Assessment of Parking Space Demand in University of Ibadan, Ibadan, Nigeria: Case Study of Faculties of the Social Sciences, Law and Education

Olugbenga Olufemi Soyebo, Oluwole Ajayi

Abstract— The demand for vehicular parking spaces has hardly been given proper attention in the dynamics of physical and land-use development alongside demographic and socio-economic development of communities and cities. Similar trends exists in university campuses which particularly attracts very high traffic volume and consequently generates considerable measures of parking demand. The study assessed the demand for parking spaces in selected faculties in the University of Ibadan through investigative parking utilization indices survey and the parking facilities users' behavioral survey. Findings reveal a mixture of inadequacy of designated parking facilities for staff and students in particular, and the under-utilization of some other parking provisions. This is indicated by a range of 60.7% to 133% peak parking occupancy ratios through the designated parking facilities only. Also, parking behaviours reveals strong preference (46.3%) for proximity to destination and (33.2%) for tree-shaded areas found mostly in un-defined parking situations and some stretches of on-street parking. The study portends the need (as recommendations) for more parking supply for staff, students and visitors based on the current parking demand excesses over the existing parking supply, and the parking generation capabilities of the faculty activities. Thus recommends that improvements on existing parking facilities and the planning and construction of new parking facilities be given due consideration to capture to a large extent, the convenience, comfort and ease of parking for the major users. Finally, effective parking management strategy should be put in place to fore-stall future burst in demand for parking in the event of space limitation for parking.

Index Terms—Parking Spaces, Parking Demand, Parking Facilities, Parking Behaviour, Parking Generation, Parking Management, University Campus.

1 INTRODUCTION

The rapid rate of urbanization has its effect on the developments of the university campus vis-à-vis population increase, expansion in physical development and increases in demand for auxiliary facilities. Parking facilities particularly have received little consideration in subsequent physical development and expansion. The consequences are highlighted with growing reliance on the use of motor vehicles apparently brought about by improvements in the state of socio-economic development in the country, which have not left out the staff of the university community and some proportion of the student population who have become empowered, as to make affordability and ownership of vehicles/cars possible.

From the early period of motorization, planning and provision for parking spaces were less considered than the motorways as the need for them were less critical. The problems associated with the demand for parking space evolves gradually with the increasing reliance on the use of the private/single occupant motor vehicles [10].

In Nigeria today, tertiary academic institutions located within most of our cities are characterized by high influx of population.

Consequently, the institutions' campus environment are faced with shortage of developmental support spaces such as those for vehicular parking. These spaces are either not provided for at all or that those provided were not adequate.

Parking is an important element of transportation systems having several impacts on the environment, yet it is often neglected and rarely given considerable attention in transportation studies [15]. The integration of all the factors of motorization and the need to exercise parking all culminate into the demand for parking.

The phenomena of parking are common occurrences on the urban and city road systems. Shoup [17] likened these city road and parking characteristics to that of big university campuses as they exhibits similar developmental or landuse features such as offices, libraries, theaters (though for lectures or multipurpose), housing, hospitals, restaurants, sporting facilities and a number of other functional and support services. Higher education is an expanding sector, in terms of both student and staff population and demand for physical facilities. Universities and colleges across the globe are faced with growth in the campus population and the loss of surface parking lots for new buildings (though at differing paces of development between the advanced countries and the developing countries). The campuses are locations of high concentrations of students and staff involved in academic and support services activities including working and living such

- *Olugbenga Olufemi Soyebo is currently a Lecturer in the Department of Architecture, Ladoke Akintola University of Technology, Ogbomoso, Nigeria. PH-+2348033343739. E-mail: oosoyebo@lautech.edu.ng*
- *Oluwole Ajayi is currently a Lecturer in the Department of Architecture, Ladoke Akintola University of Technology, Ogbomoso, Nigeria. E-mail: wolex2345@gmail.com*

that the parking demands generated often constitutes problems in meeting up with reasonable parking supply and effective parking management strategy [4],[14]. Thus, University campuses in comparison to urban centers also experience dynamic growth primarily in the academic, administrative, social and economic support services which translates to concentrated activity areas, spatial expansion and extensive physical developments and renewals. Parking provisions as auxiliary facilities need to be well integrated into the development plan for effective ordering, use and management of space, devoid of the consequences of parking inadequacy such as congestion, hazard, time loss and lower human economic input.

The scenarios of existing developments on fixed landuse environment being affected by rapid population growth and changes in landuse development, requires specialized approaches towards the planning and management of parking provisions. From the early period of the development process of cities and urban areas, parking facilities were not often backed by strong policies to ensure functional and adequate provision. In most cases, the problems of the peculiar motor vehicle overpopulation were either unexpected or allowed to be experienced to start with before making redress. Finding a parking space at an instance often constitute a source of frustration on college campuses resulting into competition for the limited number of parking spaces compels drivers to arrive well in advance of their preferred time [17], [12]. University campuses, like the cities and urban centers, are becoming highly concentrated with activities and with similar characteristics of central areas having limited or no space for spatial expansion and particularly with attendant problems from inadequate parking facilities.

The inherent problems of parking usually determine the approach towards the provision of parking facilities. This most often involves carrying out the study of inventory and assessment of existing parking facilities and situations in order to derive the peculiar demand for parking at specific locations.

The university of Ibadan, at inception, had quite some buildings and facilities to administer the processes of education in the south west region of Nigeria at a period when land use and physical planning, alongside standards and controls were contemporarily at infancy stage. The period was characterized by low level motorization / motor vehicle ownership, relatively small student population, low density compact developments and seemingly high level pedestrianization within the compact campus environment. The current parking provisions within the university campus predate the use to which it is being put now, although efforts are on-going to ameliorate the parking conditions. However, the increases in car ownership and uses in the university campus have continued to create increasing demand for vehicular parking spaces.

Adequate parking provision are seemingly slow to meet up with the growing demand, thereby creating an atmosphere that fosters traffic congestion, degradation of the pedestrian environment, friction and accident, restrain in levels of accessibility and waste of precious time. The study assessed the demand for parking spaces in selected faculties in the University of Ibadan through investigative parking utilization indices survey and the parking facilities users' behavioral survey.

2 LITERATURE REVIEW

The demand for parking spaces is brought about by the necessity (in the motorized culture) to utilize the road transport infrastructure at particular destinations. Literatures and reports on parking studies and transport demand management [11], [13], [22], etc. emphasizes that every vehicle trips requires parking at its destination, and so considers parking facilities as integrated component of the roadway system. The understanding of parking demand is critical to the findings associated with parking studies.

Most literatures refer to parking demand as the observable parking occupancy of a defined parking facility. Some describes it as the extent to which drivers use the existing supplies of these transport infrastructures; on-street parking spaces and off-street parking lots. For example, Rye [13] simply put parking demand as the necessity for a car to be parked.

The increasing reliance on the motor vehicle, particularly the private cars, is reflected in their increasing number all around the globe, but in varying degrees between the cities of the advanced and the developing nations or regions of the world and attributable to the prevailing level of technological, economic and social development.

2.1 The Global Implications for Parking Demand

A statistical reference point in time puts the world motor vehicle census to 12,588,949 (about 12.6million). In a breakdown of the figure, North and South America put together had a share of 11.16million vehicles while Africa had just 55,832 [23].

It is however noted that motor vehicles and ownership, from this reference period, has been growing at a dynamic and exponential rate. In the year 1960, the world motor vehicle rose to about 125million, and then doubling the figure by the year 1970. The trend continued up to the year 2002 when the world vehicle population rose to about 800 million. Thus, the rate of growth of the total stock of motor vehicles in the world is about 3 percent per year [5]. At this rate, the number of motor vehicles is expected to double in 25 years.

Findings from the literary statistics shows that the trend and character of motorization is not evenly spread across the globe. Some regions or countries are placed ahead in the vehicle holding per 1000 people influenced by demographic and economic factors. In other finding bordering on the regional relativity, the number of motor vehicles around the world increased by about 60 percent between 1980 and 1995 with one third portions recorded in countries of the Far East including Japan, China, Taiwan, Cambodia and Thailand [6].

Since the year 2000, the world vehicle population had been on the increase at the rate of 3.6 percent up to the year 2010 thus reflecting the world figure of over one billion vehicles in operation [21, [19]. China particularly, played a major role in

overall vehicle population growth in the year 2010 and made the country to have the world's second-largest vehicle population after the United States of America. Also, India, Brazil and some other countries recorded increases in their vehicle population [19].

The unprecedented surge in the rate of vehicle ownership in the early 20th century brought to the fore increased demand for parking spaces on-street and the consequent problem of street congestion and associated dangers due to many more vehicles exercising on-street parking [10]. The negative attributes and restriction policies of on-street parking necessitated considerations for alternative provisions for parking at a period when the demand for parking spaces were becoming critical and congestion was already a bane. Off-street parking (parking spaces provisions detached, but having access, from the street and linking the building/facilities the serve) became a solution to decongest the street of vehicles that were not in motion [3], [18].

The implied policies merely encouraging the use of off-street parking did not fully take care of the demand for parking spaces as there were controversies in development requirements bordering on the provision of parking spaces (parking requirements). The requirement was borne out of the effect of heavy reliance on the use and ownership of motor vehicles in conjunction with the high level of traffic congestion that ensued, especially at the city centers. According to Shoup [16], parking requirements are based on the observations made on the number of cars parked (at peak periods) at locations of existing developments. They are implicitly based on the observed demand for free parking. Shoup [16]'s argument were majorly based on the cost implication of providing off-street these parking spaces.

Apart from this, the minimum parking requirement has also been subjected to other opinions peculiar to advanced level of traffic congestion and management. These include the excess provision of parking lots, the resultant increase in the demand for car travel and the notion of the exercise of parking as a right, all of which hitherto have been the results of some related studies carried out in such respects.

The management of parking is considered to be borne out of the need to control the generation and the demand for parking vis-à-vis the existing parking supply with the aim of achieving efficiency of the roadway system. Thus, the management of parking is considered to be transportation demand management (TDM) oriented. According to Litman [9], parking management refers to various policies and programmes that result in more efficient use of parking resources. Several literatures including Spack, M., et al. [20], Kuzmyak, et al. [8] describes TDM as a binding agreement outlining the efforts the owner/tenants towards reducing their traffic impact and to reduce parking demand and traffic generation by 10 to 20 percent compared to typical demand standards of the Institute of Transportation Engineers (ITE).

Parking management can therefore be described as one that embraces the totality of sustainability as regards the ordering and optimal use of spatial environment with parking demand being the central issue. It proffers solutions to problems evolving with the trend of motorization without definite or deliberate control of its widespread adoption and consequential effects.

2.2 Parking Trends in University Campuses

University campuses of large sizes according to Shoup [17] are likened to small cities and exhibits similar characteristic parking tendencies. The university campuses are described as large attractors and generators of traffic, and consequential parking demand [1], [14]. Parking supply in most universities seems to be relatively static compared to the growing need and development of faculty physical and building structures. The basic educational needs commands more consideration than that which is due to the demand for parking, most especially in this era of heavy vehicular ownership and socio-economic up-trends. Like the old city centers, land becomes more valuable within the campuses and favours investments in basic activity structures other than parking.

According to several literatures on university campus parking around the world, parking spaces have become so valuable almost much more than some academic prizes [17].

The issue of parking infrastructure provision is seen as the responsibility of the universities [2] and as such, sustainable approaches towards effective campus transportation planning has been put in the fore-front for combating campus parking problems. The strategies proposed do not necessarily consider parking requirement as has been the tradition in most American cities but those that can greatly reduce the demand for parking spaces via parking pricing and subsidized public transport pass and a bundle of TDM interventions that are particularly suited for university campuses [4], [7].

It is noted however, that the trends of parking demand in university campuses are understood to be of varying degrees in the contemporary scenarios around the world and depends greatly on the regions' socio-economic character and vehicle ownership rate. The basic facts are that at a particular point in time, the parking problems at certain regions are more critical than in others, yet dynamic in upward surge. These are situations to learn from and to deduce parking demand trends.

3 RESEARCH METHODOLOGY

The research first employs purposive sampling in the identification and delineation of the study area after which the parking study methodology was used. The methodology adopts the parking beat method of longitudinal data collection in the study area. Additionally, structured questionnaires and interviews were used to obtain relevant information from the same study area.

3.1 Parking Beat Data

The survey observations were taken using the parking beat survey method. It involves patrolling of the parking areas and

vehicular count at regular interval of 30 minutes. The survey commences at 8:00am and ends at 4:30pm and was executed for five regular working days of the week (Monday to Friday).

From the parking beat survey data, the observed peak parking counts at each parking area through the period of survey were taken as the peak parking accumulation for the respective parking areas.

3.2 Questionnaire Data

The observed peak parking accumulation retrieved from the parking beat survey was used as a basis for sampling and questionnaire administration. Thus a total number of 459 (four hundred and fifty-nine) questionnaires were administered throughout the identified parking areas according to the respective peak parking accumulation.

Auto-Cad drawing package, 2010 version, was used in the graphic presentations of maps retrieved and downloaded from the internet Google satellite imageries and other drawings that were needed for this study. The parking beat data were recorded using Microsoft Excel 2013 package from which time series graphs were generated for respective parking accumulation curves of the parking areas. The data from the questionnaires administered were captured for processing using the SPSS Statistics 17.0 package.

4 THE STUDY AREA

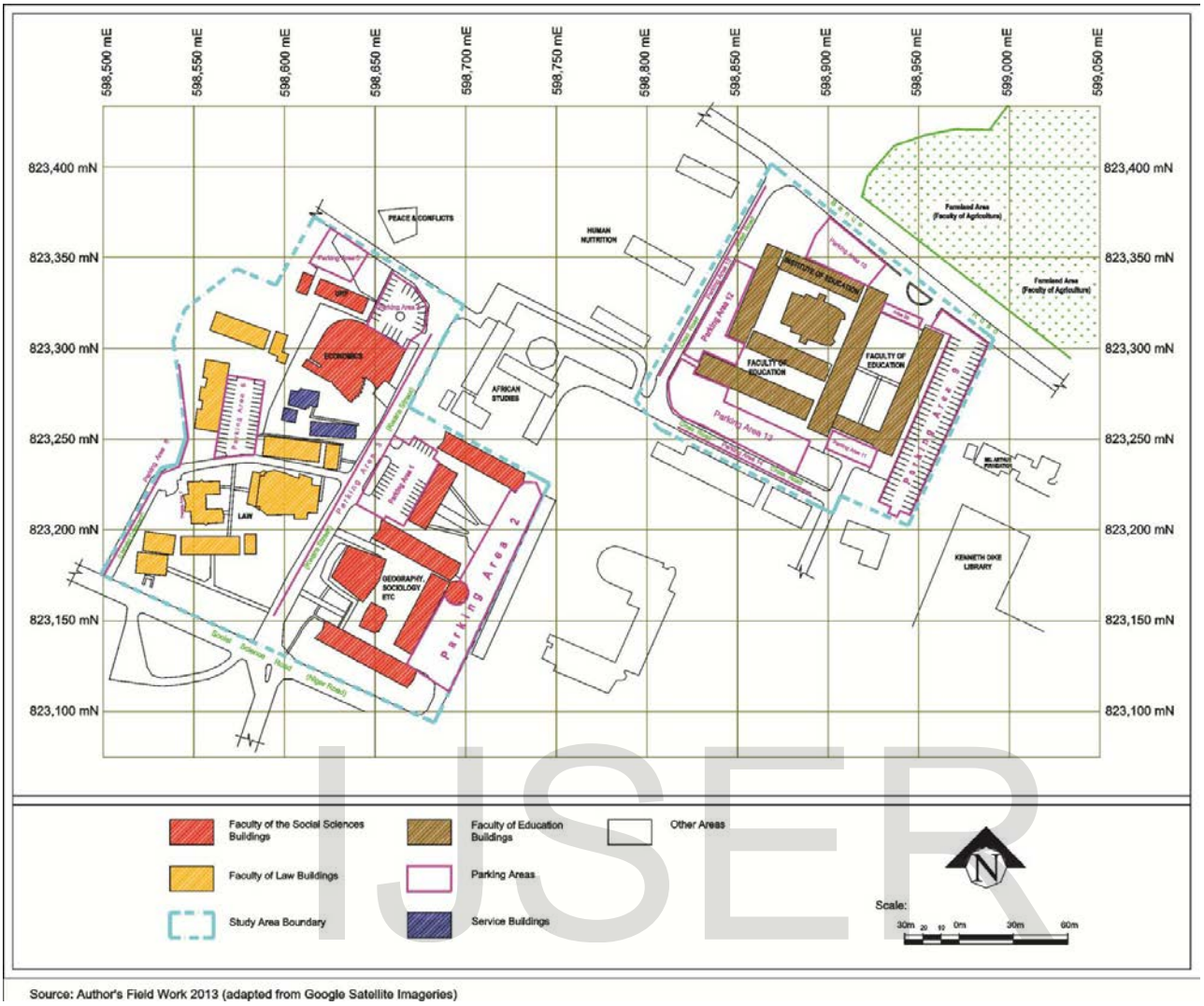
Generally, the campus area is built up with structures and facilities including thirteen faculties (with the exclusion of those of the college of medicine located outside the campus), eighteen campus units, twelve halls of students' residence; staff supports facilities and several other auxiliary services structures.

Vehicular parking activities at destinations on campus are exercised in a number of designated parking lots and at the open spaces around the campus buildings. Some others exercise parking at locations and spots particularly under tree shades in the university environment. Most of the designated lots are tagged as staff car parks except for a few that also allows parking for visitors and students.

Particularly noteworthy are the highly developed trees (in terms of age and size) that constitute the major landscape elements on the university campus. The trees, forming shades, are lined along the roadways and also in single spots and clusters in the open spaces around the campus buildings are noticeably favourite spots for vehicular parking.

The data presented in this study makes reference to the inventory of buildings, roads and parking situations in the study area and the relative locations of the faculties in focus.

Figure 1: Map Showing the Study Area Coverage (Faculty of the Social Sciences, Law and Education)



Source: Author's Field Work 2013 (adapted from Google Satellite Imageries)

Also, there exists several other areas not particularly designated for parking, in terms of parking planning features and organization, but have assumed the status of parking areas by their frequency of use and volume of parking accumulation.

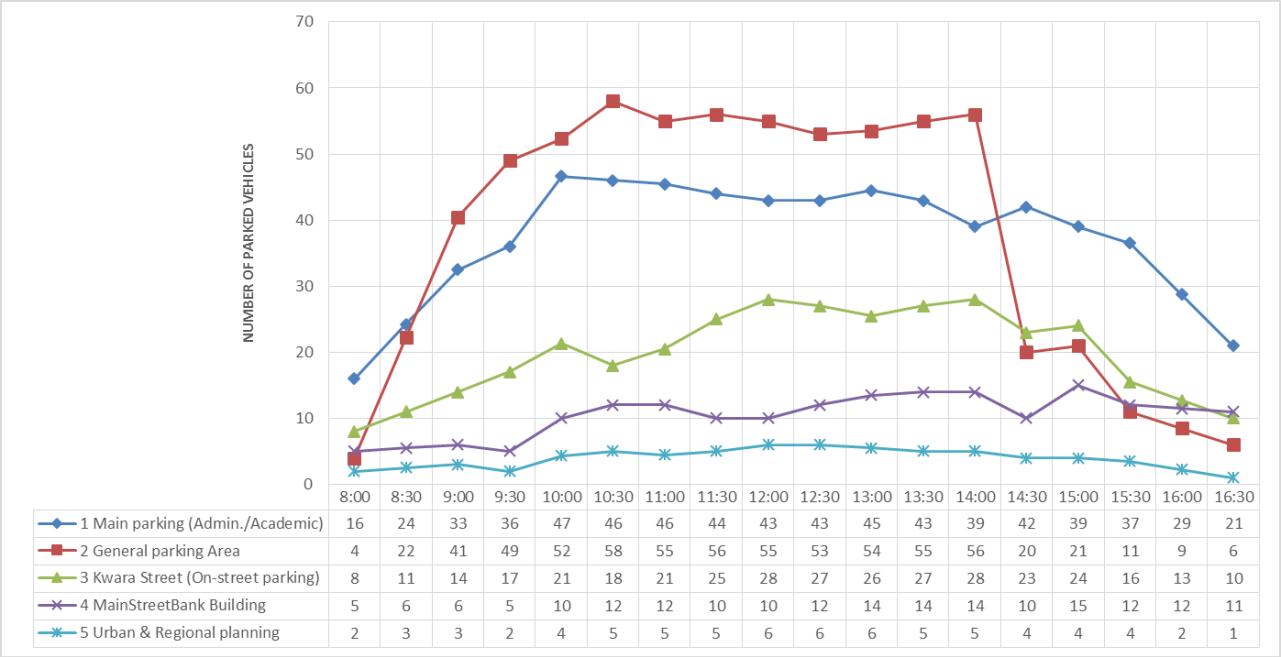
The study is limited to the academic areas of the university campus with particular focus on three faculties namely; Faculty of the Social Sciences, Faculty of Law and Faculty of Education (Figure 1).

5 DATA ANALYSIS AND FINDINGS

Survey data are presented from two methods of survey mentioned in the methodology and were subsequently analyzed.

Firstly, the analysis for the parking characteristics of the study area based on observations and data recordings from the parking beat survey presented in weekly averages for the period (Figures 2,3,and 4). The parking accumulation for all the parking situations and the parking parameters of each of the defined parking areas with known capacities are calculated; from which some indices of parking utilization are derived.

Figure 2: Parking Accumulation Trends (week averages) for faculty of the Social Sciences.



	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30
1 Main parking (Admin./Academic)	16	24	33	36	47	46	46	44	43	43	45	43	39	42	39	37	29	21
2 General parking Area	4	22	41	49	52	58	55	56	55	53	54	55	56	20	21	11	9	6
3 Kwara Street (On-street parking)	8	11	14	17	21	18	21	25	28	27	26	27	28	23	24	16	13	10
4 MainStreetBank Building	5	6	6	5	10	12	12	10	10	12	14	14	14	10	15	12	12	11
5 Urban & Regional planning	2	3	3	2	4	5	5	5	6	6	6	5	5	4	4	4	2	1

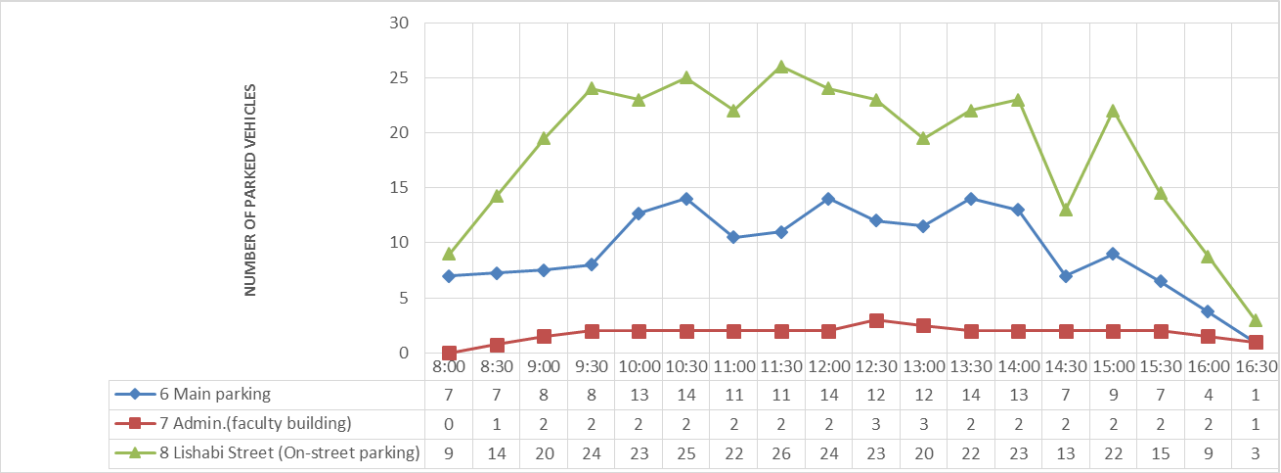
Source: Author's Field Work 2013

The results and findings are tabulated as shown in Table 1. The Table explains the ratios of peak and average parking accumulation to the defined capacities of some of the parking areas. Thus for the Main Parking area at the front of the Faculty of the Social Sciences with parking capacity of 44 number vehicles, the peak and average occupancy ratios are 111% and 84% respectively. For the main parking area at the Faculty of Law with capacity for 28 vehicles, the peak and average occupancy ratios are 60.7% and 32.1% respectively. Similarly for the main parking area at the Faculty of Education with capacity 66 vehicles, the ratios are given as 108% and 66.7% respectively.

In the analysis for the parking utilization for the defined parking areas with measureable capacity, the concept of 85% occupancy being commonly accepted as "technically full" for defined parking areas was adopted. This is used to appropriate the level of utilization and adequacy of a parking area or facility. Therefore using the average occupancy ratio (Table 1), the Main Parking area at the front of the Faculty of the Social Sciences with 84% is considered as near being technically full and tends towards being inadequate.

The parking area is also considered to be efficient. The other parking areas with measureable capacities and with average occupancy ratios of 32.1% and 45.5% may be considered as under-utilized while the ratios 65.3% and 66.7% may be considered as averagely efficient.

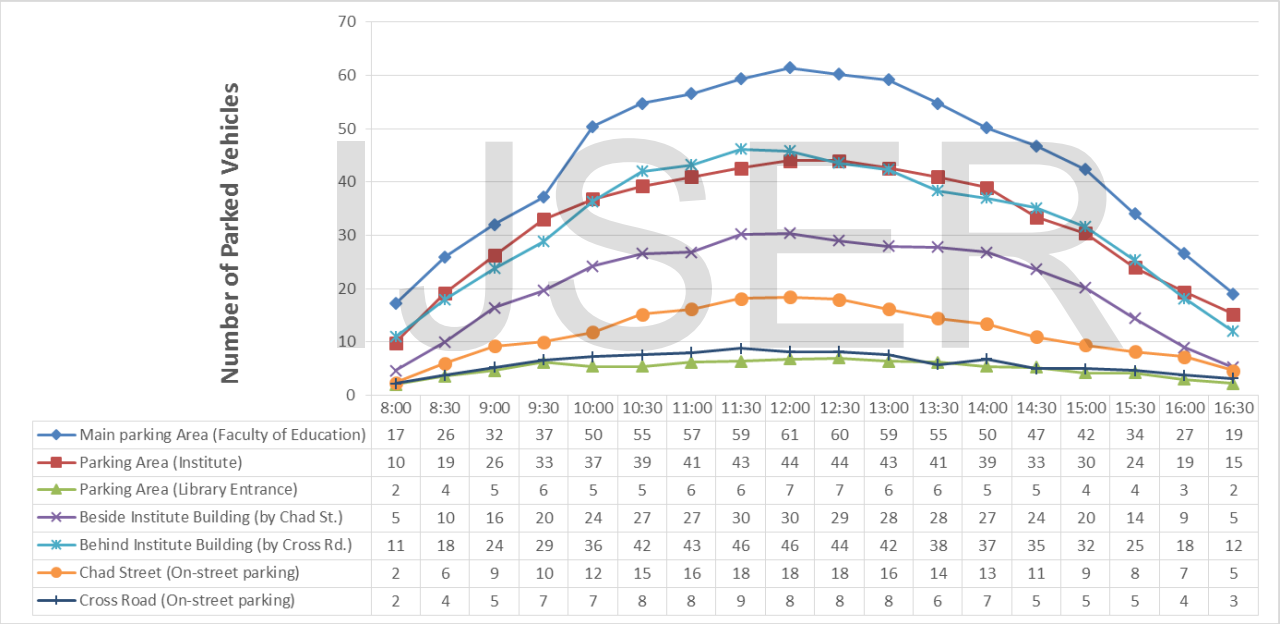
Figure 3: Parking Accumulation Trends (week averages) for the faculty Law.



	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30
6 Main parking	7	7	8	8	13	14	11	11	14	12	12	14	13	7	9	7	4	1
7 Admin.(faculty building)	0	1	2	2	2	2	2	2	2	3	3	2	2	2	2	2	2	1
8 Lishabi Street (On-street parking)	9	14	20	24	23	25	22	26	24	23	20	22	23	13	22	15	9	3

Source: Author's Field Work 2013

Figure 4: Parking Accumulation Trends (week averages) for the faculty of Education.



	8:00	8:30	9:00	9:30	10:00	10:30	11:00	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	16:00	16:30
Main parking Area (Faculty of Education)	17	26	32	37	50	55	57	59	61	60	59	55	50	47	42	34	27	19
Parking Area (Institute)	10	19	26	33	37	39	41	43	44	44	43	41	39	33	30	24	19	15
Parking Area (Library Entrance)	2	4	5	6	5	5	6	6	7	7	6	6	5	5	4	4	3	2
Beside Institute Building (by Chad St.)	5	10	16	20	24	27	27	30	30	29	28	28	27	24	20	14	9	5
Behind Institute Building (by Cross Rd.)	11	18	24	29	36	42	43	46	46	44	42	38	37	35	32	25	18	12
Chad Street (On-street parking)	2	6	9	10	12	15	16	18	18	18	16	14	13	11	9	8	7	5
Cross Road (On-street parking)	2	4	5	7	7	8	8	9	8	8	8	6	7	5	5	5	4	3

Source: Author's Field Work 2013

Secondly, the analysis for the parking characteristics of the study area based on questionnaire administration and derived information. 449 of the 459 number questionnaires administered were returned and analyzed. It entails the users' characteristic parking behaviour and perception of the parking area. Some of the variables analyzed include the category of users, trip purpose, parking area proximity to destination, reason for parking location choice, duration of parking and the suggestions for the improvement of the parking areas. The results are presented in tables of frequencies of the parameters measured.

Table 1: Parking Areas Capacity and Occupancy Ratios

Faculty of the Social Sciences	Parking Capacity	Peak Parking Accumulation	Average Daily Parking Accumulation	Peak Occupancy Ratio	Average Occupancy Ratio
Main parking (Admin./Academic)	44	49	37	111%	84%
General parking Area	Undefined	61	38	N/A	N/A
Kwara Street (On-street parking)	Undefined	30	20	N/A	N/A
MainStreetBank Building	22	18	10	81.8%	45.5%
Urban and Regional Planning Department	Undefined	8	4	N/A	N/A
Faculty of Law	**Parking Capacity**	**Peak Parking Accumulation**	**Average Daily Parking Accumulation**	**Peak Occupancy Ratio**	**Average Occupancy Ratio**
Main Parking Area	28	17	9	60.7%	32.1%
Admin. (faculty building)	3	4	2	133%	66.7%
Lishabi Street (On-street parking)	Undefined	28	19	N/A	N/A
Faculty of Education	**Parking Capacity**	**Peak Parking Accumulation**	**Average Daily Parking Accumulation**	**Peak Occupancy Ratio**	**Average Occupancy Ratio**
Main parking Area (Faculty of Education)	66	71	44	108%	66.7%
Parking Area (Institute of Education)	49	48	32	98%	65.3%
Parking Area (Library Entrance)	Undefined	9	5	N/A	N/A
Beside Institute Building (by Chad St.)	Undefined	32	21	N/A	N/A
Behind Institute Building (by Cross Rd.)	Undefined	53	32	N/A	N/A

Chad Street (On-street parking)	Undefined	20	12	N/A	N/A
Cross Road (On-street parking)	Undefined	11	6	N/A	N/A

Source: Author's Field Work 2013

5.1 Users Characteristics

The number of students using the parking spaces is highest in the distribution of the type or categories of users. Students account for 45.4% of the total parking space while the Academic Staff take up 29.7% of the spaces. The non-academic staff and visitors utilizes 17.6% and 7.3% of the spaces respectively (Table 2).

Table 2: Category of Respondents

Category	Frequency	Percentage	Cumulative %
Student	204	45.4	45.4
Academic Staff	133	29.7	75.1
Non-Academic Staff	79	17.6	92.7
Visitor	33	7.3	100.0
Total	**449**	**100.0**	

Source: Author's Field Work 2013

5.2 Trip Purpose

Findings reveal that the purposes for the trips being made to the buildings being serviced by the parking spaces in the study area do vary. Work and schooling purposes ranked very closely with the work purpose marking 49.3% of the total and being higher over schooling purpose with 43.4%. The purpose of trips, from the findings, is not however limited to academic purposes only, as other purposes such as for business having a proportion of 5.8% and pleasure/visiting having just 1.5% (Table 3).

Table 3: Purpose of Trip to Serviced Building

Purpose	Frequency	Percentage
Work	221	49.3
Business	26	5.8
Schooling	195	43.4
Pleasure/Visiting	7	1.5
Total	**449**	**100.0**

Source: Author's Field Work 2013

5.3 Parking Area Proximity to Destination

The convenience of parking vehicles very close to destinations have not ruled over from findings (Table 4). Only 42% of the users choose parking spaces that are less than 50metres from their destinations while the remaining 58% walk up distances between 50metres and 100metres to destinations. The walking distance from the parking area is

also influenced by other factors which explains why a lesser proportion of the respondents park at spaces less than 50metres from destination. The factors are tabulated as reasons for the respondents' choice of parking space location in Table 5.

Table 4: Walking Distance from Parking Area to Destination

Distance	Frequency	Percentage
Less than 50metres	189	42.0
Between 50 and 100metres	260	58.0
Total	**449**	**100.0**

Source: Author's Field Work 2013

A proportion of 46.3% of the respondents particularly choose to park at spaces in close proximity to their destination. Interestingly, the analysis reveals that a considerable proportion of 33.2% actually choose to park their vehicles at spaces that are shielded from the sun's direct glare and heat. Tree shades therefore are favourite spot for parking for these respondents (Table 5). This also explains why there are always clusters or line of vehicles that are parked under tree shades despite available parking spaces in some defined parking areas not peculiar alone to the study focus area but a common situation around the university campus. Taking the faculty of Law main parking facility as example, observations and average occupancy ratio (Table 1) showing that the facility is underutilized may be attributed to the choice of the users opting for sun shaded-under trees areas.

Table 5: Reason for Parking Location Choice

Reason	Frequency	Percentage
Proximity to destination	208	46.3
Shade from Sun	149	33.2
The Only Available Space	68	15.1
Others	24	5.4
Total	**449**	**100.0**

Source: Author's Field Work 2013

However, some respondents up to 15.1% proportion chooses to park at the only available spaces while others up to 5.4% choose to park at the particular location because it is the designated parking space where the respondents, by their category of users, ought to park.

5.4 The Duration of Parking

This statistical analysis for the duration of parking at the parking spaces is not based on a parking duration survey method of observations and data collection but on the responses gotten from the respondents (Table 6).

A majority of 66.8% of the respondents claim to utilize the parking spaces for over four hours followed by 18.5% of the respondents parking for durations between three and four hours. These two constitute the major categories of users of the parking spaces. Presumably, staff and students would largely constitute the respondents in the categories.

Respondents exercising shorter parking durations such as 2-3hours, 1-2hours, 30-59minutes and 15-30minutes altogether constitute 14.6% (Table 6).

Table 6: Duration of Parking

Parking Duration	Frequency	Percentage	Cumulative %
15-30minutes	18	3.9	3.9
30-59minutes	15	3.4	7.3
1-2Hours	9	2.0	9.3
2-3Hours	24	5.4	14.6
3-4Hours	83	18.5	33.2
Above 4Hours	300	66.8	100.0
Total	**449**	**100.0**	

Source: Author's Field Work 2013

5.5 Users' Suggestion for Parking Area Improvement

As part of the users' perception of the functionality parking areas, several comments were elicited from the respondents to suggest possible modifications and/or improvements that might enhance the functionality and adequacy of the parking situation.

Table 7: Suggestion to Make Parking Area More Effective

Suggestion	Frequency	Percentage
Provision of Tree Shade	39	8.7
Provision of more Parking Space	24	5.4
Improvement of Design	134	29.8
Others	252	56.1
Total	**449**	**100.0**

Source: Author's Field Work 2013

While 29.8% of the respondents suggested improvement of the design of the parking areas, 5.4% suggests provision of more parking space and 8.7% suggested that tree shades should be provided in the parking areas (Table 7).

A considerable proportion of the respondents, 56.1%, constituting others made side comments and suggestions pointing towards improving the circulation of the parking areas, ensuring adequate control of parking area, proper planning and better construction and to incorporate trees for shielding from sun glare. Other suggestions include adequate parking provision for students and provision of parking spaces for services (supplies) vehicles.

6 SUMMARY OF FINDINGS

From the parking survey research, finding reveals that the average peak accumulation for the three-Faculty facilities is 203 vehicles.

There is the seeming inadequacy of off-street parking spaces as on-street parking constitute about 20 percent of the peak accumulation.

This does not hold true as the computed parking turnover of 0.5 vehicles per space is indicative of adequate parking supply in excess of about 100 percent. The probable cause of on-street parking could then be traced to parking behaviours and preferences including proximity to destination (to some extent) and the exercise of parking under tree shades along the streets. This trend also could account for the under-utilization of some of the defined or designated parking areas; the main parking area of the faculty of Law is a very good example with average occupancy ratio of 32.1 percent. Observations also shows that the parking area (at faculty of Law) is an open expanse of asphalt surfaces barely with trees to provide shade from the sun. This trend could be counter checked with the undefined general parking area at the rear of the faculty of the Social Sciences which attracts larger parking generation most probably due to the many trees and abundant shading from the sun. A converse situation exists in the main parking area of the faculty of Education where the parking area is also an open expanse with barely any tree shade and yet records peak occupancy ratio in excess over 100 percent. Also, the main parking area for the Social Sciences faculty, which has restriction of parking for the staff, is often times congested. The area's peak parking occupancy is 111 percent while its average occupancy is 84 percent. This means that the parking area itself is not adequate for the staff and so, many staff members do use the undefined general parking area. Additionally, a large percentage of the respondents who chooses to park at nearby parking places (other than on-street) during peak period might exercise parking at some parking areas outside the study area. Therefore, there exists evidences of inadequacy in parking supply or off-street parking spaces in general aside the observations of under-utilization in some parking areas.

8 RECOMMENDATION

Generally, parking demand in the study area, though approaching a level of inadequacy, is not critical against parking supply estimate, therefore suitable parking demand management strategy needs to be put in place to check haphazard pattern of parking and on-street parking in particular. This should involve enforcement of valid parking restrictions at certain areas.

Also, parking areas need to be improved upon in terms of adequate provision for students, visitors and even staff of the faculties. The design also to put into consideration the aspects of the comfort of the parking areas such as reduction of direct and prolonged sun glare as the major users of the parking areas (both staff and students), constituting up to 90 percent of users, exercises average parking duration of over 4 hours. This means that the design of the parking areas should incorporate vegetation such as trees adequate enough for providing considerable sun shade; and that which is also suitable for such areas. Additionally, a parking place is more than just an open space, paved or tarred with asphalt, proper planning of the parking areas in terms of circulation and manouvre-ability should be given due consideration. This includes appropriate accommodation for unit car parking space with allowance for door opening, adequate turning radii and accesses (entry and exit points).

In order to guard against future bursts or phenomenal increase in parking accumulation as vehicle holding rate increases, parking management measures need to be put in place which may include parking charges via parking permits or parking meters as can be administered effectively. This is in consideration of parking pricing as one of the measures of parking demand management used as congestion control and even on a long run as revenue generator for parking facilities maintenance and future development.

7 CONCLUSION

Vehicular parking need to be given adequate consideration in transportation and landuse planning, having as bases the parking generation characteristics of developments and situations. More so, data base for parking generation rate similar to that of the ITE need to be developed and updated for peculiar regional needs and references. To prepare for 'impending disaster' is to keep abreast of all necessary information concerning 'disaster' parameters. The following quote from Shoup [18] sets out a clear analogy for the developmental trend of parking problems;

> "Coming to grips with the parking problem is essential because the rest of the world is poised to repeat America's mistakes. America adopted the car much faster…and many factors help to explain this phenomenon—abundant land, rapid population growth, low fuel prices, and high

incomes, among others. Abundant free parking also contributes to our high demand for cars because it greatly reduces the cost of car ownership. And because we own so many cars, we need lots of land to park them.…" [18] Car explosion)

America at a time earlier, must have had similar parking characteristics as is experienced currently in this region's urban settings and characteristic landuse types such as the university campus. It is therefore informative and imperative to take cue from similar developments and researches with a view to evolve local adaptions.

9 REFERENCES

[1] Balsas, C. (2003): "Sustainable Transportation Planning on College Campuses", Transport Policy, 10(1).

[2] Boamah, E.F. (2013): "Managing Parking on Campus: Agent Based Models" Published in the New Planner, Winter 2013, American Planning Association

[3] deCerreño, A. L. C., (2002): "The Dynamics of On-Street Parking in Large Central Cities", Rudin Center for Transportation Policy & Management NYU Robert F. Wagner Graduate School of Public Service North New York. (Accessed Online, September 2012), www.nyu.edu/wagner/rudincenter

[4] Barata, E. et al. (2010): "Parking Problems at the UC Campus: Setting the Research Agenda", 12th WCTR, Lisbon, Portugal

[5] Harrinton, W. and McConnell, V. (2003): "Motor Vehicles and the Environment", Resource for the Future (RFF) Report, Volume VII of the International Yearbook of Environment and Resource Economics

[6] Ingram, G.K. and Liu, Z. (1998): "Determinants of Motorization and Road Provision," Policy Research Working Paper Washington, D.C.: World Bank.

[7] Isler, E. and Hoel, L.A. (2004): "The Effect of Land Use Planning on University Transportation Systems" A Research Project Report for the Mid-Atlantic Universities Transportation Center (MAUTC).

[8] Kuzmyak, J. R., Weinberger, R., Pratt, R.H. and Levinson, H.S. (2005): "TCRP Report 95: Chapter 18, Parking Management and supply - Traveler Response to Transportation System Changes", Transportation Research Board.

[9] Litman, T. (2012): "Parking Management: Strategies, Evaluation and Planning", Victoria Transport Policy Institute.

[10] Marshall, W. E., Garrick, N. W. and Hansen, G. (2008): "Reassessing On-Street Parking", Journal of the Transportation Research Board, No. 2046, pp 45-52.

[11] Okoko, E. (2006): Urban Transportation Planning and Modelling, Akure, Millenium Publishers.

[12] Polak, J. and Axhausen, K. (1990): "Parking Search Behaviour: A Review of Current Research and Future Prospects", Transportation Studies Unit, Oxford University.

[13] Rye, T (2010): "Sustainable Transport: A sourcebook for policy-makers in developing cities", Parking Management: A contribution towards liveable cities, Division 44.

[14] Shang, H., W. Lin and H. Huang (2007): "Empirical Study of Parking Problem on University Campus", Journal of Transportation Systems Engineering and Information Technology, 7(2), pp. 135-140.

[15] Shaw, J.G. (1997): "Planning for Parking", Public Policy Center and Graduate Program in Urban and Regional Planning, Iowa, University of Iowa public policy center

[16] Shoup, D.C. (1995): "An opportunity to reduce minimum parking requirements," American Planning Association, Journal of the American Planning Association; winter 1995; 61, 1

[17] Shoup, D.C. (2005a): "Parking on a Smart Campus", Published in California Policy Options 2005, Daniel Mitchell (ed.), Los Angeles: UCLA School of Public Affairs, 2005, pp. 117-149.

[18] Shoup, D.C. (2005b): "The Twenty-First Century Parking Problem", Chapter 1of "The High Cost of Free Parking", Chicago, American Planners Press

[19] Sousanis, J. (2011): "World Vehicle Population Tops 1 Billion Units". Ward Auto World. http://wardsauto.com/ar/world_vehicle_population_110815/. Retrieved September 2012.

[20] Spack, M., et al. (2010): "Travel Demand Management: An analysis of the effectiveness of TDM plans in reducing traffic and parking in the Minneapolis-St. Paul metropolitan area". Spack Consulting, Minnesota. www.SpackConsulting.com

[21] Sperling, D. and Claussen, E. (2004): "Motorizing the Developing World," Access Journal, Number 24, Spring 2004

[22] TDM Encyclopedia (2011): "Parking Solution- A Comprehensive Menu of Solutions to Parking Problems", Victoria Transport Policy Institute, October 2011update.

[23] The New York Times (1922): "World Motor Car Census", The New York Times February 26, 1922
Edition.