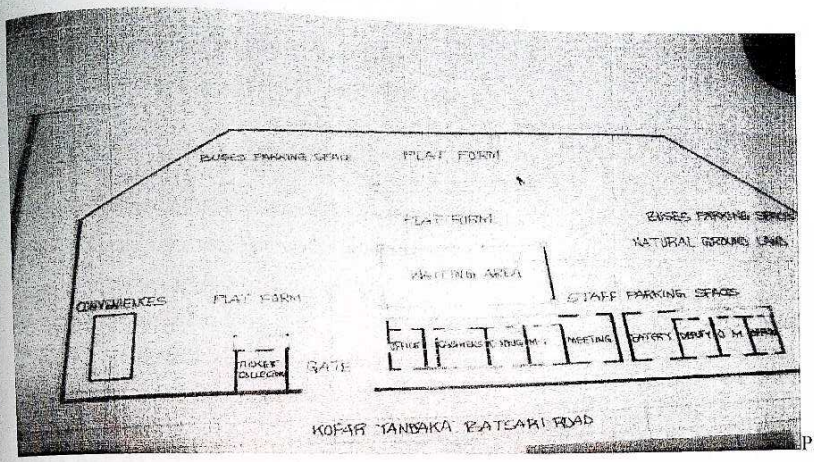


Plate: 3.7; Lay-out of the terminal

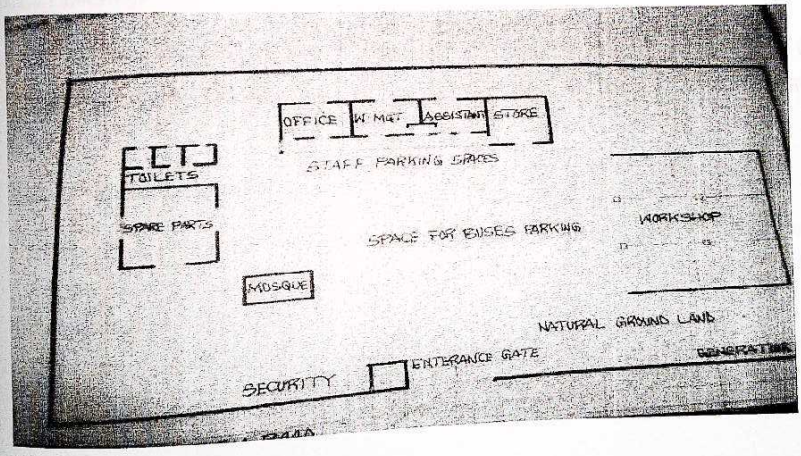


Plate: 3.8; The workshop lay-out of the terminal

(Source : author field work)

Merits of the case study

1. Good management system in the terminal
2. Use of coal tar as a finish to some parking areas.

De-merit of the case study

1. Poor relationship between each department
2. One entry and exit gate which result to traffic jam,(see plate 3.3)
3. Poor drainage system in the terminal,(see plate 3.2)
4. Un-organized parking space for buses and staffs vehicles,(see plate 3.4)
5. No space to develop other structures and hence no room for expansion.
6. Absence of toilets in the offices.

3.1.2 CASE STUDY TWO: KADUNA STATE TRANSPORT AUTHORIY TERMINAL

3.1.2.1 Location

The administration unit and workshop department are located at kakuri area, Kaduna north, Operation department located at unguwar sarki Ahmadu Bello way opposite juma'at mosque Kaduna state.

3.1.2.2 General assessment of the terminal

The building plan/form was rectangular in shape, most of the wall are made of 225mm sand screed block wall and cement sand floor finish in the administration and normal ground land at parking spaces.

Observation from the case study

Plate: 3.9 The administration block in the terminal.

Plate: 3.1 The waiting hall inside the administration, notice the sparse seats for waiting

(source :author field work)

Plate 3.11 The unplanned nature of the terminal infront of the temporary shops.

(Source; author field work.)

Pla

te: 3.12 Car wash area within parking spaces. (source:author field work)

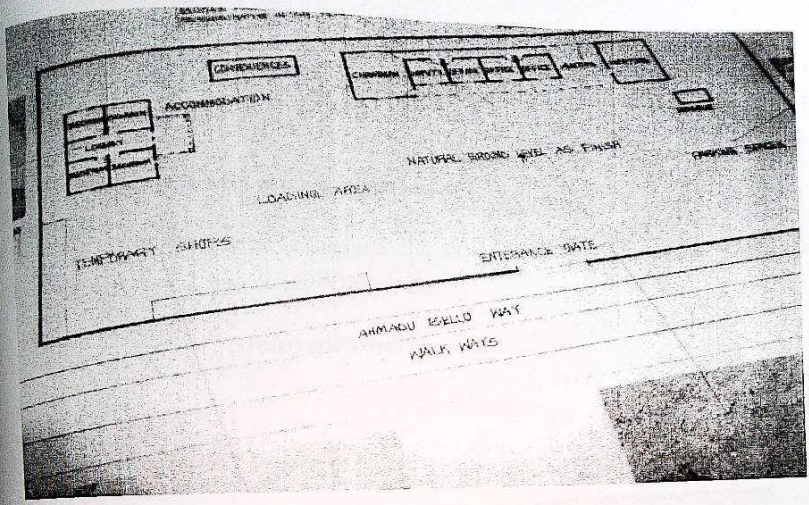


Plate: 3.1 The lay-out of the terminal.

Merit of the case study

1. They have accommodation for late passengers.

De-merits of the case study

1. Poor relationship between each department.
2. Traffic conjunction at the entrance.
3. No space to develop other structure and hence no room for expansion.
4. Poor drainage system, the terminal lead to marshy especially during rainy season.
5. Un-organized parking spaces.

3.1.3 CASE STUDY THREE: DUTSE ULTRA MODERN PARK.

3.1.3.1 Location

The terminal located at dutse along shuwarin road opposite farewell restaurant dutse. Jigawa state.

3.1.3.2 General assessment of the terminal

Most of the structures are rectangular in shape, the are made of 225mm sand creed block and most of the finishes at this terminal is of concrete.

Observation from case study

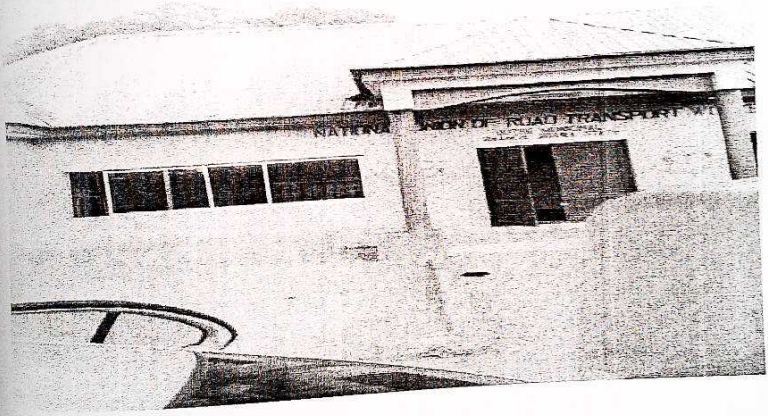


Plate 3.14; The NURTW office in the park

(Source: author field work)

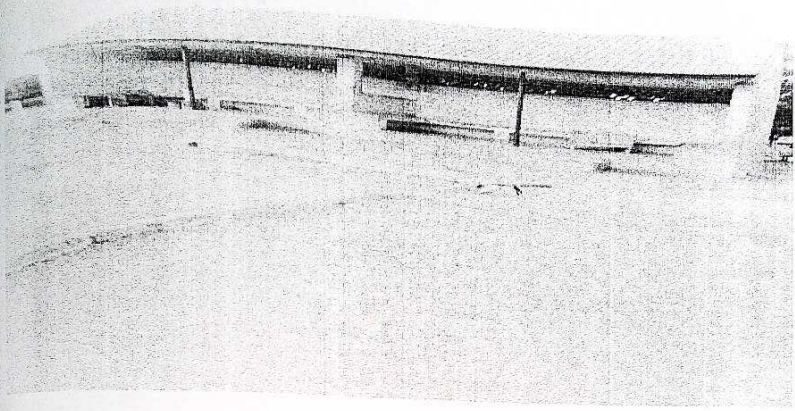


Plate 3.15 The passengers waiting area in the terminal.

Plate 3.16 Rental shops in the terminal.

(Source :author field work)

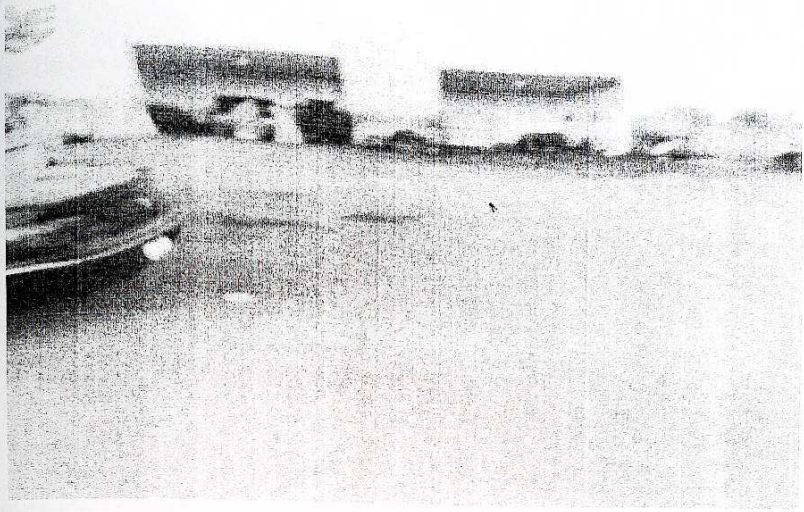


Plate: 3.17 pictorial view of workshop in the terminal.

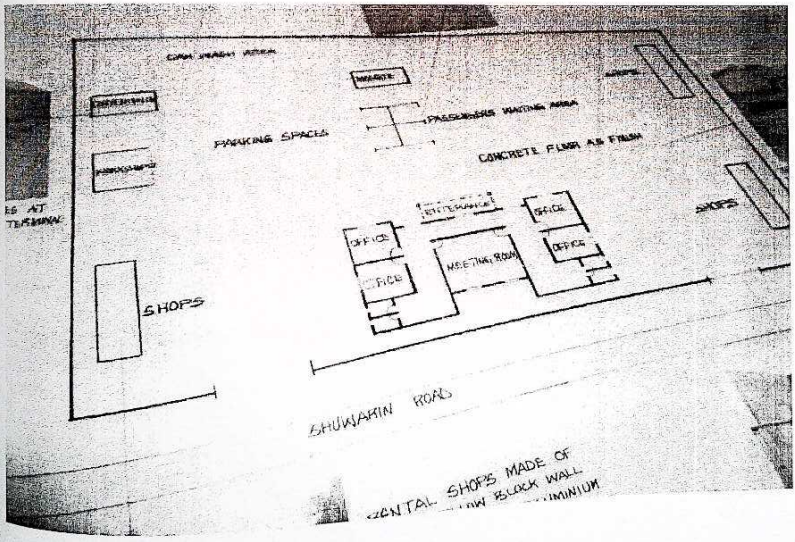


Plate: 3.18 The lay-out of the terminal.

Merit of the case study

1. The park has two gates both entrance and exit gate.
2. The park has all its units in it.
3. Vehicles are organized in their parking spaces demarcated with kerbs.

De-merits of the case study

1. Exposition of vehicles and passengers to weather.
2. In adequate number of offices in the administration
3. Small workshop (see plate 3.17)
4. Improper use of spaces due to lack of planning.

3.1.4 CASE STUDY FOUR

Case study four at kuching Terminal,Sarawak Malaysia.

3.1.4.1 Location

Kuching Terminal, Sarawak, Malaysia. It lies along Latitude 4°North and Longitude 103°East.

3.1.4.2 Description

The terminal is a contemporary colourful building designed to admit adequate light into the building without glare or tropical heat. It adopted a rectangular plan for the structure. Site planning concept is a radial space set. Multi coloured aluminium composite panels were used in cladding the structure. Some area that required day lighting was covered with double glazed glass.

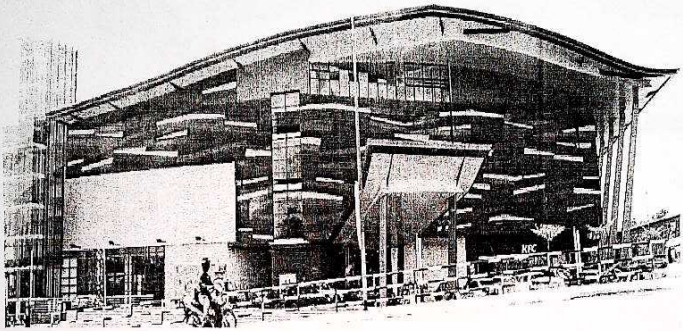


Plate 3.19:Street view of Kuching Terminal (Retrieved from the net, daily arch)

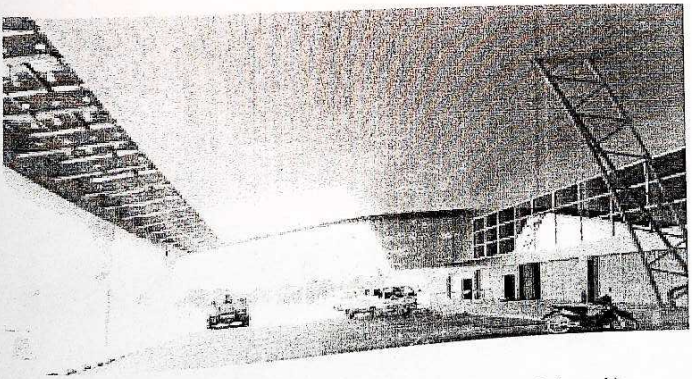
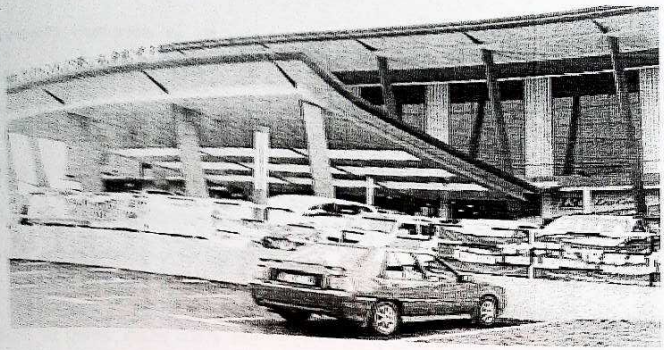


Plate 3.20: Kuching Terminal vehicle access (Retrieved from the net, daily arch)

Plate 3.21 Kuching Terminal lay-over parking area (Retrieved from the net, daily arch)

Plate 3.22: Kuching Terminal general parking area showing reversing pattern.



Merit of the case study

1. Departure concourse consists of a waiting area situated close to twelve aisles, each leading to a conveyor down to the boarding platforms.

2. General waiting area comprises of a sitting area, shops, security post and ticket stands.

De-merit of the case study

1. The site is facing a perennial problem of inadequate parking and the underground was not properly designed as it allows only one car to pull out at a time in each column. This is as a result of the inadequate space left in between the columns.

3.2 DEDUCATIONS FROM CASE STUDIES

Problem common to all terminal in Katsina: as a result of exploratory survey and observation of some motor parks and bus station in Katsina, the following common features are prominent;

- Most of the parks are centralized resulting in complication of urban Centre.
- Most are built temporary structured of some simply fenced round. The layout is usually a large uncovered spaced for parking with small stalls aligned along the sides of the fenced parts.
- Most of these stalls carry out function from selling union offices. petty trading, drivers shade etc
- The waiting passenger usually site inside vehicles waiting for other passengers. Both passenger and vehicle are unprotected from the weather.
- Most of the and station are accessible marshy rough (especially during rainy season), dirty uninviting Passengers to move unload and load. Also there is no definition coordination and improper use of space due to lack of our poor planning.
- Consideration is not given for expansion to accommodate increase in number of passenger and vehicles.
- Maintenance: this is conspicuously absent in some unit of the motor parks and the stations.
- Poor and grossly inadequate basic service and facilities such as drainage , water electricity.
- Absent of all element of landscape.

CHAPTER FOUR

4.1 THE SITE

4.1.1 SITE LOCATION

The site is located in katsina state, at the extreme margin of northern Nigeria that lies on geographic coordinates of latitude 11^0 30 and 13N and longitude 7^0 and 9^0 in north western Nigeria. It has a land mass of about 23,560km and a population of 5,801,584 which is based on the 2006 census. Katsina is one of the oldest urban centers of Nigeria believed to have been established in 1100AD as citadel and political capital in the pre and post Danfodio's Jihad, of the 19th century. It has its roots stretching back considerably before the advent of British colonizers and has served as entre port to the Saharan and trans-Saharan trade (Isah, 2011).
The site for the proposed Katsina state Transport Authority is located along Dutsinma road, Katsina State.

To choose the site for a building project many factors would have to be taken into consideration, especially site like a terminal station. Factors like Space, in case of future expansion, the site location itself, climatic conditions, temperature, geology and topography, transportation and traffic flow, existing land use and future trends, assess and circulation, utilities and environmental problems.

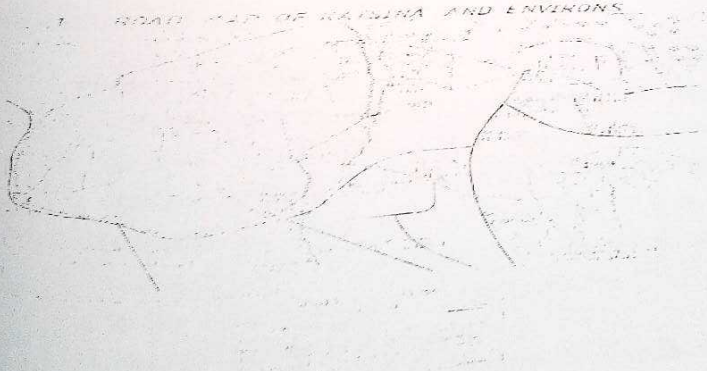
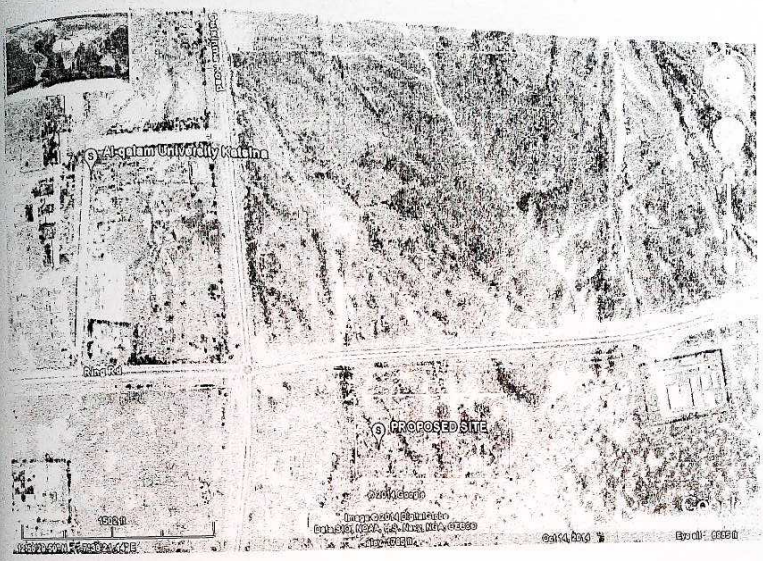


Fig.4.1.

1 Map of katsina and environs; (source geography dept. umyu)

4.1.2 SITE CHARACTERISTICS



The site is characterized by the following natural factors:-

- **Geology:** This is the type of rock below the surface of soil, the depth, and the characteristic feature of rock should be identified, such rocks could act as a foundation for many buildings these are natural and could form visible landforms. The stability of such geological formations is also important.
- **Topography:** The form of land is called its topography of the site which is relatively flat. This is the most important factors to be analyzed. Geology and the slow process of natural erosion (soil being worn away because of wind or water) are responsible for landforms and slopes.
- **Hydrography:** Hydrography provides information about all types of water bodies present in and around the site lakes, stream, any marshy land (swamps), or

natural wells. It also reveals the availability or otherwise of a groundwater table and the depth at which it is available. The physically hydrography of the site does not show the presence of any lake, stream, marshy land or natural wells.

- **Soil:** The different types of soil present are analyzed. Soil decides the stability of land, foundation, suitability, excavation, erosion, drainage, and plant growth (as the top soil is essential for good plant growth). The bearing capacity of soil is an important factor to be considered while locating buildings. The soil type for the proposed site is considered to be laterite.
- **Vegetation:** A study of vegetation helps in locating large existing trees, which can be retained. These can be used for providing seating. The ecology of the area should also be examined to know what plant or shrubs would grow in that area. The vegetation on site has located some large existing trees that are not many staged within the site. These trees shall be removed and replace by planting new one in other to avoid inconvenience during the execution on site.
- **Climatic factors:** Across a piece of land, the elevation difference, character of topography, vegetation cover, and water bodies influence that climate of the area. On the other land, precipitation and temperature are the major factors affecting vegetation in cool and temperate climates, vegetation may be used to block harmattan winds.
- **Temperature:** There are three main temperature seasons, a cool and dry season last from November to February, following by a hot and dry season which last from March to mid-May. This is followed by wet season which is warm, with mean monthly temperature about26°c and a a diurnal range of about 10°c, raising to 130c in September.
- **Relative Humidity:** At the start of the dry season, relative humidity falls from58% in October to 30% in November with stabilization of the easterly winds; it further falls to 28% in January and 25% in February.
- **Rainfall:** Rainfall starts usually in the month of March and increase from 137.2mm to 314.0mm in August which is peak in the year. Annual total rainfall lies within a range of 884.4mm.

- **Cultural factors:** Linkages, traffic and transit- vehicular and pedestrian circulation on or adjacent to site ,density and floor area ration, Utilities- sanitation, water, gas, electricity, storm water drainages Exiting buildings, historic factors- historical buildings and landmarks.
- **Existing land use:** This implies a survey of the present status of the land-whether it is residential, commercial, industrial or recreational. The ownership of the adjacent site will also affect the land surveyed.

4.1.3 SITE SELECTION CRITERIA

The following criteria some of which are considered as the key point or measure use to appraise a bus terminal performance which will also be used to test the suitability of the proposed sites.

a) Land use provision as regards location of such facilities (Bus Terminal) is located outside residential and commercial land use, but close by them. The location should be a less intensive land use area to avoid environmental hazard which are tied to such facilities i.e pollution, noise and gas.

b) Location with respect to the regional route since the terminal is for inter-city/intra-city road transportation; its location most enhance easy linkage from regional routes and as much as possible reduced the intra-city transport conflict with inter-city transport while making intra-city transport accessible to the terminal to carry away passenger brought, going out.

c) Accessibilities to both inter-intra city routes for maximum utilization.

d) Essential services must be close –by this refers to service such as electricity, water supply, telephones service lines etc.

e) The site must be optimum, convenient access to all potential users.

4.1.4 SITE ANALYSIS

Site analysis is an integral part of pre-design analysis and its may involved physical infrastructure, ecological, cultural, aesthetic acoustic and climatic site analysis. The site climate determined by climatic variables, ground cover and topography, Climatic site analysis should provide design guidelines for layout, orientation , and spacing, and cross- vegetation, treatment

of spaces between building, shades trees, courtyards, shape and height of building as well as houses.

a) The physical site analysis involves the types and depth of soil and substructure for foundation design. Analysis has shown that the site soil type is laterite mainly of coarse texture intimately with fine ones, and has a sufficient bearing support to foundation.

b) No presence of any water bodies, such as stream, well swampiest and drainage found across or within the site.

c) The ecological site analysis deal with dominant plants and animal communities, their self-regulation and sensibility to change, mapping of ground cover and trees to be retained. The dominant plant found were shrubs, few large trees mainly of locust beans type staggered within the site. None shall be retain because the staggered nature could obstruct the execution of building during setting -out.

d) The infra-structural site analysis covers existing building, roads, pathways, and all services including electricity, sewerage, water and telephone service line.

e) Acoustic site analysis maps out the sources of noise which is mainly from the passage of vehicles on the highway. This can be prevented by proper organizing planning, and building design.

4.2 THE DESIGN

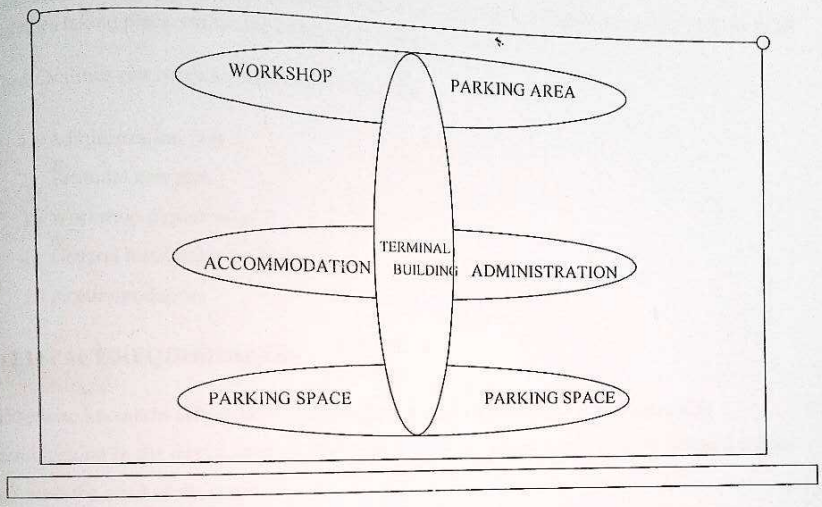
4.2.1 DESIGN CONCEPT

Research study has shown that there are basically two concepts in the design trends of bus terminal, they are:

- **Linear concept**
- **Radial concept**

1. **Linear concept:**

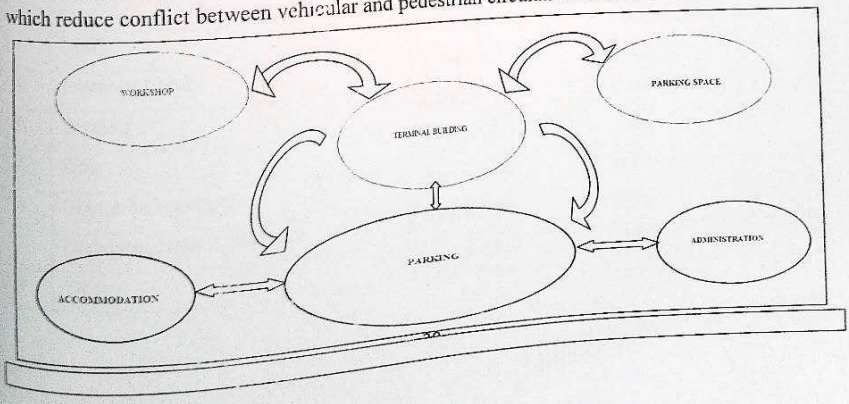
The functional units in this concept are normally arranged in straight line pattern and the bus area determined the direction of movement. This concept enhance expansion, and is best for bus stop and terminals to avoid long span corridor and undue vertical segregation of circulations involves in large station and terminals.



Source: Abdullahi, 2002

2. **Radial concept:**

This concept makes the entire facility in bus terminal radiates from central point, which serves as the focal point or sort magnet that attract people. It is a form of service concept that gives a maximum utilization of functional spaces and district identity to vehicular areas in the complex, which reduce conflict between vehicular and pedestrian circulation to the minimum level.



For this project the linear concept was adopted because the functional units are normally arranged in clear and easily identifiable direction in order to achieve harmonious movement in the terminal.

4.2.2 DESIGN BRIEF

The brief for the proposed bus terminal is developed for well coordination and simplicity of all activities taking place within the terminal complex.

These facilities can be grouped into the following:

1. Administration unit
2. Terminal complex
3. Workshop department
4. General auxiliaries facilities
5. Accommodation

4.2.3 SPACE REQUIREMENTS

Otherwise known as schedule of accommodation of each functional unit is taken into consideration in the design stage of this project. Success cannot be achieved in design if it does not meet the need of the users.

This varies from one function to the other because of the various form of function to the others, because of the various activities that will be undertaking, the spaces are allocated putting in mind furniture, circulation and utilization areas. These form the basis for determining the spaces as table below.

ADMINISTRATION UNIT

	UNIT	DIMENSION (M)	AREA (M^2)	NO.
1	Entrance porch	4.20x5.40	22.68	1
2	Waiting	4.20 x 4.80	21.16	2
3	Stair	3.00 x 5.00	15.00	1
4	Operation manager	5.80 x 6.00	34.80	1
5	Deputy operation manager	4.20 x 5.80	24.36	1
6	Eatery	7.60 x 8.00	60.80	1

7	Kitchen	3.60 x 5.20	18.72	1
8	Exit	2.60 x 3.60	9.36	1
9	Securities	6.00 x 6.00	36.00	1
10	General manager	6.00 x 6.00	36.00	1
11	Conference hall	7.60 x 11.60	88.16	1
12	Offices	3.80 x 4.00	15.20	9
13	Executive officer	3.80 x 6.00	22.80	1
14	Toilets	1.80 x 2.00	3.60	8

OPERATION DEPARTMENT

S/N	UNIT	DIMENSION (M)	AREA (M^2)	NO.
1	Entrance porch	5.00 x 9.60	48.00	1
2	Ticket collection	7.60 x 14.60	110.96	1
3	Haulage section	8.20 x 9.60	78.72	1
4	Inter-state waiting hall	15.00 x15.00+4.8 x5.0	249.00	1
5	Intra-state waiting hall	15.00 x15.00+4.8 x5.0	249.00	1
6	Arrival waiting hall	8.00 x 13.00	104.00	2
7	Plat form	10.00 x 19.00	190.00	2
8	Conveniences	1.50 x 1.80	2.70	16

WORKSHOP DEPARTMENT

S/N	UNIT	DIMENSION (M)	AREA (M^2)	NO.
1	Entrance porch	3.00 x 10.8	32.4	1
2	Spare parts store	5.80 x 9.60	55.68	1
3	Meeting room	7.00 x 7.00	49.00	1
4	Workshop manager	4.80 x 4.80	23.04	1
5	Deputy workshop manager	4.20 x 4.80	20.16	1

6	Office (Technician)	3.80 x 6.00	22.80	1
7	Workers entrance	3.60 x 8.00	28.80	1
8	Changing room	10.60 x 12.00	127.20	1
9	Conveniences	1.50 x 1.80	2.70	6
10	Diesel section	12.00 x 15.00	180.00	1
11	Petrol section	12.00 x 15.00	180.00	1
12	Alignment	8.00 x 13.00	104.00	1
13	General store	7.00 x 13.00	91.00	6
14	Car wash	8.00 x 13.00	104.00	1
15	Panel beating	7.00 x 13.00	91.00	1

ACCOMODATION

S/N	UNIT	DIMENSION (M)	AREA (M^2)	NO.
1	Entrance porch	4.00 x 6.00	24.00	1
2	Reception	4.00 x 6.00	24.00	1
3	Stair hall	3.00 x 5.00	15.00	1
4	Bedroom	3.60 x 3.80	13.63	1
5	Conveniences	1.5 x 1.80	2.700	32

4.3 DESIGN SOLUTION

4.3.1 MATERIALS AND CONSTRUCTION

This examines the performance and the expected efficiency of the individual composition to the overall functionally of the entire project. This part will be based on the main components of building namely foundation, floors and the roofs.

4.3.1.1 Materials

The success of every construction project lies on its ability to withstand long use and return value to the investment made. To this effect the choice of materials is of paramount importance. The choice of materials has been limited to a relatively small range for the reason of so many

factors and conditions. However, for the purpose of this project materials to be used are considered based on the following conditions;

(a) Cost
(b) Durability
(c) Strength
(d) Accessibility to materials
(e) Structural stability
(f) Fire security
(g) Technology
(h) Maintenance
(i) Resistance to environmental such as solar radiation and rain.
(j) Aesthetic value
(k) Weight

Having considered the above mentioned factors the choice of materials for the proposed bus terminal would be based on the following materials:

1. Concrete; reinforced concrete, pre-cast and plain in-situ concrete.
2. Facial bricks for tiling of floor beds.
3. Sandcrete blocks for partition and load bearing walls.
4. Steel- for roof structures and railings.
5. Wood- both soft and hardwood of different sizes and shape.

The reasons for selecting these materials are because the selected materials are modern building material, the material are structurally sound, welcoming and attractive. The material can also stand for the test of time.

4.3.1.2 Construction

Simple and advanced construction technology shall be applied in the construction of the entire structure. Though physical inspection of the site shows that the site is well drained because of the nature of the site.

When this is done, the type of foundation to be used is then chosen. The structural frame system of construction will be employed for the purpose of this project in some part of the building. This system provides skeletal frame that support and transfer all horizontal and vertical loads to the foundation through the columns, beams and slabs, basically for the purpose of better

understanding of the construction technology and techniques, the whole building will be divided into structural elements and emphasis should be laid on each element.

4.3.1.3 Foundation

The foundation of the building constitutes its substructure and acts as an anchor between the building and the ground on which it is built and also distributes vertical load from the superstructure to the ground.

Foundation is the major functional unit of sub-structure, sub-structure is the part of the building below the ground level and it support the super structure. The foundation carries the load of the super structure which is transmitted through load bearing wall to the foundation, from foundation to the sub-soil. The suitable foundation for this project is strip foundation, this foundation type is selected due to good bearing capacity of the sub-soil. This foundation is design to transmit both the live and the dead load. The foundation should be design in such a way that no significant settlement/movement will occur due to unequal loading.

4.3.1.4 Walls

Walls constitute those vertical elements of a structure which compartmentalized its space in the horizontal plane. They may be load bearing and non-load bearing elements. The external walls use is 225x225x450 sandcrete blocks while the internal partitions shall be made up of 150x225mm. The internal walls of toilets shall be finished with wall tiles.

Doors are to be made of anodized aluminium frame and glass, timber and steel as panel doors depending on where they are to be fixed. Also special security doors shall be provided for the terminal. Alluminium windows of different types will be employed, these would include vertical and horizontal sliding.

4.3.1.5 Roof

Long span alluminium roofing sheets will be used in the roofing with timber roofing members in the administration and accommodation, steel roofing members shall be used in the workshop.

Finishes shall be made to give a final and consistent outlook not compromising conditions already listed for the selection of materials.

4.3.2 SERVICES

4.3.2.1 Electricity

Katsina state transport authority shall have electricity supply from the municipal supply system which is the Power Holding Company of Nigeria (PHCN) line, which runs directly in front of the site. None the less a generator house is also provided for effectiveness and comfort at all times in case of power failure from PHCN which is inevitable.

4.3.2.2 Lighting

Light is the electric magnetic radiation with wavelength capable of causing the sensation of vision. In other words, it is radiant energy sensed by the optical nerves. The sun is the highest producer of radiant energy. The major objective of the lighting design is to provide a specific illuminant on task. The natural day light, finishes adequate illumination for only 10 to 25% of the total work time and it travels/covers a distance of about 6meters only. Artificial illumination is installed primarily for seeing, but it could serve architectural purpose.

The design is based on the integration of both natural and day lighting while the wiring system shall be conduit system. This shall supply electricity requirements, to avoid energy wastage, and energy use such as lighting system shall centrally control.

4.3.3 SPECIAL DESIGN CONSIDERATION

4.3.3.1 Cooling

Katsina like other towns of Nigeria, also experiences heat during the dry season with temperature going up as high as 38^0C, making people uncomfortable at times. In order to solve the problem of heat, effective cooling system would be employed, mostly especially in the terminal which is devoid of any natural lighting or ventilation. Air conditioning and ventilation plant would be use to solve the problem of cooling in the structure. However, these plants produce a great deal of noise most especially in the ducts.

4.3.3.2 Ventilation

Natural ventilation is given priority as a means of ventilation. In the orientation of the centre generally the design of windows and doors, corridors and courtyards exhibit this attempt. However, mechanical means would be employed as alternatives.

4.3.3.3 Water supply

Physical inspection revealed water mains pipe that passes just in front of the site. Just like electricity, water will be tapped from the existing network with an effective piping system. Alternatively, borehole would be sunk in the centre to supplement that of the water board.

4.3.3.4 Drainage

The drainage system on the site is designed with respect to the natural topography of the site. The slopping topography of the site is utilized fully in draining the site of storm water. Storm water is drained through a network of concrete drainage along the sloping terrain of the site and connected along the sides of the roads.

4.3.3.5 Sewage disposal

Due to existing regulation, which specifies that wastewater meant for discharge into municipal sewer must have pollution load not exceeding that of domestic sewage, coupled with the absence of any municipal sewer with a reasonable distance necessitates the provision of a central sewage system for the centre. All the sewage lines would be connected to a central sewage system outside the site.

4.3.3.6 Refuse disposal

The Katsina State Environmental Protection Agency (SEPA) is in charge of collecting solid waste all over in habited areas of the town through sanitary and fills disposal method, in view of this, the centre shall liaise with the board and other private refuse collectors for the evacuation of its waste.

4.3.3.7 Fire service

Fire risk of various types of buildings must be assessed from the aspect of personal safety, safety of the structure and security of contents. Furthermore, the extent of potential damage to a building depends very largely upon the amount, nature and distribution of combustible materials within it. The studio complex is the area of most prone to fire, because the materials used for the acoustic treatment are highly combustible materials.

The ideal way to make a terminal safe against the danger of fire would be to make sure that the fire does not start but one cannot rely on this, because a large proportion of fire that occurred in the past were attributed because that can never be eliminated. The use of water on fires in areas would be avoided because of the great potential for extensive damage and the possibility of electric shock. However, the sprinkler system would be strictly used in the administration wing of the building. Fire protection would be of a type suitable for use with electronic equipment, like the halogen gases types. Provision of fire alarm system particularly in unattended equipment areas, would be taken into consideration.

4.3.3.8 Security

For structural security, first the stability of the building has to be ensured. This is to allow for resistance to both dead and live loads. The safety of the assets and people is vested in the strategic security design. It is proposed that the whole site be fenced to enhance security and discourage trespassers into the property. External security best served by good lighting and visibility. The accesses are properly lighted. At the entrance to the terminal, a full security detachment is stationed which allowed the entrance and exit of people and materials (goods) to and from the centre.

4.3.3.9 Maintenance

Regular maintenance work and periodic turn around maintenance charts shall be provided. This will allow for long span use and avoid unexpected breakdown. The administrative unit is responsible for this task.

4.3.3.10 solar control

The effect of radiation from the sun is been controlled by the use of sun shading device such as curtains, window blind and window hood. Another important and effective method employed is the orientation of the building in such a way that the positioning of windows is avoided as much as possible not to face the sunrise and sunset.

4.3.4 SITE PLANNING

This is the organization of different function unit in relation to one another on site. The integration of other services parking spaces, clear pedestrian access, circulation etc. As a

terminal circulation is the most critical factor of planning. The circulation concept is such as to allow for easy and unhindered access of pedestrians to the nucleus of the terminal i.e. to use the pedestrian traffic as the denominator of planning. Around this nucleus the vehicular traffic can perform the function properly and interaction between the two should be reduced as much as possible to the loading dock.

4.3.4 REASON FOR GOOD PLANNING IN BUS TERMINALS

- To balance traffic flow, transit, pedestrian and motorist use, safety, and to create attractive and effective streetscapes.
- To create attractive and streetscapes that provide safe linkage to public facilities, shorelines, and other public open spaces, and that complement the aesthetics of adjacent natural feature and buildings.
- Minimize steep gradient in circulation patterns.
- Allow safe, efficient access for emergency vehicles.
- Provide direct access to transit stops from building via defined, safe pathway system
- Provide easements for pedestrian access to facilities the future extension of this path as adjoining properties are improved.
- To provide clear internal vehicle circulation patterns and consideration of pedestrian walkways in parking lots.
- To set standards for paving, lighting, and other design element;
- To provide a functional relationship among the users.

Also providing spaces for future expansion as well as landscape that will enhance human activities, planting trees in the direction of wild/harsh wind to prevent tears of roof etc. And also toward the sun path to prevent unwanted glare and also to serves as shading device.

CHAPTER FIVE

5.1 SUMMARY

Then aim and purpose of this thesis is to show the value of circulation in bus terminal of both pedestrian and the buses.

Chapter one states the background of the study of bus terminal in Nigeria. It also states the aim and objectives, the statement of problems of the study as well as scope of the study and also the significance of the study.

Chapter two gives the historical review of bus terminals in Nigeria .it also states the types of bus terminals and it gives the detailed discussion of the circulation which in bus terminals.

Chapter three is specifically based on the methodology of research which is case studies both national and international. This chapter helped immensely in the outcome of the design.

Chapter four gives the detailed discussion about the site, its location most important the analysis on the site. It also discussed about the design, its concepts, zoning, material and construction forms and the special design consideration.

5.2 CONCLUSION

This research shows/portrays that circulation and organization in bus terminal is very important to our bus terminal in Nigeria, though the provision comfortable circulation premises in the environment. Also the provision of good ventilation and lighting in the main terminal building is very important. This research also shows that good organization and circulation of the passengers and the bus can reduce the congestion of passengers.

5.3 RECOMMENDATION

It is highly recommended that bus terminals should be design by architects because most of the architects know the value of organizing and circulation in bus terminal of both passengers and the buses.

It is recommended that bus terminal environment should be designed with full measures, this will help in enhancing the in organizing and circulation of both passengers and buses, aesthetic

and restorative value of the environment thereby providing a comfortable environment that will boost transportation process in Nigeria.

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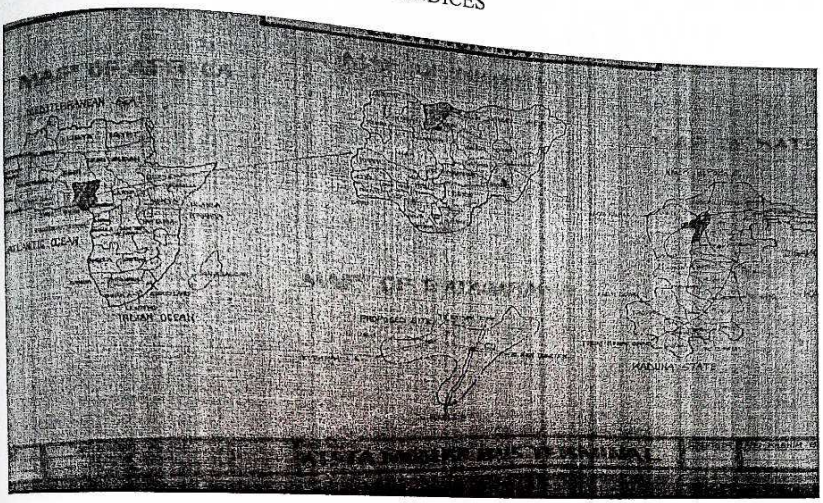
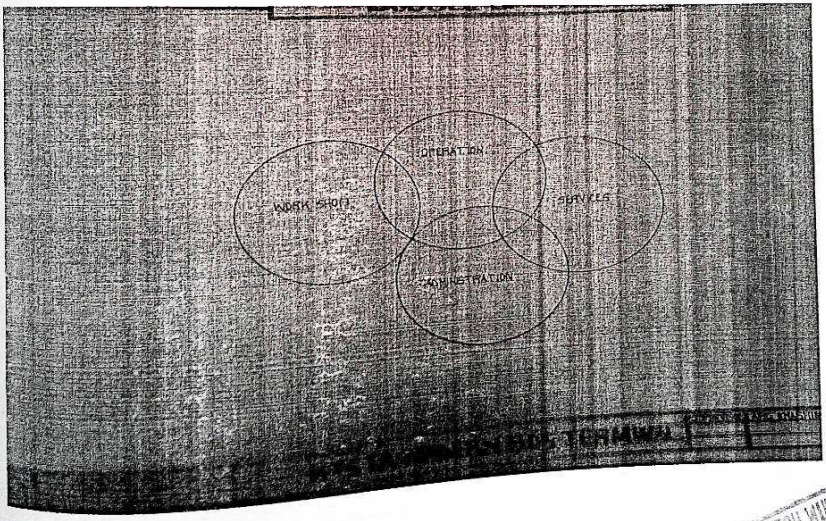
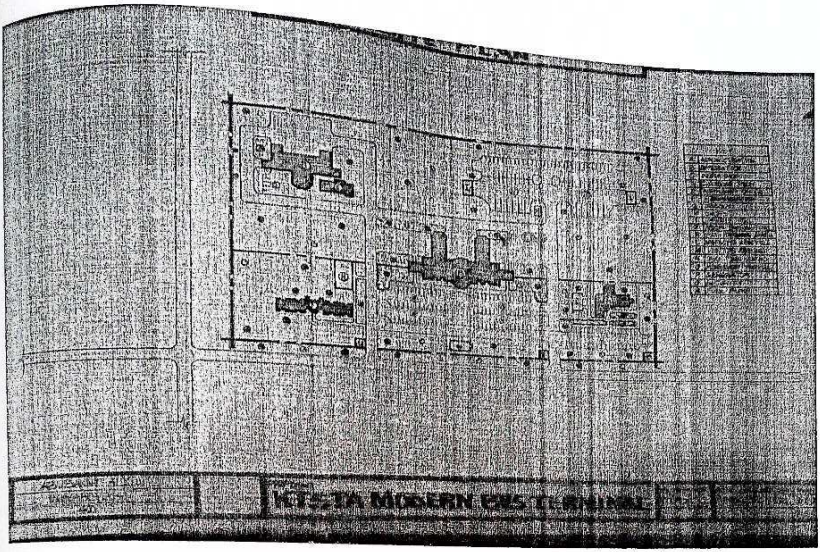
APPENDICES



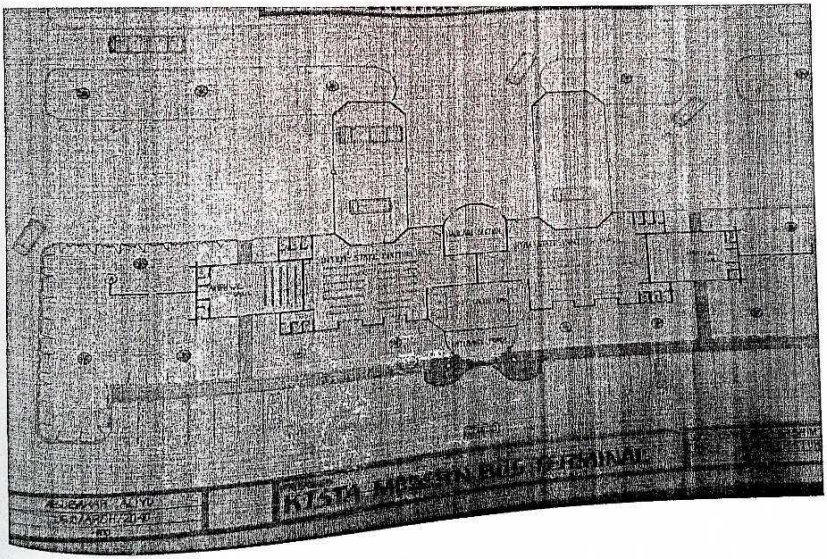
Appendix 1: location map



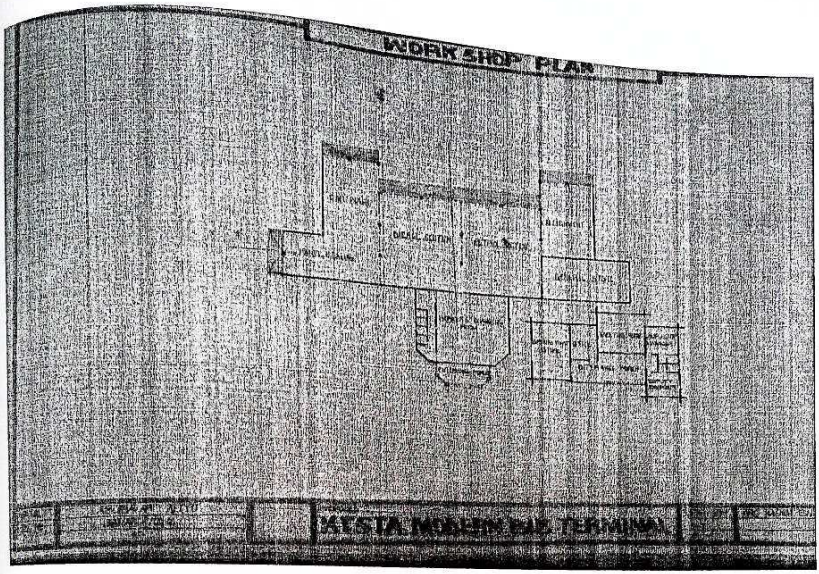
Appendix 2: bubble diagram



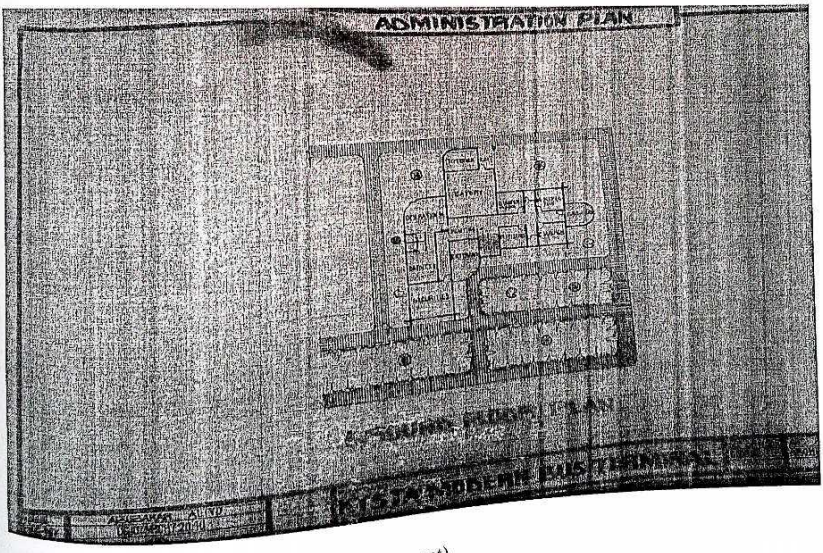
Appendix 3: site plan



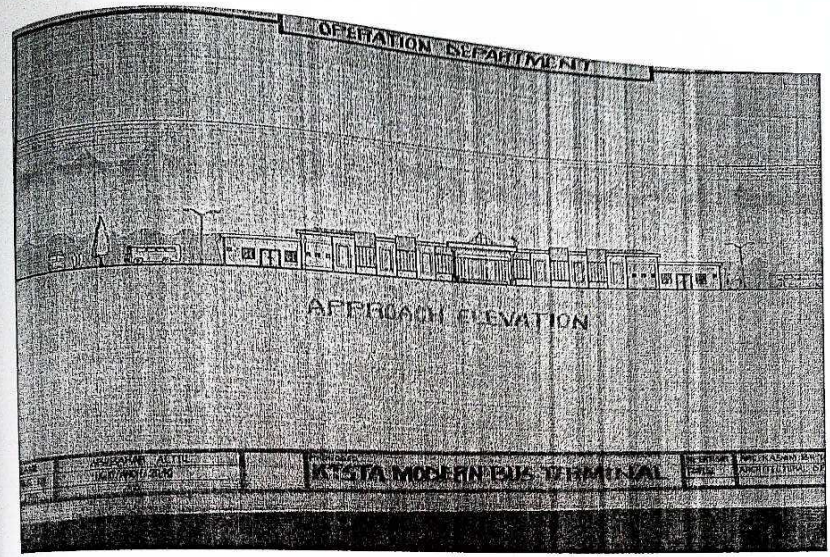
Appendix 4: floor plan (operation department)



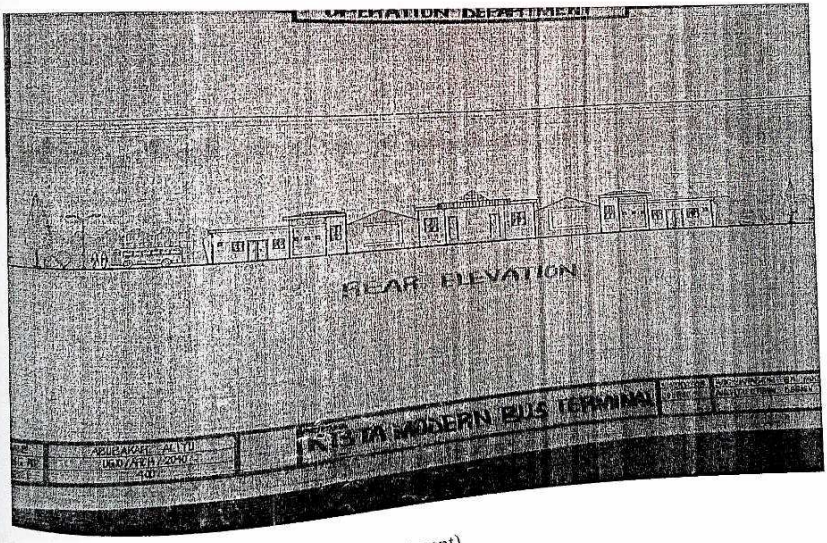
Appendix 5: floor plan (workshop)



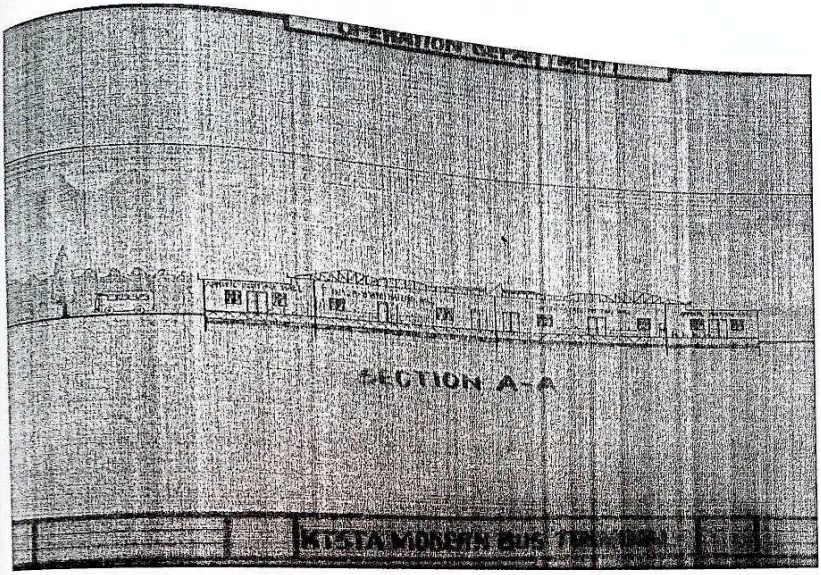
Appendix 6: floor plan (administration department)



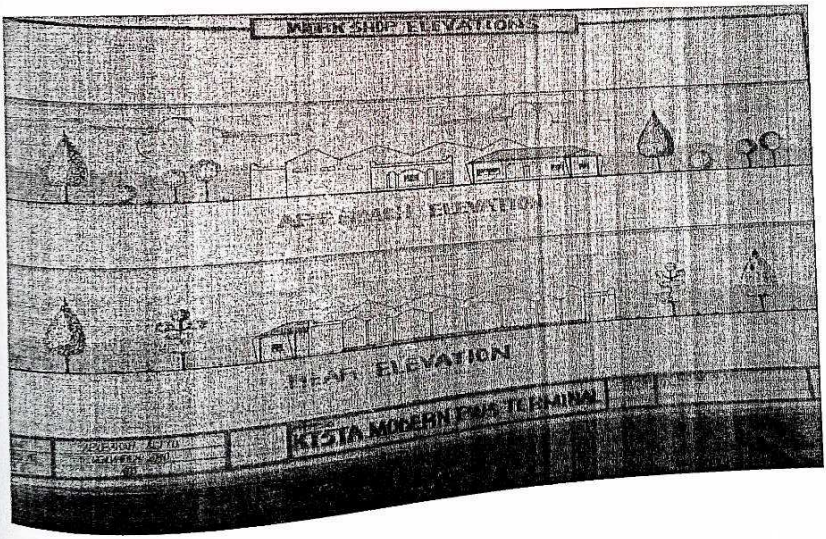
Appendix 7: front elevation (operation department)



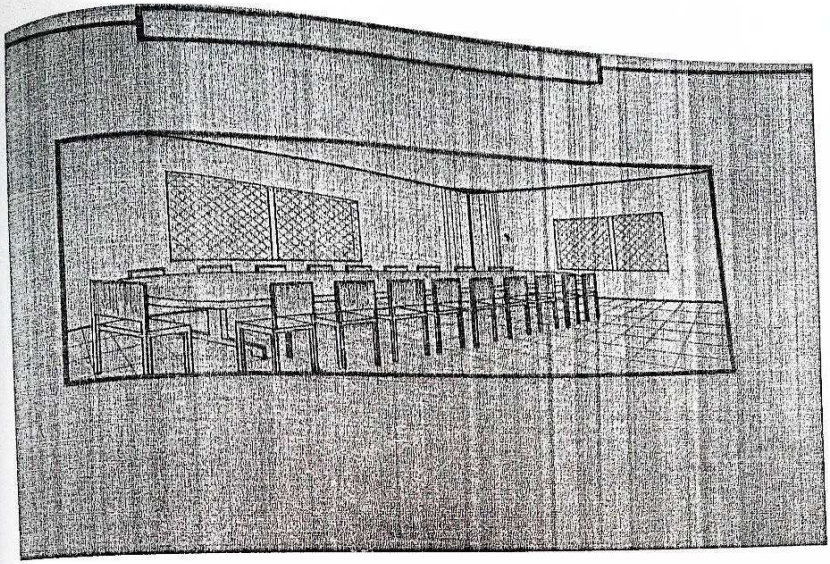
Appendix 8: Back elevation (operation department)



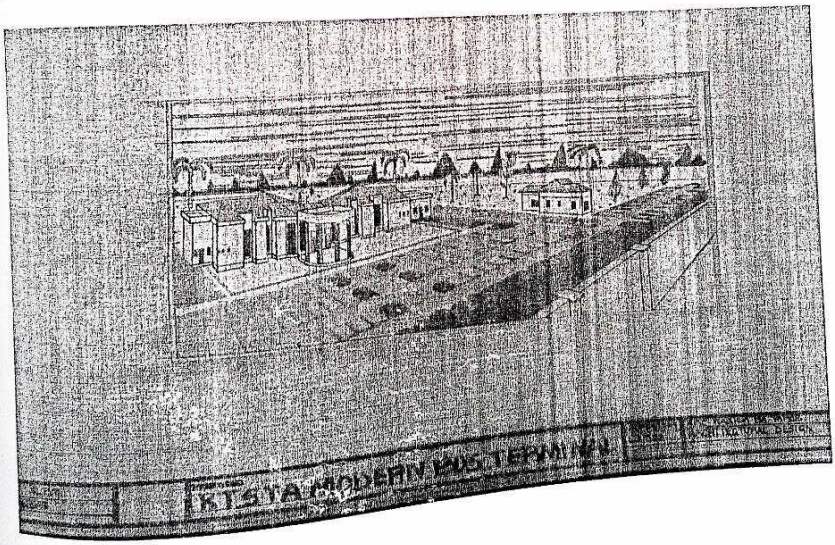
Appendix 9: section A-A (operation department)



Appendix 10: Workshop elevations



Appendix 11: interior perspective



Appendix 12: exterior perspective