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## Performance Analysis of Off-Street Parking around the Central Business District of Akure Southwest Nigeria

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### Abstract

Central Business Districts (CBD) are areas of dense traffic which result in parking problems. Four parks were selected for detailed study in Akure, the capital of Ondo State, Nigeria. Parking surveys were conducted to evaluate their parking index (efficiency) using both close and open-ended questionnaires. Parking index (efficiency) for OFP1, OFP2, OFP3 and OFP4 were obtained as 42.5%, 69.52%, 74.88% and 26.66% respectively. The study shows that OFP1 and OFP4 operated below the maximum capacity at parking index lower than 50%, while OFP2 and OFP3 operated above the maximum capacity when compared with Policy 7 of the Parking Space Requirements in Parking Code Guidance 2012 of San Francisco Department of Transportation. Furthermore, 50%, 36% and 14% of the respondents affirmed that the facilities are not adequate, adequate and very adequate respectively. Inadequacy in parking signage and deficiency in enforcement by Management was observed. However, effective communication, parking enforcement, operational efficiency and provision of parking signage should be adopted in the study area.

**Keywords:** Traffic, Parking Index, Central Business District, Enforcement, Operational Efficiency

## Introduction

Parking, an integral component of the transport system, is a serious problem that confronts the urban planner and traffic engineer, as it plays a crucial role in the management of traffic and congestion mitigation. Any vehicles traveling on highways will at one time or another be parked at some point for either a relatively short time or a much longer time, depending on the reason for parking. The provision of parking facilities is therefore an essential element of the highway mode of transportation.

The growing use of the automobile as a personal feeder service to transit systems (“park-and-ride”) has also increased the demand for parking spaces at transit stations. In areas of high density, where space is very expensive, the space provided for automobiles usually has to be divided between that allocated for their movement and that allocated for parking them. Providing adequate parking space to meet the demand for parking in the central business district (CBD) may necessitate the provision of parking bays along curbs which reduces the capacity of the streets and may affect the level of service (LOS). Before any measure for the betterment of the conditions can be formulated, basic data pertaining to the availability of parking space, extent of its usage and parking demand are essential. If it is proposed to implement a system of parking charges, it will also be necessary to know how much to charge and what will be the effect of the pricing policy on parking.

Parking is one of the major problems created by increasing road traffic; it has an impact on transport development. The availability of less space in urban areas has increased the demand for parking space, especially in CBD affects the mode choice and has a great economical impact. However, the minimum parking requirements for all new development and land use changes is not normally considered. These requirements are meant to ensure that there will be sufficient parking to avoid shortages and prevent spillover at adjacent properties. With the increasing growth in vehicle population on road, the problem of parking has assumed serious proportions in the study area. As a result, a systematic study of parking characteristic, demand, and regulatory measures that are possible for the control of vehicle is very important. This research, aim in analyzing the performance of off street parking at CBD in Akure, Nigeria, with a view to identify the various factors influencing the supply of parking facilities and formulate strategies for better management.

## Literature Review

Transportation is a process that involves the movement of commuters, goods and services from a given point of origin to a specific destination (Okoko, 2006). It is a means to access business activities, education, employment and recreational opportunities (World Bank, 2002). Also, Talvitie (1997) opined that urban transport is very crucial because it facilitates the movement of people and goods, which marks the backbone of economic growth and sustainable development of a country. However, Urbanization is increasing at an alarming rate with 50% of the world population expected to be living in urban areas by 2025 and more transformation is expected in developing countries (World Bank Report, 2003). With rapid urbanization and economic growth, motorization has been accelerating in cities in developing countries. This rapid urbanization with its increase in both vehicular and human population is foreseen to affect sustainable development through its negative consequences such as traffic congestion, traffic accidents, global warming through air pollution and traffic noise pollution, among others.

Transport is described as the 'maker and breaker of the cities.' Ogunsanya (2002) confirmed how transport has built cities over the year in some urban areas in Nigeria and how it has gradually destroyed them. Filani (2002) and Ikporukpo (1994) stated that inadequate and poorly maintained infrastructure facilities, accidents, the relative immobility of the disadvantaged, waiting for a long period at the bus-stop, pollution from transportation, traffic congestion and parking problems are becoming acute in the city. In another study by Brierley (1962), traffic congestion is described like a disease which if not treated, will bring death to the heart of the city. UN-Habitat (2006) also emphasized the effects of traffic on environmental pollution in cities and towns, which is a health hazard to human beings and animals.

Knoflachner (2006) affirms that cities in the third world countries face traffic congestion, which is mainly caused by the following factors:

- a) The urban setup is not compatible with the traffic demands;
- b) The rate of car usage is high rather than using a car at some point, and then one has to walk or use public transport;
- c) Little budget is put on car maintenance by owners resulting in slow-moving vehicles due to inefficiency;
- d) Inadequate traffic management measures;
- e) Flouting of traffic rules by motorists; and
- f) Inadequate public transport.

The significant role of transport in the movement of people, good and services from origin to destination which thus

improves the socio-economic status and the general development of the nation cannot be over-emphasized. Transport problems are very common in the CBD of Nigerian cities as a result of the growing concentration of population, rapid urbanization and economic activities. According to Ogundare and Ogunbodede (2014), the city is an engine of economic development and centre of industry, commerce and administration, which functions only with an efficient system of transportation. Traffic congestion is therefore one of the most predominant problems encountered in such environment, and the case of Nigeria is no exemption. In the study of Ogundare and Ogunbodede (2014) on traffic congestion and parking difficulties in Akure metropolis, Nigeria, they observed that parking problem in the CBD of Akure is a major cause of traffic congestion.

On-street parking constitutes one major problem that makes the traffic situation chaotic in Nigerian cities. Because most of the roads in Nigerian cities are narrow and lack pedestrian lanes; parking along these narrow roads therefore causes traffic congestion. This is due to the unavailability of off-street parking facilities along the transportation routes coupled with inadequate traffic management (Asiyanbola and Akinpelu 2012; Olorunfemi, 2013). However, in western countries, standards for parking requirements have been reoriented towards limiting the use of private car in congested central areas but maintaining minimum levels to preserve city center activities. This is most feasible in CBDs, where activities are interrelated because of the mix of land uses and efficient public transportation system that would decrease reliance on private cars.

Cities are characterized by different various land uses activities, and patterns of circulation is partly a functions of the land use activities and their spatial distribution. The efficiency of this circulation depends upon existing transportation systems, of which parking facilities are major component. According to Obot et al, (2009), in situations of lack of provision and poor planning in respect to other urban land use activities, the economic activities of the city may be affected. Increase in numbers of vehicles without adequate infrastructure has accentuated the problems of traffic congestion, traffic delays, parking problems, accidents, and urban land use severance (Raji and Wasiri, 2008).

In Nigeria, like elsewhere, where cars are one of the dominant modes of transportation, urban circulation is one of the most obvious problems and parking seems to be an overlooked element in transportation development (Obot and Umoh, 2007). Tanimowo and Atolagba (2006) affirmed that improvement in the living standards of people as a result of wage increases contributes almost as much as the growth of cities to contemporary urban traffic condition in Nigeria. However, for a

city to function as a system, transportation must be efficient and reliable to facilitate, not only intercity movement of people and their activities, but encourage intra-city movements within the city. These movements are from point of origin to the point of destination. They also recommended the use of benefit districts, where parking areas are shared within neighbourhoods, not only for maximizing the use of parking, but also in improving the efficiency of land use.

## **Overview of Parking Policy**

Parking policy, as a regulating tool for the use of cars in urban areas, plays a vital role in defining urban planning and transport policy. By setting appropriate standards for parking requirements, the urban transport and land use systems are supported. The amount of parking supplied influences such systems and even the characteristics of the market.

Generally, parking spaces are related to some quantitative measure of land use. The Institute for Transportation Engineers (ITE) identifies the number of dwelling units as the variable determining the number of parking slots. From parking occupancy studies, the ITE developed parking generation rates, defined as the number of parking spaces per unit of independent variable. Other foreign studies suggest using building floor area and number of bedrooms as qualitative measures. Notably, these studies stress the need to undertake localized parking studies from which to base such requirements.

## **The Study Area**

Akure with the provisional census figure of 387,087 people according to 2006 national population census, is located on latitude 7° 20'N and longitude 5° 0'E, while the natural pattern of development is linear along its main roads viz Oyemekun-Oba Adesida road and Arakale-Oda road. The existing land use is characterized by a medium density of structure within the inner core areas. Akure is mostly residential areas forming over 90% of the developed area but additional activities such as warehousing, manufacturing, workshops and other commercial uses are commonly located within the residential neighborhoods. At present the traffic composition of Akure is dominated by taxis, Okadas and minibuses.

## **Methodology**

Following the reconnaissance survey of the study area, four parks around the central business district shown in Figure 1.0 were selected for detailed study. The parks were as coded and shown in Table 1 while Plates 1 to 4 shows typical scene at

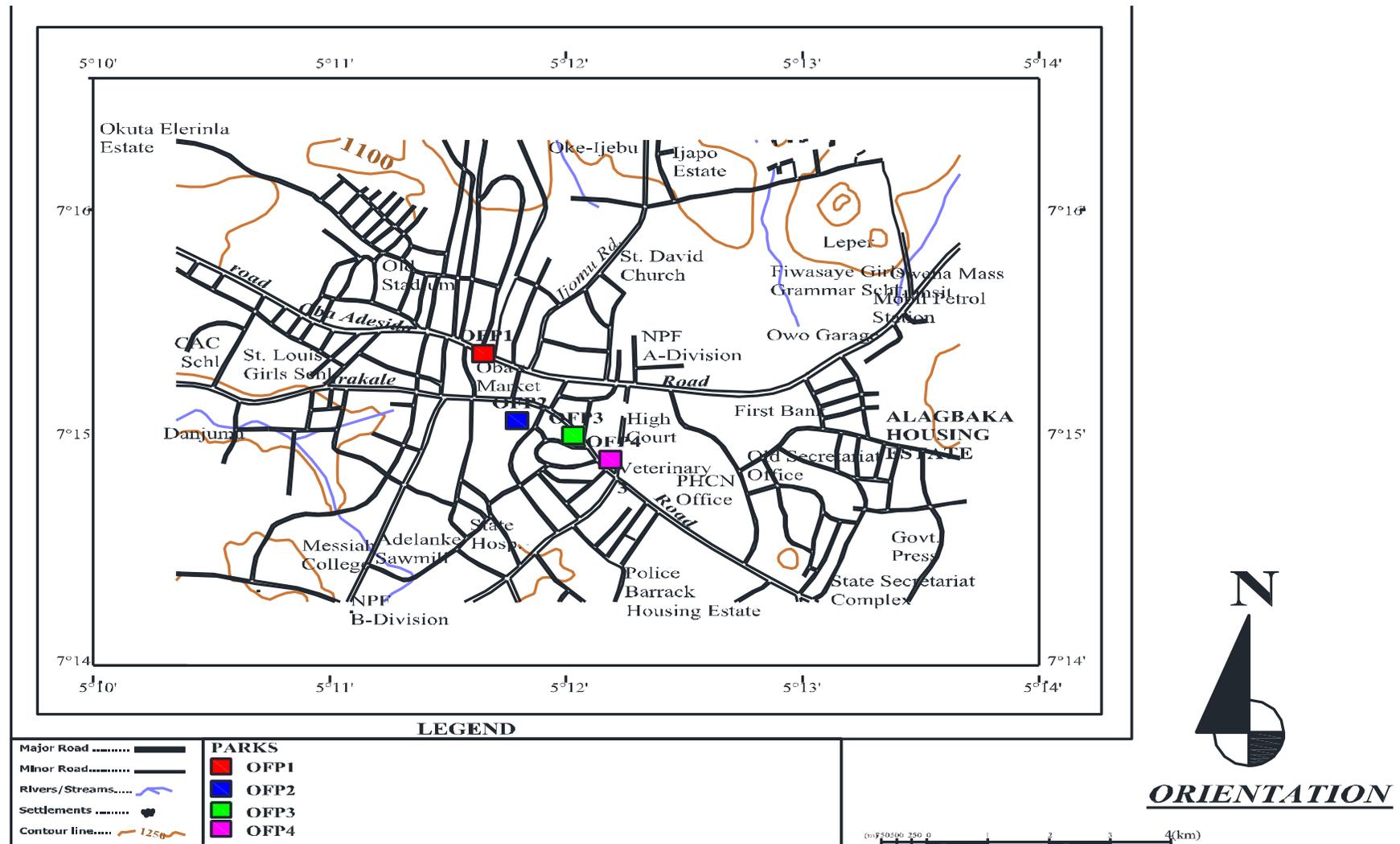
the parks. The primary data were obtained from well-structured questionnaires and personal interview while the parking surveys were conducted between 8a.m and 5p.m. License plate method of survey was adopted, so in this case of survey, every parking stall was monitored at a continuous interval of 15 minutes or so and the license plate number was noted. This gave the data regarding the duration for which a particular vehicle was using the parking bay. Both close-ended and open-ended questionnaires were administered to 800 users representing 75% of the total population.

The calculation for sample size was based on the consideration to examine at least half (50%) of the total parking bay; 680 questionnaires were retrieved for data analysis, which represent 85% of the total population.

**Table 1:** Selected Parks around The Central Business District

S/No	Park	Capacity (No. of Bays)	Cross sectional Areas (m <sup>2</sup> )		Park Use Characteristics'
1.	Democracy Park(OFP 1)	400	15,744	Behind Akure Central Mosque in OJA-OBA	Commercial, truck parks, and residential.
2.	Arakale Park 1 (OFP 2)	250	4,014.36	Along Arakale road	Commercial and residential.
3.	Arakale Park 2(OFP 3)	120	1,926.72	Along Arakale road	Commercial and residential.
4.	Arakale Park 3(OFP 4)	300	5,790.00	Along Arakale road	Commercial, truck parks, residential

**Note:** OFP is the off-street Parking



**Figure 1.0:** Existing Land-Use Structures Showing the Study Location  
**Source:** Department of Urban and Regional Planning, FUTA. (2015)



**Plate 1:** Typical Scene at Democracy Park (OFP1)



**Plate 2:** Typical Scene at Arakale Park (OFP2)



**Plate 3:** Typical Scene at Arakale Park (OFP3)



**Plate 4:** Typical Scene at Arakale Park (OFP3)

## Results and Discussion

Table 2 and Table 3 show the summary of parking accumulation and arrival - departure survey for OFP1 respectively; Figure 2 shows the parking accumulation curve, while equations 1, 2 and 3 were used to evaluate the parking statistics.

**Table 2:** Summary of Parking Accumulation for OFP1

Time of day	Number of stalls available	Number of vehicles parked inside the parking lot	Percentage (%)
Before 8a.m	400	22	5.42
8-10a.m	400	88	22.00
10-12a.m	400	197	49.33
1-3p.m	400	219	54.67
3-5p.m	400	69	17.33

**Table 3:** Arrival - Departure Survey for OFP1

Time Interval (min) (i)	Arrival (ii)	Departure (iii)	Accumulati on (iv)	Occupancy (%) (v)	Parking Load (vi)
5	8	7	138	34.50	690
10	13	6	145	36.25	725
15	11	6	150	37.50	750
20	16	7	159	39.75	795
25	11	4	166	41.50	830
30	9	7	168	42.00	840
35	10	3	175	43.75	875
40	10	5	180	45.00	900
45	15	8	187	46.75	935
50	8	8	187	46.75	935
55	13	7	193	48.25	965
60	9	9	193	48.25	965
				510.25	10,235

$$\text{parking duration} = \frac{\text{parking load}}{\text{parking volume}} \quad (1)$$

$$\text{parking turnover} = \frac{\text{parking volume}}{\text{no. of bays available}} \quad (2)$$

$$\text{parking index(efficiency)} = \frac{\text{parking load}}{\text{parking capacity}} \times 100 \quad (3)$$

Accumulation

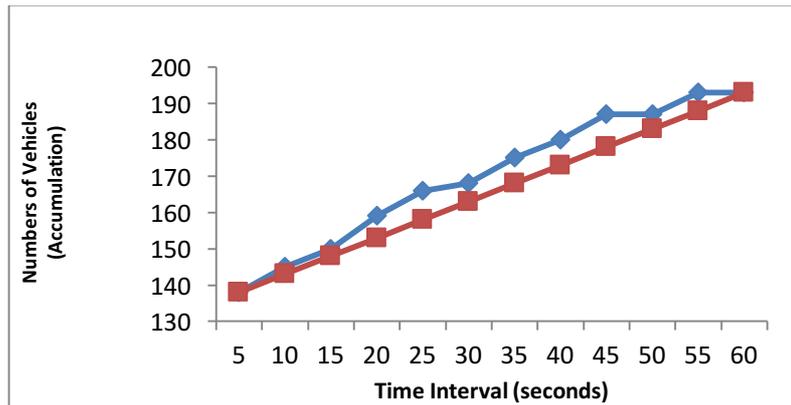
$$\begin{aligned} &= \text{initial count} + \text{no. of entering vehicles} \\ &- \text{minus the no. of exit vehicles.} \\ &= 137 + 8 - 7 = 138 \end{aligned}$$

$$\text{Parking Index} = \frac{138}{400} \times 100 = 34.5\%$$

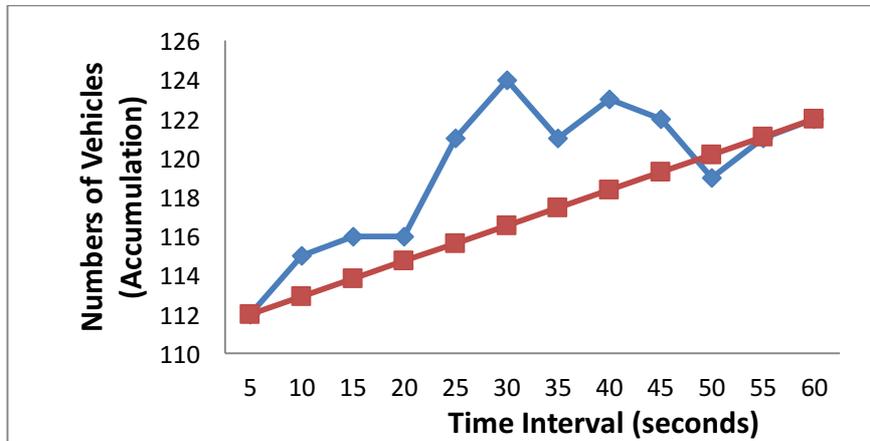
$$\text{Average Parking Index} = \frac{510.25}{12} = 42.5\%$$

$$\text{Average Parking Index} = \frac{510.25}{12} = 690 \text{ Vehicle minutes}$$

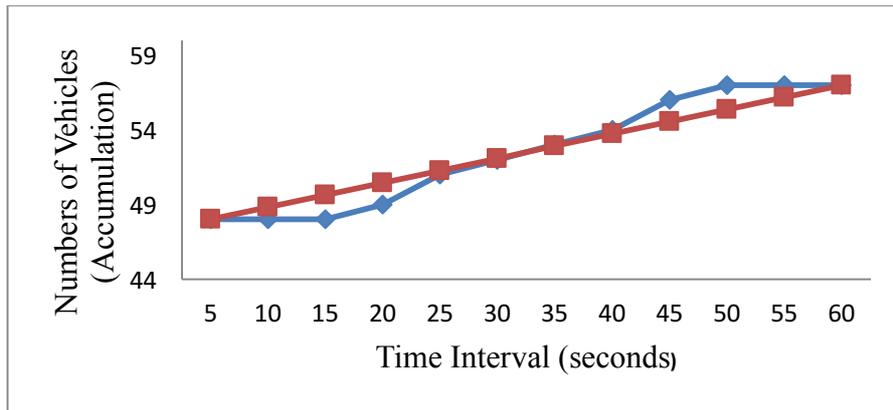
The analysis of surveys at other parks was carried out in a similar manner. Figures 3 to 5 is the parking accumulation curve for OFP2, OFP3, and OFP4.



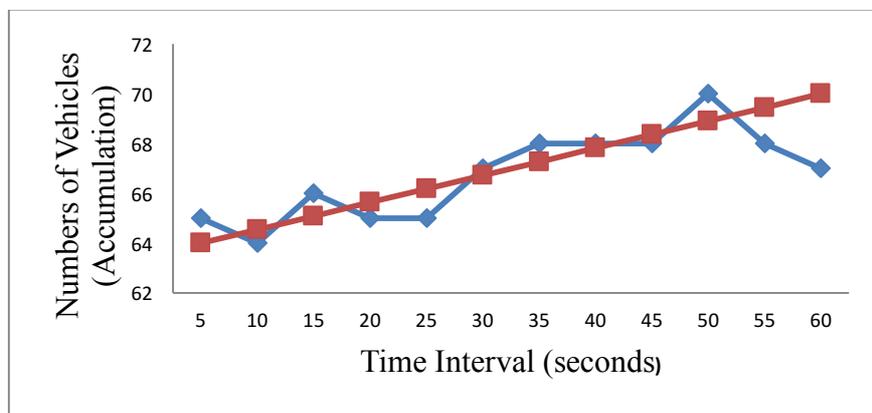
**Figure 2:** Parking Accumulation Curve for Democracy Park (OFP1).



**Figure 3:** Parking Accumulation Curve for OFP2



**Figure 4:** Parking Accumulation Curve for OFP3



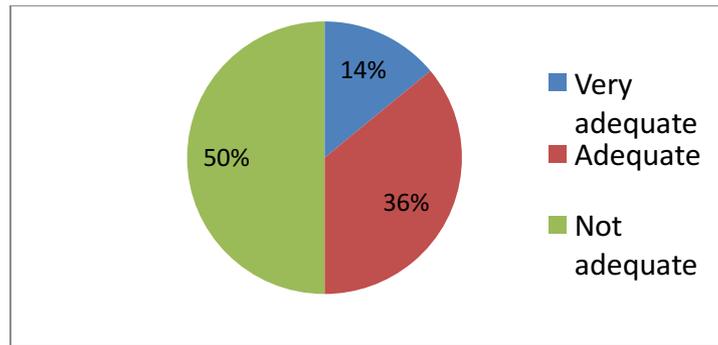
**Figure 5:** Parking Accumulation Curve for Arakale Park 3

**Remarks**

The parking index (efficiency) of 42.5%, 69.52%, 74.88% and 26.66% respectively were obtained for OFP1, OFP2, OFP3 and OFP4. The study shows that OFP1 and OFP4 operate below their maximum capacity, while OFP2 and OFP3 operate above the maximum capacity when compared with Policy 7 of the Parking Space Requirements in Parking Code Guidance 2012. Also, 50%, 36% and 14% of the respondents affirm that the facilities are not adequate, adequate and very adequate respectively.

**Analysis from users’ perspectives**

Figure 6 shows the schematic representation of the user perspective of the parks. Figure 6 shows that 50% of the respondents affirmed that the facilities are not adequate, while 36% are of the opinion that it is adequate, and 14% believed it is very adequate.



**Figure 6:** Adequacy of the Parking Spaces

## Conclusion

The growing concentration of population, rapid urbanization and economic activities at the CBD has resulted in aforementioned transport problems around it. In Akure, the development of all transport modes served as a useful catalyst in the economic development of the town. The provision of the existing parks reduces the traffic problems arising from on street parking; however, at OFP 2 and OFP3, the demand exceeds the supply.

Parking plays a vital role in promoting the efficiency of road network and accessibility of commercial land for customers especially at the CBD. However, inadequate or improper management of parking spaces, as well as ineffective law enforcement has compelled many to park along the road including the public transport operators. This act contributed immensely to traffic congestion around the CBD; thus, it causes delays in traffic movement, increase in travel time, noise pollution, air pollution, and accidents. Strategies such as effective communication, parking enforcement, operational efficiency and provision of parking signage for better and efficient management of off-street parking should be adopted in the study area.

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