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AN ASSESSMENT OF THE URBAN PUBLIC PARKING MANAGEMENT IN UGANDA: A CASE STUDY OF KAMPALA CITY

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I ORASHIDA NAKANWAGI declare that the content of this thesis entitled "**AN ASSESSMENT OF THE URBAN PUBLIC PARKING MANAGEMENT IN UGANDA: A CASE STUDY OF KAMPALA CITY**" is my original work and has never been submitted for any award whatsoever.

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APPROVAL

This dissertation entitled **"AN ASSESSMENT OF THE URBAN PUBLIC PARKING MANAGEMENT IN UGANDA: A CASE STUDY OF KAMPALA CITY"** has been submitted with our approval as the University's Supervisors.

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DEDICATION

I dedicate this thesis to my late father, Hajji Ahmed Sseguya, my children, Babirye Raihana Mpungu and Kato Raihan Mpungu, my entire family and friends.

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ABSTRACT

The purpose of this study was to assess the management of public parking in Kampala city with a special focus on the city's Central Business District (CBD). A mixed methods research design was used in carrying out this study. Key research methods used in the study include: questionnaires, face- to -face interviews and observation. Under this study, 328 questionnaires were used and distributed to collect quantitative data. Face - to- face interviews targeted key informants to collect qualitative data. Respondents for the questionnaires were selected using convenience sampling technique while purposive sampling was used to select respondents for the face -to -face interviews. Data collected using qusetionnaires was processed using the Statistical Package for Social Sciences (SPSS) software. Qualitative data that was collected from the key informants and analyzed thematically. Findings revealed the underutilization of the majority of studied parking facilities based on their parking indexes. For parking facilities along Kampala-road, the Parking Index was indicated as 49.88% and 57.5% on a weekday and a weekend respectively. Results for parking facilities along Buganda-road showed that the Parking Index was 60.733% and 31.45% on a weekday and a weekend respectively. Besides, the Parking Index for William Street was 42.1% and 55.74% on a weekday and a weekend respectively. The Parking Index for Watoto Parking Lot was 83.07% and 68.86% on a weekday and a weekend respectively. For Mercantile multi-storied parking facility, the parking index was 75.96% and 56.37% on a weekday and a weekend respectively. Lastly, the Parking Index for Mabirizi basement parking was 27.7% and 35% on a weekday and a weekend respectively. Based on the Importance Performance Analysis (IPA), the customer satisfaction Index (CSI) was 52.4% indicating a moderately satisfaction level of the parking management in Kampala among motorists and drivers. However, from the fifteen public parking management attributes that were studied, only four (4) of them that included affordability of parking, availability of parking spaces, accessibility to parking spaces as well Safety and security of the vehicles were accorded the greatest importance by the drivers. Consequently, the existing public parking management system in Kampala was found to be inneficient. Based on the study results, it is important to introduce a coherent and comprehensive public parking policy to guide investors, transport regulators and motorists in Kampala city.Recommended also is the preparation of a public parking design manual to guide the gazetment of off-street and on-street parking, establishment of car free zones in the CBD to manage rising demand for parking and improve traffic flow, promotion of city densification and mixed- use development programmes, adoption of new parking technology to enhance efficiency, attracting more investment in multi-storied car parking facilities through public private partnerships (PPPs) as well as establishment of park and ride facilities along public transit corridors such as the proposed bus rapid transit (BRT) stations, passenger railway stations.

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ACRONYMS

GKMA: Greater Kampala Metropolitan Area

KCBD: Kampala Central Business District

KCCA: Kampala Capital City Authority

CCD: Central Commercial District

URA: Uganda Revenue Authority

CBD: Central Business District

IPA: Importance Performance Analysis

CSI: Customer Satisfaction Index

PT: Public Transport

CBO: Community Based Organisation

NGO: Nongovernmental Organisations

UBOS: Uganda Bureau of Statistics

MoLG: Ministry of Local Government

MoLHUD: Ministry of Lands Housing and Urban Development

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Car parking is one of the most intractable problems faced by modern -day cities. This is mainly due to the increase in ownership and use of private cars (also known as motorization) (Kiggundu et al., 2021). In many developing countries, the main reason behind the vehicle growth is population increase, urbanization, economic prosperity, and government policies towards the transportation sector (Waleed & Marizwan, 2024). With rapid urbanization and increased use of motor vehicles, parking problems in several cities across the globe have become more pronounced. Poor planning of public transport especially in developing country cities has in a way forced commuters and travellers to use private vehicles (Kiggundu et al., 2021). Motor vehicle owners and users need space for parking in cities. As the number of vehicles grow, the need for parking space also increases.

Both developed and developing economies have demonstrated growth in private car ownership among citizens as a way of meeting their mobility needs. Car ownership per 1000 inhabitants has roughly doubled since 1970 in most North American and Western European countries, as well as in Australia and New Zealand. In the global South too, the growth rate of car use has been significant (Dimitrou & Gakenheimer, 2011). It was projected that China's car ownership levels may double to exceed 400 per 1000 population by 2040 (Ma et al., 2019).This is in line with the historical trends of fast-growing car ownership rates and the consequent domination of automobiles in North America in the 1950's and in Western Europe in the 1960's and 1970's (Ma et al.,2019).

However, more than 3,000 vehicles enter Uganda each month, compared to 20 vehicles that were imported in 1962 for the same period (Uganda Revenue Authority, 2020). This explains an enormous growth in the use of automotive in the country. Motor vehicle ownership among the high and middle income people in Kampala is also on the rise. Cars are still considered a status symbol by the majority of individuals in developing countries, though, a considerable proportion of individuals and businesses consider them a necessity (UBOS, 2024). The persistent growth in private car ownership is compounding the traffic congestion problem, increased delays, air pollution, loss of productivity with more parking

management requirements. Most of the roads in the greater Kampala were constructed in the 1960s for 100,000 vehicles. Today, over 400,000 vehicles use the same roads each day (World Bank, 2017). The growth in the number of vehicles in cities leads to an increase in the parking demand and thus a need for its efficient management.

A 2008 UN-Habitat Survey estimated that 20,000 minibus taxis and 22,000 private cars operate in the central business district (CBD) area of Kampala city. As a result of increased motorisation in the city, Kampala is predicted to grapple with numerous transportation challenges including public parking which has already impacted the city and its residents. According to Shoup (2011), an average car is parked 23 hours a day and as a consequence, takes up space without being used. The United Nations Sustainable Development Goal (SDG) 11 requires that governments should aim to establish cities and settlements that are sustainable, resilient and safe. Under the same goal, cities are required to adopt strategies that aim to invest in sustainable transport. Shoup (2006) shows that up to 30% of urban traffic results from searching for parking.

Over the last decades, a rising number of initiatives started opposing car-oriented planning, calling for enhanced liveability and a fair allocation of urban space (Bertolini, 2020, Creutzig et al., 2020, Ravazzoli and Torricelli, 2017).Re allocating on street parking has gained attention in public discourse as more citizens have begun to question whether dedicating scarce public space to car parking is in line with social and environmental goals (Kodransky and Hermann, 2011).

Currently Kampala city has 5,082 gazzeted on street public parking spaces under the management of the contracted firm (Multiplex) with 1500 spaces adversely affected by the construction of the Kampala Fly Over, the non motorised transport (NMT) project that was implemented along Luwum Street as well as the many mushrooming Boda Boda stages in the city among others (KCCA , 2022). Insufficient parking spaces frustrate several drivers who end up parking illegally especially on walkways. This in turn inconveniences the travel and movement of city residents and hence the detoriation of the city image and experience. It also cripples various activities which affects the quality of life of the urban residents.

Proper parking management influences the viability and competitiveness of major cities. Since cars are a critical factor in urban mobility, city managers and planners must aim to meet the needs of the motorists including adequate and safe parking. The provision of

parking space should consider the critical importance of its proper management. City managers should position themselves for the changing urban parking requirements and the need for management strategies and systems in the short, medium and long run to be able to serve their increasing urban societies.

Parking management is more than a requirement for larger residential and commercial activities in cities such as Kampala. It is also an aspect of land use that affects travel behaviour. Urban parking management also has a direct link to the condition of the urban environment. In addition, parking management affects the perception of mode choice, economic competitiveness and vitality of cities. Proper parking management ensures equal access to public roads and thus it is a way of meeting the mobility needs of various stakeholders. More efficient management of parking resources can help to solve parking problems and reduce the amount of parking that must be supplied in a particular location (Litman, 2008).

Inefficient public parking management contributes to the rising motorisation in urban areas like Kampala.The absence of a coherent and effective parking policy in Kampala has meant that motorists park in undesignated areas including walkways, and road intersections which has adversely affected traffic flow management. Through partnerships with private companies such as Multiplex, the city authorities have been regulating on -street parking in various parts of Kampala. Generally, however, public parking is still one of the key challenges faced by Kampala city in Uganda.

In many cities, parking management has dedicated departments that are often positioned as a means to improve the parking experience through deliberative practices. One of the most promising strategy for managing public parking challenges in cities is having localized parking policies. While local public parking policies are increasingly common, there is sometimes conflicting relationships between parking revenue raising and economic development and the circumstances in which it may be appropriate to use parking policy as a demand management tool (Rye & Koglin, 2014).

There is no urban mobility strategy that will be successful unless it incorporates a performant parking strategy combined with efficient parking management to include both onstreet and off-street parking facilities (Litman, 2018). Kendell's (1951) Queueing theory and Kefei's (1994) Parking Generation rate modal are now accepted as imperative among theorists and professionals for their effectiveness in achieving a balanced utilization of

parking lots, preventing some from being over used while others remained empty. Existing studies did not focus on public parking characteristics and management practices and as well the user point of view in regard to public parking management in developing cities, with insufficient transport infrastructure and services which was a gap filled by this research.

1.2 Problem Statement

In recent years, car parking problems in Kampala city have become more pronounced and intractable. Statistics show that Uganda's motor vehicle fleet increased by 83% from 739,036 in 2012 to 1,355,090 vehicles in 2018 of which more than 50% are estimated to be in the Greater Kampala (Ministry of Works and Transport, 2021). These figures are set to grow significantly over the years which is likely to have a major implication on the travel behaviour and patterns, as well the city life. Due to the increased motorization levels, car parking has emerged as a key challenge faced in various parts of Kampala. A 2017 study by the World Bank also found that commuters in the Greater Kampala lose 24,000-man hours each day due in part to traffic jam caused by the increased use of private vehicles (Kiggundu et al., 2021).

Motorists often find it difficult to get safe parking spaces especially in the city centre, which is the main vehicle attraction zone. Besides, there is an apparent mismatch between car parking supply and demand management. The city is still looking at parking minimum standards as a tool for controlling and managing parking supply. Minimum parking requirements increase the supply and reduce the price but not the cost of parking (Shoup, 1999). Parking minmums are the strange, out dated and totally unscientific law that is probably languishing in the citys' zoning codes (Barter, 2019). Given the limited-on street parking spaces in the central business district (CBD) and the surrounding business centres, several roads get clogged and incidences of violence over occupancy and illegal parking have become common, especially during the peak hour periods which leads to slow traffic flow. Vehicles in the city are parked wherever they can physically fit, including prohibited zones close to busy junctions and this situation also brings adverse effects on road safety by hampering visibility at junctions.

Newly constructed commercial buildings in the city centre have also remained under utilised because of the failure by the owners to provide adequate parking facilities. In some buildings, car parking facilities already approved by the city authorities have been

converted into shops for profit maximization by the property owners. Many strategies adopted by the city authorities including public private partnership with multiplex to improve the management of on street parking especially in the city centre have not produced the desired results. Multiplex only operates on certain streets in the Central Business Area of Kampala City though there is parking demand across the entire city. User information is not readily available even when there is some techinological improvement through the introduction of the Plex mobile application which is unknown to so many drivers. While, off street parking is completely unregulated by city authorities which could otherwise be part of the overall parking inventory in the city.

The purpose of this study therefore, was to assess the management of public parking in Kampala and suggest new strategies for its improvement based on local conditions as well as the city's future development needs. Existing research on parking management and user perceptions in consideration of both onstreet and off-street parking facilities were not found. The research intergrated Kendall's Queueing theory and Kefei's Parking Generation Model to study the public parking management in terms of parking characteristics and management practices and as well the user perceptions towards public parking management. This was to ascertain wheather the parking challenges exist based on its supply and demand management practices and how this influences the user perception and satisfaction. This is vital in understanding the role of effective public parking management in sustainable city planning and development.

1.3 Objectives of the study

1.3.1 Overall Objective

The overall objective of the study was to assess public parking management in Kampala city in view of the city's recent experience as well as its development needs.

1.3.2 Specific Objectives

Specifically, the study aimed at achieving the following objectives:

a) To investigate the current public parking characteristics and management practices in Kampala Central Business District (KCBD);

b) To assess people's perceptions towards public parking management in Kampala Central Business District;

c) To propose potential strategies that can be introduced to improve public parking management in Kampala city.

1.4 Research Questions

The questions that were answered in guiding this study and investigations are:

i) What are the key characteristics and practices of managing public parking in Kampala city?
ii) What are the people's perceptions towards the management of public parking in Kampala city?
iii) What potential strategies can be introduced to improve public parking management in Kampala city?

1.5 Scope of the Study

1.5.3 Content Scope

The studys' content scope defined the boundaries of the research project. It outlines what the study covered, the specific areas of focus and the parameters within which the study was conducted.

Under this study, the main content that was covered included the public parking characteristics such as Peak times, Parking accumulation, Peak Parking Saturation,

Average parking duration, Average parking ratio, average parking accumulation and parking index and public parking management practices such as parking service suppliers and management, policies and regulations, as well as enforcement and controls. The user perceptions of public parking management in terms of acess, availability, affordability, walking distance after parking, safety and security, sanitation and hygiene, higher user priortization, management behaviour, use of techinology, clear rules and regulations, peak demand management, enforcement and customer response.

Stategies to improve public parking management in Kampala, was focused on city public parking management policy, having parking design standards, proper pricing and financial assessment, parking zoning, transport demand management and stakeholder engagement as provided in Table 1.1 below:

Table 1.1 Content Scope of the Study.

Public Parking characteristics	**Public Parking Management practices**	**User perceptions towards public parking management**	**Strategies to improve public management**
a. **Peak Time** b. **Parking Accumulation** c. **Peak Parking Saturation** d. **Average Parking Ratio** e. **Average Parking Accumulation** f. **Average Parking Duration** g. **Parking Index**	a. Suppliers and Management b. Policies and Regulations c. Enforcement and Controls	a. Accessibility b. Availability c. Affordability d. Walking distance after parking e. Safety and Security f. Sanitation and Hygiene g. Higher User Prioritization h. Management Behavior i. Use of Informatio	a. City public parking management policy b. Having public parking infrastructure design standards c. Proper pricing and Financial Assessment d. Parking Zoning e. Effective enforcement standards and controls f. Transport demand Management g. Stakeholder Engagement

		n Technology (IT) j. Clear rules and Regulations k. Peak Demand Management l. Enforcement m. Customer Response n. User Information

1.5.4 Time frame

The field work study was carried out between the months of January and May 2024. While, information regarding paid for- on-street car parking in Kampala since its introduction in 1997 under Green Boat Entertainment to the time of Multiplex contract was equally considered. This was intended to evaluate the activities of the contracted frims to manage street parking.

1.6 Significance of the Study

This research contributed to the existing literature on public parking management in the context of a developing country city. It provides information on the demand characteristics and management practices of both on-street and off-street public parking in Kampala city. Understanding the parking characteristics and management practices forms the basis for formulation of efficient and effective parking policies for urban areas including major cities like Kampala.

Secondly, the research highlighted areas for consideration if the city authorities are to provide a great parking experience to the parking facility users based on local conditions. Scholars like March (2007); Guo & Ren (2013); Hensher & King (2001); Shoup (2004) and Troung et al., (2016) suggest critical solutions to parking problems in cities with uniform infrastructures, public transport systems and technology. Therefore, this research identified and discussed the public parking demand characteristics, public parking

management practices, user perceptions towards public parking facilities in Kampala and potential measures to improve management of public parking in the city.

Findings of this study are expected to form a basis for reviewing of existing Kampala public parking guidelines as well as the formulation of a coherent public parking policy for the city. Lessons will be drawn from the Kampala's public parking experience for the newly established cities in Uganda such as Jinja, Gulu, Mbarara, Arua and others, whose motorisation levels have in the recent years increased. The study also provides for a future research direction and practice.

1.7 Justification of the Study

Knowledge in the understanding of public parking characteristics, management practices and user perceptions were established. While public parking management has been studied in the developed world (March, 2017; Liu, 2015; Litman, 2006; Joshi et al, 2009), there is lack of a user point of view of the parking management in cities. The research enriched the ability of public parking suppliers to provide services that meet the needs and preferences of the users.

Research that focused on onstreet, off-street public parking, user perceptions and satisfaction levels from both a supply and a demand perspective were not found in the context of Kampala. This is a gap filled by this research which examined the parking characteristic management practices, user perceptions and the interventions for improving public parking management. The research contributed to knowledge by presenting aspects that should be considered and prioritized in order to efficiently and effectively manage public parking.

The research also contributed to practice by presenting potential strategies the city authorities can employ to mitigate public parking management challenges based on the current situation and international experience from Sub Saharan African Cities (SSA) and role modal cities elsewhere.

1.8 Conceptual Framework

This study is under pinned by the Queueing Theory by Kendell and the parking generation rate modal by Kefei. The Queueing theory analyses the relationship between arrival

interval, service intensity, queueing time, queue lenghth and other paramenters under specific service regulations which is parking in this case. While the parking generation rate models are applied to study parking demand in a certain area.

Parking problems experienced in urban areas and cities differ according to land uses, population and the parking management of both its supply and demand (Litman, 2006). Parking management embraces a variety of strategies that seek to either reduce parking spaces needed or to use parking spaces more efficiently. Litman (2006), considers 'optimal parking supply' to be ,the amount that motorists would purchase if they paid all costs directly and had good parking and transport options. The management of parking demand and supply is paramount if cities are to be sustainable. The fact that there are various competing demands on car parking spaces in urban areas, be it from commuters, residents or shoppers, proper management becomes critical. Many cities across the globe have been able to solve their parking problems. Hong Kong and Singapore for example, have sufficient public transit systems that enabled these cities to reduce private car ownership and thus the low demand for parking which consequently reduces the parking management requirements.

Besides, there is adequate enforcement of parking rules that allows the realisation of their parking strategies. On street parking is normally considered on local distributors and roads lower in hierarchy. On such roads, on street parking spaces are provided where off street facilities are inadequate to meet demand and where provision would not adversely affect the flow of traffic. On street parking spaces mainly cater for short term parking needs and parking meters are installed to encourage turnover of vehicles parked there. The cost and availability of a parking space are important factors in determining whether an individual makes the decision to drive to a particular location, chooses an alternative mode of travel, or decides whether to own a car in the first place (Ison ,2014).

Parking policies should aim at shifting private car users to more sustainable options especially public and non- motorised transport. The existing parking minimum standards do not usually base on a behavioural reasoning and thus do not answer what supply is required that does not weaken the city centre or what asupply encourages the use of public transport.

Car parking characteristics form the foundation for efficient and effective urban parking policies. These include parking accumulation, peak time, average parking duration, peak parking saturation and the parking index. Parking characteristics and problems may vary between developing and the developed world. Aside from the disparity between the number of vehicles and number of parking slots available in most developing countries ,there are also the issues of parking designs, informal parking, inefficient policies causing altercations and accidents related to parking (Vasallo, 2015).

The user perception towards public parking management could be viewed through various vital areas such as accessibility, affordability, safety and security, user information and Aesthetics. Individuals' beliefs of public parking are important in determining the kind of issues people deem as important in regards to public parking management. This could be through the identification of negative aspects that might need priority for improvement. Identification of those factors or aspects that the user of public parking deems more important and evaluating their performance is of the great importance since vehicles or cars a critical element in urban transportation. Central to the implementation of an acceptable and long-lasting parking management strategy is the support of motorists which requires the use of clear and effctive communication of any parking changes and their relative benefis (Ison, 2014).For as long as travel by private car remains for many individuals as their preferred transport mode, associated demand for parking will persist, and parking management strategies will remain at the forefront of controlling this important yet limited resource (Ison ,2014).

This study was concerned about the public parking management practices in Kampala and the users' perception towards the management of public parking in the city.

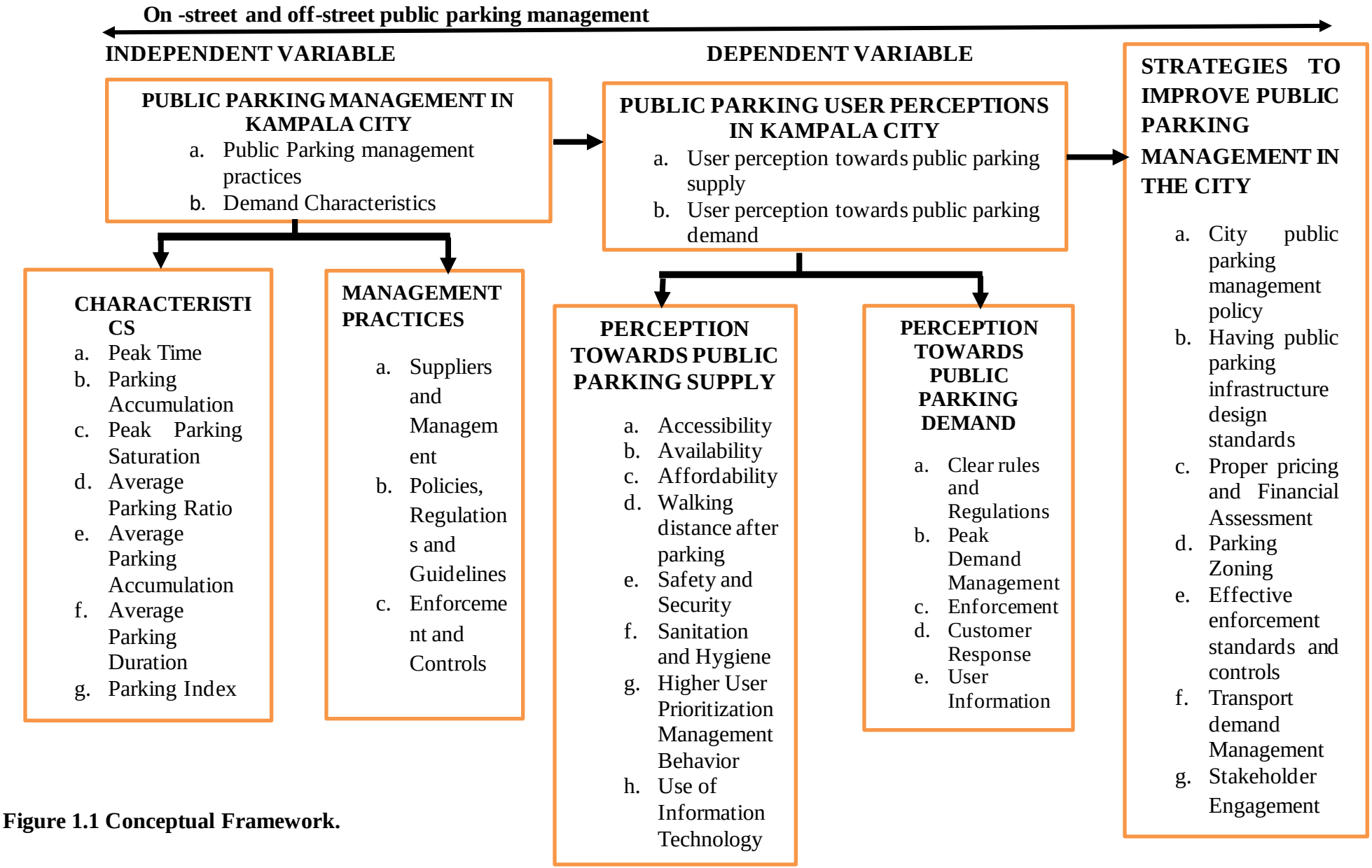

Figure 1.1 Conceptual Framework.

1.9 Critical Concepts used in this study as eraborated in Figure 1.1

1. **Parking Facility**: Means a structure or an area providing for the parking of motor vehicles. It's any lot, garage, building or structure or a combination or a portion thereof, on or in which motor vehicles are parked (Author ,2024)
2. **On street Parking:** On street parking refers to available parking spaces for vehicles on a designated area along streets. On street parking is usually managed and controlled using a combination of parking meters, parking enforcement services and parking signage that outlines the regulation and instructions for the paid-on street parking area (Bray, 2020).
3. **Off street Parking:** Off street parking refers to available parking spaces for vehicles within an enclosed parking lot or garage. Parking lots could be owned privately or by the government. Therefore, on street parking for vehicles are on the side of a road while off street parking is provided within a parking lot (Bray, 2020).
4. **Public on street parking**: Designated parking lanes for the general public besides streets (Author, 2024)
5. **Public off street Parking**: Privately owned Parking lots that could be used by any one at a fee (Author,2014)
6. **Parking accumulation:** This is the number of vehicles parked at a given instant of time (Mathew, 2009).
7. **Average Parking Duration:** It is the ratio of total vehicle hours to the number of vehicles parked (Mathew, 2009)
8. **Parking Index:** Parking index is also called occupancy or efficiency. It is defined as the ratio of number of bays occupied in a time duration to the total space available. It gives an aggregate measure of how effectively the parking space is utilized (Mathew, 2009).
9. **Parking turnover:** This is the average number of parked vehicles in each parking space within the surveyed time period (QunChen et al., 2015).
10. **Parking Demand:** Refers to the amount of parking that would be used at a particular time, place and price.
11. **Central Business District (CBD):** Is that part of the city which contains the principal commercial streets and main public buildings (Rice, 2009).
12. **Parking management**: This refers to various policies and programmes that result in more efficient use of parking resources (Barter, 2016).

1.10 Research Structure.

The rest of this research dissertation is structured as follows:

Chapter Two reviews the literature relevant to the research topic. Starting with the theoretical review where it discusses the theory and models which guided this research .It looks at public parking magement and its under lying arguments as an important aspect in urban sustainable transport planning.It also looks at the debates on the nexus between parking planning and land use ,parking characteristics and parking perceptions .It also looks at how public parking is managed in sub Saharan Africa and Asian cities for best tranferable practices that could fit within the Kampala situation The chapter concludes with a literature synthesis which interpretes and concludes the literature that was reviewed for this research purpose.

Chapter Three introduces the case area, Kampala Central Business District and the specific onstreet and off street parking facilities which were considered in this study, and justifies their selection. It gives a description of the selected parking facilities in terms the number of lots,ownership and use.This chapter also describes the methodology and data used in this thesis. It offers a rationale for the use of a mixed methods approach and the way to interpret the findings obtained from a series of analyses. The analytical tools used for analysis are also introduced, together with the specific techniques employed in the analysis chapters.

Chapter Four presents the analysis and interpretation of data in relation to the three study objectives.Data on public parking characteristics and management practices,user perceptions of the public parking management and strategies to improve public parking management in Kampala city was presented and interpreted.

Chapter Five discusses results presented in Chapter 4 on the public parking management in Kampala city in terms of the current parking characteristics and management practices, the user perceptions of public parking management in the city and strategies to improve public parking management in Kampala.

Finally, **Chapter Six** concludes this research report by giving the studyoverview,summarizes its key findings and addressing several implications for transport and planning policies. It also identified the research contribution to theory, methodology and practice, study limitations as well as key areas for further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the review of parking models, theories as well as the related literature on urban public parking management and the public perceptions on public parking. Previous studies on the issues that are being investigated were also examined and analyzed. Summary of reviewed existing literature is provided under this chapter.

2.2 Theoretical Review

This research was guided by the following parking theory and models:

2.2.1 Queueing Theory

The queueing theory was developed by Kendall (1951) as a mathematical study of queues to analyse the relationship between arrival interval, service intensity, queueing time, queue lenghth and other paramenters under specific service regulations. Queueing theory is one of the oldest and most commonly used quantitative analysis techniques (Chowdhury, 2013) and an important study in modern society (Aronu et al., 2021). It has been applied in various fields including health care, finance, retail businesses and transportation.

The basic queing modal includes three main components (Bhat, 2015). These include:

i. The input process also known as the arrival process which describes the objects that go into the system that satisfy a certain requirement.
ii. The service mechanism: Which determines the service rules
iii. The queue discipline: which describes the behaviour of customers.

The application of the queueing theory in parking management focuses to reduce construction costs, improve parking lot performance, optimize the use of parking spaces, estimate the appropriate parking price, estimate the availability of parking and the parking demand (Thi & Mahn, 2021). Queueing models are used to gain information about

activities within a parking system ((Thi & Mahn, 2021). Abdeen et al. (2021) used a queueing model to estimate the availability of the parking spots in the parking lot.The proposed algorithm demonstrated effectiveness in achieving a balanced utilization of

parking lots. This means that parking spaces were distributed efficiently across different lots, preventing some from being over used while others remained empty. Keren & Hadad (2021) also used a queueing model to estimate the appropriate parking price. The models explored the payment per hour and the entrance fee models, with one or several customer types, and where each customer type faces different prices (price discrimination). The models are also applicable for cases where the objective function is to set the park occupancy rate at a desired level .However, this model does not provide for user perceptions and the parking demand characteristics.

2.2.2 Parking Generation Models

a) Parking Generation Rates are parking demand quantities generated from land use in per unit area, on the basis of land use types, which are applied to study parking demand in the certain area. The parking demand in certain Central Business District is equal to the total parking quantities generated by these individual areas. The method of parking demand forecast, Professor Yan Kefei (1994) established Static Parking Generation Rate Model based on land use and Linear Correlation Model based on vehicle travel; Professor Chen Jun (1999) established Static Parking Generation Rate Model and gave searching algorithm from analysis on the factors of urban parking lot demand while Guan Hongzhi (2006) established Parking Supply-Demand Forecast Model.

b) Thompson (1998), described a model of parking search behaviour. Relationships for estimating the utility of a car park including access,and cost components were developed. A function was then proposed to estimate the perception/utility of the attributes of parking. A stopping rule formulation and direction of search were provided. However, how the parking demand was assigned onto the network; and how real time information about parking and searching vehicles embedded into travellers's decision were not clarified.

2.3 Parking Management

Parking management refers to various policies and programmes that result in more efficient use of parking resources (Barter, 2016) . It arose out of a concern that parking lots and off-street parking cover a significant proportion of urban areas, particularly high-demand regions such as central business districts (Barter, 2016). Parking policies such as high car parking charges are considered as an effective strategy to restrain the car ownership and use (Rye et al, 2023). In Hong Kong for example, apart from the difficulty of finding

parking spaces, parking is also expensive for many central locations at about HKD 30 - HKD 100 per hour (Cullinane, 2003). This makes private car ownership expensive and thus the increased use of other mobility options. However, acute shortage of parking might drive away commercial and other activities from a city as well.

Proper parking management can significantly reduce the number of parking spaces required in a particular situation, providing a variety of economic, social and environmental benefits (Litman, 2021). The importance of parking policy grows and will continue to grow over the coming decades as car ownership continues to rise. It is therefore important that ffective parking policies are formulated by the government and city authorities. An effective parking policy seeks to address the City's existing with future growth and transport challenges as well provide fairer and more reliable access to parking in all locations and at all times. Control and management of parking space means managing the demand for car use and congestion. This is because every car trip ends in a parking space. Where to park, who may park, for how long and at how much are key issues to be clearly addressed in parking control and management. An effective parking policy has the potential to improve traffic flows in urban centres.

Parking management holistically and strategically starts with an overall vision strategy and goals and translates these subsequently into operational action plans using a mix of measures (Auwerx et al., 2019). Auwerx et al. (2019) further explain that although parking seems most logically directed to car-policy or mode, smart Parking Management is an important leverage factor to a more and integrated development of all modes, while especiallye ncouraging a shift to sustainable modes. Some people for example may want to cycle to cities and thus a clear need to keep their bikes in good conditions with assured safety and security. Poorly regulated parking makes government and road users pay a high cost in terms of travel time and efficiency, and cities in the country face challenge in managing parking within their CBDs and residential areas (Yue , 2004).

Singh et al. (2009), explain that before parking is provided, there should be an analysis of particular areas parking needs. These authors studied traditional methods of parking in comparison to innovative parking management approaches. In their work, they explained that traditional parking methods solved parking issues only by looking at parking supply, but this seemed unsustainable. They looked at various innovative approaches to parking in various cities which included; Policy based Solutions where parking is managed by

institution-based policies and Technology driven solutions, where parking management issues could be solved by using technology such as parking applications.

However, the application of technology can be more useful and effective in countries with minimal illiteracy levels. Such technologies have been applied in countries like Australia and the results have been interesting because of their uniform highway infrastructures and high literacy levels. Other approaches included Economic based solutions which are motivated by the parking needs and other external economic and environmental factors such as laws limiting areas used by parking spaces. The innovative parking solutions approach has a wide range of applications. This approach may be applied in many types of scenarios such as university parking lots, street parking, airport parking, commercial car parks, etc. Of course, minor alterations to the required hardware are needed but the core functionality remains the same. Many would benefit from the use of this approach, local governments, universities, medical Institutions and finally the public. No matter how many parking infrastructures and policies are created, the city government must have the political will to follow through and implement legislation. If not, the issue of parking will have a domino effect, affecting mobility, economy, environment, and the general well-being of the city's people (Vassallo, 2015). Therefore, there are no single parking policy that will be compatible to all regions.

According to Litman (2006), the following principles should be put into consideration by city planners in order to have effective parking policies in cities:

a) **Consumer Choice**. People should have viable parking and travel options.
b) **User information**. Motorists should have information on their parking and travel options
c) **Sharing**. Parking facilities should serve multiple users and destinations.

Shared parking can take various forms according to Litman (2023) as:

i. ***Shared Rather Than Reserved Spaces*.** Motorists share parking rather than being assigned reserved spaces. For example, 100 employees can usually share 60-80 spaces, since at any time some are on leave, in the field, commuting by alternative modes or working another shift. Hotels, apartments, and dormitories can share parking spaces among several units, since the number of vehicles per unit varies over time. Sharing can be optional, so for example, motorists could choose between $60 per month for a shared space or $100 for a reserved space.

ii. ***Share Parking Among Destinations.*** Parking can be shared among multiple destinations. For example, an office building can share parking with a restaurant or theater, since peak demand for offices occurs during weekdays, and on weekend evenings for restaurants and theaters. Sharing can involve mixing land uses on single site, such as a mall or campus, or by creating a sharing arrangement between sites located suitably close together.

iii. ***Public Parking Facilities***. Public parking, including on-street, municipal off-street, and commercial (for profit) facilities generally serve multiple destinations. Converting from free, single-use to paid, public parking allows more efficient, shared use.

iv. ***In Lieu Fees.*** "In lieu fees" mean that developers help fund public parking facilities instead of providing private facilities serving a single destination. This tends to be more cost effective and efficient. It can be mandated or optional.

v. ***Special Parking Assessment***. Businesses in an area can be assessed a special assessment or tax to fund parking facilities in their area, as an alternative to each business supplying its own facilities.This is often implemented through a downtown business improvement district.

d) **Efficient utilization**. Parking facilities should be sized and managed so spaces are frequentlyoccupied.

e) **Flexibility**. Parking plans should accommodate uncertainty and change.

f) **Prioritization**. The most desirable spaces should be managed to favor higher-priority uses.

g) **Pricing**. As much as possible, users should pay directly for the parking facilities they use.

h) **Peak management**. Special efforts should be made to deal with peak-demand

i) **Quality vs. quantity**. Parking facility quality should be considered as important as quantity,including aesthetics, security, accessibility and user information.

j) **Comprehensive analysis**. All significant costs and benefits should be considered in parking planning.

2.4 Urban Public Parking Supply and Demand

Under normal conditions, the ratio of urban parking spaces to the total amount of cars should be 3:1 to meet the needs of parking, with the number of parking spaces and cars in government departments and communities should be 1:1, and the parking spaces for

commercial parking must reach a third of the number of cars (Yang et al 2017). According to Kiggundu & Mukiibi (2012), inadequate parking spaces and insufficient public transport are a major cause of traffic jam in Kampala. Kiggundu and Mukiibi further note that to reduce traffic jam in Kampala , it is critical to invest in new car parking facilities and modern bus terminals.

Minimum parking standards are the key tool to ensure that the parking supply meets demand. With such requirements, spill over of parking would be eliminated (Geok & Kuah, 2011). Traditionally, a development's parking demand is calculated based on parking code requirements as stipulated in city or county parking ordinances (Geok &Kuah, 2011). The procedure for estimating parking demand is complex. It involves many factors, including project size,type of zoning, type and number of persons expected to visit the site, availability of alternative transportation modes, and the time frame of the analysis. Generous parking requirements for new buildings and a focus on providing "enough" on-street parking make the city friendly to cars but not to people,drivable but not walkable (Pressl and Rye, 2020).

As cities adopt new strategies to reduce automobile use and dependence, minimum parking requirements (MPRs) are increasingly debated (McAslan & Sprei, 2023). Many municipalities are taking steps to reduce or eliminate parking minimums in part or all of the city, introduce maximum parking requirements, and allow for flxible parking arrangements that better allow new development to meet context specific characteristics that influence travel behaviors (Mingardo et al., 2015; Rosenblum et al., 2020; Weinberger, 2014). Litman (2006) considers optimal parking supply to be the amount that motorists would purchase if they paid all costs directly and had good parking with transport options.

Truong et al. (2016) proposes a concept of legalising Para-parking to solve the problem of parking scarcity in developing cities. He observes that legalising illegal parking through transition process that better understands the interrelations between parking stakeholders in urban areas could allow for more parking supply while establishing reasonable pricing schemes and effective regulations. However, in his work, land use relationships in specified illegal parking areas were not considered and therefore incompatible land use aspects could eventually breed out.

Cheng et al. (2012) argue that parking demand forecast is the key to public parking planning and provision because it provides the basic data for the size of the parking lot. He developed an improved model on the basis of the Parking Generation Rate Model by Yan (1994) based on land use and Linear Correlation Model based on vehicle travel and Chen (1999) established Static Parking Generation Rate Model and gave searching algorithm from analysis on the factors of urban parking lot demand. This modal however requires large data like origin destination.

The demand for car parking is difficult to predict as it is influenced by many factors. A primary predictor for parking demand is travel mode choice; if a person chooses to drive, they will need a place to park at the end of their trip. Household income and trip purpose are the two most significant predictors of whether one will choose to drive (Hasset et al, 2023). The availability of parking at a destination also has a significant impact on a person's choice to drive or pursue alternative modes of transportation. The way a municipality manages its parking can strongly influence travel behaviour and assist in achieving (or not achieving) its planning goals.

2.5 Nexus between Parking and Land Use

Parking, land use and transportation planning decisions are intertwined. The different land use surrounding parking facility can produce different parking demand, and it also can make the parking behavior significantly different (Yin et al , 2016). Parking becomes a necessity when one recognizes the fact that urban centres are characterized by interrelated complex land use activities which requires well planned and efficient performance of the transportation system (Asiyanbola & Akinpelu, 2012). Overlooking parking is also overlooking the expanses of artificial surfaces that expand urban sprawl and contribute towards the urban heat island effect yet urban mobility research to date has sought to primarily focus on the brief daily peaks when cars are in motion or at least locked within traffic congestion (Kimpton et al., 2021).

The parking requirements depend on the type of building and land use. Only a common parking place is required for residential plots of less than 300 sq. m. A minimum of one fourth of the open land on a residential plot of 500–1000 sq. m should be set aside for parking. At least one parking place may be required for every 70 sq. m of office space. In

a restaurant, one parking place is sufficient for ten seats, whereas theaters and cinema halls require only one parking space for 20 seats.

The Ugandan National Physical Planning Standards and Guidelines 2011 recommend the following parking requirements in Table 2.1 for specified developments:

Table 2.1 Parking Standards for Specified Developments in Uganda extracted from the National Physical Planning Standarsd and Guidelines 2011.

No.	Type of Development	Parking Requirements
a)	**Residential**	A minimum of two parking spaces on a low density plot and one space on a medium density plot.
b)		**Housing Estates**
	Dwellings with 5+ bedrooms	3 per unit
	Dwellings with up to 4 bedrooms	2 per unit
	Flats with 2+ bedrooms	2 per unit
	Flats with 1 bedroom only	2 per unit
	Visitor parking provision	Visitor parking provision
	Medium Density Residential flat building	1 space for each unit plus 1 for each 5 x 2 bedroom unit plus 1 for each 2 x 3 bedroom units
c)		**Shops, Supermarkets, Wholesale Shops, Offices and Banks**
	Banks	1 space per 25sq.m of gross floor area plus 5 stacking spaces per drive-up window
	Commercial Premises	1 space per 40 square metres gross floor area
	Shopping centre	4.4 spaces per 100 square metres of gross leasable floor area (i.e. 1 space per 23 square metres)

Motor showroom	0.75 spaces per 100sq. m site area plus 6 spaces per service bay
Car tyre retail outlet	3 spaces per 100 sq. m Gross Floor Area (GFA)
Roadside stall	4 spaces minimum
Drive in liquor store	Sufficient to avoid queuing onto public road
Drive in take-away	12 spaces per 100sq. m GFA plus 1 pace per 5 seats
Markets	2.5 spaces per stall (customers only)
Bulky goods retail	stores 1 space per 40sq.m of GFA and/or comparisons should be drawn with similar developments
Video Stores	6.1 spaces per 100sq.m GFA
Industrial areas	For every 100 sq.m of gross floor space, provide two parking spaces plus 1 parking space for every 2 employees of the largest work shift.
Warehouses	One parking space per 30sq.m of gross floor space plus 1 space for every 2 employees on the largest work shift
Hotels and Motels	One parking space for every two bedrooms and one parking space for every three managerial staff are adequate.
Bars	One parking space per 15sq.m of gross public floor space is required
Licensed Clubs, Dance Halls and Discotheques	One parking space per 20sq.m of gross public floor space
Doctors Surgeries, Clinics and Health Centres	Two parking spaces per consulting room plus one parking space for every 4 staff members and 3 additional parking spaces (9m x 3m) for ambulances for polyclinics will be sufficient.
Recreation and Tourist Facilities	Sports and playing fields facilities require one parking space for every four players and one parking space for every thirty spectators will suffice

Source: (Ministry of Landa Housing and Urban Development, 2011)

Abundant parking requirements create more dispersed, automobile-oriented land use development patterns that encourage increased automobile ownership and use (McCahill et al.2016). Parking management must therefore be implemented as part of an integrated effort to reduce parking costs, encourage more compact development, encourage use of resource-efficient transport options to reduce congestion, accidents and pollution emissions. These require coordinated parking, landuse and transport policy reforms, which lead to changes in physical design and operations, therefore changes in travel behaviour. In most cases, some planners propose a zoning regulation to force the parking supply to be above the amount that would be provided by the private market, while others recommend an upper limit on the quantity of parking spaces to decrease the amount under which supply would be provided by the private market. Cities with high-density development need less parking because some trips can be made by walking , therefore, are much more enjoyable places to work, shop, and visit .

Bendor et al (2012) suggested that developing municipalities should act steadfast in planning for their parking as part of their critical service requirements in their development scenarios. Their research deployed systems dynamics models described by a set of non-linear equations defining the accumulated state of the system. The main variable that was considered was the total amount of open space in an area of jurisdiction and its increase with time through an open space generation rate. It is assumed that the population is constant and issues such as parking prices and cruising time were left out. Parmar et al. (2020) argues that the behaviour of inhabitants to park as near as possible to their destination tends to increase the cruising for parking, consequently encouraging them to use curb side parking. Parking demand in developing countries is dependent on location, as highly commercialized areas need more parking slots compared to less urbanized zones Vasallo (2015).

2.5.1 Parking Location and Distribution

Distribution and nature of parking play an important role in the city form (March, 2007). The type and location of parking has an impact on car ownership and travel patterns (Mc Aslan & Sprei, 2023). Models for the location of parking facilities have been proposed based on various elements. A location model of the minimum walking distance to parking facilities was proposed in Japan for example, under the circumstances that the demand and the supply of parking facilities were constant. Related studies were done in China which

focused on parking facilities survey and parking location. The acceptable maximum walking distance after parking is equal to 350m (Zhang et al. 2020). A survey was carried out in Le Song CBD in China to ascertain the acceptable walking distance after drivers parked. Results show that 95% of the participants were unwilling to walk more than 350m from where they parked their vehicles to their final destination (Zhang et al. 2020). Parking designers usually call for maximum walking distance between 91.44 meters and 182.88 meters for retail customers but between 91.44 meters and 457.2 meters for employee parking. That also, distances increase even more when you look at special event standards: maximum walking distances accepted for theme parks, stadiums and arenas reach as high as 2,000 feet (Zhang et al. 2020).

Generally, it is assumed that short stay parking facilities (for shopping, medical visits and drop offs) have to be located close to the final destination and that long stay parking facilities (for work, recreation and travel) can be located at some distance (Waerden & Timmermans,2017). Most studies regarding maximum walking distances come up with fndings in a specifc travel context. In many cases, this context is defned in general terms of trip purpose (shopping, commuting or recreational). Marsden (2006) gives an overview of parking studies in the context of different trip purposes (commuting, commercial and leisure uses, and residential parking). Other trip related variables such as length of stay at the destination and trip frequency are mostly neglected. The same holds true for the influence of personal characteristics of the car driver.

Imposing minimum parking requirements may act as a limit upon higher density development, while encouraging sprawl (March, 2007). Further, distribution and nature of parking play an important role in the city form. In Los Angeles a minimum parking required strategy is used, and the result was that the suburban areas are 74% as dense as the CBD, but in New York City with a maximum parking strategy (establishing a maximum parking area), it is 12% as dense as the CBD (March, 2007).

2.6 Parking Characteristics

In order to make a firm parking policy, it is desirable to study the parking characteristics properly (Parmar et al., 2018). These different parking characteristics are used to assess an existing configuration of parking areas or spaces to determine their adequacy and efficiency (Parmar et al., 2020). As suggested by Gray et al (2008) and Tong et al., (2004),

an urban car parking policy should aim to address the following parking characteristics: parking volume, parking accumulation, parking capacity, parking load, average parking duration, parking turnover rate and peak parking saturation. Parking characteristics are also important in determining the efficiency of parking facilities. Chen et al. (2015) studied the characteristics of parking in Central Shanghai of Shanghai city in China. The authors classified the whole survey area based on the land use and analysed parking facilities for the same. They suggested the parking policy for different areas and modern techniques in parking to balance the parking facilities types and to provide choice to parking users. Parking characteristics and problems may vary between developing and the developed world. Aside from the disparity between the number of vehicles and number of parking slots available in most developing counties , there are also the issues of parking locations, lack of parking signage, informal parking, and inefficient policies causing altercations and accidents related to parking (Vasallo, 2015).

2.7 User Perceptions towards public parking management

Perception is psychological processes through the experience gained by the five senses, individuals can process responses into positive or negative perceptions. Obtaining responses is normally through the stages of selection, interpretation, and reaction (Erin, & Maharani, 2018). The views of the parking users would help to expose the conditions and status of these facilities .Individuals' beliefs of public parking are also important in determining what kind of issues people deem as important in regards to public parking. This could be through the identification of negative aspects that might need priority for improvement. Public perception of the parking problem is also fundamental in informing parking planning and management. However, it should be noted that perception is personal and more subjective and thus may differ from varying individuals or users.

Shaffer and Anderson (1985) explored the public perceptions of security and attractiveness of urban parking lots. In this study, participants viewed different scenes of various parking facilities and were asked to rate the slides for attractiveness,security, or prominence of various variables in the scenes. Findings revealed that maintenance with design of parking facilities was critical for users and the general public.

Mendat and Wogalter (2003) assessed perceived problems of parking facilities by conducting two studies. In their first study, 319 participants were asked to generate a set

of parking facility-related problems from their life experience. These were categorized into different problem types. The second had participants rate the 30 problem categories. Five main factors were identified (a) Compliance and Visibility, (b) Layout and Design, (c) Safety and Crowding, (d) Difficulties at Access Points and Environment, and (e) Aesthetics. It was concluded that aspects of each of these factors have implications for improving parking facilities.

Mohamad and Shahdin (2003), assessed the perception of service characteristics amongst parking facility users, specifically the parking payment systems and enforcement in Petaling Jaya and Subang Jaya Municipal councils in Kalang Valley region, Malaysia. Parking service is beyond payment systems and enforcement. Various aspects from the demand and supply angle should be given the desired attention if drivers are having a good parking experience. Hamas et al. (2021), investigated the user perceptions of park and ride facility at Gombak LRT terminal station in Malaysia.

Considered under the study were also ten (10) variables which included: travel distance after parking, safety, reasonable charges, outside parking due to excessive demand, illegal parking due to excessive demand, easy circulation, congestion, accessibility and early arrival to get a space. Findings revealed that poorly maintained automated system for entry, narrow accessways to the entrance to the parking facility, poor lighting system are some of the issues that are required to be addressed.

2. 8 Public parking Management in Sub-Saharan Africa (SSA) cities

2.8.1 Dar el Salaam (Tanzania)

Tanzania Rural and Urban Roads Agency has implemented a smart parking system which allows for effective and quick information transmission on the vehicles that are parked for easy control. The motorists pay through a government payment gateway using mobile phones and this makes their on- street parking under control. The Construction of the Dar el Salaam Bus Rapid Transit (BRT) has also shifted some private car owners to public transit which ultimately reduces the levels of parking demand. It is also a requirement for each building in the city centre to at least provide one floor for parking in busy areas for example in Kariakoo, which is a hub to other regions in supplying goods and services. Buildings within the city centre are required to provide for basement parking which is a condition for acquiring building permits.

Other plans and efforts to overcome the challenges of public parking has been the establishment of public private partnerhips (PPPs) where private companies have been let to build ten (10) floors of office space within the city in return for creating five (5) stories of public parking. Also, there has been establishment of park and ride facilities especially along the Bus Rapid Transit (BRT) phase 1 corridor. The policy of park and ride facilities aims to discourage motorists from driving into the city centre. Besides, parking spaces are provided at each BRT station to enable car owners to use BRT services for their journeys to the city centre.

2.8.2 Kigali (Rwanda)

Rwanda has established a decongestion plan through enforcement of regulatory initiatives such as the public transport policy which are premised to managing traffic. The authorities have improved and facilitated walkability to decongest the city. They have created a car free zone in CBD of Kigali to ease access with limited parking spaces.

Kigali also has parking zones where street parking is divided into different parking zones, each with its pricing structure and time limits. Rates vary depending on the zones proximity to popular areas and demand. There are also strict traffic rules and illegal parking results into huge fines forexample if a driver parks on a walkway, they will be obliged to pay a fine of USD. 130.Some areas within the city have specific regulations during certain hours of the day. The parking fares are dependendant on the type of the vehicle. Forexample, motorcycles pay 100 RWF (USD.0.069)/hour, 500 RWF (USD.0.35)/day and 10,000 RWF (USD.6.92)/Month. Small lorries and mini buses are charged 200 RWF (USD.0.14)/hour, 1000RWF (USD.0.69)/day and 12,000 RWF (USD.8.310)/month and heavy trucks with trailers and buses are charged 400 RWF (USD. 0.28) /hour, 2000 RWF (USD.1.38)/day and 15,000 RWF (USD.10.38)/month.

Various parking techinologies have been adopted to revolutionalize the landscape of urban mobility and security in the city. Such parking management systems intergrate advanced techinology with meticulous planning to optimize parking spaces, enhance security and streamline the parking experiences for both motorists and parking managers a elaborated in Table 2.2.

Table 2.2 Summary of key mobility and parking management practices in Sub Saharan Africa (SSA) cities.

City Name	Country	Area coverage (sq.km)	Population size	Population density (Persons/ sq.km)	Modal Split (%)	Parking management practices
Kampala	Uganda	194.3	1,875,834	7,650.2	a. Walking:50 b. Cycling:3 c. Motor Cycle: 10 d. Private Car: 4 e. Taxi:1 f. Large Bus:1 g. Mini-Bus:30 h. Others:1	i. Public Private Partnerships
Dar-el Salaam	Tanzania	1,393	6,368,000	5,000	a. Walking: 25 b. Cycling:1 c. Motor Cycle:1 d. Private Car:10 e. Taxi:1 f. Large Bus:10 g. Mini Bus:51 h. Others:1	i. Improved public transport ii. Use of Techinology iii. Public Private Partnership
Kigali	Rwanda	730	1,095,000	2,400	a. Walking: 40 b. Cycling:12 c. Motor Cycle:2.15 d. Private Car:15.68 e. Taxi:1 f. Large Bus:18.17 g. Mini Bus:10 h. Others:1	i. Improved Public transport and NMT ii. Use of techinology iii. Parking zoning iv. Effective enforcement (heavy fines) v. Time limits and time regulations

Sources: (KCCA,2019;UBOS,2025;Mkalawa & Pan,2014;National Institute of Statistics of Rwanda)

2.9 Car parking experience from Asian cities

2.9.1 Singapore's Experience

Management and control of parking facilities have been an important element of Singapore's transportation policy. Both the private and public sector are active in parking provision. Very high standards of parking provision are imposed on developers and building owners and this makes the city to have ample parking capacity. Singapore also has a policy of providing ample off-street parking capacity which contributes to the flow of traffic in the cities central areas. Singapore has used land-use planning as an explicit solution to parking problems. For decades, land-uses associated with nuisance from parking, such as warehouses and markets, have been systematically relocated and rebuilt with modern parking and with loading and unloading areas. Since 2002, the Urban Redevelopment Authority and the Land Transport Authority have sought to ease parking problems in 18 areas with many restaurants but with limited parking by capping the number of restaurants in each area (Urban Redevelopment Authority, 2016). Standards for the provision of parking accommodation in Singapore are based on the principle that all buildings including residential buildings are required to have sufficient parking to accommodate all residents and visitors' cars regardless of the size of the building, the level of parking provision is subject to periodic review and amendment as is the supply and demand for parking changes. The parking standards do not apply uniformity to the entire urban area with different levels applied to different zones depending on district land use and traffic condition. There is also an upper limit of parking fees imposed on privately operated car parks to restrict excessive profits and a lower limit was set to maintain a restraining effect of car use.

Besides, a government surcharge was added to parking fees in the CBD to restrain the number of vehicles entering the CBD and also acted as a restrain on car use. There is no freedom to own cars in Singapore. Each year, cars are bought through a 'bidding system'. The highest bidder takes the car. The idea is to discourage car use and promote public transit. This also reduces the demand for parking in Singapore city.

Singapore introduced congestion charges in 1975 to discourage the use of private cars. It is one of the first cities to introduce this policy as well.

2.9.2 Hong Kong's Experience

Hong Kong has one of the best public transport systems in the world and this has enabled it to partly solve its parking problems. Private car ownership in Hong Kong is very low at only 48 cars/1000 (Hong Kong Transport Bureau, 2001). The Hong Kong government has taken an active role in producing policies to discourage car ownership and use. Public transport is comprehensive, frequent, integrated, of high quality and is fairly cheap with the result that car ownership is not an inevitable desire of expectation (Cullinane, 2003). Therefore, 350,000 cars and taxis in Hong Kong, there are 1600 on street parking spaces and 7300 parking spaces in 13 governments owned multi-storey car parks (Hong Kong Transport Department, 2001). This implies that there are only parking spaces for a half of the cars in public places with a high pressure for parking in CBD. A part from the difficulty of finding parking spaces, parking is also expensive for many central locations at about HKD 30 - HKD 100 per hour (Cullinane, 2003).

Hong Kong has an adequate enforcement of parking rules that allows the realisation of their parking strategies. On street parking is normally considered on local distributors and roads lower in hierarchy. On such roads, on street parking spaces are provided where off street facilities are inadequate to meet demand and where provision would not adversely affect the flow of traffic. On- street parking spaces mainly cater for short term parking needs and parking meters are installed to encourage turnover of vehicles parked there. All parking areas are well designated with signage. The use of parking signage gives information on what class/type of vehicle the parking place is designated for and the allowed parking period. Hong Kong has also promoted high vertical development which does not allow private car use to flourish with 301 persons per hectare (301pph) making it the highest in the world.

2.9 Literature synthesis

Based on the reviewed literature it is clear that public parking management is a very critical issue in urban transport planning. How parking is planned and managed is an effort to curb motorisation and congestion in cities. Fundamentally, effective parking management systems are a essential tool to facilitate the efficient use of roads and ensure seamless

movement for pedestrians, cyclists, passengers of public transit as well as car users. It is also a supplementary way to reduce travel costs. Effective vehicle parking management is a mechanism for managing travel demand in cities. The management and control of public parking is a mechanism by which cities can control motorisation. Parking problems do not only affect drivers in urban areas but may have an effect on the entire urban population either directly or indirectly. Fewer studies on public parking management have been done in the context of Kampala City. Different urban centres have varying parking challenges and needs.

Fewer studies on the urban public parking management have been conducted in the Sub - Saharan Africa (SSA) specifically in East African cities, compared to the Western cities. Various parking models have also been developed to solve parking problems in developed cities with efficient public transport systems, effective policies and highly sophiscated technologies. Cities have different characteristics with varying parking requirements. The balance between parking demand and supply is closely linked to how laws, regulations and policies are designed and implemented. Examining the international experience and identifying best transferable practices to Kampala also gives this study a different research dimension on public parking management. Due to the changing urban planning and management practices as well as the emergence of new technologies that are useful in managing public parking, there are several knowledge gaps that need to be filled to improve car parking in Kampala under this study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter focuses on the research study area and the methodology that was adopted in carrying out the study. It presents and justifies the adopted research design, study population and sample size, sampling design and procedure, methods of data collection, data collection tools and sources of data, measurement of variables, data analysis, presentation and limitations.

3.2 Study Area

The study was carried out in Kampala city with a specific focus on the Central Business District (CBD) also known as Kampala Central Division. Investigations on the on-street parking facilities focused on selected streets, namely: a) Kampala Road; b) Buganda Road and, c) William Street as eraborated in figures 3.1,3.2,3.3, and 3.4.

Investigations on the off – street parking facilities focused on the Watoto Church parking which is located near Sure House, Mabirizi Complex (basement parking) which is located near the constitutional square (town square) as well as mercantile parking (multistoried parking facility) located opposite the Crusader House in the central business district (CBD) of Kampala. Crusader House is located near the Workers House, which is owned the National Social Security Fund (NSSF).

The selection of study areas was based on their varying spatial characteristics such as road hierarchies as well as existing key land uses and landmarks. Also important is that the selected study areas have a higher parking turnover, located in a busy area with several activities being carried out such as shopping (several shopping malls exist), public administration (existence of government departments and agencies such as Ministry of Local Government, Uganda High Court, Kampala Central Police station and Kampala Capital City Authority offices/city hall). Selected study areas are also close to religious institutions such as Watoto church and Christ the King church as well as key financial institutions such as Bank of Uganda, Bank of India, Tropical Bank, Bank of Baroda and Centenary Bank. Such institutions and landmarks attract many people including motorists

that requires car parking facilities. The study areas are close to the city square (constitution square), a key public open space as well as a landmark that attracts many people to the city centre.

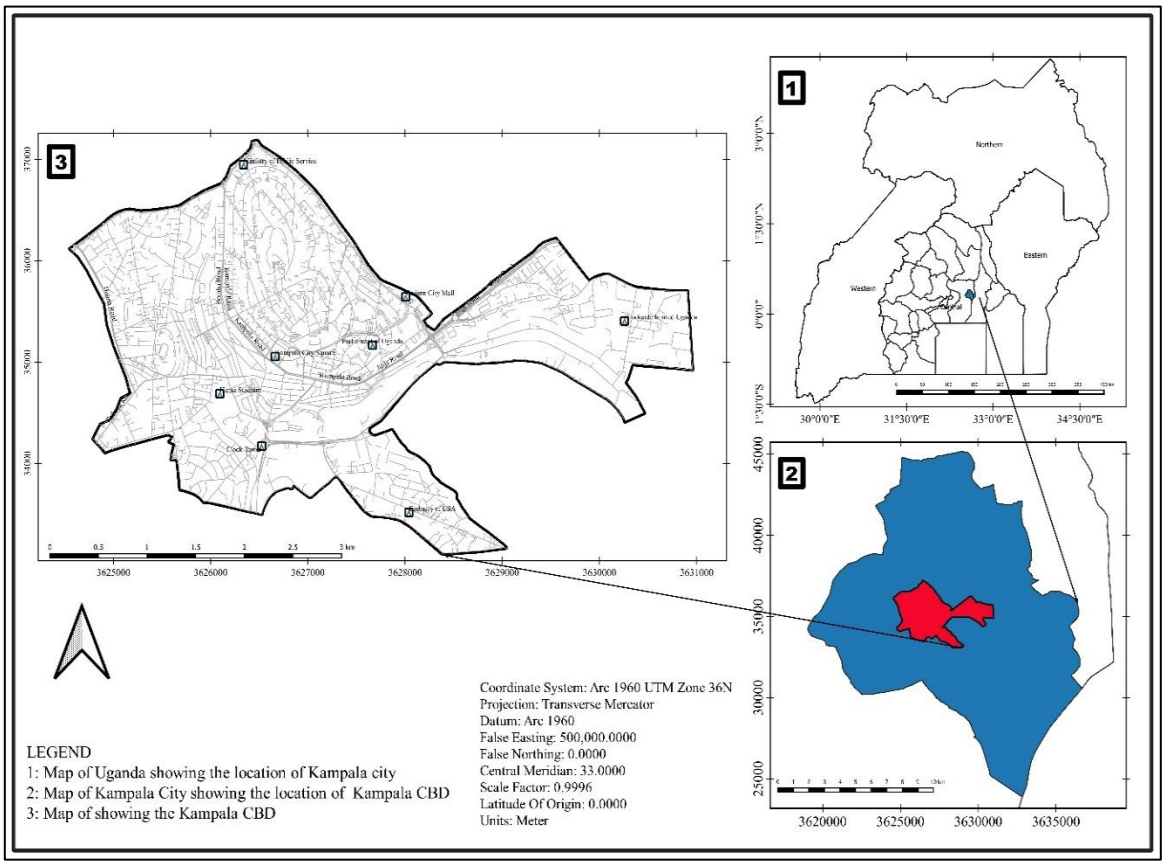

Figure 3.1 Location of Kampala Central Business District. Source; ArcGIS data edited by the Author, 2024.

3.2.1 Characteristics of the selected study areas

Table 3.1 provides the key characteristics and features of the selected parking facilities, which are indicated as study areas in this study. Kampala road which is one of the study areas is a-two lane major (arterial) road with 423 gazetted parking spaces, connecting key land marks such as Watotto church, King Fahad Plaza, Mabirizi Complex, constitutional square, Centeray Bank, Church House Building, Bank of Uganda, Greenland Tower, Post Office Building, Tropical Bank and is open for public use. Buganda road is a collector road linking various activity centres such as the constitutional square/town square, central police station (CPS) and Buganda Road primary school. William Street is a local collector linking various places in the down town of Kampala city with 378 parking lots open for public use.

While, Watoto Church parking lot is an open ground off street parking privately owned facility with 114 parking spaces open for public use. Mercantile parking is a multistoried off street car

parking facility with 460 parking slots available for the public but under institutional arrangements. And, Mabirizi Complex parking is an under ground off street parking along Kampala Road with 55 parking slots available for public use

Table 3.1 Summary of the general characteristics of the selected parking areas for the study.

Road Name	Type of road /Parking Lot	Number of Parking Slots	Types of Parking spaces	Restrictions	Type of Ownership
Kampala Road	Arterial two-lane road	423	Parallel and Angel Parking	Open for public use but Some spaces are restricted	Government
Buganda Road	Local Collector (up town street)	389	Parallel parking	Open for public use but Some spaces are restricted	Government
William Street	Local Collector (down townstreet)	378	Parallel parking	Open for public use but Some spaces are restricted	Government
Watoto Church Parking Lot	Open ground off street parking facility	114	Parallel and Angel Parking	Open for Public use	Private
Mercantile Parking	Multistoried off street car parking facility	460	Parallel Parking	Open for use by public but under institutional arrangements	Private
Mabirizi Complex Parking	Underground off-street parking facility	55	Parallel Parking	Open for Public use	Private

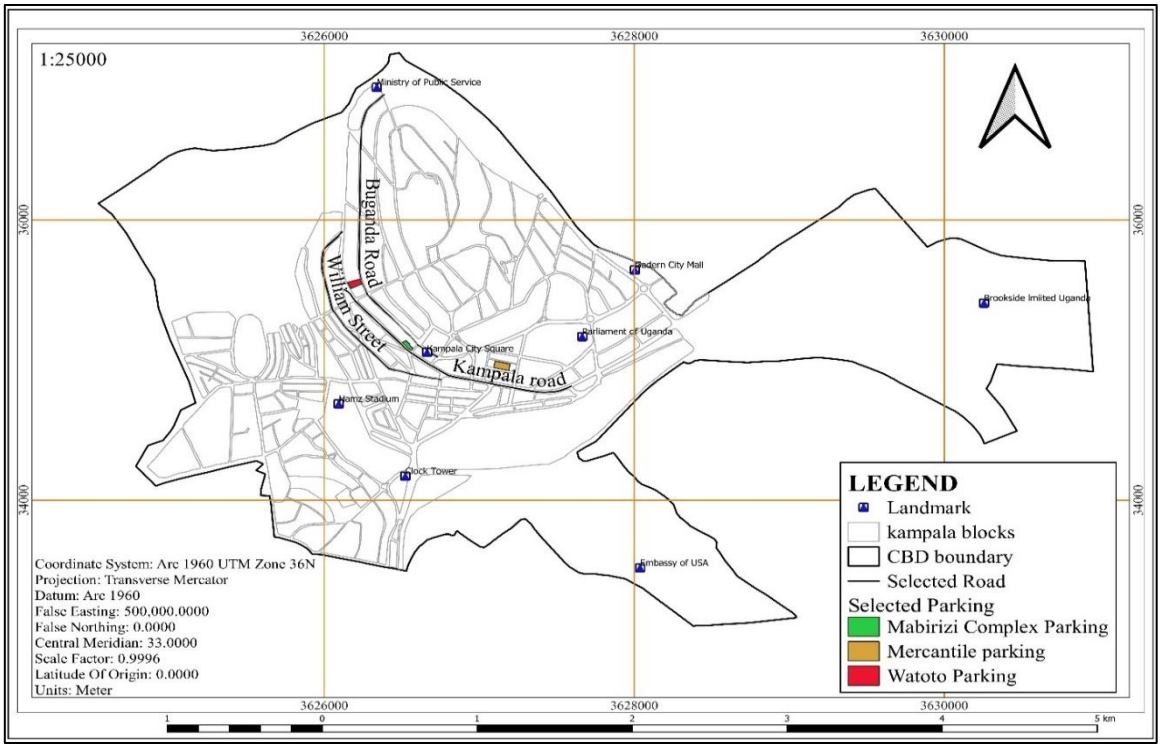

Figure 3.2 Location of selected on -street and off-street parking facilities in Kampala Central Business District (KCBD).

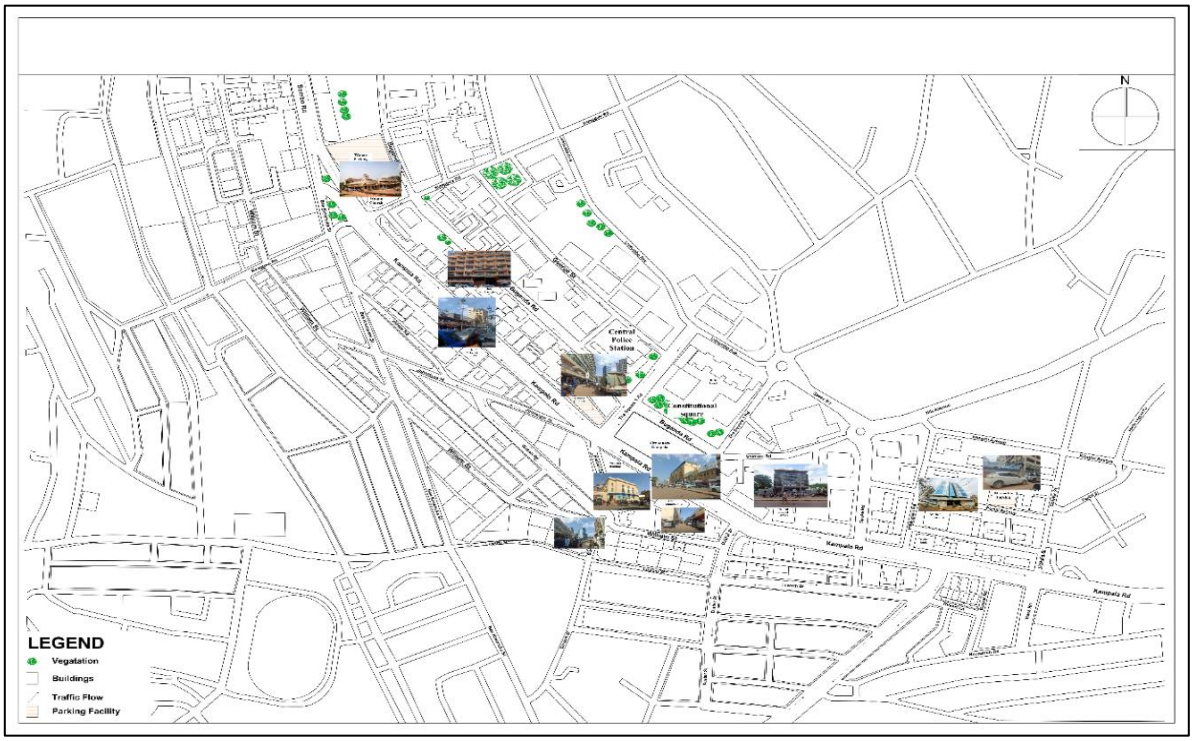

Figure 3.3 Key Land uses near and within the study areas.

Figure 3.4 Traffic flow around the selected study areas. Source; Google image edited by the Author, 2024.

3.3 Research Design

The research design is a reflection of the researcher's ideas and how they are to be realized. Researchers should reflect upon the strategies they intend to use within their study which will in turn inform their methods (Asenahabi, 2019). Research designs provide an overview that sets out how the research project intends to address the stated objectives (Oppenheim, 1992; Jongbo, 2014 and Asenahabi, 2019). The researcher design should clearly elaborate the strategy for analyzing and interpreting data to facilitate relevant recommendations. According to Akhtar (2016), it is explained that a research design is necessary because it makes possible the smooth sailing of the various research procedures, thereby creation research as professional as possible, yielding maximum information with a minimum expenditure of effort, time and money. The use of a research design prevents such a blind search and indiscriminate gathering of data and guides him to proceed in the right direction.

A research plan prescribes the boundaries of research activities and enables the researcher to channel his energies in the right work with clear research objectives in view, the researcher can proceed systematically focused their achievement the design also enable the research to anticipate potential problems of data gathering operationalization of concepts, measurement, etc (Khanday, 2019).

3.3.1 Mixed Methods Research Design

Mixed methods is defined as 'research in which the investigator collects and analyses data, integrates the findings and draws inferences using both qualitative and quantitative approaches or methods in a single study' (Tashakkori and Creswell, 2007:4; Asenahabi, 2019; Burke-Johnson et al., 2007). A mixed methods research design is one that includes a qualitative and quantitative dimension, but difficulties often arise when the researcher attempts-to-articulate how the two elements relate to one another (Tashakkori and Creswell, 2007). This method was born out of the idea that both qualitative and quantitative designs have weaknesses, thus collecting both of them neutralized the weakness of the other (Asenahabi, 2019).Moreso, the researcher collects and analyzes both qualitative and quantitative data in either sequential and/or simultaneous and the exhaustive manner in which the researcher integrates the two forms of data will depend upon the nature of the inquiry and the philosophical outlook of the researcher (Creswell & Plano-Clark, 2011).

The Research philosophy deals with the source, nature and development of knowledge. In simple terms, research philosophy is belief about the ways in which data about a phenomenon should be collected, analysed and used. There are four types of research philosophies which are positivism, interpretivism, pragmatism and critical realism (Mitwa,2025).The choice of a specific research philosophy is impacted by practical implications. Accordingly, the underpinning research philosophy adopted for any research project inherently shapes the methodological approach, data collection methods adopted, and analysis techniques deployed. Further, it holds the potential to influence how findings are presented, with an interpretive approach incorporating a degree of reflection and reflexivity into presenting results.Therefore, the philosophical underpinning for this research was pragmatism that followed a research problem and research questions.

Characteristics of research located within the pragmatic paradigm

Drawing on the works by Creswell (2003) and Martins (2005), research located within the pragmatic paradigm demonstrates the following characteristics:

a) A rejection of the positivists that social science inquiry can uncover the "truth" about the real world. An emphasis of "workability" in research.

b) The use of "what works" as to allow the researcher to address the question being investigated without worrying as to whether the questions are wholly quantitative or qualitative in nature.
c) Adoption of the worldview that allows for a research design and methods that are best suited to the purpose of the study.
d) A rejection of the need to locate your study either in a positivist paradigm or an interpretivist paradigm.
e) Choice of research methods depending on the purpose of the study or research questions.

Furthermore, this paradigm advocates for a mixed methods approach which is a combination of quantitative and qualitative research approaches. The use of both qualitative and quantitative methods is recommended by Amin (2005) as an important form of triangulation in a study that involves a large number of people. The study used triangulation methods that complemented each other with the aim of achieving the best results possible. Tashakkori & Teddlie (2003a) also assert that triangulation is one way that involves a combination of data collection to get good results.

Although the term "triangulation" has different meanings, it is associated with using a combination of methods with a strategy of convergent validity being common (Bryman, 2001). The study merged qualitative and quantitative data which allowed for a diverse perspective and enriched the analysis for better credibility, validity and depth of research findings. The significance of using triangulation to improve understanding and strengthen the validity of qualitative research findings has been highlighted in several studies (Clifford et al., 2010; Longhurst,2016). Triangulating data from multiple sources, including stakeholder interviews, enhances scientific research (Sands & Roer-Strier, 2006).
Kholoud (2009) identified four types of triangulation. That is; Data triangulation, investigator triangulation, theory triangulation and methodological triangulation. Therefore, this study ensured;

a. Data triangulation by collecting data at different times and days of the week through administering questionnaires that were evenly spread within the study areas, conducting interviews with key informants and carrying out parking surveys in selected on street and off-street parking sites;

b. Investigator triangulation by involving research assitants during the data collection process;
c. Theory triangulation by using multiple theories and models in the interpretation of the phenomenon and;
d. Methodoligical triangulation involved using interviews, observations, questionnaires, and photography with document analysis.

The drawbacks of triangulation include the lack of a uniform methodology. The use of triangulation often fails researchers to explain their techiniques adequately and use varying methods for combining results. While, the research design employed in this study was the cross-sectional descriptive research design of the mixed method. Both qualitative and quantitative research approaches were used. Qualitative and quantitative approaches allowed collection of data through both primary and secondary data collection techniques. The focus was on empirical investigation into the public parking characteristics and management practices,user perceptions of public parking management and strategies to improve public parking management in Kampala city.

3.4 Study Population

The main target actors focused in this study were private vehicle drivers. Under this study, 328 private vehicle drivers were conveniently selected across the study sites to participate in the questionnaire survey. The study also targeted key informants comprising of officials from Kampala Capital City Authority (KCCA), Ministry of works and transport, multiplex, parking managers, academia and Transport experts. These were mainly targeted for interviews because of their expertise and experience in regards to parking management in Kampala City.

3.5 Sampling Design

Sample design refers to the plans and methods to be followed in selecting samples from the target population and the estimation technique formula for computing the sample statistics (Kabir, 2016). The basic purpose of sampling is to provide an estimate of the population parameter and to test the hypothesis (Kabir, 2016). Sampling theory stipulates that after identification of the statistical population, a sampling frame is established which ideally lists all the individual members of the statistical population from which a sample is to be drawn.

3.6 Sampling Techniques

3.6.1 Convenience Sampling Technique

To select the respondents for the questionnaire survey, convenience sampling technique was used. Convenience sampling involves taking samples that are easily accessible and willing to participate in the study (Edgar& Manz, 2017). This sample method does not require a random selection of respondents based on any criteria, but instead researchers can subjectively select respondents at random who are happy to be approached and become part of the research. According to Nikolopoulou (2022), this technique will be a good fit for your study: a) when you plan to obtain people's perceptions and attitudes; b) if you intend to conduct a test pilot for your survey, and c) if you plan to produce hypotheses being tested in details in upcoming studies. The researcher creates inclusion criteria and then approaches any member of the target population being available at the moment and who met the criteria (Golzar et al., 2022). In this study therefore, 328 private car drivers (motorists) who were willing to give the required information were approached within the selected study areas.

According to Golzar et al (2022), the researchers carefully conduct the research using a convenience sampling technique while controlling biases and uncertainty, it produces meaningful results. Golzar et al. (2022) further suggest that convenience sampling can be improved by evaluating and controlling the sample's representativeness, including diversity, and using other data. This research therefore reduced biases by evaluating and controlling representativeness of the sample. However, questionnaires were distributed at different times and locations to achieve an appropriate cross section of the target population. It might be challenging to replicate results of convenient samples. Furthermore, Sekaran & Bougie, (2010); Skowronek & Duerr, (2009), suggest that when larger numbers of respondents are used, the findings can be representative and it is a way to control bias with uncertainty. Therefore, this study ensured using sufficient samples with a survey that was evenly spread. Roscoe (1975) suggested that a sample size greater than 30 and less than 500 is suitable for most behavioural studies, while a sample size larger than 500 may lead to a type II error (Sekaran & Bougie, 2016). A type II error is a statistical term used within the context of hypothesis testing that describes the error that occurs when one fails to reject a null hypothesis that is actually false (Sekaran & Bougie, 2016). A type II error produces a false negative, also known as an error of omission**.**

3.6.2 Purposive Sampling Technique

Subsequently, for the face-to-face interviews, the sampling technique used to select respondents was purposive sampling. Purposive sampling is a non-random sampling technique that does not need underlying theories or a set number of informants (Tongco, 2007). Simply put, the researcher decides what needs to be known that sets out to find people who can and are willing to provide the information by virtue of their knowledge or experience (Bernard 2002, Lewis & Sheppard 2006). Therefore, in this study, purposive sampling was used through expert sampling. It involved gleaning knowledge from individuals who are knowledgeable about Urban Public Parking Management. Selected respondents comprised of officials from Kampala Capital City Authority (KCCA), Ministry of Works and Transport, academia, researchers, civil society organisations and managers of selected parking facilities.

Gillham (2000, p12) believes that interviews, "can be very effective even with as few as four or five interviews of individuals, carefully selected as typical." In which case, the persons selected as 'typical', are those who have knowledge and interest in parking. In other words, they will be considered to be 'experts' (i.e., individuals with specialised knowledge in a specific field with demonstrated experience and involvement to a specific study (Glaser and Laudel, 2004).

3.7 Data Collection Methods

Data collection is the process of gathering and measuring information on variables of interest, in anestablished systematic fashion that enables one to answer stated research questions, test hypotheses, and evaluate outcomes (Kabir, 2016).

3.7.1 Face to Face Interviews

Face-to-face interviews usually focus on a conversation between the interviewer and interviewees (these normally serve as selected respondents/key informants). Face-to-face interviews are often considered to give the highest response rates (Schroder, 2016). According to Schroder (2016), the interviewer can explain questions and tasks in a much more comprehensive way. If respondents are uncertain about something, interviewers can explain it in more detail; they can probe if the respondent's answer does not match the question; and they can motivate the respondent to answer all the questions (Groves et al., 2009; Loosveldt, 2008; Schnell, 2012). Face to face interviews were conducted mainly

with key informants from relevant organisations and government agencies in Kampala because of their knowledge and experience in regards to the subject. The key informant Interview guide collected information from purposively selected key informants. These were selected because they are knowledgeable about the issue of Parking management and transport in general in the context of Kampala City.

Seventeen (17) respondents were selected purposively for interviews using an interview schedule as in Table 3.2 below. These included 2 officials from KCCA, 1 official from Uganda police,1 official from Ministry of Works and Transport , 3 officials from Multiplex ,1 official from the Chartered Institute of Logistics and Transport ,1 lecturer from Makerere University under the department of Urban and Regional Planning ,1 parking officer for Mabirizi parking facility,1 parking officer from Mercantile parking ,3 parking control officials from Watoto parking facility and the director Civil Society Coalition on Transport.These were selected due to their rich experience,knowledge and expertise as well as their responsibility in providing,managing and controlling parking in Kampala city.

Table 3.2 Characteristics of respondents that were interviewed

Institution	Respondent	No.	Justification
Kampala Capital City Authority	Head of Engineering and Works and Senior Physical Planner	2	Responsible for the over all transport aspects in the city
Uganda Police	Director of Traffic and Road Safety	1	Responsible for traffic regulation and parking has a key influence on traffic flow and acccidents in the city
Ministry of works and transport	Director of Transport	1	Responsible for road infrastructure planning and management in the country including ensuring proper parking in urban areas

Multiplex	Head of Field Operations, Operations Monitoring Officer, Parking Attendants	3	Directly concerned with parking management in the city
Chartered Institute of Logistics and Transport (CILT)-Uganda Chapter	Head of Research and Academics	1	Contemporarly knowledge and information about parking management in general
Makerere University, Department of Urban and Regional Planning	Senior Lecturer	1	Contemporarly knowledge and information about parking management in general
Mercantile Parking	Head of Operations (Parking Manager)	1	Primary information on parking issues in Kampala City
Mabirizi Complex	Parking Control Officer	1	Primary information on parking issues in Kampala City
Watoto	Parking Control Officers	3	Primary information on parking issues in Kampala City
Civil Society Coalition on Transport (CISCOT)	Director	1	Knowledge and expertise in the city transportation issues including parking
TOTAL	**17**		

3.7.2 Questionnaire Survey

This is the most commonly used method in undertaking research. Questionnaires are a list of questions either open-ended or close-ended for which the respondents give answers.

Questionnaires can be conducted via telephone, mail, live in a public area, or in an institute, through electronic mailor through fax and other methods (Kabir, 2016). Questionnaires for individual drivers were carried out. This was direct in order to understand their parking management perception in Kampala city, needs and prefrences. The questionnaires included only close- ended questions that enabled eliciting straight forward responses. In close ended questions, responses to questions were pre-specified. Close ended questions involved option questions where respondents were required to give one response to rate responses according to a five point Likert scale. Using the 5-point Likert scale provided nuanced, actionable, and clear-cut feedback without unnecessary responses.328 questionnaires were distributed to car drivers/motorists using the parking facilities under study.

3.7.3 Parking Count Survey

The parking survey was carried out on the selected on street and off-street parking facilities in Kampala in consideration of a weekday (Monday 8th, April 2024) and a Weekend (Saturday,13th April 2024). The data were collected through the license plate method. Every parking stall within the selected parking facilities was monitored at a continuous interval of 15 minutes and the license plate numbers were noted down. The occupancy count in the selected parking lots was taken at the beginning of the exercise from 8:00am to 6:00pm. The data that were collected facilitated the determination of efficiency and turnover of the study areas.

3.7.4 Direct Observation

Observation can be done while letting the observing person know that she/he is being observed or without letting him know (Kabir, 2016). Observation involved collecting data through observing. This data collection method involved watching, listening, reading, recording behavior and characteristics of drivers. The researcher conducted field observations throughout the data collection process, to further enable verification as well as to provide qualitative illustration of the quantitative information collected.

Photographs were taken during observation to capture some moments that informed the study. Photography has some important strengths. It helped to overcome the typically fleeting nature of observation. It also allowed recording behavior in its situational context, allowing for reflection, informants, coding, and using of the behavior or situation for

illustration. In addition to its analysis of behavior, visual methods were also used for the purpose of analysis of environments. Photographs and videos can reveal insights into the interpretive side of the equation xamining people's focus and interpretation of their behaviors and rituals (Bisil et al, 2011). This visual information can be qualitative aiming for naturalistic, descriptive, and "rich" data; they can be used to quantitatively measure circumstances and events.

3.8 Secondary Data

A thorough desk review of the existing documents on urban parking provided by practitioners, and other partners was undertaken by the researcher as working documents. A checklist was used to summarize the required information according to the different study variables being studied. Data from documents was analyzed through content analysis. This exercise helped to identify information gaps for further investigations and to modify data collection tools.

The desk study was based on the secondary data sources consisting of:

a) Status Report on Management and Modernisation of on street parking (2020).
b) Greater Kampala Multimodal Urban Transport Master Plan (2022-2025)
c) Smart City Strategic Plan for Kampala (2020/21-2024/25)
d) Relevent reports, studies and related articles.

The data collected from these documents included the status on management and modernisation of on street parking. Also, information on the Kampala Citys agenda to adopt and priortise sustainable transport especially non-Motorised transport and public transport that have a direct influence on parking demand and supply.

3.9 Data Processing, Analysis and Presentation

3.9.1 Descriptive statistics

Descriptive statistics are brief description coefficients that summarize a given data set, which can be either a representation of the entire population or a sample of a population (Ibe,2014). Descriptive statistics are broken down into measures of central tendency and measures of the mean score rating for the study variables. In the study the mean and median scores of the quantitative data were determined.

3.9.2.1 Normality Tests

Due to the fact that the sample (number of observations) was less than 50 for the study areas selected, normality tests that included the Kolmogorov-Smirnova as well as Shapiro-Wilk were used .The analysis compared the parking characteristics for both a weekday and a weekend for all the study cases.

The parking characteristics were analysed based on the following formulars;

Peak Parking Saturation $= \frac{Number\ of\ Vehicles\ at\ Peak\ Times}{Number\ of\ Bays}$……Equation 1

Peak Parking Ratio $= \frac{Peak\ Parking\ Accumulation}{Average\ Parking\ accumulation}$……Equation 2

Parking Index $= \frac{Parking\ Load}{Parking\ Capacity} X\ 100$ …… Equation 3

Parking Duration $= \frac{Parking\ Load}{Parking\ Volume}$……Equation 4

3.8.2.2 Importance Performance Analysis (IPA)

The Importance -Performance Analysis (IPA) developed by Martilla and James (1977) was adopted to study the user perceptions. This is a statistical method to compare between service performance based on user experience and the level of satisfaction. As per thisframework, customer satisfaction is a function of perceived importance and performance of an attribute associated with the service. Under this study, the users of public parking were asked to respond to the established 15 public parking service attributes on a on a five-point Likert scale in terms of how important and how well the service attribute performs. The 15 attributes that were rated and analysed included; Accessibility to parking, Availability of parking, Affordability of parking, walking distance after parking, Safety and Security, Sanitation and Hygiene, Higher User Prioritization, Management Behavior, Use of Information Techinology, Clear rules and Regulations, Peak Demand Management, Enforcement, Customer Response, User Information, The responses were compiled for all the samples and mean importance and performance ratings were computed and plotted on Importance performance grid to determine what attributes perform better and what the users deem as most important within the current public parking management system in Kampala.

The quadrant of each attribute suggests a different managerial strategy, as described in Figure 3.5. Attributes positioned in Quadrant I (*Concentrate here*- **High Importance/Low Performance)** pose the greatest weakness of parking management and require urgent managerial attention in order to improve quality and performance. Attributes that are positioned in Quadrant II (*keep up the good work*- **High Importance/High Performance**) suggest that managers are doing the right thing and that in future they strive to preserve the quality of these attributes. Attributes in Quadrant III (*low priority*- **Low Importance/Low Performance**) are considered as attributes of low priority and do not require additional financial resources or improvement of performance attributes. The attributes that fall into Quadrant IV (*possible overkill*- **Low Importance/High Performance**) and thus managerial suggestions are aimed at allocating funds to the attributes that have greater importance for the consumer.

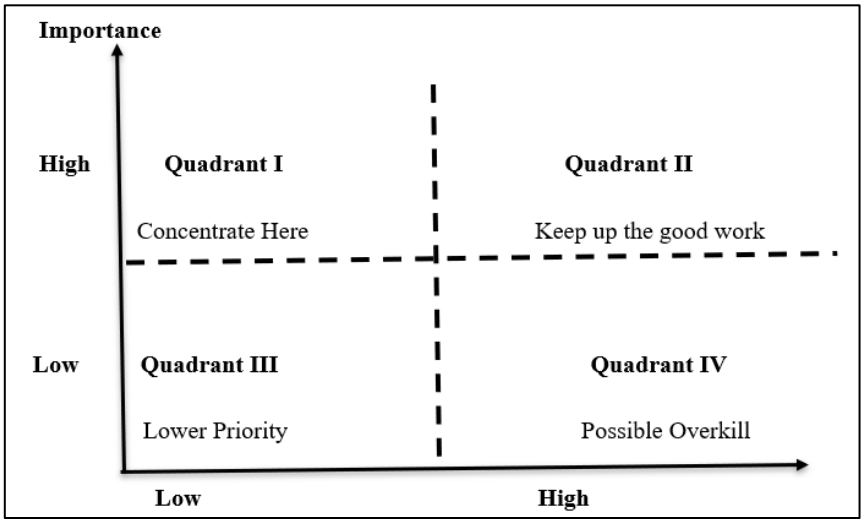

Figure 3.5 Importance Performance Grid.

Source: Martilla and James (1977)

3.9.2.4 Customer /User Satisfaction Analysis

This was done to determine the users perceived difference between actual and expected benefits of the public parking management in Kampala city, in this case the private car drivers. Customer Satisfaction Index (CSI) can represent a good measure of overall satisfaction as it is able to summarize user judgments about various service attributes in a single score (Eboli and Mazzulla 2009). To compute the customer satisfaction Index of the

public parking management in Kampala city, equation 1 given by Ebolli and Mazzulla (2009) was adopted;

$W_i = \frac{I_i}{\sum_{i=1}^{n} I_i}$……Equation 1

$CSI = \sum_{i=1}^{n}(P_i W_i)$

Where;

W_i = Weighted Importance score of attribute $'i'$

li = Avg.Importance Score of attributes $'i'$

Pi = Avg.Satisfaction or perception score of attributes $'i'$

n = Total number of attributes (15).

3.8.2.5 Criteria for classifying Customer Satisfaction Index (CSI) Values

The customer satisfaction index is a number between 00-100 and to evaluate this, (Lubis et al, 2020) highlighted the guidelines in Table 3.3;

Table 3.3 The Criteria for Classifying CSI Values

CSI Value	CSI Criteria
81% – 100%	Very Satisfied
66% – 80%	Satisfied
51% – 65%	Quite Satisfied
35% – 50%	Less Satisfied
0% – 34%	Not Satisfied

Source: Lubis et al, 2020.

3.9.2.6 Chi-Square Analysis

Chi square statistics were used to analyses the relationship between the responses to the study variables and demographic characteristics of respondents. The chi square statistics compares survey responses to questions with expected answers to assess the statistical significance of a given assumption. The chi square test analyses categorical data. It means that the data has been counted and divided into categories. Conditions that must be satisfied

to apply Chi-square test are data type and independence of variables. Achi square test of independence is used when you have two categories of variables.

3.10 Validity and Reliability

3.10.1 Validity

Input was collected from subject matter experts because of their experience with the subject. The experts determined the necessity and usefulness of questions on the tools of data collection. The content validity ratio (CVR) was then calculated using the following formular;

C.V.R = (ne-N/2)/(N/2)
Where;
ne= number of panelists indicating necessary
N=total number of panelists
Then the Content Validity Index was calculated using the formular below;
CVI = Total number of all content validity ratios for individual items
Total no. of items

Thus, the CVI = 60.2 = 0.9
65

As recommended by Amin (2005), for the instrument to be valid, the C.V.I should be at least 0.7. The number of people included for the validity test were 10 experts .

3.10.2 Reliability

According to Saunders et. al., (2003), reliability refers to the degree to which data methods will yield consistent findings, similar observations would be made or conclusions reached by other researchers or there is transparency in how sense was made from the raw data. A measure is reliable to the degree that it supplies consistent results. The following models of reliability are available according to Saunders et al., 2003) but this study adopted the Cronbach's Alpha due to its consistency in measuring what it is meant to measure.

a) **Alpha (Cronbach):** This is a model of internal consistency based on the average inter-item correlation.

b) **Split -half:** This model splits the scale into two parts and examines the correlation between the parts.

c) **Guttman:** This model computes Guttman's lower bounds for true reliability.

d) **Parallel:** This model assumes that all items have equal variances and equal error variances across replication

e) **Strict parallel :**This model makes the assumptions of the parallel model and also assumes equal means across items.

The Questionnaire was divided into three parts in order for the respondents to concentrate more on each question. A pilot test was undertaken to assess the reliability of the attributes, and to ensure that the wordings of the questionnaire were clear. 40 questionnaires were completed by the guests in accompaniment of the researcher. Some problems were identified with the wordings and implications of some questions, so some minor revisions were made to avoid confusion. Reliability analysis was also applied to test the internal consistency of each of the management and perception attributes. The results showed that the Cronbach a coefficient for all the management and perception attributes, 0.942 were quite high, and they were internally consistent and reliable.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. Items
0.942	0.938	65

3.11 Ethical Consideration

Permission was sought from the respondents before collecting data from them. All the sources consulted during the research process were cited and acknowledged. The researcher strictly adhered to universally accepted research norms and ethics as well as standards. Also, the University research ethics were adhered to throughout the research process.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter focuses on the presentation, analysis and interpretation of the qualitative and quantitative data collected during the study. Data were collected through face- to -face interviews, questionnaires and observation. It includes results the demographic characteristics, movement and travel patterns, parking characteristics and management practices, user perceptions of the public parking management and strategies to improve public parking management in Kamapala City.

4.2 Characteristics of Respondents for the Questionnaire

Table 4.1 results indicated that a majority respondents, (61.9%), were males due to their higher levels of willingness to participate and share the required information, while their female counterpart's representation was 38.1%. With regards to the age of respondents, the study revealed that though there existed age differences, a large number of the respondents (30.9%) were between 20 and 29 age brackets, closely followed by those between 40 and 49 years at 29.9%. Those between 30 and 39 years were 29.0%, and between 50 and 69 years were 10.4%. In terms of education, 43.9% of the respondents were bachelors' degree holders while 21.7% were post graduates, 17% were diploma holders while 16% were certificate holders. At least all the private car drivers in this study area had attained a certain form of education. However, on the employment, Majority (54.3%) were private formal business owners and employees, 23.8 % were civil servants, 11.5 % were informal business owners and the least 10.4 % were employers.

Table 4.1 Demographic Characteristics of the Respondents for the questionnaire.

	Characteristic	Frequency	Mean	Median	Percentage
Sex	Female	125			38.1
	Male	203			61.9
	Total	**328**	**164**	**164**	**100**
Age Group	20-29	101			30.8
	30-39	95			29.0
	40-49	98			29.9
	50 -69	34			10.4
	Total	**328**	**82**	**144**	**100**
Highest Levelof Education	Bachelor's Degree	144			43.9
	Certificate	54			16.5
	Diploma	59			17.9
	Post Graduate	71			21.7
	Total	**328**	**82**	**94**	**100.0**
Occupation	Civil servant	78			23.8
	Employer	34			10.4
	Private formal business	178			54.3
	Private informal Business	38			11.5
	Total	**328**	**82**	**77**	**100.0**

4.3 Movement and Travel Dynamics

Understanding the movement and travel dynamics of drivers in the city is important considering the constant growth in private car use and change in travel behaviour. This facilitates the anticipation of the future and analysis of the current demand for public parking and management requirements. The study results in Table 4.2 indicate that 61.9% of the respondents use private cars frequently as a means of travel, 20.1% use Taxi or Matatu, while 16.8% use Boda Bodas frequently, 3% walk and 0.3% use buses. This implies that majority of private car owners rarely use other available mobility options in the city.

In addition, the proportion of respondents significantly reduced with the daily number of trips to the Central Business District (CBD) with 85.7% making one or two trips while 12.5% making 3 to 4 trips daily. Besides, 1.2% of the respondents make 5 to 6 trips, 0.3% make 7 to 8 trips and 0.3% of the respondents make over 9 trips to the CBD daily. The distribution of the respondents decreased with the increase in the number of cars owned with 85.1% owning a single car and 14% owning two cars. It is also clear that the majority of respondents, 82.9%, made trips to the central business district (CBD) for work while 16.5% drove to the city center for shopping purposes.

With regards to the distance covered to the central business district (CBD), it was revealed that 67.1% of the users of parking facilities in the CBD, covered less than 11km to the CBD, while 29.3% covered between 11 and 20km. Lastly but not the least, 66.2% usually utilized on-street parking, followed by off-street at 24.1%.Findings also revealed that 70% of respondents walked a distance of 100m after parking their vehicles, 16.8% walked 200m, 3.6% walked 400m and 0.6 walked for 400m and above. Parking designers usually call for maximum walking distance between 300 and 600 feet for retail customers but between 1,200 and 1,500 feet for employee parking. Maximum walking distances accepted for theme parks, stadiums and arenas is 2,000 feet.

According to Zhang et al. (2020), the acceptable maximum walking distance after parking is 350m (Zhang et al. 2020). Based on the study results, majority of the drivers walk a reasonably acceptable distance after parking their cars and it takes them between 1- to-3minutes to arrive to reach final destination. Majority of the respondents, 51.5%, spend between UGX. 5000 to 7000 on parking daily. Since majority of trips made by car drivers were work-related and given that car drivers mainly used on -street parking without time restrictions, the relatively low parking fees contributed to the increase of demand for on-street parking. Under such a policy priority users of parking facilities especially short stay parkers wanting to shop may find it difficult to find suitable parking. This in turn effects especially nearby businesses as they lose out on potential clients.

Besides, unrestricted on -street parking could have a huge impact on traffic flow in the city which may result into accidents and low urban productivity. Majority of the respondents, 83.2%, spend between 1-5minutes looking for suitable parking in the city while 15.9% spend between 11-15 minutes and only 0.9% spend 16 to 20 minutes. Drivers should be able to access information about available parking before making the trip. If user

information is not provided, drivers tend to spend a lot time cruising around which escalates their transportation costs and as well leads to more pollution in cities. It also damages the image of the city especially for visitors and foreign investors as it may give them a bad experience.

Table 4.2 Movement and Travel Dynamics of Respondents.

	Travel Dynamics	Frequency	Mean	Median	Percentage
Most Frequent Transport Means	Boda-Boda	55			16.8
	Bus	1			0.3
	Private vehicle	203			61.9
	Taxi	66			20.1
	Walking	3			0.9
	Total	**328**	**65.6**	**55**	**100.0**
Daily Number of Trips	0-2	281			85.7
	3-4	41			12.5
	5-6	4			1.2
	7-8	1			.3
	Over 9	1			.3
	Total	**328**	**65.5**	**4**	**100.0**
Number of Cars in the household	1	279			85.1
	2	46			14.0
	3	3			.9
	4	0			
	5 above	0			
	Total	**328**	**65.5**		**100.0**
Reasons for coming to CBD	Leisure	2			.6
	Shopping	54			16.5
	Work	272			82.9
	Services	0			
	Others	0			
	Total	**328**	**65.5**	**2**	**100.0**
Distance to CBD	0-10km	220			67.1
	11-20km	96			29.3
	21-30km	11			3.4
	31-40km	1			.3
	40 above	0			
	Total	**328**	**65.5**	**11**	**100.0**
Where does your vehicle get parked?	Off street open ground	79			24.1
	Off street undergrou nd	5			1.5

	On street open ground	217			66.2
	Garage	0			
	Others	27			8.2
	Total	**328**	**65.5**	**27**	**100.0**
How long do you normally walk after you have parked to your destination?	100m	259			79.0
	200m	55			16.8
	300m	12			3.6
	400m	2			.6
	500m above	0			
	Total	**328**	**65.5**	**12**	**100.0**
How long does it take you to reach final destination after parking in terms of time	1-5mins.	217			66.2
	11-15 mins	10			3.0
	16-20 mins	1			.3
	6-10 mins	100			30.5
	10mins above	0			
	Total	**328**	**65.5**	**10**	**100.0**
How much do you normally spend on parking each time you come to Kampala?	10.000-12000ugx	2			.6
	2000-4000ugx	135			41.2
	5000-7000ugx	169			51.5
	8000-10.000ugx	21			6.4
	Above 12.000ugx	1			.3
	Total	**328**	**65.5**	**21**	**100.0**
How much time do you normally spend looking for a suitable parking space?	11- 15 mins	52			15.9
	16-20 mins	3			.9
	5-10 mins	273			83.2
	16-20mins	0			
	Above 20mins	0			
	Total	**328**	**65.5**	**3**	**100.0**

4.4 Current Public Parking Characteristics and Management Practices in Kampala Central Business District

The study's first objective entailed assessing the parking characteristics of selected on-street and off-street parking and management practices in Kampala Central Business District (KCBD).

4.4.1 Parking Characteristics on Selected Streets and Parking Lots

The parking characteristics of selected case studies have been displayed in Table 4.2 . Also, the plots for parking accumulation curves and parking demand to capacity ratio for the same have been displayed.

4.4.1.1 Kampala Road

Subsequently in Table 4.3, it is evident that whereas parking saturation was slightly different for Kampala Road (with Weekends' parking saturation being greater by about 0.097), the difference in Peak parking ratios for this area for the given days was insignificant (at 0.0003). On the whole, it is evident that parking at Kampala Road is underutilized with occupancy being 47.91% during weekdays and 57.5% during weekends. The reasons could be attributed to the fact that the early birds take up the best and secure spaces leaving others to look for space elsewhere.

4.4.1.2 Buganda Road

Same Table 4.3, it is evident that whereas parking saturation was slightly different for Buganda road (with Weekends' parking saturation being greater by about 0.2955), the difference in Peak parking ratios for this area for the given days was insignificant (at 0.0363). On the whole, it is evident that parking at Buganda Road is underutilized during the weekends with occupancy being 31.45% as compared to the weekdays where occupancy is at 60.73%. This is because most of the users of parking facilities on this street are (off-street spaces) are civil servants and only a handful work on weekends

4.4.1.3 William Street Parking Demand

From Table 4.3 , it is evident that whereas parking saturation was slightly different for William Street (with weekends' parking saturation being greater by about 0.1402), the difference in Peak parking ratios for this area for the given days was insignificant (at

0.0053). On the whole, it is evident that parking at William Street is underutilized during the weekdays with occupancy being 42.1% as compared to the weekends where occupancy is at 55.74%.

4.4.1.5 Mercantile multi-storied parking facility

Table 4.3 showed that whereas parking saturation was slightly different for Mercantile Parking (with weekday's parking saturation being greater by about 0.2544), the difference in Peak parking ratios for this area for the given days was insignificant (at 0.0719). On the whole, it is evident that parking at Mercantile Parking is optimally utilized during the weekdays yet not optimally utilized on the weekends with occupancy rates of 75.96% and 56.37% respectively

4.4.1.6 Watoto Parking Lot

From the Table 4.3, it is evident that whereas parking saturation was slightly different for Watoto Parking (with weekday's parking saturation being greater by about 0.1228), the difference in Peak parking ratios for this area for the given days was insignificant (at 0.068). On the whole, it is evident that parking at Watoto Parking is optimally utilized during the weekdays and the weekends with occupancy rates of 83.07% and 68.86% respectively.

4.4.1.7 Mabirizi Complex

Table 4.3 showed that whereas parking saturation was slightly different for Mabiriizi Complex (with weekends' parking saturation being greater by about 0.2423), the difference in Peak parking ratios for this area for the given days was insignificant (at 0.073). On the whole, it is evident that parking at Mabiriizi Complex is underutilized during the weekdays with occupancy being 27.5% as compared to the weekends where occupancy is at 3

Table 4.3 Parking Characteristics for the Studied Areas on a Weekday and a Weekend

TIME OF THE WEEK	WEEKDAY							WEEKEND						
ST./LOT	**PT**	**PPA**	**PPS**	**APA**	**PPR**	**APD**	**PI**	**PT**	**PPA**	**PPS**	**APA**	**PPR**	**APD**	**PI**
K'la Rd	10:30am - 11:31am	211	0.4988	203	1.04	146.8	**49.88%**	8:31am-10:31am	252	0.5957	243.25	1.0397	103.8	**57.5%**
Bgd Rd	9:31am – 2:00pm	248	0.6375	236.25	1.0497	124.5	**60.733%**	11:00am-1:00pm	133	0.342	122.35	1.086	96.6	**31.45%**
Will St.	11:31am -1:00pm	167	0.4418	42.1	1.0493	104.02	**42.1%**	1:00pm - 3:00pm	220	0.582	210.7	1.044	132.64	**55.74%**
Watoto	10:31am -1:00pm	113	0.9912	94.7	1.193	160.6	**83.07%**	11:00am -2:00pm	99	0.8684	78.5	1.261	154.2	**68.86%**
Mercantile	8:00am - 11:00am	381	0.8283	349.4	1.09	439.5	**75.96%**	9:00am - 11:00am	264	0.5739	259.3	1.0183	167.2	56.37%
Mabirizi	10:00am - 12:31pm	31	0.4697	27.5	1.27	75.14	**27.5%**	11:00am -1:00pm	47	0.721	35	1.343	132.78	35%

PT=Peak Time; PPR= Peak Parking Ratio; PPA=Peak Parking Accumulation; APD=Average Parking Duration; APS=Peak Parking Saturation; PI= Parking Index; APA=Average Parking Accumulation

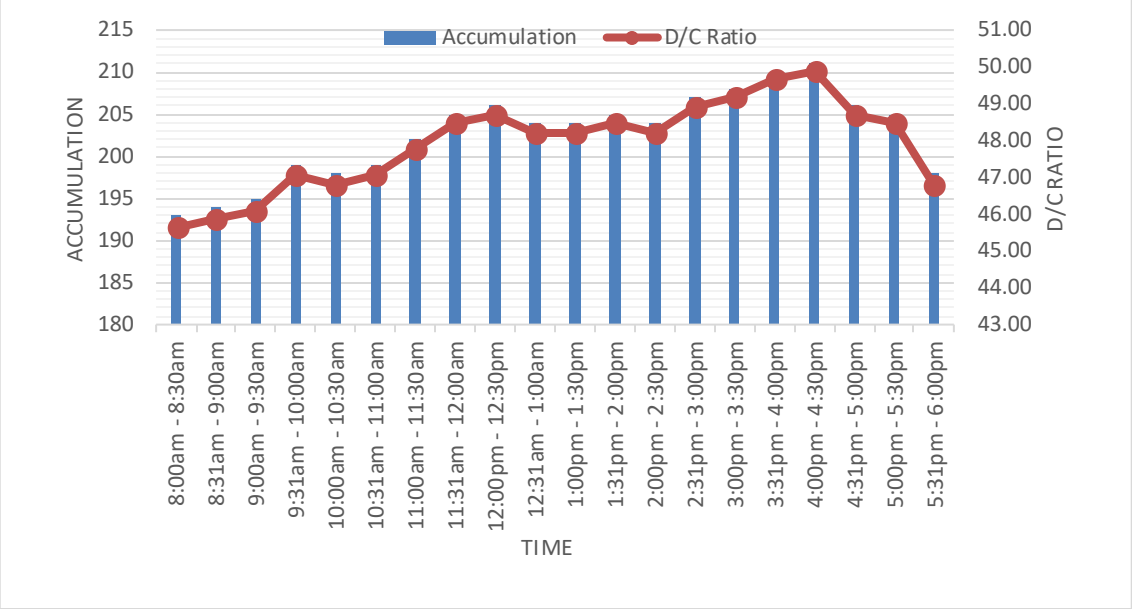

Figure 4.1 Accumulator and Demand Capacity Ratio for Kampala Road on Weekday.

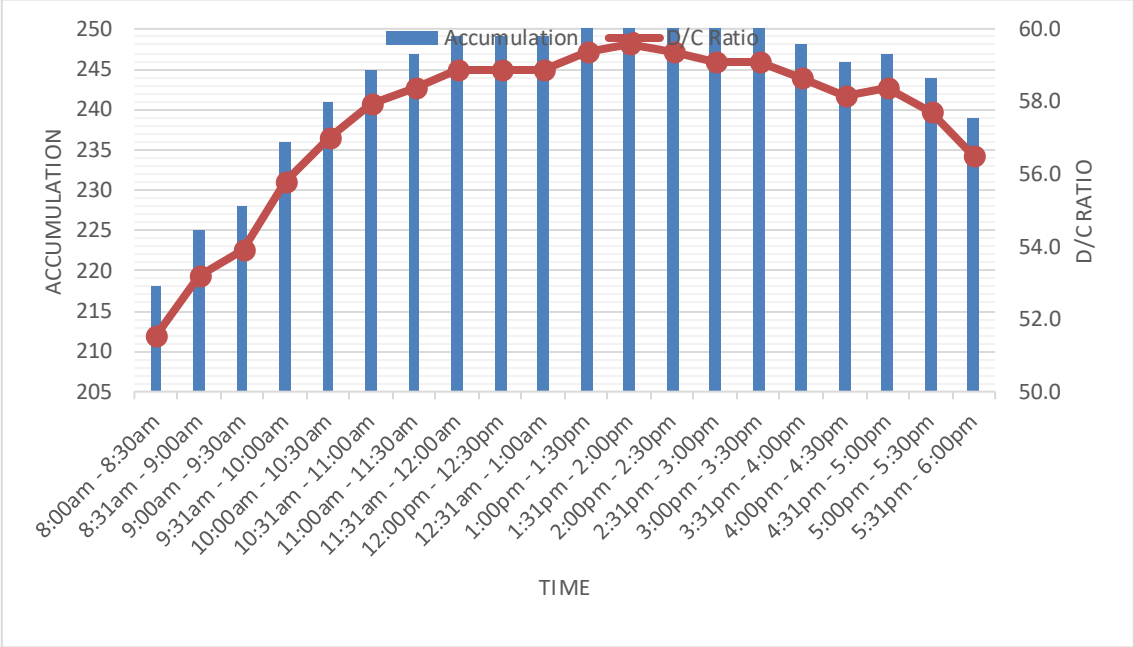

Figure 4.3 Accumulator and Demand Capacity Ratio for Kampala Road on Weekend.

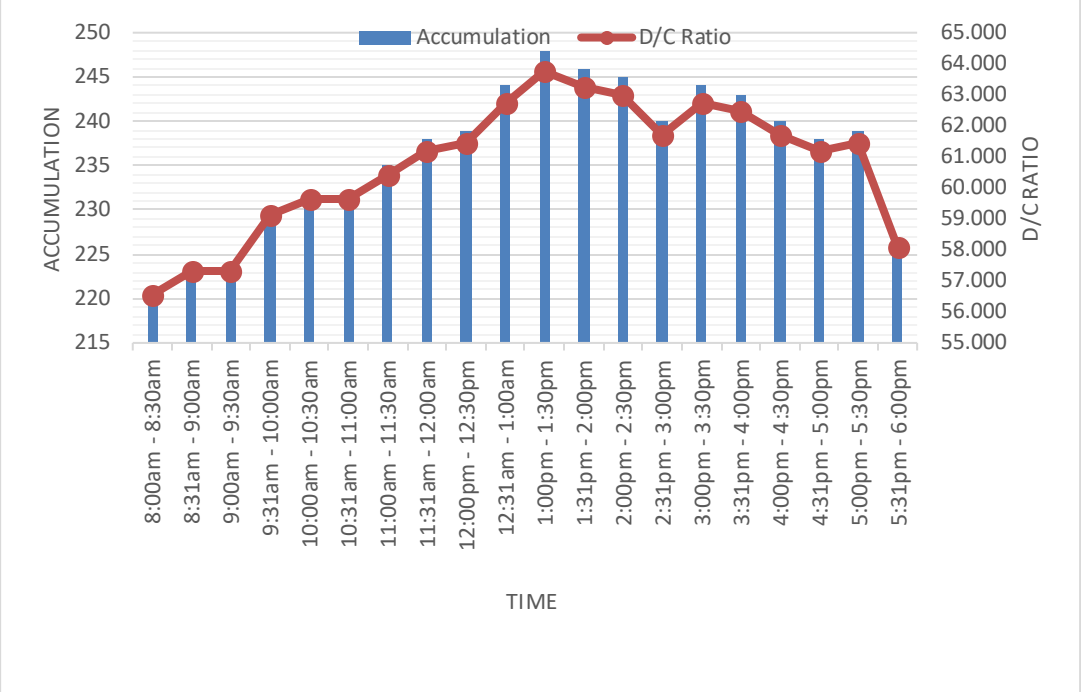

Figure 4.2 Accumulator and demand-capacity ratio for Buganda Road Parking on a weekday.

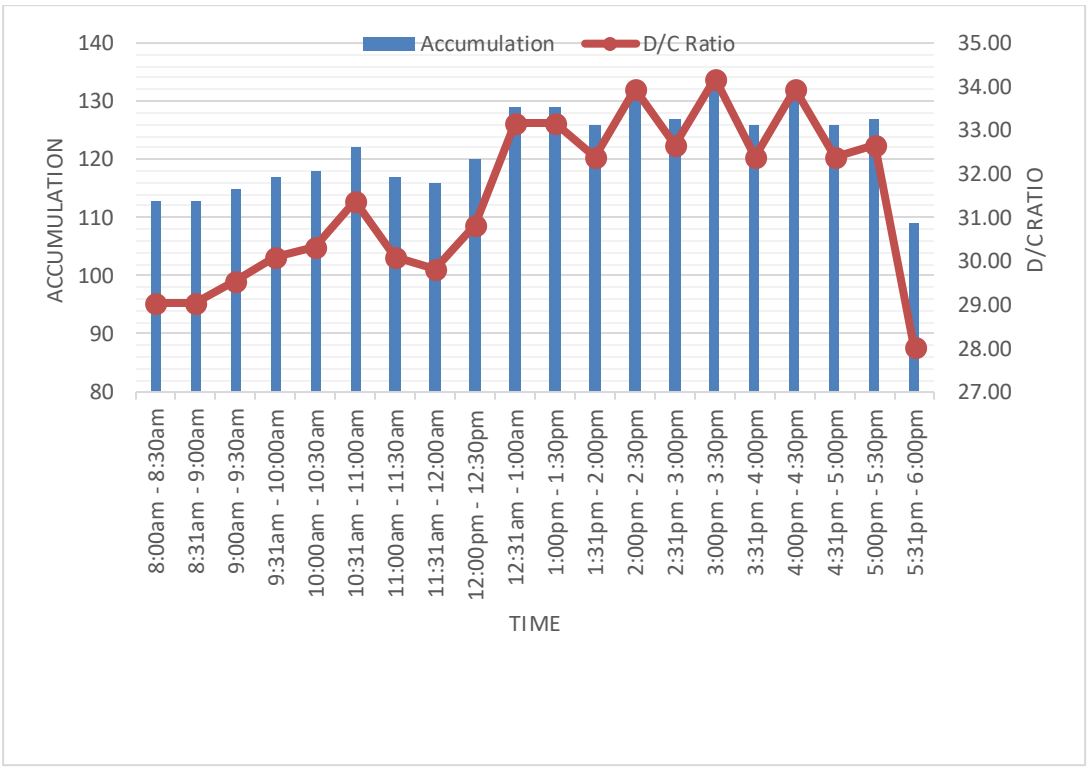

Figure 3.4 Accumulator and demand-capacity ratio for Buganda Road Parking on a weekend.

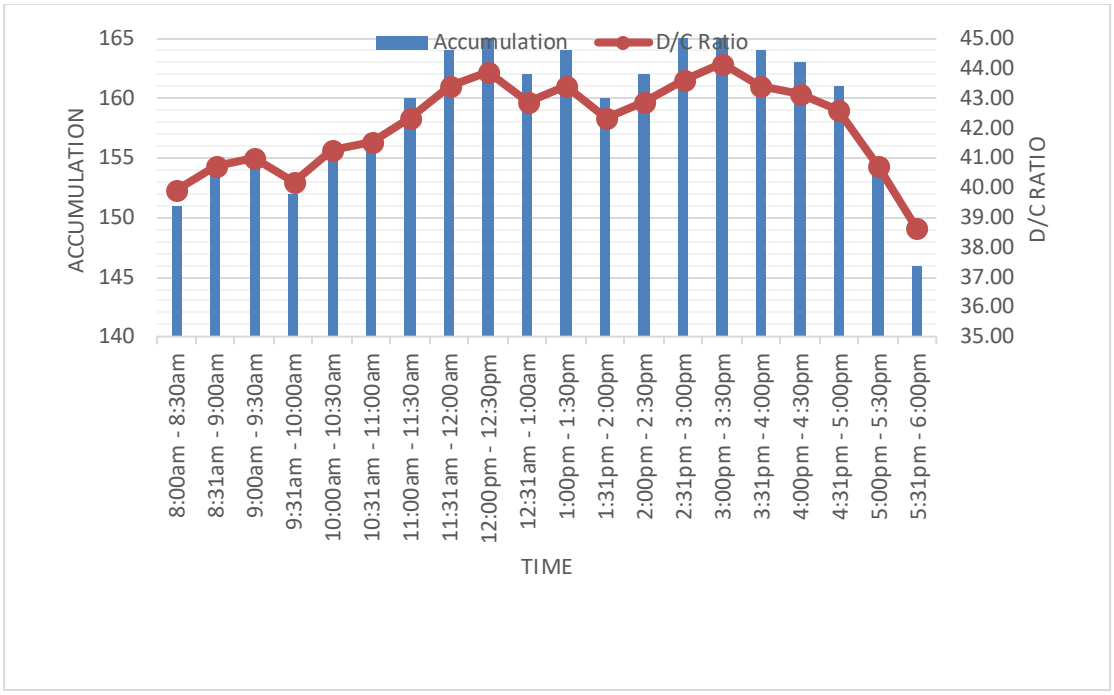

Figure 4.4 Accumulator and demand-capacity ratio for William Street for a weekday.

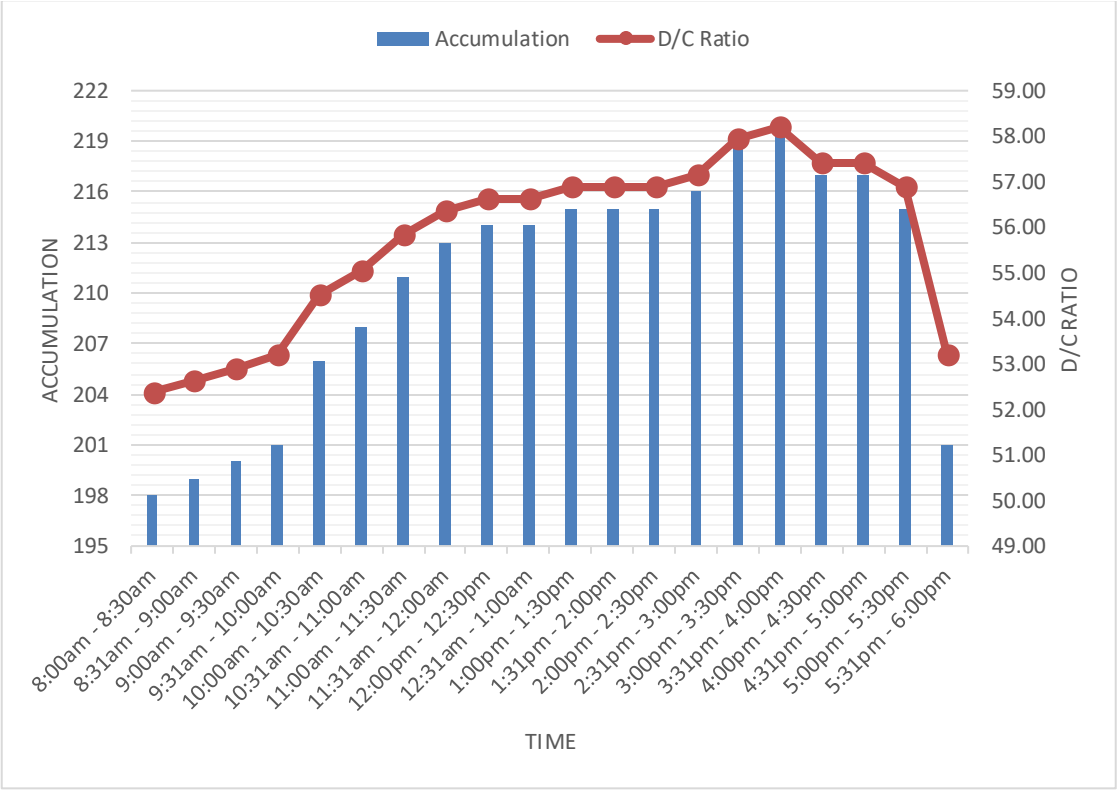

Figure 4.5 Accumulator and demand-capacity ratio for William Street for a weekend.

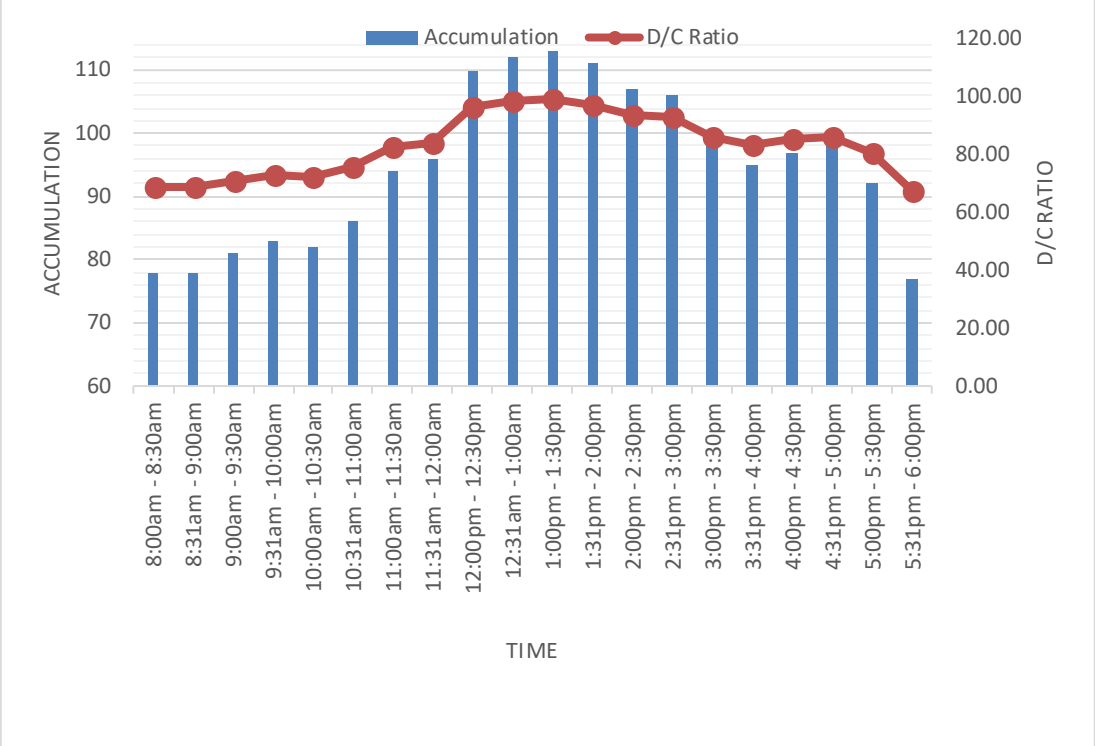

Figure 4.6 Accumulator and demand-capacity ratio for Watoto Parking Lot for a weekday.

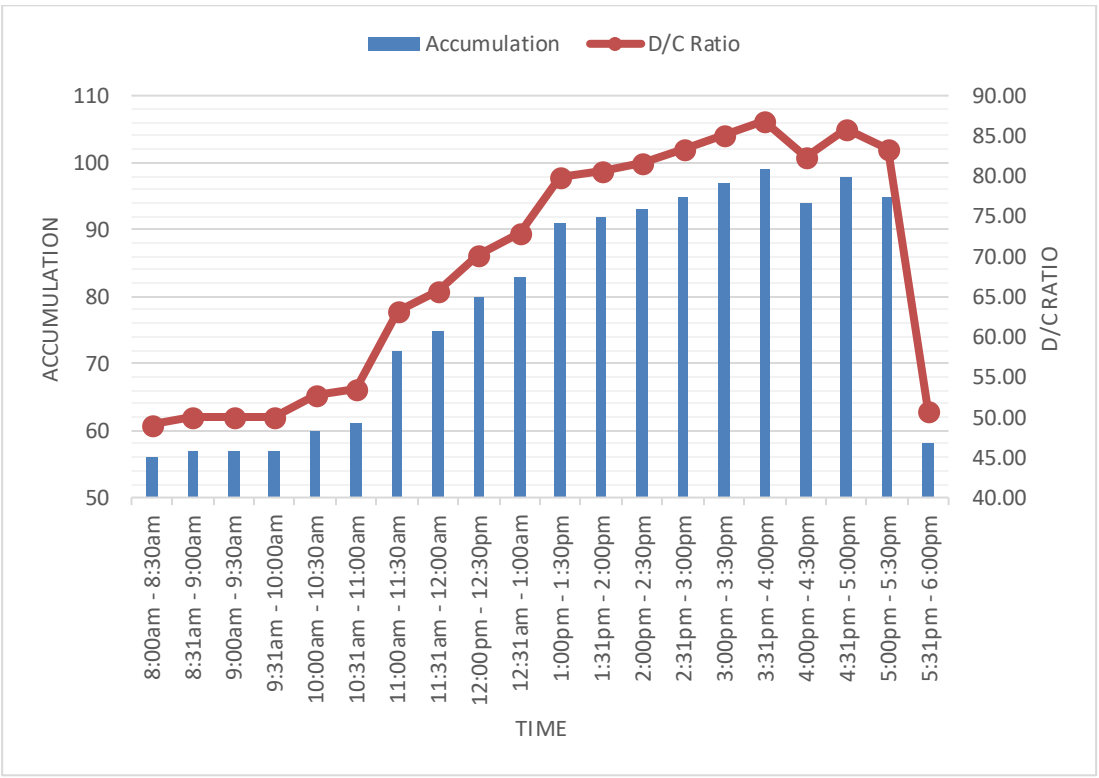

Figure 4.7 Accumulator and demand-capacity ratio for Watoto Parking Lot for a weekend.

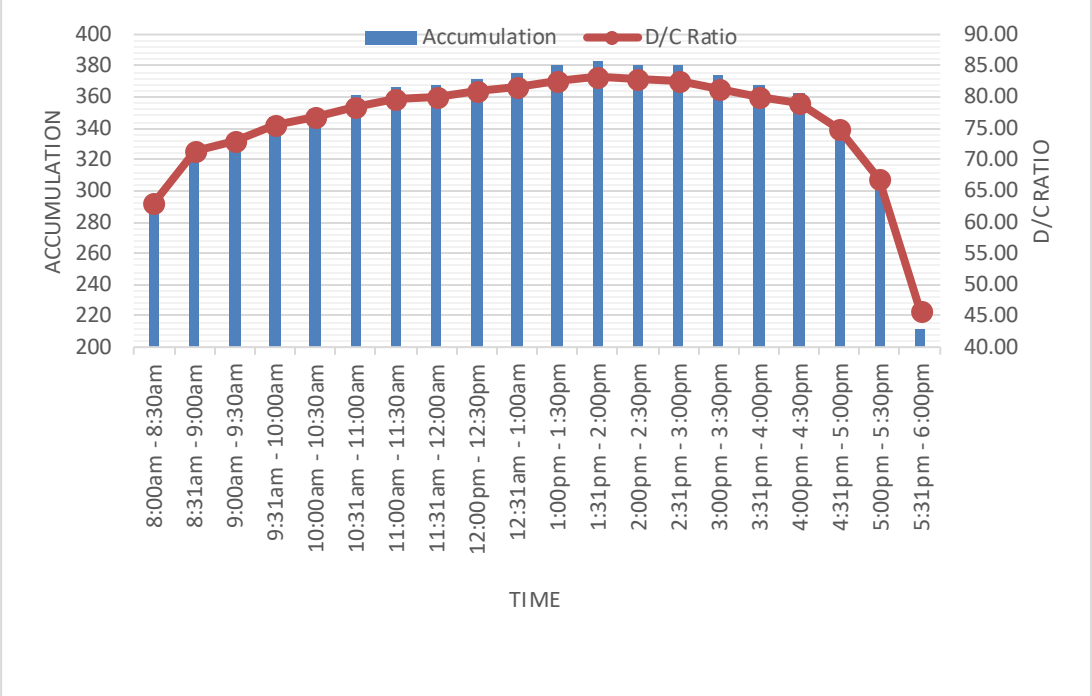

Figure 4.8 Accumulator and Demand-capacity Ratio Mercantile Parking for a Weekday.

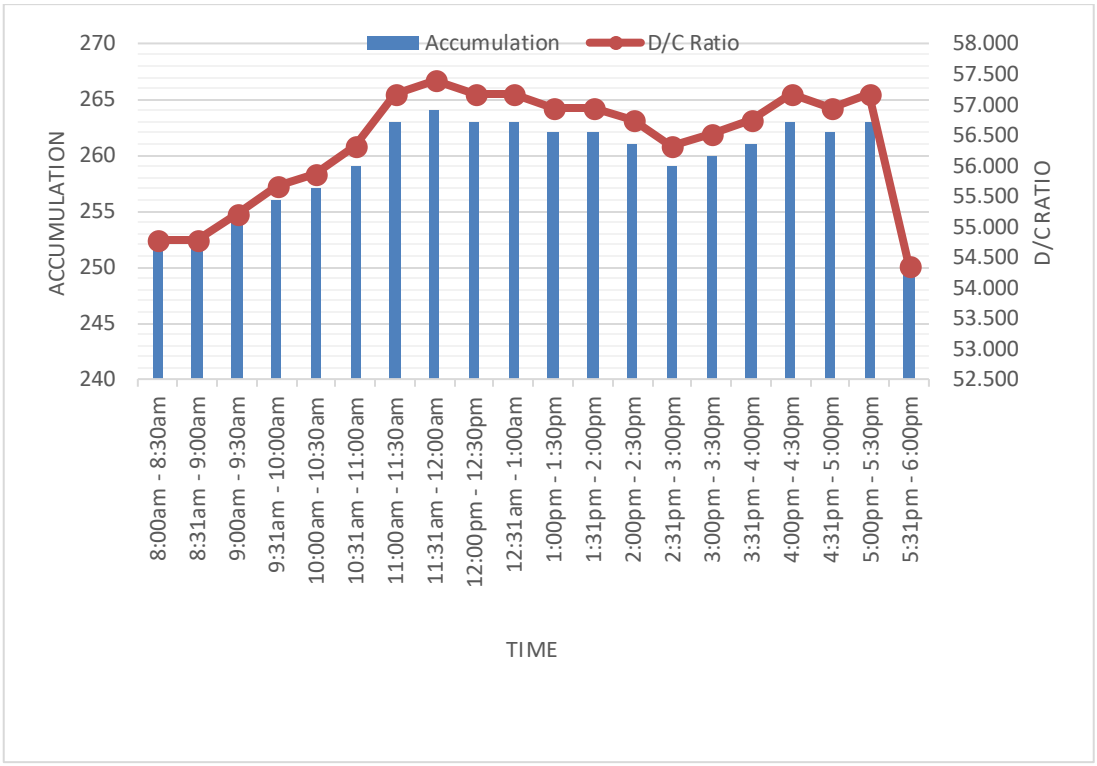

Figure 4.9 Accumulator and Demand-capacity Ratio Mercantile Parking for a Weekend.

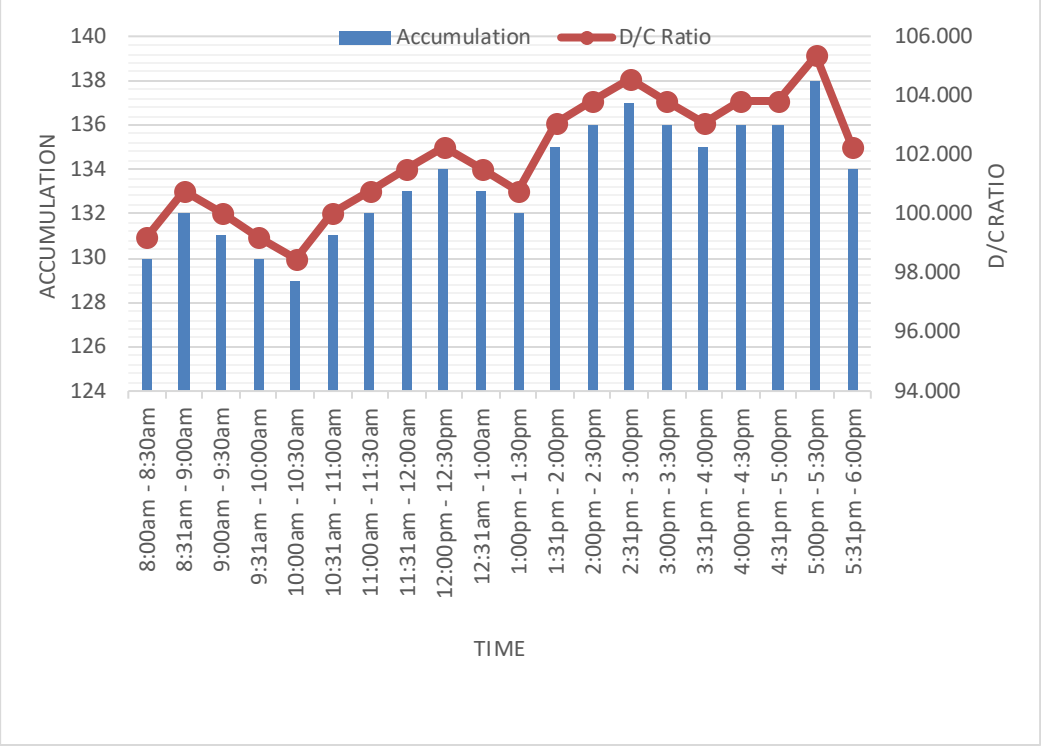

Figure 4.10 Accumulator and Demand-capacity Ratio for Mabiriizi Parking for a weekday.

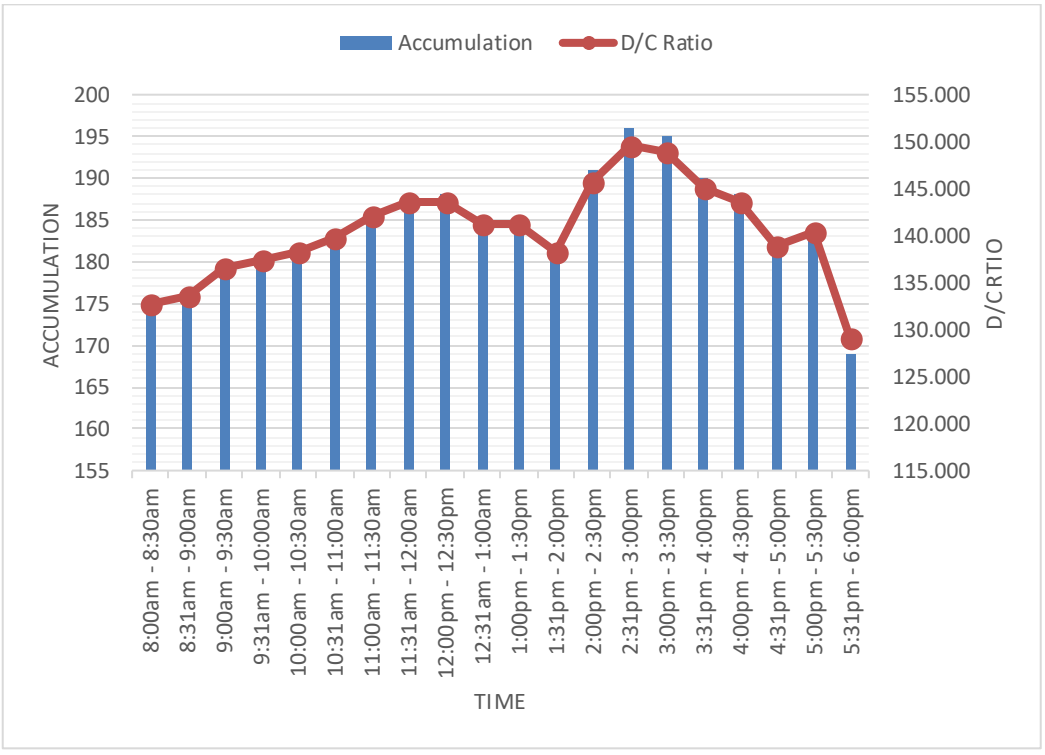

Figure 4.11 Accumulator and Demand-capacity Ratio for Mabiriizi Parking for a weekend.

4.5 Suitability Tests

The study also aimed at comparing the vital parking statistics for the various parking facilities in the 6 selected locations in Kampala and hence overarching to test for normality (a critical element in deciding whether to use parametric or non-parametric means as in the Table 4.3.

4.5 .1 Normality Tests for Vital Parking Statistics

Due to the fact that the sample (number of observations) is less than 50 (selected areas), the most appropriate tests for normality are Kolmogorov-Smirnova as well as Shapiro-Wilk where conclusions are based on testing the hypothesis that the data set is normally distributed and for this to be accepted, the Sig. Value should be greater than the level of significance ($p>0.05$). Since it is a comparative study (comparing parking characteristics for two different days including a weekday and a weekend), the use of parametric tests requires that both indicators of the variable as captured on the two days must be normally distributed (otherwise, non-parametric tests can be adopted).

Table 4.4, has $p<0.05$ for Mercantile parking efficiency indicators implying that the hypothesis indicators normally distributed is rejected. This is true for the components of parking for William Street, Kampala Road and Watoto (especially for the observations captured over the weekends). The implication is that when comparing the indicators across the different days, the parametric tests (such as samples t-tests) cannot be applied for misleading conclusions can be made. However, $p>0.05$ for Buganda Road and Mabiriizi Complex (for both data collection periods) implying that the hypothesis that the indicators are normally distributed is accepted and that parametric tests can be carried out when comparing the variables. In line with this assertion, the most appropriate parametric test applicable here is paired samples t-test at a 5% significance level as presented in the Table 4.3 below.

Table 4.3 Normality Tests for Vital Parking Characteristics.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	**Df**	**Sig.**	**Statistic**	**Df**	**Sig.**
K'la Rd. Accumulation weekday	.203	20	.031	.946	20	**.306**
K'la Rd. Occupancy weekday	.204	20	.029	.945	20	**.301**
K'la Rd. Load weekday	.203	20	.031	.946	20	**.306**
K'la Rd. Accumulation weekend	**.231**	**20**	**.006**	**.795**	**20**	**.001**
K'la Rd. Occupancy weekend	**.234**	**20**	**.006**	**.792**	**20**	**.001**
K'la Rd. Load Weekend	**.231**	**20**	**.006**	**.795**	**20**	**.001**
Bug. Rd. Accumulation weekday	.183	20	.078	.931	20	**.163**
Bug. Rd. Occupancy weekday	.183	20	.077	.931	20	**.163**
Bug. Rd. Load weekday	.183	20	.078	.931	20	**.163**
Bug. Rd. Accumulation weekend	.193	20	.050	.940	20	**.242**
Bug. Rd. Occupancy weekend	.193	20	.050	.940	20	**.242**
Bug. Rd. Load weekend	.193	20	.050	.940	20	**.242**
W. Street Accumulation weekday	.159	20	.200*	.940	20	**.238**
W. Street Occupancy weekday	.159	20	.199	.940	20	**.237**
W. Street Load weekday	.159	20	.200*	.940	20	**.238**
W. Street Accumulation weekend	**.226**	**20**	**.009**	**.866**	**20**	**.010**
W. Street Occupancy weekend	**.225**	**20**	**.009**	**.866**	**20**	**.010**

W. Street Load weekend	**.226**	**20**	**.009**	**.866**	**20**	**.010**
Watoto Accumulation weekday	.129	20	.200*	.921	20	**.105**
Watoto Occupancy weekday	.129	20	.200*	.921	20	**.105**
Watoto Parking Load weekday	.129	20	.200*	.921	20	**.105**
Watoto Accumulation weekend	**.218**	**20**	**.013**	**.835**	**20**	**.003**
Watoto Occupancy weekend	**.219**	**20**	**.013**	**.835**	**20**	**.003**
Watoto Parking Load weekend	**.218**	**20**	**.013**	**.835**	**20**	**.003**
Merc. Accumulation weekday	**.211**	**20**	**.020**	**.744**	**20**	**.000**
Merc. Occupancy weekday	**.211**	**20**	**.020**	**.744**	**20**	**.000**
Merc. Parking Load weekday	**.211**	**20**	**.020**	**.744**	**20**	**.000**
Merc.Accumulation weekend	**.203**	**20**	**.031**	**.854**	**20**	**.006**
Merc. Occupancy weekend	**.203**	**20**	**.031**	**.854**	**20**	**.006**
Merc. Parking Load weekend	**.203**	**20**	**.031**	**.854**	**20**	**.006**
Mab. Accumulation weekday	.133	20	.200*	.960	20	**.538**
Mab. Occupancy weekday	.133	20	.200*	.960	20	**.538**
Mab. Load weekday	.133	20	.200*	.960	20	**.538**
Mab.Accumulation weekend	.080	20	.200*	.982	20	**.958**
Mab.Occupancy weekend	.080	20	.200*	.982	20	**.958**
Mab. Load weekend	.080	20	.200*	.982	20	**.958**
*. This is a lower bound of the true significance.						
a. Lilliefors Significance Correction						

K'la=Kampala Road; Bug. =Buganda Road; W. Street= William Street; Merc. =Mercantile Parking; Mab= Mabirizi Complex Parking

4.5.2 Comparing Vital Parking Characteristics for the Various Locations

This entailed determining whether there existed significant differences in parking accumulation, occupancy and parking load for the different days and the different parking areas. For the indicators that passed the test of normality in the preceding table, the parametric tests are presented as in the Table 4.5.

4.5.2.1 Parametric Tests

With parametric tests, accumulation statistics for a weekday are compared with the weekend, Occupancy statistics for a Weekday are compared with the weekend and parking Load statistics for a weekday (Load weekday) are compared with the a weekend statistics (Load weekend) for the two parking areas i.e. Buganda Road and Mabiriizi Complex , using paired Samples t-tests, the results are presented as in the Table 4.5.

It is shown that parking accumulation for Mabiriizi Complex was less by 7 vehicles on a weekend and this was significant at a 5% significance level. Secondly, occupancy rates were less by an average of 11.36% on a weekend in comparison to a weekday and this difference was significant at a 5% significance level. However, parking load for Mabiriizi Complex was 225 minutes less on a weekend in comparison with a weekend was also significant at a 5% significance level. The results indicate significant differences in mean parking accumulation (113.9), mean Occupancy rate (29.28%) and parking load (3417) for Mabiriizi Complex parking statistics captured on a weekday being less than those of a weekend

Table 4.4 Parametric Test for Various Parking Characteristics.

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Merc.	AccumWeekday - AccumWeekend	-7.500	5.854	1.30888	-10.239	-4.761	-5.730	19	.000
Merc.	OccupWeekday – Occupweekend	-11.364	8.869	1.98313	-15.514	-7.213	-5.730	19	.000
Merc.	LoadWeekday – Loadweekend	-225.00	175.604	39.266	-307.185	-142.815	-5.730	19	.000
Bug.Rd.	AccumWeekday - Accumweekend	113.900	4.339	.97035	111.869	115.931	117.380	19	.000
Bug.Rd.	Occupweekday – Occupweekend	29.281	1.115	.24939	28.759	29.803	117.409	19	.000
Bug.Rd.	Loadweekday – Loadweekend	3417.00	130.186	29.11050	3356.071	3477.929	117.380	19	.000

4.5.2.2 Non-Parametric Tests

The observations that depicted non-normal distributions in table 4.6, Mann-Whitney U-Test was applied and the results are presented as in the tables below. From the table 4.5, the p value < 0.01, indicating that the null hypothesis that parking accumulation along Kampala Road was similar across the two days in consideration is rejected in favor of the alternative hypothesis which states that there exist differences in parking accumulation on Kampala Road across the two days under comparison. The same narrative can be adopted for the two indicators (occupancy rate and parking load) where the mean rank of the three parking indicators for a weekend are higher than those of a weekday.

Table 4.5 Comparing Vital Parking Characteristics for Kampala Road.

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Parking accumulation on Kampala Road Parking is the same across categories of Days under comparison	Independent-Samples Mann-Whiteney U Test	.000[1]	Reject the null hypothesis.
2	The distribution of Parking occupancy on Kampala Road Parking is the same across categories of Days under comparison	Independent-Samples Mann-Whiteney U Test	.000[1]	Reject the null hypothesis.
3	The distribution of Parking Load on Kampala Road Parking is the same across categories of Days under comparison	Independent-Samples Mann-Whiteney U Test	.000[1]	Reject the null hypothesis.

A Symptotic significance are displayed. The significance level is .05.
[1] Exact significance is displayed for this test.

From table 4.7, the p value < 0.01, indicating that the null hypothesis that parking accumulation along William Street was similar across the two days in consideration is rejected in favor of the alternative hypothesis which states that there exist differences in parking accumulation on William Street across the two days under comparison. The same narrative can be adopted for the two indicators (occupancy rate and parking load) where the mean rank of the three parking indicators for a weekend at William Street are higher than those of a weekday

Table 4.6 Comparing Vital Parking Characteristics for William Street.

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Parking accumulation on William Street Parking is the same across categories of Days under comparison	Independent-Samples Mann-Whiteney U Test	.000[1]	Reject the null hypothesis.
2	The distribution of Parking occupancy on William Street Parking is the same across categories of Days under comparison	Independent-Samples Mann-Whiteney U Test	.000[1]	Reject the null hypothesis.
3	The distribution of Parking Load on William Street Parking is the same across categories of Days under comparison	Independent-Samples Mann-Whiteney U Test	.000[1]	Reject the null hypothesis.

A Symptotic significance are displayed. The significance level is .05.
[1] Exact significance is displayed for this test.

Table 4.7, showed that the p value < 0.01, indicating that the null hypothesis that parking accumulation at Mercantile was similar across the two days in consideration is rejected in favor of the alternative hypothesis which states that there exist differences in parking accumulation on Mercantile Parking across the two days under comparison. The same narrative can be adopted for the two indicators (occupancy rate and parking load) where the mean rank of the three parking indicators for a weekend at Mercantile are higher than those of a weekday.

Table 4.7 Comparing Vital Parking characteristics for Mercantile Parking.

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Parking accumulation at Mercantile Parking Parking is the same across categories of Days under comparison	Independent-Samples Mann-Whiteney U Test	.005[1]	Reject the null hypothesis.
2	The distribution of Parking occupancy at Mercantile Parking Parking is the same across categories of Days under comparison	Independent-Samples Mann-Whiteney U Test	.005[1]	Reject the null hypothesis.
3	The distribution of Parking Load at Mercantile Parking Parking is the same across categories of Days under comparison	Independent-Samples Mann-Whiteney U Test	.005[1]	Reject the null hypothesis.

A Symptotic significance are displayed. The significance level is .05.
[1] Exact significance is displayed for this test.

Table 4.8 showed that the p value < 0.01, indicating that the null hypothesis that parking accumulation at Watoto was similar across the two days in consideration is rejected in favor of the alternative hypothesis which states that there exist differences in parking accumulation at Watoto across the two days under comparison. The same narrative can be adopted for the two indicators (occupancy rate and parking load) where the mean rank of the three parking indicators for a weekend at Watoto are higher than those of a weekday.

Table 4.8 Comparing Vital Parking Characteristics for Watoto Parking Lot.

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of Parking accumulation at Watoto Parking Parking is the same across categories of Days under comparison	Independent-Samples Mann-Whiteney U Test	.000[1]	Reject the null hypothesis.
2	The distribution of Parking occupancy at Watoto Parking Parking is the same across categories of Days under comparison	Independent-Samples Mann-Whiteney U Test	.000[1]	Reject the null hypothesis.
3	The distribution of Parking Load at Watoto Parking Parking is the same across categories of Days under comparison	Independent-Samples Mann-Whiteney U Test	.000[1]	Reject the null hypothesis.

A Symptotic significance are displayed. The significance level is .05.
[1] Exact significance is displayed for this test.

4.6 Public Parking Management Practices in Kampala

4.6.1 Public Parking Management and Governance

Public Parking management in Kampala by both government and private sector. Kampala Capital City Authority (KCCA) is responsible for :1) Planning and designation of parking areas 2) Determining and reviewing of parking tariffs 3) Supervising on street parking management and ensuring that monthly subscription has been realised by the contracted firm (Multiplex) to manage on street parking. While Multiplex is responsible for management and control of on street parking demand and collection of revenue from drivers on behalf of KCCA. It was contracted since 2003 and replaced green boat entertainment. The traffic police and Ministry of Local Government also regulate parking in the city. Responsibilities for each entity that is mentioned above in regards to public parking is not very clear. Clarification of roles and responsibilities is important in ensuring accountability. When parking functions are divided between multiple agencies or city departments, it implies that there is no single entity responsible for planning, managing,

operating and delivering of city parking services to the public. The most efficient way to provide parking services to the public could be through having a single government entity charged with the responsibility of planning, managing and controlling of all parking functions including both on street and off-street parking services.

"KCCA is our boss but they don't closely monitor our activities but they follow the reports we give them every after three months just to ensure the agreed payments have been made" .... Respondent from Multiplex.

KCCA has prioritised and put much emphasis on the financial benefits and meeting of monthly subscriptions by Multiplex. Parking management is beyond raising municipal finance. It's a fundamental aspect of managing urban mobility. Effective parking management strategies should contribute to the overall wellbeing in cities. Managing parking demand and supply means managing the car use and congestion in urban areas. Face to face interviews conducted with one key informant revealed that: *"parking management is not given the desired attention by the city authorities. KCCA only put emphasis on the monthly income that Multiplex bring in. City managers don't really care about the needs and demands of the drivers especially in the CBD where the demand is overwhelming'' Respondent from KCCA….*

4.6.2 Public Parking Supply in Kampala City

4.6.2.1 On Street Parking Supply

Paid on street parking was introduced in 1997 through the city's Strategic Framework for Reform whose overall objective was to improve service delivery in the KCC area. Through a process of competitive bidding, the contract to manage and control on street parking was awarded to Green Boat Entertainment. The contract was to run for four years between 1998 and 2002 and then after it was re-advertised. Kampala City Council (KCC) awarded the contract to manage the city streets parking spaces to Multiplex (U) Ltd on September 1, 2017. Kampala Capital City Authority (KCCA) later renewed their contract until 2020. However, the contract only covers Kampala Central Division.

Parking for private motor vehicles within the KCCA central area is dominated by use of on-street space. Information from KCCA and Multiplex Ltd indicates that the existing on-street parking supply in the city is approximately 5,082 parking spaces. Out of these, 554 spaces are not available to the public (309 are designated as 'No Parking Areas' by Police,

192 are occupied by Boda Bodas and 53 have been made unavailable by property developers). The remaining **4,528** are available for public use at a fee.However, unspecified number of spaces are reserved parking for various firms for their own use while others are designated as "NO PARKING" indicated in Figure 4.13, despite clear indication of parking lines. While, some are occupied by bodabodas and taxis. There are no spaces reserved for loading and unloading, residents and the disabled

Figure 4.12 Police Restricted Parking along Buganda Road.

Figure 4.13 Bodabodas Occupying Vast Parking Spaces Along Kampala Road.

A study undertaken by Saad Yahya et al. (2007) indicated that there were 5,500 parking spaces in the city. The current inventory indicates a reduction in number of parking spaces, which is attributed to abolition of parking on some roads, such as Entebbe Road, Hannington road as indicated in Figure 4.14 and others. Further reductions in street parking spaces are due to construction of the Kampala fly over.On-street parking which is under the management of Multiplex has been provided on various streets such as: George Street, Buganda Road, King George Way, Jinja Road, Dewinton Road, Said Barre Avenue, Parliament Avenue, Pilkington Road, Cilville Road, Speke Road, Nile Avenue, Clement Road, Johnson Road, Wilson Road, William Street, Nakivubo Street, Ben Kiwanuka Street, Katwe Road, Kisenyi Road, Market Street, Duster Street, Burton Street, Nkurumah Road, Nasser Road, Station Road and Industrial areas.

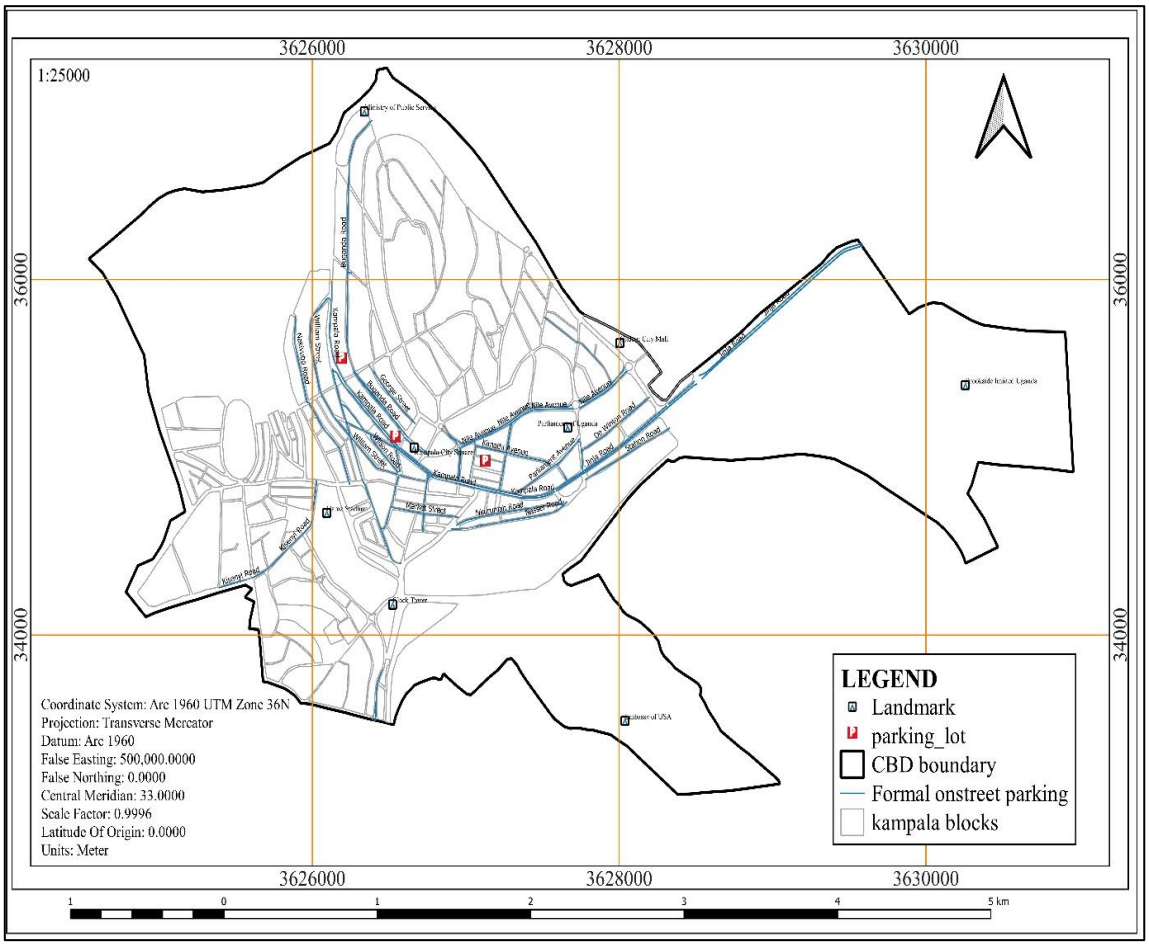

Figure 4.14 Location of on Street Parking under Formal Control by Multiplex.

In Kampala, on-street parking is allowed in many places as indicated in Figure 4.15, even on major roads where it constrains traffic flow. The Parking of Motor Vehicles Regulations of 2001, applying to Kampala District empowered Kampala City Council to identify roads

and streets on which parking places may be designated, and charge a fee for their use. Currently Multiplex Limited uses parking bay sizes of 6.6m long x 3m wide. Angle parking spaces are 2.5m wide but the angles are not defined. Generally, it is assumed that short stay parking facilities (for shopping, medical visits, drop off someone, etc.) have to be located close to the final destination and that long stay parking facilities (for work, recreation, travel etc) can be located at some distance (Van et al., 2017).

4.6.3 Off-street Parking Supply

There are some private off-street parking areas and facilities in the city. Some of these are basement parking while others are open parking yards. Generally, very limited amounts of these off-street parking facilities are available for public use. The premises that provide off-street parking are largely office or commercial sites with their parking spaces are reserved for tenant and customer use, with tenants having priority. However, there is no comprehensive inventory of available off-street vehicle parking spaces, space utilization and tariff structure in the CBD yet exists. KCCA does not have a comprehensive regulatory framework for the operation of the off-street parking facilities.

Unlike on-street parking, which is often characterized by its curbside accessibility, off-street parking provides a more secluded and secure environment for vehicles. Off street car parking facilities offer a range of options for drivers seeking a safe haven for their vehicles.Off street parking lots are also cleaner and aesthetically pleasant than on street parking. The lack of proper parking signage on streets has contributed to illegal parking and violation of parking rules in the city. Many on street parking lots lack clear parking lines and other necessary information that could enhance their proper utilization. Some of the off-street parking facilities are unbundled with external management while others are managed by the suppliers themselves.

4.6.4 Informal Parking supply

Informal public parking operates outside the regulated system in Kampala City. The demand for parking especially around social institutions like schools, hospitals, government ministries and authorities is overly whelming. In most circumstances, there is reserved parking either for employees or for certain customers which is unshared. The same applies during city events like sports galas, concerts, festivals among others, and as well around commercial areas especially markets.

The relaxed enforcement in certain areas of the city makes the informal market to taken over. The informal parking management is created and led by individual actors on ground. They mainly target private car drivers who pay an agreed amount in exchange for a parking space either on street or off street. Some commercial motorcycles locally known as boda-bodas and special hire taxis create their own parking as a way of responding to their parking needs. The same applies to some commercial and delivery vans. Such a system though serving a multitude of drivers has drawbacks. Informal parking management create barriers for Multiplex to realize their revenues as it creates an intense competition for potential clients.

4.6.5 Free Parking

There are certain areas where drivers can park without payment for the spaces. This is because Multiplex operates within certain areas. Free parking is abundant especially to those drivers well familiar with the city. City residents especially those who drive to the city centre for work normally identify parking spots either on street or off street and claim ownership. Within themselves, they provide surveillance for the safety of their vehicles and never allow any persons not among them to use such spots. Drivers tend to occupy free parking longer than they would if they paid for it. Free parking means a reduction in the cost of driving and thus the use of cars becomes an obvious choice for most trips. However, there are exemptions of payment from government vehicles (state house). Drivers of such government vehicles normally park freely as long as they want anywhere in the city without payment. On Sundays and Public holidays, on street parking is free of charge. When parking is plentiful and costs nothing, people are more likely to choose driving over alternatives like walking, biking, or taking public transit. More cars on the road means more exhaust in the air and traffic congestion, contributing to air pollution and greenhouse gas emissions.

4.6.7 Public Parking Policies and Regulations in Kampala

It is always useful to know the existing policies and laws that are in place as it makes it easier to justify their relevancy and contribution to the levels of service provided. This section lists national, state and regional policies, regulatory and legal frameworks that are related to public parking management in the city. Most policies related to parking seem to be generalized transport guidelines.There is little doubt that cities in Uganda are continually growing and thus the number of vehicles which translates to a more need and

demand for parking. Though The National Physical Planning Standards and Guidelines 2011 and the Traffic and Road Safety Regulation 2001 provide for minimum parking requirements, there is no clear and coherent parking policy in Kampala. This has contributed to improper organization, utilization and management of parking in the city.

There are no criteria for the supply and demand of public parking. Individuals and organizations reserve parking spaces in front of their premises and it is not clear who qualifies or does not qualify for this reservation. Likewise, there is no policy on the level of monthly stickers that should be sold and to what discount level for on street or off-street parking. Imbalanced fees create imbalanced demand on the less-expensive parking facility and encourage drivers to drive in circles, wasting gas and time to seek cheaper parking spaces (Eggleston, 2015). Parking schemes must be designed to fulfill objectives of the parking policy, which could include traffic restraint, accident prevention, and provision of adequate parking spaces for loading and unloading and customers of local shops.

The current public parking system in Kampala city also lacks a clear vision. It also has no monitoring and evaluation mechanism. Multiplex as managers of on street parking only have a vision statement as an agency. Various off-street parking lots don't have clear visions to guide their services. The lack of a clear city public parking vision and a monitoring mechanism has negatively affected the performance of the current parking management in the city. Where institutional responsibilities in regards to public parking management are fragmented, cities cannot ripe the benefits of effective parking management and control.

Off street parking is not gazatted by the authorities in Kampala city. Private organizations or institutions just pay the required Revenue without being regulated. Additionally, parking rates in buildings, shopping malls and open grounds are usually much more expensive. It is not clear how they arrive at such fares. Unfortunately, this is a foundation for future parking problems. Congested parking charges encourage on street parking blocking areas for short term stay drivers.Asked about the management of public parking in the city, one key informant and interviewee responded as follows:

"When you look at the parking situation in the city, as if it is not regulated at all, parking is just an after thought for city authorities, yet it's an issue that requires special attention, I personally never visit some areas in the city especially those down town shops, not

because I don't need any thing there, but because I am worried of where I will leave my car safely……"

4.6.8 Enforcement and Controls

Currently Multiplex has an automated onstreet parking fee collection technology known as pay and display meters. In addition to parking attendant deployment, this sytem partially helps to ease enforcement. The automation technology (using park and display devices) meets most of the requirements for parking control devices and it is used widely in many countries. The system is also operational in Kenya and Tanzania, which suggests that it is adaptable to Ugandan environment. Park and display meters enable better control of the parking revenue using internet capabilities. Multiplex also introduced the Plex Application which avails information on available parking to the users. The application enables users of street parking to pay their current and historical bills instantly. However, the application is accessible to only android phone users. While, many parkers are not aware of such an innovation. Without such awareness, new customers may not be attracted and this could compromise royalty. Real time information on available parking spaces allows drivers to find suitable parking without delays. This subsequently improves the overall parking experience, accelerates traffic flow and reduces emissions.

Majority of off-street parking facilities have not adopted technology. Their activities are mainly hands on which makes their operational costs higher. Subsequently, this leads to a lot of errors in their parking and payment records. Smart parking systems can contribute to the overall car park efficiency and security. Such systems provide real time information about parking availability and consist of various components that could include sensors, cameras and communication devices which work together to collect and transmit data to a central system timely hence fostering easy and effective control and management of parking facilities. Where there is violation of parking rules and regulations, vehicles are usually clamped and the owners are fined accordingly. Defaulting of on street parking fares after 48hours leads to a surcharge and when it accumulates to UGX 14,000, the vehicles are usually clumped and if the owner does not pay after 6:00pm, the vehicle is towed to multiplex premises for more charges. While for off street facilities, the use of security guards is common in ensuring law and order. Fines vary depending on a given facility in case of violation. There are no general guidelines for handling infringement of parking rules and regulations in the city.

The traffic police also take care of parking violations in the city especially for on street parking. However, often lack time and have more important tasks to do than controlling parking infringements. Thus, private entities and multiplex monitor any parking violation to handle such cases by themselves. This has led to decriminalization of parking violation where by non-police staff do the enforcement. This is in one way of an advantage because the fines levied now from on street parking is an income to the city instead of the state.

4.7 User Perception towards Public Parking Management in Kampala.

The study's second objective entailed assessing the user perceptions on the public parking management in the city in consideration of both demand and supply aspects. This was done through performance Importance Analysis as developed Martilla and James (1977) to determine the User /Customer Satisfaction Index (CSI) and those public parking attributes that drivers deem as the most important when choosing a parking space.

4.7.1 Public Parking User Performance Importance Analysis

Table. 4.9 shows the average importance and performance ratings which indicate a gap between importance and performance with a lower performance rating on majority of key important public parking attributes. The customer satisfaction index (CSI) is 2.62 which indicates that generally, the parkers are moderately satisfied with the parking management in Kampala Central Business District (KCBD). By converting this score into a percentage (2.62 out of 5), one can see that the existing parking service in the selected areas of KCBD is 52.4% successful in satisfying its users. Based on this value satisfaction as tabulated below, the users of public parking facilities are moderately Satisfied with the services provided.

"I actually fear bringing my car to the city centre due to safety reasons when parked because the parking receipts from these attendants clearly show that parking is at one's risk…. yet, I pay for it…but I have no option as you know our public transport also …."

Table 4. 9 Average Scores for Performance and Importance.

Attribute	Importance rating (Ii)	Performance Rating (Pi)	W_i	P_iW_i
Availability of parking spaces	4.000000	1.432927	0.026682	0.038233
Accessibility to parking spaces	4.192073	3.625000	0.067499	0.244685
Walking Distance after parking	2.871951	3.603659	0.067102	0.241812
Affordability of parking	4.420732	3.902439	0.072665	0.283572
User Information	2.975610	4.103659	0.076412	0.313569
Customer Response	2.942073	3.201220	0.059608	0.190819
Enforcement	3.103659	2.509146	0.046722	0.117231
Management Behaviour	4.253049	3.402439	0.063355	0.215562
Safety and Security	4.390244	3.006098	0.055975	0.168266
Design and Aesthetics	3.039634	4.301829	0.080102	0.344586
Sanitation	3.780488	2.600610	0.048425	0.125934
Higher User Prioritization	3.164634	2.801829	0.052171	0.146175
Clear Rules and Regulations	3.490854	1.902439	0.035424	0.067393
Peak Demand Management	4.064024	2.201220	0.040988	0.090223
Use of IT	3.015244	1.335366	0.024865	0.033204
Total				2.621264
Average	3.5802846	2.928658667		

Table. 4.9, illustrates the intersection in the IPA determined using the mean level of importance at 3.6 and the mean level of performance at 2.9. In Quadrant I, parkers reveal the attributes (Design and Aesthetics, User Information, Walking Distance after parking and customer response) as very important, but the performance is low and therefore pose the greatest weakness of parking management and require urgent managerial attention in order to improve quality and performance. Attributes in regards to Affordability of parking, Availability of parking spaces, Accessibility to parking spaces and Safety and Security fall under Quadrant II and parkers in Kampala Central Business District (KCBD) gave them the greatest importance and they feel satisfied. Such attributes must be preserved in the future not to risk falling back to Quadrant I.

The attributes that are considered as low priority in Quadrant III include Higher user prioritization, Enforcement, Clear rules and regulations and the use of Information Technology (IT). These attributes are not regarded as very important by the parkers. However, their performance is fair. Management could therefore transfer resources to

improve and maintain the most important attributes. The attributes (Sanitation, Peak Demand Management and Management Behavior) in Quadrant IV are considered unimportant with good performance. Parking management Authorities in Kampala City should strategically give attention to those attributes that parkers give the greatest importance yet their performance is not satisfying especially in Quadrant I as shown in Figure 4.16.

In an interview that was conducted with a key informant, it was revealed that:

"…when you look at the city, everything seems disorganized. .....earlier planners did not perform their duties well. The roads are narrow, buildings are very close to the road and this creates jam everywhere. When it comes to parking, only a few buildings provide secure parking without 'parking at owner's risk' and these come at a hefty fee…some charge as high as 3000shs per hour. On streets, cars are stolen in broad day light…some private entities provide parking spaces but without trained individuals to guide the equally ignorant (less trained) vehicle owners…..parking lots are put forward without a pre-defined pattern and without a set of qualities…even on the streets managed by Multiplex, parking does not follow a uniform pattern…In some basement parking, it is better but the lots are not effectively designed with clear signage and the fares are very high and for many, the tickets have very small letters…if the tickets can be sent online, the better… …"

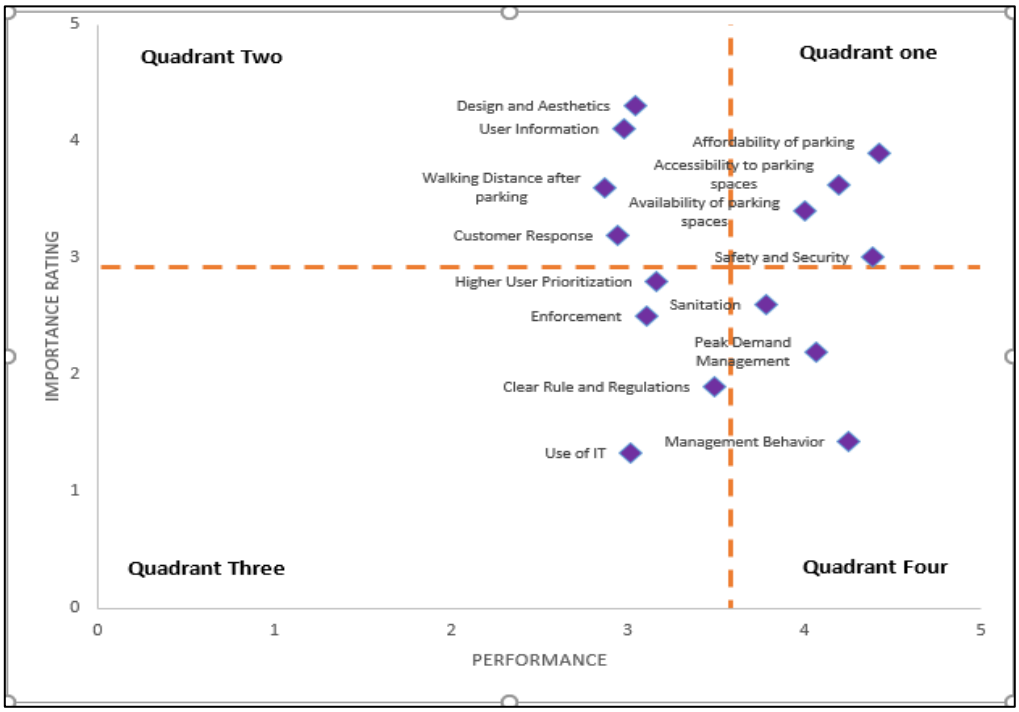

Figure 4.15 Importance Performance Grid of Parking Management in Kampala City.

4.7.2 Testing for Differences in Response to Importance and Performance by Demographic Characteristics

A number of studies have shown that demographic variables affect the way individuals respond to the survey and run using chi square statistics (χ^2), the table below presents the p-values related with the responses regarding the differences in the ratings of importance per attribute. For the importance Table 4.10 below indicate that for all attributes, gender and occupation did not explain significant differences in ratings of attributes in regards to importance ($p>0.05$). In addition, there were no significant differences in responses ratings about the importance of all the parking attributes by age ($p>0.05$) except for 'affordability of parking' ($p<0.05$) where the older individuals believed that the parking services were affordable.

Lastly, there were no significant differences in responses ratings about the importance of all the parking attributes ($p>0.05$) except for 'Use of ICT' ($p<0.05$) where the more educated individuals believed that the use of ICT for parking purposes is important. While for performance, Table 4.11 below indicates that for all attributes, despite being positive, gender, age and occupation did not explain significant differences in ratings of attributes in regards to performance ($p>0.05$). Secondly, there existed significant positive differences in all the attributes ($p<0.05$) except for 'enforcement', 'Design and Aesthetics', 'Sanitation', and 'Use of IT' where $p>0.05$.

Table 4.10 T -Test for Respondent's Characteristics and Ratings for Importance and performance.

	IMPORTANCE				**PERFORMANCE**			
Attribute	**Gender**	**Age**	**Education of level**	**Occupation**	Gender	Age	Education Level	Occupation
Availability of parking spaces	.416	.575	.860	.565	.911	.741	.000	.430
Accessibility to parking spaces	.765	.379	.540	.819	.108	.416	.020	.498
Walking Distance after parking	.244	.451	.692	.683	.140	.418	.002	.765
Affordability of parking	.192	.011	.349	.478	.573	.427	.000	.397

User Information	.876	.477	.164	.630	.286	.195	.000	.529
Customer Response	.909	.328	.486	.983	.448	.368	.000	.124
Enforcement	.879	.484	.210	.836	.122	.246	.284	.534
Management	.209	.178	.554	.617	.940	.614	.009	.430
Behavior								
Safety and Security	.869	.191	.730	.252	.843	.579	.000	.207
Design and Aesthetics	.749	.342	.508	.265	.533	.869	.633	.826
Sanitation	.802	.669	.260	.563	.216	.216	.393	.725
Higher User Prioritization	.581	.784	.118	.570	.455	.074	.005	.327
Clear Rule and Regulations	.672	.628	.973	.823	.861	.453	.000	.347
Peak Demand Management	.214	.207	.467	.795	.733	.644	.000	314
Use of Information Techinology	.447	.730	.000	.981	.987	.785	.418	.326

4.8 Strategies to Improve Public Parking Management in Kampala City

The study's third objective entailed proposing strategies to improve public parking management in Kampala City. The questionnaire, face to face interviews and as well secondary data and personal point of view was considered in this regard.

Table 4.11 Strategies for Improving Public Parking Management in Kampala City.

Responses	Strongly Disagree		Disagree		Undecided		Agree		Strongly Agree	
Interventions	F	%	F	%	F	%	F	%	F	%
There should be a general public parking management policy for the city	2	0.6	51	15.5	26	7.9	200	61.0	49	14.9
The design of parking facilities in the city should have guidelines	10	3.0	42	12.8	9	2.7	211	64.3	56	17.1
Better pricing mechanisms could improve the overall parking experience	8	2.4	32	9.8	20	6.1	209	63.7	59	18.0
The number of parking facilities provided should depend on the land use	2	0.6	32	9.8	10	3.0	251	76.5	33	10.1
Proper Enforcement and Control	5	1.5	38	11.6	22	6.7	190	57.9	73	22.3
Transport demand management measures should be adopted	9	2.7	48	14.6	41	12.5	188	57.3	42	12.8
Various stakeholders should be involved when planning for parking	2	0.6	51	15.5	18	5.5	226	68.9	31	9.5

4.8.1 Public Parking Management Strategies

a) Establishment of a City Public Parking Policy

The results showed that 61.0% agreed while 14.9% strongly agreed that there should be a general public parking management policy for the city which implies that a majority (75.9%) agreed that in Kampala there should be a public parking policy. Parking policy measures are relatively more important than many Transport Demand Management measures. Clearly, effective parking policies could complement other transport initiatives in achieving objectives relating to accessibility and environmental management. The importance of parking policy becomes more important as car ownership continues to rise. It is therefore important that ffective parking policies are formulated and implemented by the government and city authorities. If there is an excess of city centre parking over demand for it, improvements in public transport alone cannot be expected to result in a change in modal split. Many of the most significant initiatives and policies towards city centre transport depend on their success to restricting road traffic, and parking policy is one of the most potent yet also publicly acceptable means of restriction. These policies should address critical aspects of parking supply and demand management.

b) Parking Infrastructure Design Standards

On the design of parking infrastructure, 81.4% of the respondents agreed that the design of parking facilities in the city should be based on clear guidelines. Parking lot design involves many considerations. All too often the only consideration for the design is developing a sufficient parking area to meet the required number of vehicles based on adjacent occupancy. However, there should be a standardized designs for on street and off-street parking facilities to guide cities and towns. Proper designs should put into consideration of pedestrian and vehicular circulation, ease of access by drivers, provisions for Persons with Disabilities (PWDs), Provision for Bicycle parking, Proper drive way design and Layouts.

However, off- street parking facilities, circulation patterns in parking facilities should be obvious. Consideration of all pedestrian routes is key while designing off street parking. Where pedestrian circulation crosses vehicular routes, a crosswalk with yellow striping in

plastic paint, speed bumps, or signage should be provided to emphasize the conflict point and improve its visibility and safety.

Circulation routes should focus upon main entries and exits and also identify secondary access points. All elements of the site design should accommodate access requirements of emergency service vehicles.on-street parking should be restricted whenever practical along major_roadways. For on street parking, the identification of what should constitute a major urban roadway necessitates the establishment of a functional hierarchy for the urban roadway network. On the higher-level road classes, no on-street parking would be allowed except at lay-bys specially designed and provided for the purpose.

There should be allowance of a minimum of 6m wide for two traffic lanes or 3.6m wide for single traffic lane. There should be no parking 10m from pedestrian crossings and junctions. There should also be no street parking on roads where volume or capacity ratio is more than 0.8. There should be dimensions of parking bays for different uses: cars, loading and unloading, motor cycles, bicycles should be defined and the loading and unloading bay should be considered to be equivalent to two (2) car parking bays. Handicapped accessible parking spaces should be located on the shortest accessible route of travel to an accessible facility entrance. Where buildings have multiple accessible entrances with adjacent parking, the accessible parking spaces must be dispersed and located closest to the accessible entrances.

Drives that do not allow parking within the driveway right-of-way are normally 24’ for two-way traffic and 12’ for one-way traffic. For drives serving thirty (30) or fewer vehicles and where parking is not provided on either side, the width for two-way drives can be reduced to twenty-two (22) feet. Aisle widths are dependent upon traffic flow (one or two-way), angle of parking and whether or not parking is on both sides of the aisle. Signs displaying the international access symbol should be provided at each accessible parking space. The signs should be displayed on fixed mountings in an area where they are not hidden from view. Pavement marking symbols may be used to supplement signs. Spaces intended for van parking should be marked accordingly.When the side of a parking space adjoins a wall, column, or other obstruction that is taller than 0.5 feet, the width of the parking space should be increased by 2 feet on the obstructed side, provided that the increase may be reduced by 3 inches for each 12 inches of unobstructed distance from the

edge of a required aisle, measured parallel to the depth of the parking space. Lighting, security and safety, landscaping, repair and maintenance are also critical components when designing parking facilities.

c) Parking Pricing and Financial Assessment

Findings revealed that, 63.7 % agreed and 18% strongly agreed that parking pricing and Financial Assessment could improve the overall parking experience. The provision of parking requires resources that range from land, construction and management costs. Underpricing increases the amount of parking needed to meet demand, and tends to increase problems such as traffic congestion, housing unaffordability, sprawl and pollution (Litman, 2024). Most public parking is inefficiently priced or bundled with building rents, forcing consumers to pay for parking facilities regardless of whether or not they want it. When there is demand -based pricing, users tend to pay directly for the parking service and this tends to be more equitable and efficient. Experts recommend setting prices to maintain 85-90% occupancy rates; this is called performance-based or responsive pricing (Shoup, 2005).

Currently, anyone who parks at any gazetted space in Kampala Central Division is supposed to pay Shs1,000 per hour, and this only applies to the first two hours. If one spends 30 minutes parking in the same place after the first two hours, they are expected to pay an additional Shs800.This means that if you park your car for eight hours, you will be required to pay Shs 11,600; Shs2,000 for the first two hours and Shs9,600 for the extra six hours.

Parking prices should be set to equal marginal costs except if a subsidy is justifiable. For off street parking, initial marginal costs are sunk to include operational and maintenance costs but in cases where the facility has much demand, the marginal cost is the cost for expansion in order to improve supply and the parking facility in this case takes up resources that could otherwise be for other uses while on street parking also occupies land resources that could be used for example for sidewalks, bike lanes or bus lanes. Providing a free parking space is equivalent to giving out a stack of hundred dollar bills, but only to motorists; it is essentially a matching grant to purchase and drive an automobile (Litman, 2024). Free parking also incentivizes people to drive, which generates green house gas (GHG) emission as vehicles travel from parking space to parking space. The costs may

vary depending on land and labour costs. Effective pricing mechanisms could be adopted to realize maximum revenue from parking. These may include;

a. Charging the highest feasible rates
b. Use flexible and advanced payment systems
c. Improving enforcement mechanism to realize more revenue from fines
d. Refraining from free parking
e. Expansion on the management area to include the whole city rather than concentration on particular areas.
f. Gazatting off street parking as part of the whole public parking inventory in the city
g. Increase on operational hours and days including Sundays
h. Charging based on vehiche type

d) Parking Zones

A majority of the respondents (86.6% agreed that in Kampala, the number of parking facilities provided should depend on the land use. Market demand should be allowed to determine the appropriate supply of parking. This will reduce the cost of development and result in a better balance of parking supply and expected demand for the specific areas. The Central Business District could also be zoned for varying parking regulations based on the surrounding land uses, each with its pricing structure and time limits. Rates could vary depending on the zones proximity to popular areas and demand. This could help in controlling who parks where for how long and for how much.

e) Effective Enforcement

Majority of the respondents 80.2% agreed that enforcement is a key intervention in parking demand management. This involves enforcement of parking policies and regulations regarding prices and conformation to parking demand rules effectively and considerately to include time limits and time period regulations and as well parking spill over management. There should be adequate staff to guide drivers and as well control the use of parking facilities to avoid illegal parking, defaulting of parking fees and over stay. Time limits can be used to improve turnover and hence allowing for more cars to use the same spot over the course of the day. Short stay shoppers should have priority over long-stay parking for commuters, and reservation for specific users should only be allowed in very special circumstances. The current practice of space reservation and over-discounted monthly stickers appears to encourage long stay on street parking. Time limits could lead

to compelling environmental, well-being and economic advantages. Time limits may also be imposed on different categories of parkers, especially in dense areas to increase turnover. Regulations prohibiting certain hours for parking are used to discourage a particular user group from storing vehicles on street for longer periods of time. In some cities such as Bogota, parking overnight on the streets is prohibited to allow for street cleaning and snow clearing.

Adoption of appropriate techinology in parking management could also make enforcement more effective and timelier. Smart parking systems can contribute to the overall car park efficiency and security. Such systems provide real time information about parking availability and consist of various components that could include sensors, cameras and communication devices which work together to collect and transmit data to a central system timely hence fostering easy and effective control and management of parking facilities. Parking applications and websites give travelers the information they need (about on and off-street parking prices, locations, and availability) to decide how they will travel to their destination.

Digital enforcement technologies enable cities to monitor compliance with parking regulations and issue citations without using staff. Data collected from these technologies can populate parking databases to capture data on parking supply, monitor parking demand, identify trends, feed key information into parking apps and websites, and support adjustments to parking management strategies.

In case of city events, extra enforcement efforts could be a critical requirement.to manage over flow of parking. City events whether sports galas, cultural events or music concerts attract people to enjoy shared experiences. However, one of the most common challenges associated with such events is controlling parking with the influx of attendees. To ensure that city event parking is as smooth as possible, it is important to plan through estimating the number of potential drivers and identify available parking that is accessible to them. This should include both on street and off-street parking facilities. It also requires working with local authorities and private parking owners to secure enough spaces. Also, encouraging attendees to opt for public transport use could help to reduce on parking related concerns. There could be collaboration with transportation agencies also to make arrangements for special event transportation services often with discounts to make it more attractive.

f) Transport Demand Management (TDM)

Findings indicate that 70.1% of the respondents agreed that managing the demand for transport can reduce the demand for parking in the city. Public transport, cycling and walking should be an integral part of the overall transportation planning in the city. The growth of motor vehicle ownership in the city implies an increase in parking demand. Provision of a condusive environment for walking and cycling could actually supplement on the socio economic and as well the environmental wellbeing in the city. Cities such as HongKong, Singapore, Bogota and others have heavily relied on public transport and non-Motorisation as a means of travel. This has helped to curb their vehicle numbers and thus the demand for parking in the cities. In order to enhance the transition to less car dependency and more active modes, cities should reconsider standards for traditional car parking and for bicycle parking. Existing buildings without bicycle parking should be retrofitted either by converting some of their car parking spaces to bicycle parking or by providing facilities near to such buildings. This should be coupled with minimum standards depending on the land use in that particular area. These standards should be monitored, evaluated and modified regularly depending on the changing travel patterns and modal split in the city.

g) Stakeholder Involvement in Parking Planning and Management (Parking Authorities and Associations)

Majority of the respondents 78.4% agreed that various stakeholders should be involved in parking related issues in the city. Citizens and various relevant stakeholders should be involved in parking decisions. Parking attracts the interest of different road users. It is important to recognize that parking needs are wide ranging and that facilities and services should be flexible to meet the diversity of user needs. Citizens and various relevant stakeholders should be involved in parking decisions. Parking attracts the interest of different road users. Consultation is all-important in terms of parking policy,not least in order to obtain public acceptance. Consultation can be undertaken at a number of levels whether it be at a national or local level. Implementation of parking policies becomes difficult if the general public and relevant stakeholders are not involved in the initial stages of planning. Parking can also be managed through a parking management association. This could be a parking management authority or a transportation management association. These could play a role is to ensuring that the residents and visitors of the city have the best parking experience. Such an could also actively represent and promoe the citys parking

policy in line with national, urban transport policies by advancing knowledge, raising standards and assessment of parking related fees.

4.8.2 Testing for Relationship between Response to Parking Management Strategies and Demographic Characteristics

Table 4.12 below revealed that there existed no significant differences in responses about the interventions to improvement in parking management services by sex and age. The study results indicated that there existed significant differences in response S7 and Education level. However, except for S1, S5 and S6, , there existed significant differences in responses S2,S3,S4 and S7 and occupation of the respondents.

Table 4.12 Differences in responses to intervations to improve public parking management by Demographic characteristics: Chi Square Statistics.

	Chi-Square Statistics (p-values)			
	SEX	**AGE**	**Education Level**	**Occupation**
Establishment of a City Public Parking Policy (S1)	.641	.884	.928	.239
Parking Infrastructure Design Standards (S2)	.652	.172	.108	.002
Proper pricing and Financial Assessment(S3)	.697	.379	.318	.013
Parking Zoning (S4)	.462	.510	.091	.039
Proper enforcement and control(S5)	.609	.203	.207	.218
Transport demand management (S6)	.694	.090	.171	.146
Stakeholder Engagement in parking planning(S7)	.799	.676	.003	.019

CHAPTER FIVE

DISCUSSION OF THE FINDINGS

5.1 Introduction

This chapter discusses results presented in Chapter 4 on the public parking management in Kampala city in terms of the current parking characteristics and management practices, the user perceptions of public parking management in the city and strategies to improve public parking management in Kampala.

5.2 Public Parking Characteristics and Management Practices in Kampala City

There is underutilization of public parking facilities in Kampala especially for off-street parking. In the Central Business District of Kampala, the demand pattern for on street parking is spatially concentrated. The off-street parking facilities are normally under prioritised due to lack of user information. The lack of a clear public parking approval process indicates issues of micro planning and leads to wastage because some spaces or facilities will turn into empty fields. Most drivers think there is no enough parking in the city and thus issues of illegal parking and cruising for parking are common. Some public off-street parking facilities execute a closed-end management, the parking spaces are only for internal or selected customer use, which directly leads to a considerable number of vehicles parked on the roads around these units causing traffic congestion. The inefficiency of facility usage aggravates the parking problem (Liu et al, 2012).

The intensive use of motor vehicles leads to high demand of parking spaces while it is an uneven distribution in space and demand. During the period of commuting time, a large part of cars are driven out from garages and need parking lots afterwards, and thus, the accumulated time for parking is comparatively long, that is, demand for parking stays at specific time intervals in the morning and afternoon whereas parking supply is evenly distributed all day (Liu et al ,2012). According to Shoup (2005), it is highlighted that the oversupply of car parking caused traffic congestion and pollution, making cities more drivable and less walkable.

There is no comprehensive public parking policy in Kampala. Both on street and off-street parking planning and management is based on own supplier determination. What

constitutes an ideal parking facility and who should use such facilities are not well defined. If properly regulated, public parking can be a tactic to reduce congestion in cities and towns as travellers can be forced to switch to other modes of transport especially public transport. The Smart City Strategic Plan for Kampala (2020/21-2024/25) and the National Physical Development Plan (2018-2040) emphasize the need for improved mobility and transportation networks in the greater Kampala region through the provision of bypass road assets which allow for regional and intercity traffic to avoid entering city centers reducing pollution and safety risks.

Series of projects have been proposed whose ultimate goal is to achieve a congestion-free city. With such projects, it would be expected that parking issues and challenges in the region could be addressed. One of the most pressing issues outlined in the National Transport Master Plan (2008-2023) is the development and implementation of a new public parking plan. This contribute togreatly contributes to reducing the use of non-sustainable transport options, ensuring citizen mobility and destination accessibility, improving urban safety, reducing pollution and generating transparent revenue. In 2014, a BRT system was proposed for Kampala with a pilot to operate a fleet of 165 articulated buses with a capacity of 150 passengers each. These buses were expected to operate on three main routes with five non -BRT feeder lines. With such efficient higher volume public transport systems, private car usage could be minimised and thus the parking demand in the city.

Currently, less than five buses are operational on only one route. In 2011, the Ministry of Works and Transport developed a policy for Non- Motorised Transport whose primary objective is to increase the recognition of NMT as one of the key transport modes and an essential component of public transport. One of its short -term strategies was to introduce traffic management signals and bicycle parking. Under the same policy, it was proposed that by 2020 at least 50% of the trips in Kampala should be non-motorised with 200km of bicycle lanes constructed. However, the number of motorised trips still continue to grow in the city.

Off street parking facilities are not a concern of the city authorities. It is critical to consider both on street and off-street public parking as part of the overall parking inventory for the entire city. The lack of an integrated approach towards public parking management makes coordination and accountability difficult. As the parking lot management policy involves many departments and stakeholders (such as the police, KCCA, Ministry of Local

Government, Transit operators), it is difficult to coordinate the related departments, which leads to a series of problems during the construction, management, operation and other process of parking lots (Liu, 2015).

Insufficient public transport systems in the city resulted in residents to continue to acquire private vehicles. Clearly, it is difficult to regulate private driving if people have no reliable options to meet their mobility needs. An increase in vehicle ownership means an increment in parking demand and thus its control and overall management requirements. While PPPs are a great tool in the effective management of parking in cities, proper monitoring and evaluation of the contracted firms is critical. On addition to revenue raising by the cities, parking management usually has other various objectives which may include: reducing parking conflict; efficiency; urban regeneration; mobility management (Nuwagaba et al 2022).

5.3 User Perceptions towards Public Parking Management

User satisfaction are considered as a measure of a successful parking sector in cities. User satisfaction is difficult to define but is considered an evaluation construct. The provision of parking facilities and linking them to users should take into account the critical factors that users deem important. The user satisfaction index (52.4%) of parking management in Kampala city is relatively lower and this indicates a need for improvement. Affordability of parking, availability of parking spaces, accessibility to parking spaces and safety and security were accorded the greatest importance by drivers in Kampala. Drivers are often not interested in the number of parking spaces city authorities provide, rather the accessibility and safety of such facilities.

However, circling crowded streets in searching for parking spots to grappling with confusing signage, the parking experience is frequently married with dissatisfaction and inefficiency. Unclear parking regulations, poor mantainace of parking facilities, poor techinology and inadequate enforcement measures further exacerbate the negative perceptions associated with the parking services in the city. While traditional parking management has primarily focused on vehicle storage, modern urban environments must now address a broader scope of curb space management (Ahmadian et al,2025). Ahmadian et al (2015) argue that the rise of shared mobility through new services and modes, coupled with increased e-commerce has transformed curb space into a dynamic asset serving

multiple functions beyond parking and thus this evolution demands that parking policies adapt to these changing dynamics while maintaining user satisfaction.

5.4 Strategies to Improve Public Parking Management in Kampala

Generally, Parking supply and demand management strategies rotate around three major aspects. These are Infrastructure, Policy and Technology as in Table .

Table 5.1 Major Parking Management Strategies.

	Strategy	Key Elements
a.	**Policy**	Parking Management Authority
		Pricing
		Shared Parking
		Parking Zoning
		Overflow Parking Plans
		Travel Demand Management
		Stakeholder involvement
b.	**Infrastructure**	Design and Aesthetics
c.	**Techinology**	Parking Applications and Digital Enforcement

Parking planning and management has gone through a radical change where parking that would be assumed free and abundant requires optimal supply and pricing. Too much supply of parking is considered to be more or less harmful like little supply. The new paradigm strives to use parking facilities efficiently and emphasizes sharing of parking facilities between different destinations while charging parking facility costs directly to users, and providing financial rewards to people who reduce their parking demand, while the old paradigm resists change and places a heavy burden of proof on innovation (Litman, 2006 – 2023).

5.4.1 Parking Policy

As a major component of travel-demand-management strategies, parking policies have been widely used across cities to pursue two important goals relieving parking demand pressure in central areas and reducing car use (Yan et al., 2018). Many city governments are beginning to take the view that pricing and managing on and off-street parking supply more efficiently is critical to better transportation and city planning in the long-term. Cities such as Hong Kong and Singapore have used parking policies to manage the need to travel in these cities. This has mainly been well managed through provision of sufficient public transport systems and then setting parking fares that are way high for drivers so that it

becomes irrelevant for people to acquire more cars or use private cars mostly in meeting their mobility needs. De-incentivizing driving is an important first step. Providing access to public transit and creating safe corridors for pedestrians and bikers lowers the city's' reliance on cars.

According to the Institute for Transportation & Development Policy (2022), 18.6 billion pounds of carbon emissions are released into the atmosphere each year just from vehicles looking for parking. Dedicating valuable curb space to free and underpriced parking encourages drivers to take more trips by car rather than choosing alternative modes of travel. Unlike the current practice in Kampala, Parking policies should clearly stipulate the supply and utilization procedures. These should indicate parking allocations procedures, restricted spaces, essential users, Persons with Disabilities (PWDs) and the other users. Uneven parking policy has also had a number of implications on equity within cities. Allocating public resources to building free and low-cost parking ultimately shifts the costs onto everyone, so that low-income communities end up having as big of a role in subsidizing infrastructure that tends to benefit wealthier car owners and those able to afford recurring fuel costs (Institute for Transportation & Development Policy, 2022).

5.4.2 Parking Infrastructure

The Third National Development Plan (2021-2025), Vision 2040 and as well the Greater Kampala Strategic Development Plan (2021-2025) recognise the need for optimisation and prioritisation of transportation infrastructure and services. Planning and managing parking are a critical element of the transportation system and can result into a reduction in automobile use and improvement in road network efficiency. Parking provision is beyond making spaces available for drivers. It should be ensured that is easy and obvious for all types of vehicles and pedestrians to move through at any given point. Unclear circulation routes, dangerously angled spots, insufficient lighting, inadequate provisions for pedestrians, bicycles and persons with disabilities make parking facilities unsafe and dangerous to users. A committee report from the American Concrete Institute (1987) states that in addition to construction characteristics, parking lot characteristics such as lighting, well-defined entrances and exits, withcritical stall dimensions should be addressed. The report mentions providing "satisfactory service" to users as a necessity for well-designed parking lots.

Parking lot have often been an urban planning afterthought whose design has been given little consideration. Most of the parking facilities are pavement centric which is not ideal for an urban environment. Vegetation is one of the most important factors in a green parking lot. This strategy allows for numerous simultaneous benefits. Firstly, open planting space reduces the amount of hardscape, which of course also reduces the stormwater runoff generated in the area. The dual benefit is that, in addition to lowering the total impervious area, vegetation assists in treating the stormwater that is generated on site. Treat water as a resource instead of an obstacle to be removed in this way, the burden on gray infrastructure is reduced and the vegetation receives natural irrigation.

5.4.3 Parking Technology

The parking sector is currently poised for further innovation with the potential integration of autonomous vehicles and robotics systems which could drastically alter how parking is managed and experienced. Most parking lots in Kampala heavily depend on workforce to manage the incoming and outgoing vehicles. Manually monitoring parking facilities can wreak havoc on the flow of vehicles within urban areas. As the communication between parking and gate supervisors happens manually, a small information gap can result into long queues and congestion in front of parking. This ultimately leads to delays and user dissatisfaction. Another critical challenge of manual parking management is the lack of sustainability. Sustainability takes a beating when logistics facilities use manual parking systems. It is paper based with error prone nature contributes to more congestion, higher vehicle idealing and increased pollution within cities.

A well-implemented Parking Management System can reduce administrative overhead, enhance operational efficiency, and minimize the negative impact of parking on the surrounding community.Parking management solutions are designed to be user-friendly and adaptable. Drivers can easily book parking spaces in advance, manage their allocations, and enter parking areas seamlessly using their smartphones or access cards. The system’s real-time reporting tools also allow managers to track space usage and make adjustments as needed

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

This section focuses on an overview of the study, key findings, conclusion and recommendations. It also identified the research contribution to knowledge as well as key areas for further research.

6.2 Overview of the study

The study aimed at assessing the public parking management in Kampala city in view of the city's recent experience as well as future development needs. Specifically, the study aimed at achieving three objectives, namely: a) assessing public parking characteristic and management practices in Kampala City b) assessing user perceptions towards public parking management as well c) exploring potential strategies to improve public parking management in Kampala city. The study also explored both on street and off-street parking with their demand and supply management. A mixed methods research design was used in carrying out this study. Key research methods used included: questionnaires, face to face interviews and observation.

Under the same study, 328 questionnaires were administererd. Quantitative data were processed using the Statistical Package for Social Sciences (SPSS) software. T-tests, parametric tests as well Pearson Chi-Square tests were done to determine the relationship between the variables under study. Qualitative data collected from key informants that were selected using purposive sampling analyzed thematically that facilitated the identification with understanding of patterns and relationships within the data.

6.3 Key Findings of the Study

Findings revealed underutilization of the majority of studied parking facilities based on their parking indexes. The off-street parking facilities had higher levels of efficiency as compared to the on-street facilities. Security and safety are key in determining the choice of a parking facility. Watoto Parking Lot had a parking index of 83.07% and 68.8% for a weekly day and a weekend respectively. Mercantile parking Lot had a parking index of 75.96% and 56.37% on a weekly day and a weekend respectively and Mabirizi Complex

Parking had a parking index of 27.5% and 35% on a weekday and a weekend respectively. For on street parking, Kampala Road had a parking index of 49.88% and 57.5% on a weekday and a weekend respectively, Buganda Road had a parking Index of 60.73% and 31.45% on a weekday and a weekend respectively with William Street has a parking Index of 42.1% and 55.74% on weekday and a weekend respectively. The average parking duration for both on street and off-street parking is relatively shorter at about 2 ½ hours or less.

Management of public parking in Kampala is generally inefficient. The city authorities are greatly concerned about the revenues collected. There is lack of effective monitoring and evaluation of the contracted firm (Multiplex) to manage the government parking facilities. Off street parking is not effectively regulated and there is no data base of such facilities. The developers determine their parking fares and management mechanisms and thus no accountability to the city authorities. However, the charges for parking on street is uniform for all vehicles and locations within the CBD, unlike cities like Kigali there are parking zones and different vehicle types have different bay sizes with the fees levied are equally different.

There is no single city agency or department responsible for the regulation of public parking management and control. Parking regulation in the city is carried out by several agencies such as the police, KCCA, MoWT, Mini- Bus Taxi Operators Association and Commercial Motorcycles Operators Associations without clear roles and responsibilities. This is coupled with the informal market which operates outside the regulations in providing both paid and free parking. The city also lacks a localized city parking policy to respond to specific parking problems, needs and requirements.

Based on the Importance Performance Analysis (IPA), the user satisfaction Index (CSI) was 52.4% indicating a moderately satisfaction level of the parking management in Kampala by the drivers. Therefore, the fifteen public parking attributes that were studied however, four (4) of them that included affordability of parking, availability of parking spaces, accessibility to parking spaces as well safety and security were accorded the greatest importance by the drivers within the city.

The current pricing especially for on street parking is low which encourages the use of vehicles in the city. Currently, anyone who parks at any gazetted space in Kampala Central

Division is supposed to pay Shs1,000 per hour, though this applies to the first two hours. Cities such as HongKong and Sigapore have used very higher parking prices to discourage the residents from using private cars. However, they have well- planned public transit systems that serve as market segments. There is lack of stakeholder engagement in planning and management of public parking. Responsible authorities and developers simply decide on what is to be done without consultation from the city residents and various stakeholders.

6.4 Conclusion

Car parking is an essential component of urban transportation systems. Vehicles should be parked at every destination. Parking convenience affects the ease of reaching destinations and therefore affects overall accessibility. Parking convenience is among the major factors that affect shoppers' destination choices. Availability of parking space therefore influences the viability and competitive posture of commercial areas such as the Central Business District of Kampala.

Parking for private motor vehicles within the KCCA central area is dominated by use of on-street space, with limited amounts of off-street space provided for general public use. Taxis and Boda Bodas also greatly reduce the supply of parking by standing on-street for long periods while waiting for customers. Subsequently, the number of private automobiles in the city has increased, leading to a shortage of parking space in some parts of the CBD. Not only does this result in regular illegal parking, but also drivers circulating the city centre looking for parking spaces which exacerbates congestion and pollution problems. The spatially concentrated demand for parking has also resulted into underutilization of some parking facilities in the city. Yet, putting up such facilities takes up vital urban space and also requires a range of resources to operationalise with maintainance.

Management of public parking in the city involves both the formal and informal actors. The formal management is privatized to multiplex specifically for on street parking, while the informal management is individually formed especially in busy areas with a higher need and demand for parking. However, the studied parking facilities were relatively underutilized given their level of efficiency.

Currently there is no coherent and comprehensive parking policy for Kampala city. Individuals and organizations reserve parking spaces in front of their premises and it is not

clear who qualifies or does not qualify for this reservation. Besides, there are no guidelines on the level of monthly stickers that should be sold and to what discount level. Parking schemes must be designed to fulfill objectives of a comprehensive city parking policy, which include traffic restraint, accident prevention, and provision of adequate parking spaces for loading or unloading for customers of local shops. Many cities and urban centers currently recognize that proper parking management is a powerful tool in solving major transportation problems. Effective parking policies in modern day cities rectify past car focused planning and can lead to more investment in sustainable transport. Free and low-cost parking in Kampala allows to be drivers are prioritized while placing the physical, financial, and environmental burdens on everyone. New innovative city planning paradigms such as new urbanism, compact cities, smart cities and sustainable cities requires that parking should not be treated as a separate urban land use activity but rather as an integrated city planning strategy that aims to achieve a functional, competitive, inclusive, sustainable and resilient city.

Besides, several role model cities across the globe such as Singapore, Hong Kong, Dar es Salaam and Kigali have been able to address parking challenges as well as establish sustainable and resilient cities by adopting transport demand management (TDM) measures that aim to reduce dependence on private cars such as the promotion of public transportation, creating car free zones in the CBD areas, introduction of congestion charges targeting single occupancy vehicles as well as the establishment of park and ride facilities outside the central business districts. Therefore, this new policy shift is based on the realization and recognition that no single city will ever provide all the parking needs given scarcity of resources including urban land as well as competing city development priorities.

6.5 Recommendations

Based on the findings of this study as well as the best practices identified from role model cities, it is recommended that:

a) Preparation of a Comprehensive Public Parking Policy for Kampala City

For decades now, the city authorities in Kampala have used guidelines to regulate public parking. The problem with these guidelines tends to treat car parking as a separate urban land development activity, isolating it from the rest of city planning programmes. Many city -related problems and issues such as congestion, pollution, housing, urban sprawl

and city decay for example have a direct connection to the parking policies and strategies.

Clearly, effective parking policies could complement other transport initiatives in achieving objectives relating to accessibility and environmental management. The importance of parking policy becomes more important as car ownership continues to rise. It is therefore, important that effective parking policies are formulated and implemented by city authorities. If there is an excess of city centre parking over demand for it, improvements in public transport alone cannot be expected to result in a change in modal split.

Most significant initiatives and policies towards city centre transport depend for their success on restricting road traffic, and parking policy is one of the most potent yet also publicly acceptable means of restriction. Prioritising sustainable transport modes such as public transport, cycling and walking should be an integral part of the overall transportation planning in the city.

b) **Prioritisation of Sustainable Transport Options in Planning Especially Public Transport which is a Mess**.

The growth of motor vehicle ownership in the city implies an increase in parking demand. Proper parking provision requires land, finances and other operational resources. Provision of a condusive environment for walking and cycling actually supplement on the socio economic and as well the environmental wellbeing in the city. Both on street and off-street parking facilities in Kampala lack provisions for bicycle parking. Without secure and accessible parking, potential cyclists could be forced to opt for motorized means of travel. Though non-motorised transport cannot serve every purpose, it has a potential for saving resources and finances. Non-motorised transport is more affordable and resource efficient as compared to alternative forms of transportation and recreation (Litman, 2022).

c) Adopting an Integrated Approach towards Parking Provision and Land Use Planning in the City

Both on street and off-street parking supply, including private parking, should be considered together, as complementary parts of the total parking stock available in the city. Off street parking lots should be gazatted and regulated by the city council. The need for

new off street car parks should be considered within overall transport policy and the adequacy of the local highway network. Maximum allowable parking provision for a new office block in the city center with good public transport access can be restricted as opposed to the current practice of requiring a minimum provision. Thus a larger number of spaces would be required per unit of floor area of new commercial building to be located at some distance from public transport services than would be required or permitted near a major public transport service route. This probably offers a direct impact on levels of car use and can be used to control city center congestion, while promoting more sustainable modes of transport.

d) Preparing a Comprehensive Public Parking Design Manual for Cities in Uganda

This should stipulate that on-street parking should be restricted whenever practical along major_roadways. The identification of what should constitute a major urban roadway necessitates the establishment of a functional hierarchy for the urban roadway network. In Kampala, on-street parking is allowed in many places, even on major roads where it constrains traffic flow. The Parking of Motor Vehicles Regulations of 2001, applying to Kampala District empowered Kampala City Council to identify roads and streets on which parking places may be designated, and charge a fee for their use. On the higher-level road classes, no on-street parking would be allowed except at lay-bys specially designed and provided for the purpose. There should be allowance of a minimum of 6m wide for two traffic lanes or 3.6m wide for single traffic lane. There should be no parking 10m from pedestrian crossings and junctions. There should also be no street parking on roads where volume or capacity ratio is more than 0.8. There should be dimensions of parking bays for different uses: cars, loading and unloading, motor cycles, bicycles should be defined and the loading and unloading bay should be considered to be equivalent to 2 car parking bays. Currently Multiplex ltd uses parking bay sizes of 6.6m long x 3m wide. Angle parking spaces are 2.5m wide but the angles are not defined. It should be noted that design of parking spaces differs between agencies and purpose.

According to British practice, the minimum size for a bay, parallel to the kerb, should be 1.8 m in width and 4.5 m in length but variations up to 2.5 m and 6.0 m respectively are common, to allow for different site conditions and sizes of vehicles. A bay size of 2.5m wide *x* 6m would increase the number of bays available. However, the Ugandan fleet contains a significant number of 4WDs and long vehicles for example Land Cruisers,

Toyota Noah station wagons among others, which may require an extra 0.5m for ease of maneuvering.

e) **Promotion of City Densification and Mixed-use Development**.

Densification leads to a more efficient use of land through compact development. When integrated with public transit, compact development encourages people to be less reliant on private vehicles. It also makes places more walkable. Additionally, densification increases the economic efficiency of cities because it becomes easy and cheaper to deliver urban utilities and services.

f) Establishment of Park and Ride Facilities in Strategic Areas of the City

This approach helps in achieving traffic free roads and promoting more sustainable practices by the use of public transport. Under such a system, motorists park their vehicles in designated parking facilities. The implementation of an effective park and ride system requires proper planning. It is important to identify strategic locations such as major transport hubs, outskirts of the city and major interchanges that are accessible to commuters as indicated in Figure 5.1. There should be a reliable connection from the park and ride site to the city centre. Such a parking strategy has been adopted in Dar es Salaam, Tanzania, where a BRT system funded by the World Bank was introduced.

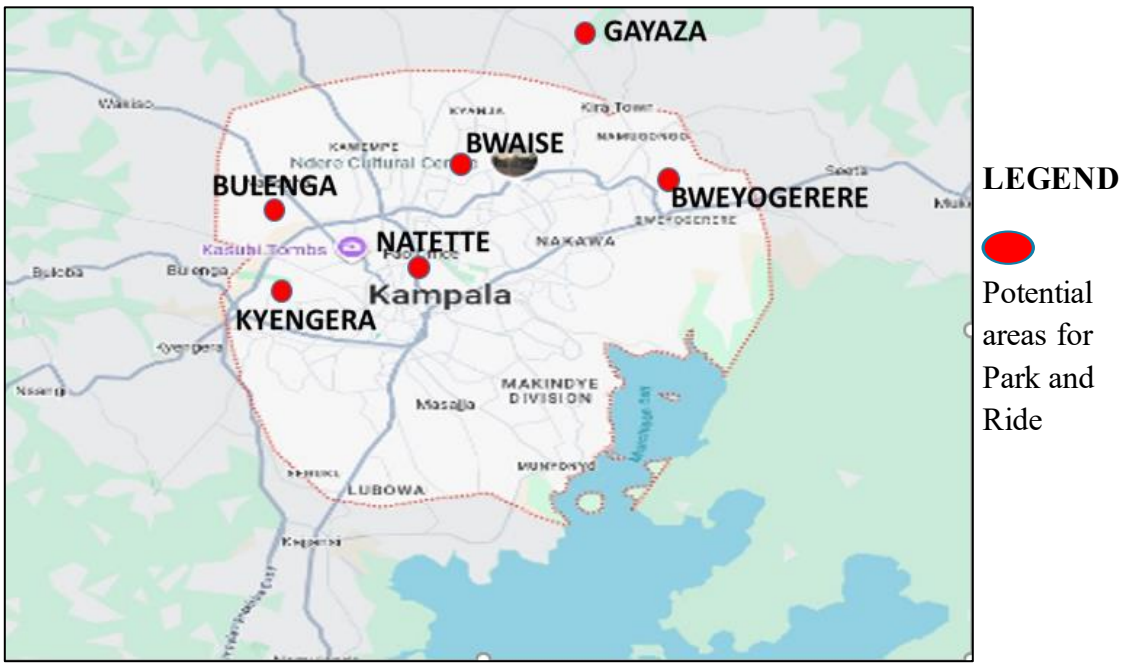

Figure 5.1 Potential areas for Park and ride facilities in Kampala City.

Institutional Reform for Improved Parking Governance and Management in the City

Establishment of a parking agency or specific department for better planning, coordination and enforcement of parking regulations in the city is extremely critical. Currently, there is an overlap in regulartory roles and duplication of functions among various agencies such as police, KCCA, MoWT, Boda Boda Association and Taxi Operators Associations. This overlap in roles and responsibilities creates gaps in communication and duplication of efforts since each entity might feel redundant and irrelevant in executing its duties and responsibilities.

h) Strict and Effective Enforcement of Parking Rules and Guidelines

Illegal and free parking in the city should be managed through strict enforcement of parking regulations. Illegal parking should be responded to effectively through a proactive approach by the city authorities. This approach includes implementing strategic steps to address the root of the problem. The control and management of illegal parking should be handled persuasively with actively leveraging community engagement, education and awareness creation to encourage responsible parking behaviours amongst motorists.

i) Flexible Parking Management Strategies

Allowing shared parking for those facilities with specific clients. The current practice in the city to reserve parking spaces for particular users makes it underutilized resulting in lower turnover rates. Shared parking ensures that the same parking facility is used by multiple users. It also allows suppliers to offer these parking spaces at better prices, compared to regular parking tariffs. Since Parking demand usually peaks at different times of the day and day of the week for different land uses, this concept helps drivers avoid the long search and circling around the city trying to find an empty parking space. Sharing arrangements could be made between individual facility developers or managers and government through development of appropriate standards with practices that could be used by relevant authorities to manage and evaluate the shared parking arrangements. Such arrangements could help to serve multiple users and destinations thus improving the

efficiency of such facilities. Improved efficiency means increased revenue for the developers or managers.

j) **Adopting New Techinology and Automation in Parking Management.**

Transitioning from predominantly manual systems to digital solutions in parking management is critical. Parking managers or developers should advance in technology in order to make it seamless for themselves and their clients. This could be through using digital barriers or QRcode scanning for entry and exit to reduce waiting times and labor costs. Automated payment systems could be intergrated to allow for quick, contactless payment options. Systems that monitor real time availability to guide drivers directly to open parking spots to reduce cruising for parking should be incorporated.

k) **Monitoring and Regulation of Contracted Private Parking Firms** like Multiplex to ensure proper accountability. This is also aimed at improving parking provision and ensuring customer satisfaction.

6.6 Originality and Research Contribution to Knowledge

The original objective of this research was to contribute to the evolving knwoledge stream on urban public parking management. The study was anchored on the idea that public parking management should be a reflection of user satisfaction so as to elicit parking management policy interventions by government or city authorities and the private sector players or developers. The other objective was also to explore best tranfereable public parking management practices especially from Sub-Saharan African cities that have tried to over come the challenges associated with car parking in their urban environments.

Although this implies that the predominant focus of the study was to provide contribution to theory given the peculiarities of the research subject and field, contribution to methodology also emerged during its operationalization. Additionally, in common with many similar researches focusing on public parking management in cities with the current urbanization arena, consequential contributions to the practice in the provision of the public parking services also flowed from the findings of the research.

More importantly, the study has initiated a deliberation in public parking management discussion by extending a debate to focus on public parking management practices and user perceptions and as well strategies for improving the parking sector, an area that is

relatively under explored especially in the context of developing cities and urban areas.

Specifically, the study has made the following significant contributions to knowledge:

a) Contribution to Theory:

i) Several research articles and papers have been published in the peer reviewed journals. This has been part of the doctoral study and training requirements. The articles published included; i) Nakanwagi, O. Kiggundu, A. Mukwaya, P. (2024). Public Parking Characteristics, Policies and Practices: Evidence from Kampala City. International *Refereed Journal of Engineering and Science.* 13, PP. 08- 22 .and; ii) Nakanwagi, O. Kiggundu, A. Mukwaya, P. (2024) An Analysis of User Perceptions Towards Public Parking Management in Kampala City (2024). *International JournalofEngineeringandComputerScience, 13*(09),2643926454. https://doi.org/10 .18535/ijecs/v13i09.4896

Information provided in these published papers will be used in formulating evidence-based policies on parking as well as in reviewing the existing parking guidelines to accommodate user needs and prefrences. The study established key attributes for an effective public parking service and what users deem as more important.These attributes included; availability of parking spaces, Accessibility to parking spaces, Walking Distance after parking, Affordability of parking, User Information, Customer Response, Enforcement, Management Behaviour, Safety and Security, Design and Aesthetics, Sanitation, Higher User Prioritization, Clear Rules and Regulations, Peak Demand Management and the use of Information Techinology in the management of public parking.

Therefore, the research provides a framework which can guide developers in the parking industry in providing services that match the needs and preferences of clients. While, the four attributes that the users accorded more importance included; affordability of parking, availability of parking spaces, accessibility to parking spaces as well Safety and security for their vehicles. However, existing theories in parking management did not consider the user point of view. The research also provides a better understanding of how proper public parking management contributes to addressing various urban transport problems and challenges.

ii) Compared and contrasted public parking management practices in Sub Saharan Africa (SSA) and Asian cities such as Dar el Salaam, Kigali, Kampala, Singapore and Hong Kong: Best practices have been identified for adoption in Kampala such as park and ride facilities, automation of parking management, time limits and time regulations, shared parking, establishment car free zones in the CBD, lowering parking requirements in Central Business areas, and fostering public private partnerships (PPPs) in the management and provision of public praking infrastructure.

b) Contribution to Methodology:

Studies on public parking management have historically been service centered than user focused. This research makes a contribution to research methodology by introducing how the Importance Performance Analysis (IPA) tool can be used to assess the user satisfaction levels in the parking service provision. The research revealed how the Importance Performance Analysis (IPA) tool can give the opportunity to assess the parking service quality for urban areas.

c) Contribution to Practice

In the context of this study, it was found that the public parking management in Kampala was inefficient with a moderate level of satisfaction to the users. Such findings make a significant contribution to an improved public parking service provision with benefits the parking suppliers including government and the private sector in refining what they offer to their customers.

6.7 Study Limitations

a) The study focused on a few parking facilities in Kampala city

b) The study focused on only private car drivers parking in the city yet parking affects a multitude of drivers.

c) Perceptions are personal and one's experience could limit the representation of multiple views.

6.8 Key Areas for Further Research

Public parking service attributes are not limited to those spelt in this research only. Future researchers could take into consideration other additional attributes. Further research could be done on how and at what level various public parking stakeholders should be engaged in parking decision making and policy formaultion. Future research on public parking technology and its application in developing cities. Besides, parking informality in cities could be explored as well as citizen participation in the design and proivision of parking facilities as well as formulation of urban parking policies. Finally, the important role of public-private partnerships (PPPs) in the provision of car parking facilities in cities.

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APPENDIX 1: QUESTIONNAIRE

Dear Respondent,

My name is Nakanwagi Orashida, a PhD student at Makerere University. As part of the course requirements, I am required to conduct a study on Public Parking management in Kampala City. You are kindly requested to fill up this questionnaire as appropriate as possible. The information given is only for academic purposes and shall be treated as confidential.

Thank you for your time and cooperation.

SECTION A: CHARACTERISTICS OF RESPONDENTS

Please circle the numbers representing the most appropriate responses for you in respect of the following items:

NAME/IDENTITY……Gender: Male……Female…..

1. What is your age group?

a) 20-29 b) 30-39 c) 40-49d) 50 -69 d) Above 70

2. What is your highest level of education?

a) Certificate b) Diploma c) Bachelor's Degree d) Post Graduate

e) Others (specify) ----------

4. What's your occupation?

a) Civil servant b) Private formal businessc) Employer d) Private informal Business e) Others (Specify)……

SECTION B: TRAVEL DYNAMICS AND MOVEMENT

1. What transport means do you mostly use

a)Public b) Private c) Walking d) Cycling e) Others (Specify)……

3. How many trips do you make in a day?

a) 0-2 b) 3-4c) 5-6d) 7-8 e) Over 9

4. How many cars do you have in your household?

a) 0-2b) 3-4c) 5-6 d) 7-8 e) Over 9

5. What brings you to Kampala Central Business District?

a) Work b) Shopping c) Leisure d) Visiting e) Others Specify…….

6. How long do you travel to reach Kampala Central Business District?

a)0-10km b)11-20kmc)21-30kmd) 30km 40 e) Above 40

7. Where does your vehicle get parked?

a) On street open ground b) Off street open ground c) On street underground d) Off street underground e) Others(specify)…….

8. How long do you normally walk after you have parked to your destination?

a)100m b)200m c)300m d) 400m e) Above 400m

9. How many minutes do you walk after you have parked to your final destination

a)1-5 b)6-10 c)11-15 d)16-20 e) Above 20mins

10. How much do you normally spend on parking each time you come to Kampala?

a) 2000-4000ugx b) 5000-7000ugx c) 8000-10.000ugx d) 10.000-12000ugx e) Above 12.000ugx

11. How much time do you normally spend looking for a suitable parking space?

a) 5-10 mins b) 11- 15 mins c) 16-20 mins d) 20-25 mins e)25 mins and above.

SECTION C: STUDY VARIABLES

1. Perceptions of the public towards public Parking Management in Kampala Central Business District;

Thinking about the public parking management in Kampala Central Business District,to what extent are you satisfied with its management.

1=Strongly unsatisfied, 2=Unsatisfied, 3=Undecided, 4=Satisfied, 5=Strongly Satisfied

a) Performance Rating

No.	ATTRIBUTES	PERFORMANCE RATING				
		1	2	3	4	5
1.	Availability of parking spaces					
2.	Accessibility to parking spaces					
3.	Walking Distance after parking					
4.	Affordability of parking					
5.	User Information					
6.	Customer Response					
7.	Enforcement					
8.	Management Behavior					
9.	Safety and Security					
10.	Design and Aesthetics					
11.	Sanitation					
12.	Higher User Prioritization					
13.	Clear Rules and Regulations					
14.	Peak Demand Management					
15.	Use of IT					

b) Importance attributes

Thinking about the public parking management in Kampala Central Business District,to what extent do you think the following aspects are important?.

1=Sstrongly unimportant,2=Unimportant ,3=Undecided,4=important ,5=Very important

No.	ATTRIBUTES	RELATIVE IMPORTANCE				
		1	2	3	4	5
1.	Availability of parking spaces					
2.	Accessibility to parking spaces					
3.	Walking Distance after parking					
4.	Affordability of parking					
5.	User Information					
6.	Customer Response					
7.	Enforcement					
8.	Management Behavior					
9.	Safety and Security					
10.	Design and Aesthetics					
11.	Sanitation					
12.	Higher User Prioritization					
13.	Clear Rule and Regulations					
14.	Peak Demand Management					
15.	Use of IT					

2.Strategies to improve Public Parking Management in Kampala

Thinking about the interventions to improve public parking management in Kampala Central Business District,to what extent do you agree with the following statements.

1=Strongly Disagree, 2=Disagree, 3=Undecided, 4=Agree, 5=StronglyAgree

	Strategies	**1**	**2**	**3**	**4**	**5**
a)	City public parking management policy					
b)	Having public parking infrastructure design standards					
c)	Proper pricing and Financial Assessment					
d)	Parking Zoning					
e)	Effective enforcement standards and controls					
f)	Transport demand Management					
g)	Stakeholder Engagement					

APPENDIX 2: INTERVIEW GUIDE

Dear Respondent,

My name is Nakanwagi Orashida, a PhD student at Makerere University. As part of the course requirements, I am required to conduct a study on Public Parking management in Kampala City. You are kindly requested to respond to this interview as appropriate as possible. The information given is only for academic purposes and shall be treated as confidential.

Thank you for your time and cooperation.

1)	Respondents Name	
2)	Date of Interview (DD/MM/YY)	_ _ / _ _ / _ _
3)	Consent obtained?	□ Yes □ No -> If no, obtain consent before proceeding
4)	Respondent's age (years)	
5)	Respondent's sex	□ 1. Male □ 2. Female □ 3. Other (specify)……
6)	Job of participant	
7)	For long have you been working in this position?	
8)	What are your main roles and responsibilities	

1. What is the Hierarchy of Public Parking management in Kampala City? *Probe for responsibilities of each.*
2. What are the key pubic parking policies and regulations in Kampala?
3. What are the public parking supply management strategies in Kampala City? *Probe for minimums and maximums, shared parking, employer parking management, residential neighbourhood parking permits, on street commercial area parking, peripheral parking lots, structured parking, park and ride, bicycle parking, design strategies, location and distribution, inventory.*
4. What are the public parking demand strategies in Kampala City? *Probe for fee and pricing system, variable rates, short term vs long term parkers, punishment method, information to parkers, coverage of demand management.*

5. What are the public parking demand and supply targets? Is there a monitoring and evaluation framework?
6. What do you think are the public parking needs for Kampala City?
7. What do you think should be the key concerns for public parking management in Kampala City?
8. What do you think are the factors that determine parking demand across Kampala City?
9. Who do you think are public parking stakeholders in Kampala City?
10. Are the stakeholders engaged during the planning of parking in Kampala?
11. What do you think are the parking needs of various stake holders in Kampala City? *Probe for Parking suppliers, regulators, management, visitors, drivers, shoppers, pedestrians, public transport users and residents.*
12. How do you think the various stakeholder parking needs could be provided for in Kampala City
13. With your experience, what challenges have you faced in relation to parking in Kampala City?
14. How do you perceive the parking supply in Kampala? *Probe for Accessibility, Affordability, Safety and security, User information, Inclusion, needs and preferences*
15. How do you perceive the parking demand in Kampala City? Probe *for Utilisation and turnover, conformation to rules and regulations.*
16. What would you consider more sustainable between off street and on street parking?
17. How do you think on street parking could be improved? How about off street?
18. What do you think are the public parking needs for a city like Kampala?
19. What do you think could be done to solve parking problems in Kampala?

APPENDIX 3 : PARKING DEMAND ON KAMPALA ROAD ON A WEEKDAY ANAD A WEEKEND

	K'la rd Day	**Wkly**	**Accumtn**	**Occupcy1**	**Load Kla1**	**K'la road Weekend**		**Accumtn2**	**Occupcy2 Kla2**	**Load Kla2**
	In	Out	**Initial count 188**			In	Out	**Initial Count 216**		
8:00am - 8:30am	5	0	193	45.63	5790	2	0	218	51.5	6540
8:31am - 9:00am	1	0	194	45.86	5820	7	0	225	53.2	6750
9:00am - 9:30am	2	1	195	46.10	5850	3	0	228	53.9	6840
9:31am - 10:00am	4	0	199	47.04	5970	8	0	236	55.8	7080
10:00am - 10:30am	2	3	198	46.81	5940	5	0	241	57.0	7230
10:31am - 11:00am	5	4	199	47.04	5970	7	3	245	57.9	7350
11:00am - 11:30am	5	2	202	47.75	6060	3	1	247	58.4	7410

11:31am - 12:00am	5	2	205	48.46	6150	2	0	249	58.9	7470
12:00pm - 12:30pm	4	3	206	48.70	6180	5	5	249	58.9	7470
12:31am - 1:00am	2	4	204	48.23	6120	4	4	249	58.9	7470
1:00pm - 1:30pm	4	4	204	48.23	6120	3	1	251	59.3	7530
1:31pm - 2:00pm	2	1	205	48.46	6150	3	2	**252**	59.6	7560
2:00pm - 2:30pm	4	5	204	48.23	6120	1	2	251	59.3	7530
2:31pm - 3:00pm	6	3	207	48.94	6210	5	6	250	59.1	7500
3:00pm - 3:30pm	3	2	208	49.17	6240	7	7	250	59.1	7500
3:31pm - 4:00pm	6	4	210	49.65	6300	3	5	248	58.6	7440
4:00pm - 4:30pm	6	5	**211**	49.88	6330	4	6	246	58.2	7380
4:31pm - 5:00pm	3	8	206	48.70	6180	5	4	247	58.4	7410

5:00pm - 5:30pm	4	5	205	48.46	6150	4	7	244	57.7	7320
5:31pm - 6:00pm	3	10	198	46.81	5940	4	9	239	56.5	7170
			202.65	**47.91**	**6080**			**243.25**	**57.5**	**7297.5**

APPENDIX 4: PARKING DEMAND ON BUGANDA ROAD ON A WEEKDAY AND A WEEKEND

	Bug rd wkly day		Accmtn	Occpncy	Load BUG1	Bug rd Wkd		Accmtn	Occu Bug2	Load Bug2
	In	Out	**216**			In	Out	**112**		
8:00am - 8:30am	4	0	220	56.555	6600	1	0	113	29.05	3390
8:31am - 9:00am	3	0	223	57.326	6690	2	2	113	29.05	3390
9:00am - 9:30am	1	1	223	57.326	6690	3	1	115	29.56	3450
9:31am - 10:00am	7	0	230	59.126	6900	3	1	117	30.08	3510
10:00am - 10:30am	4	2	232	59.640	6960	1	0	118	30.33	3540
10:31am - 11:00am	4	4	232	59.640	6960	4	0	122	31.36	3660
11:00am - 11:30am	7	4	235	60.411	7050	1	6	117	30.08	3510
11:31am - 12:00am	5	2	238	61.183	7140	2	3	116	29.82	3480
12:00pm - 12:30pm	6	5	239	61.440	7170	6	2	120	30.85	3600
12:31am - 1:00am	7	2	244	62.725	7320	11	2	129	33.16	3870
1:00pm - 1:30pm	7	3	**248**	63.753	7440	5	5	129	33.16	3870
1:31pm - 2:00pm	5	7	246	63.239	7380	0	3	126	32.39	3780

2:00pm 2:30pm	-	8	9	245	62.982	7350	13	7	132	33.93	3960
2:31pm 3:00pm	-	5	10	240	61.697	7200	8	13	127	32.65	3810
3:00pm 3:30pm	-	10	6	244	62.725	7320	12	6	**133**	34.19	3990
3:31pm 4:00pm	-	2	3	243	62.468	7290	4	11	126	32.39	3780
4:00pm 4:30pm	-	2	5	240	61.697	7200	11	5	132	33.93	3960
4:31pm 5:00pm	-	5	7	238	61.183	7140	3	9	126	32.39	3780
5:00pm 5:30pm	-	6	5	239	61.440	7170	6	5	127	32.65	3810
5:31pm 6:00pm	-	0	13	226	58.098	6780	3	21	109	28.02	3270
				236.25	**60.733**	**7087.5**			**122.35**	**31.45**	**3670.5**

APPENDIX 5: PARKING DEMAND ON WILLIAM STREET ON A WEEKDAY AND WEEKEND

		Wkly Day		Acctn	Occpncy	PkngLoad	Wknd		Accmtn	Occpncy	PkngLoad
		In	Out	Initial count (148)			In	Out	Initial Count (197)		
8:00am 8:30am	-	3	0	151	39.95	4530	1	0	198	52.38	5940
8:31am 9:00am	-	4	1	154	40.74	4620	1	0	199	52.65	5970
9:00am 9:30am	-	5	4	155	41.01	4650	3	2	200	52.91	6000
9:31am 10:00am	-	2	5	152	40.21	4560	2	1	201	53.17	6030
10:00am 10:30am	-	4	0	156	41.27	4680	5	0	206	54.50	6180
10:31am 11:00am	-	3	2	157	41.53	4710	4	2	208	55.03	6240
11:00am 11:30am	-	4	1	160	42.33	4800	6	3	211	55.82	6330
11:31am 12:00am	-	7	3	164	43.39	4920	4	2	213	56.35	6390
12:00pm 12:30pm	-	6	4	166	43.92	4980	2	1	214	56.61	6420
12:31am 1:00am	-	3	7	162	42.86	4860	2	2	214	56.61	6420
1:00pm 1:30pm	-	7	5	164	43.39	4920	6	5	215	56.88	6450

1:31pm 2:00pm	-	3	7	160	42.33	4800	4	4	215	56.88	6450
2:00pm 2:30pm	-	4	2	162	42.86	4860	5	5	215	56.88	6450
2:31pm 3:00pm	-	5	2	165	43.65	4950	4	3	216	57.14	6480
3:00pm 3:30pm	-	7	5	**167**	44.18	5010	6	3	219	57.94	6570
3:31pm 4:00pm	-	2	5	164	43.39	4920	4	3	**220**	58.20	6600
4:00pm 4:30pm	-	3	4	163	43.12	4890	5	8	217	57.41	6510
4:31pm 5:00pm	-	3	5	161	42.59	4830	5	5	217	57.41	6510
5:00pm 5:30pm	-	1	8	154	40.74	4620	5	7	215	56.88	6450
5:31pm 6:00pm	-	1	9	146	38.62	4380	0	14	201	53.17	6030
				159.15	**42.10**	**4774.5**			**210.7**	**55.74**	**6321**

APPENDIX 6: PARKING DEMAND AT WATOTO PARKING LOT ON A WEEKDAY AND A WEEKEND

		Watoto Wed(WT1)		AccmtnWT1	OccpcyWAT1	Load WT1	Watoto Wknd(WT2)		Accmtntn WT2	OccpcyWT2	Load WT2
		In	Out	**77**			In	Out	53		
8:00am 8:30am	-	2	1	78	68.42	2340	3	0	56	49.12	1680
8:31am 9:00am	-	1	1	78	68.42	2340	1	0	57	50.00	1710
9:00am 9:30am	-	4	1	81	71.05	2430	0	0	57	50.00	1710
9:31am 10:00am	-	2	0	83	72.81	2490	0	0	57	50.00	1710
10:00am 10:30am	-	1	2	82	71.93	2460	3	0	60	52.63	1800
10:31am 11:00am	-	5	1	86	75.44	2580	1	0	61	53.51	1830
11:00am 11:30am	-	9	1	94	82.46	2820	11	0	72	63.16	2160
11:31am 12:00am	-	2	0	96	84.21	2880	3	0	75	65.79	2250
12:00pm 12:30pm	-	18	4	110	96.49	3300	5	0	80	70.18	2400
12:31am 1:00am	-	6	4	112	98.25	3360	4	1	83	72.81	2490
1:00pm 1:30pm	-	10	9	**113**	99.12	3390	12	4	91	79.82	2730

1:31pm 2:00pm	-	4	6	111	97.37	3330	7	6	92	80.70	2760
2:00pm 2:30pm	-	8	12	107	93.86	3210	6	5	93	81.58	2790
2:31pm 3:00pm	-	7	8	106	92.98	3180	8	6	95	83.33	2850
3:00pm 3:30pm	-	3	11	98	85.96	2940	4	2	97	85.09	2910
3:31pm 4:00pm	-	1	4	95	83.33	2850	6	4	**99**	86.84	2970
4:00pm 4:30pm	-	3	1	97	85.09	2910	7	12	94	82.46	2820
4:31pm 5:00pm	-	2	1	98	85.96	2940	7	3	98	85.96	2940
5:00pm 5:30pm	-	2	8	92	80.70	2760	10	13	95	83.33	2850
5:31pm 6:00pm	-	2	17	77	67.54	2310	0	37	58	50.88	1740
				94.7	**83.07**	**2841**			**78.5**	**68.86**	**2355**

APPENDIX 7: MERCANTILE PARKING DEMAND ON A WEEKDAY AND A WEEKEND

	MC WKDAY		Accmtn MC 1	Occupancy MR1	Load MC1	MC Wkndd		Accmltn MC2	Occpncy MC2	Load MR2
	In	Out	213			In	Out	251		
8:00am - 8:30am	77	0	290	63.04	8700	1	0	252	54.783	7560
8:31am - 9:00am	38	0	328	71.30	9840	0	0	252	54.783	7560
9:00am - 9:30am	8	1	335	72.83	10050	2	0	254	55.217	7620
9:31am - 10:00am	12	0	347	75.43	10410	2	0	256	55.652	7680
10:00am - 10:30am	6	0	353	76.74	10590	1	0	257	55.870	7710
10:31am - 11:00am	8	0	361	78.48	10830	2	0	259	56.304	7770
11:00am - 11:30am	7	2	366	79.57	10980	6	2	263	57.174	7890
11:31am - 12:00am	2	0	368	80.00	11040	1	0	**264**	57.391	7920
12:00pm - 12:30pm	4	0	372	80.87	11160	4	5	263	57.174	7890
12:31am - 1:00am	5	1	376	81.74	11280	1	1	263	57.174	7890
1:00pm - 1:30pm	4	0	380	82.61	11400	1	2	262	56.957	7860

1:31pm 2:00pm	-	3	0	383	83.26	11490	1	1	262	56.957	7860
2:00pm 2:30pm	-	2	4	**381**	82.83	11430	0	1	261	56.739	7830
2:31pm 3:00pm	-	5	6	380	82.61	11400	3	5	259	56.304	7770
3:00pm 3:30pm	-	3	9	374	81.30	11220	1	0	260	56.522	7800
3:31pm 4:00pm	-	1	7	368	80.00	11040	3	2	261	56.739	7830
4:00pm 4:30pm	-	1	6	363	78.91	10890	3	1	263	57.174	7890
4:31pm 5:00pm	-	4	23	344	74.78	10320	1	2	262	56.957	7860
5:00pm 5:30pm	-	2	38	308	66.96	9240	2	1	263	57.174	7890
5:31pm 6:00pm	-	2	99	211	45.87	6330	0	13	250	54.348	7500
				349.4	**75.96**	**10482**			**259.3**	**56.370**	**7779**

APPENDIX 8: PARKING DEMAND AT MABIRIZI COMPLEX BASEMENT PARKING ON A WEEKDAY AND A WEEKEND

	Mabiriizi Weekday (MA1)		**Accumulation MA1**	**Occupancy MA1**	**Load MA1**	**Mabiriizi Weekend (MA2)**		**Accumltn MA2**	**Occupancy MA2**	**Load MA2**
	In	Out	22			In	Out	24		
8:00am - 8:30am	2	0	24	36.364	720	1	0	25	37.879	750
8:31am - 9:00am	2	0	26	39.394	780	2	1	26	39.394	780
9:00am - 9:30am	0	1	25	37.879	750	5	1	30	45.455	900
9:31am - 10:00am	0	1	24	36.364	720	1	0	31	46.970	930
10:00am - 10:30am	1	2	23	34.848	690	3	2	32	48.485	960
10:31am - 11:00am	2	0	25	37.879	750	2	0	34	51.515	1020
11:00am - 11:30am	1	0	26	39.394	780	6	3	37	56.061	1110
11:31am - 12:00am	1	0	27	40.909	810	7	5	39	59.091	1170
12:00pm - 12:30pm	1	0	28	42.424	840	7	7	39	59.091	1170
12:31pm - 1:00am	1	2	27	40.909	810	10	13	36	54.545	1080
1:00pm - 1:30pm	0	1	26	39.394	780	5	5	36	54.545	1080
1:31pm - 2:00pm	3	0	29	43.939	870	0	4	32	48.485	960
2:00pm - 2:30pm	1	0	30	45.455	900	13	3	42	63.636	1260

2:31pm - 3:00pm	2	1	**31**	46.970	930	8	3	**47**	71.212	1410
3:00pm - 3:30pm	0	1	30	45.455	900	12	13	46	69.697	1380
3:31pm - 4:00pm	2	3	29	43.939	870	2	7	41	62.121	1230
4:00pm - 4:30pm	2	1	30	45.455	900	1	3	39	59.091	1170
4:31pm - 5:00pm	1	1	30	45.455	900	1	7	33	50.000	990
5:00pm - 5:30pm	2	0	32	48.485	960	4	2	35	53.030	1050
5:31pm - 6:00pm	0	4	28	42.424	840	0	15	20	30.303	600
			27.5	41.667	**825**			**35**	53.030	**1050**

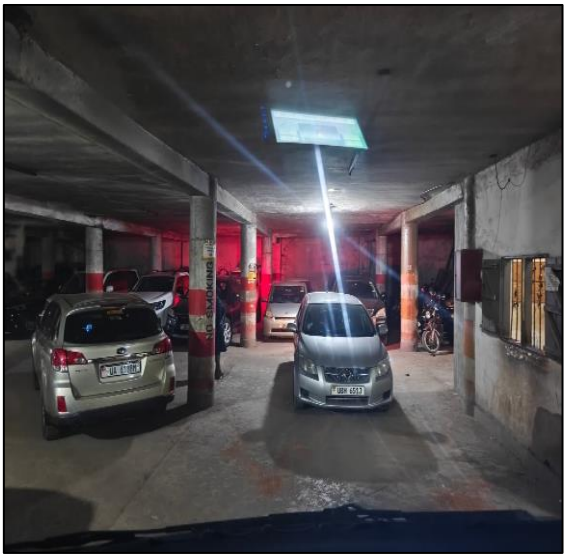
APPENDIX 9: PHOTOGRAPHY OF THE STUDIED AREAS AND PARKING BEHAVIOUR IN KAMPALA CITY

a) ILLEGAL PARKING

b) Buganda Road

c) Watoto Parking

d) Mabirizi Basement Parking



e) William Street

f) Kampala Road

h) Mercantile Parking storied parking Facility