Travel Behaviour Of University Enviroment: Inter-Relationship Between Trip Distance And Travel Mode Choice In South-Western Nigeria

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ABSTRACT
Universities' trip pattern is an important component of overall transportation demand of a province but it is often not well represented in travel demand models. This research assessed the spatial commuting patterns of the three categories of universities in Southwestern Nigeria. This was achieved with the uniform distribution of 3000 questionnaires with 80% return rate using face to face approach. Statistical software was employed in the analysis of the data. Distance was found to be a function of commuting pattern as it has a coefficient of determination (R^2) value of o.64. Moreover, 81% and 65% of staff in private and government owned universities respectively adopted the use of private cars, while walking and the use of shuttle buses were predominantly used by students for both long and short trip distances. The study showed that the use of shuttle is not affected by trip distance as compared to the other modes. However, cycling and walking should be encouraged to minimize the overdependence on the use of shuttle for both short and long distance trips. In addition, emission of greenhouse gases in universities' environments in Nigeria could be reduced if adopted.

Keywords: Trip pattern, Travel behavior, Modal Choice, Spatial Differences, transportation planning.

1.0 INTRODUCTION
Transportation in university societies have received growing consideration in modern years and forms a unique case of transportation planning owing to the centralized control of land use, transportation, and other activities (Miller 2001). Conferring to Tolley (1996) years ago, not so many means of transport existed around university communities as can be seen now. Shannon et al. (2006) states that in order to efficiently manage commuting patterns and encourage a move to a more sustainable means of transport to travel to and from campus, it is first necessary to have a clear picture of the prevailing commuting trends at the institution. The same author is of the opinion that common approach to obtaining this sort of information is through detailed commuting surveys distributed to individuals in the academic community, including students, faculty and staff.

Several recent studies have analyzed student or university community modal choice decisions with the purpose of identifying the possibility for modal change. For example, Shannon et al. (2006) executed an online survey of commuting patterns and attitudes towards switching to active modes of an urban university population in Perth, Australia. In a very dissimilar location of rural Thailand, Limanond et al. (2011) recognized vehicle ownership as the prime factor linked with student modal choice conclusions. Toor and Havlick (2004) made available an overview of sustainable transportation case studies and problems with respect to planning and policies, while Rodriguez and Joo (2004) established local topography and sidewalk availability to be significantly connected with the appeal of non-motorized transportation for campus commuters. As an alternative to

driving, bicycling is often proposed as the most promising modal switch in a university setting given the often short distances separating off campus student housing and main campuses (Tolley, 1996).

It should be noted that bicycle commuting is regarded as an active mode of commuting, which contributes to reducing CO_2 emissions and promoting health both in international and Japanese contexts (Muromachi, 2008; Oja et al., 1998; Shannon et al., 2006). However, excessive bicycle use may increase the risk of traffic accidents between bicycle commuters and cars or pedestrians on narrow streets that do not have a separate bicycle path.

Mode of transport could either be public or private; public mode of transport relating to Motorcycles, shuttle buses, cabs e.t.c. and private mode of transport is related to an individual's private-owned vehicle. These two modes of transportations are very important in University transportation planning. Polat (2012) identified the following as public transport demand determinants: fare, travel time (walk access time and accessibility of transport, waiting time, in-vehicle (journey) time), service quality, comfort, reliability, availability and costs of alternative travel modes, time of travel, purpose of travel and lastly the level of public transport dependency.

In Nigeria several studies have been done on travel demand considering cities, towns, region (Owolabi 2009; Oyedepo and Makinde 2009; Busari et al 2015; Solanke 2013) while tertiary institutions have been neglected. The university environment is very vital in any transportation planning exercise as a result of the large population it attracts yearly, yet it has been neglected. This study assessed the travel behavior of university environment in South western Nigeria considering the spatial approach. It is an attempt to study the travel behavior of the environment and suggest appropriate measures to improve the commuting modes.

2.0 METHODOLOGY
2.1 STUDY AREA
The three categories of universities are located in Lagos and Ogun state, in Southwestern Nigeria. The federal government owned university is among the first generation of universities accredited by National University Commission.It had approximately 45, 000 students as at 2010, it has one of the largest student populations of any University in the country. The University has many residential facilities and services for both staff and students. (Nigerian Education Profile, 2013). The state government owned university was established some few decades ago for the advancement of learning and establishment of academic excellence. The university caters for a population of over 60, 000 students. The third category is a Private Christian University and a member of the Association of Commonwealth Universities.

2.2 SAMPLING PROCEDURE
This descriptive study was carried out with the use of 3000 copies of questionnaires administered through a face to face method where 1000 copies were served in each of the three universities between November, 2014 and March 2015.
Out of the 1000 questionnaires that were distributed, 840, 810 and 846 were returned from the Private University, State University and Federal University respectively. In all, 2496 questionnaires were analyzed. The questionnaire was uniformly distributed between students and staff in each department of the schools during the work hours of 8am-4pm.

2.3 Data Analysis
Information such as trip pattern, spatial trip characteristics, frequency of daily and weekly trips, socio economic characteristics were collected, sorted and analyzed. SPSS and Microsoft Excel Statistical tool was employed in the analysis of data (Busari et al, 2015).

3.0 RESULTS AND DISCUSSION
3.1 Relationship Between Trip Distance And Commuting Pattern
The regression analysis of the independent variable (distance between hall and apartment) on the dependent variable (frequency of trips) is as shown in Table 1. The R-square value indicates that the model (independent variable) explains 64 % of the variance in the (dependent variable). The ANOVA Table shows the statistical significance of the result. The model herein reaches statistical significance at 5% (Significance= 0.00; $p<0.05$). This shows that distance is a significant variable affecting the frequency of trips.

Table 1: MODEL COEFFICIENT

	Model	Unstandardized Coefficients		StandardizeCoefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.206	.063		19.041	.000
	Distance between Hall of Residence/apartment and School?	.139	.039	.164	3.537	.000

a. *Dependent Variable: Number of Trips within University Campus*

b. *Adjusted R-Square 0.64*

3.2 Spatial Commuting Pattern of staff
Since the university environment is made up of students and staff (teaching and non-teaching), the assessment of the spatial commuting pattern of staff was also paramount. The study revealed that the modal choice of staff showed the same pattern for government owned universities. Figure 1 shows the distribution between distance travelled by staff and the primary mode of transportation in the three universities. Traveling by use of private cars and by walking had a very high percentage for short distance trip (0-3km). The usage reduced with increased distance as shown (Figure 1). Most respondents in the government owned university adopted the travel mode of walking due to the cost.

Also, it could be deduced that the longer the distance, the lower the use of private car, walking and bicycle. Only shuttle

buses showed a positive correlation to increase in distance traveled. The most adopted mode of transport for staff of the state university was private car and shuttle(Figure 1). No respondent who happened to be a teaching staff chose trip lengths higher than 8km as their distance from their respective apartment and offices. This can be buttressed by the fact that public universities have a larger land mass than private Universities in Nigeria.
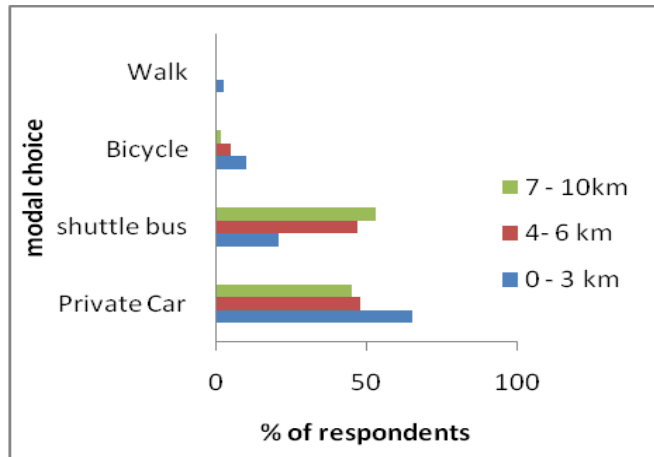

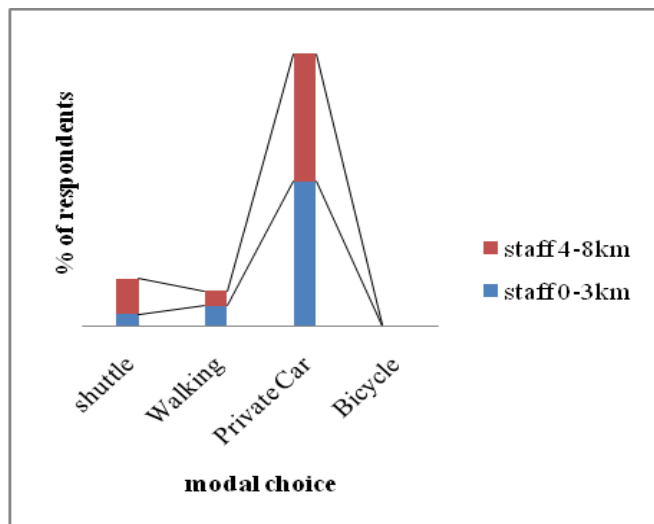**Figure 1: Spatial Commuting Pattern of Public Universities staffs**

Figure 2: Spatial Commuting Mode of Staffs in Private University

3.3 Spatial Commuting pattern of Students
3.3.1 Spatial Commuting Pattern of Students in Public Universities

Students accounted for the highest population of a university. From Figure 3, it can be deduced that for short distance trip most student adopted the use of walking and shuttle bus for long distance trip, while staff adopted the use of private cars for short distance trips and shuttle bus for long distance trips. Most of the respondent adopted the use of walking because it is economical and flexible compared to shuttle that had a

fixed route. The longer the trip length the higher the use of shuttle bus while the reverse holds for walking (Figure 3). The spatial commuting pattern of students showed that they also adopted walking and the use of shuttle bus within the university environment. Walking accounted for the highest percentage of short distance trip of students (Figure 3) as compared to staff that adopted the use of private cars for short distance trips.
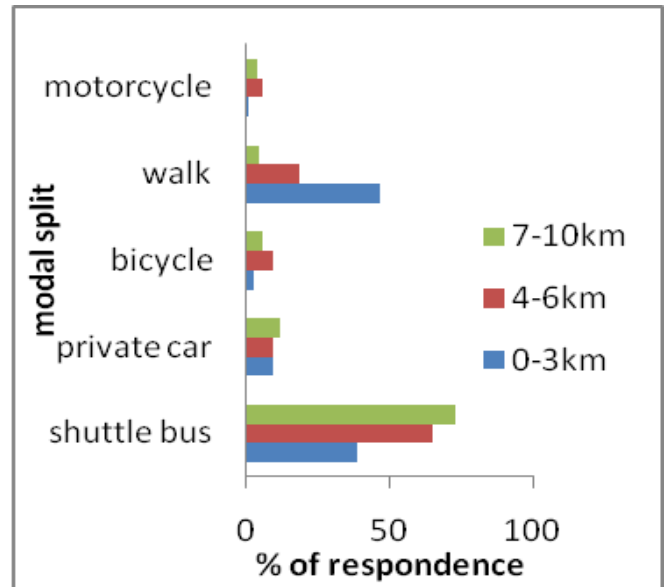

Figure 3: Spatial commuting pattern of students in public universities.

3.3.2 Spatial Commuting Patterns of Students in Private University Environment

Private universities showed a different pattern because the use of bicycle, motorcycle and personal car was not allowed for students. They were constrained to the use of the available mode (Figure4).
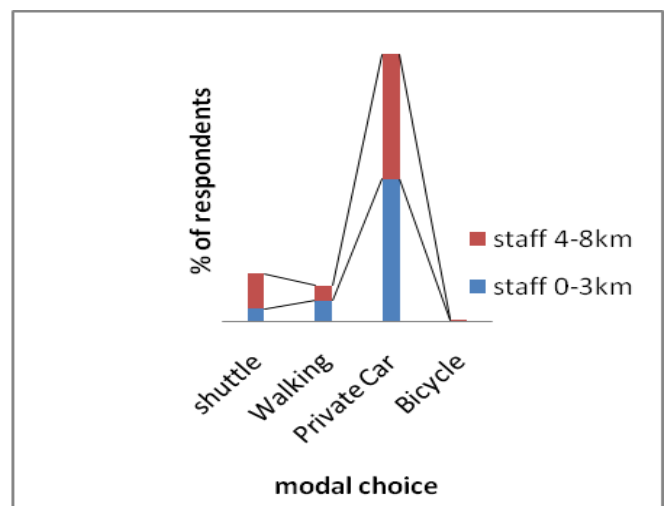

Figure 4: Spatial assessment of commuting mode of students in Private University

3.4 FREQUENCY OF TRIPS

3.4.1 Frequency of Trips of Staffs in Universities

Figure 5 showed that on the aggregate most staff embarked on short distance trips within the university more often than long distance trip. Majority of the respondents embarked on long distance trip less than five times as compared to short distance trips. No significant correlation could be deduced from the frequency of trips of staff from Figure 4, probably because embarking on such trips were necessary in order to get home or to the office.
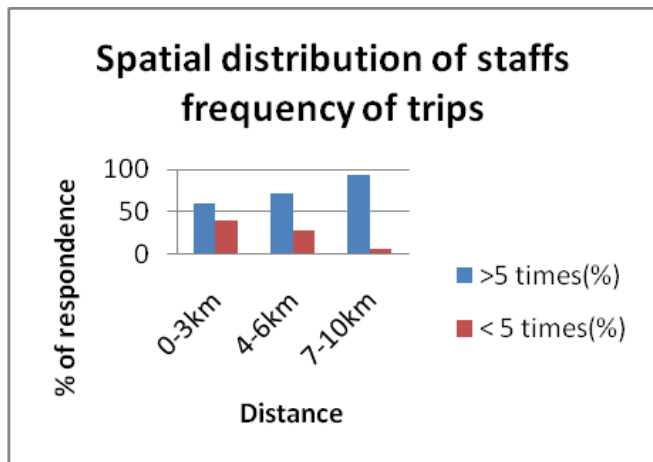

Figure 5:Spatial distribution of staff's frequency of trips

3.4.2 Frequency of Trips of Students in Universities

The frequency of trips of both student and staff are similar. The study showed that most of the students embarked on more short distance trips than long distance trips (Figure 6). Most respondents stated that this was based on the location of their halls and lecture rooms. Hence embarking on such trips may be a necessity.
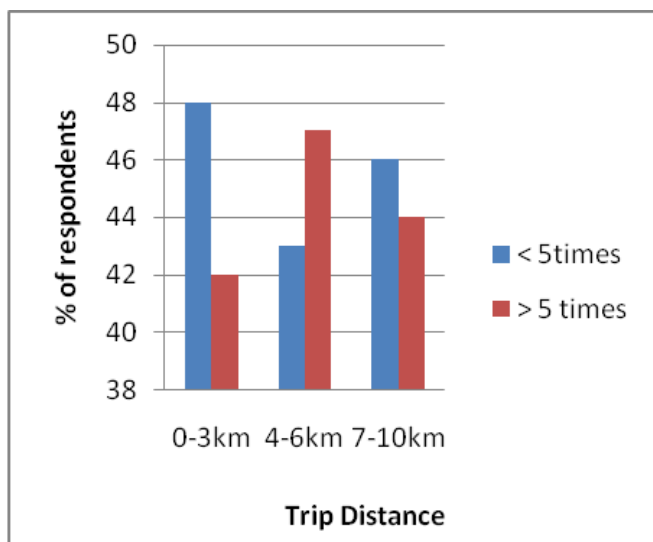

Figure 6:Spatial Assessment of Students Frequency of Trips

3.5 COMPARATIVE ASSESSMENT OF THE SPARTIAL COMMUTTING PATTERN OF THE CATEGORIES OF UNIVERSITIES CONSIDERED

The result of Government owned universities showed the same commuting pattern as regards the modal choice adopted for both short and long distance trip.

The use of shuttle is the most adopted mode for all distance of trips within state and federal universities, while walking is the predominant mode for the private university. Most of these respondents, especially students, embarked on this trip based on the fact that it is compulsory. Data from the private university showed a different trend since the land mass is lesser than the government owned universities. For trips ranging between 0-8km the use of private cars was mostly adopted by staff and shuttle buses by students, because the use of motorcycle was prohibited for safety reasons. On the aggregate, the State and Federal Government owned universities adopted the use shuttle buses with of 34% and 32% respectively, while the walking was widely used in the private institution (Figure 7). The frequency of trip of the three institutions showed similar trend. The longer the trip distance, the lesser the volume of trip except for work trip or lectures. Due to the compactness of the school environment, government owned universities have larger land mass compared to private universities.

Thus, distance is a very important and significant criterion in determining the travel behavior of university environment (Table 1).
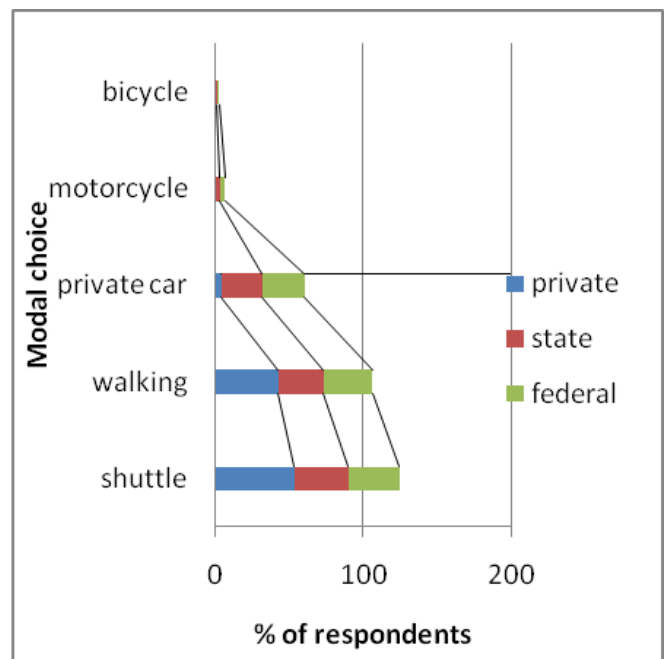

Figure 7:Comparative assessment of the modal split.

3.6 PROPOSED APPLICATION FOR TRANSPORTATION PLANNING

Mobility forms an integral part of a university system and its daily activities. Government should provide a subsidized transport scheme within government owned university because it accounts for the largest population of students in

Nigeria, compared to private institutions. Also government owned universities are patronized mainly by indigent students who may not be able to afford the daily and frequent patronage of shuttle buses. Some of the respondents (students) embarked on walking for lack of money. Efficient and comfortable mass transport scheme should be put in place of small shuttle buses at subsidized rates. Furthermore, both government and private institutions could adopt a system whereby the cost of transportation for lectures is included in the school fees.

In addition, most of the students in the private owned institution preferred the use of bicycle but there were no such facilities in place for its safe use. Therefore, the road network should be re-designed and constructed to accommodate bicycle lanes.

4.0 CONCLUSION

This study showed that the use of shuttle buses and private cars are predominantly adopted in the three universities considered. Based on spatial assessment, the longer the trip, the lower the frequency of trips. Trip distance is a very significant factor in estimating the travel behavior in a University environment. It can be deduced that the longer the distance the lower the use of private cars, walking, and bicycles. Only shuttle buses showed a positive correlation to trip distance. The percentage use of bicycle was very low in all the studied institutions. On the aggregate, the state and federal universities adopted the use of shuttle buses with the percentage of 34 and 32% respectively, while walking was widely used in the privately owned institution. The public universities showed related trip patterns for both student and staff. No significant correlation could be deduced from the frequency of trips of staff because embarking on such trips was borne out of necessity to get to their homes or offices.

4.1 RECOMMENDATIONS

Transport Schemes should be created to encourage non-motorized or public transportation to the campus for both staff and students within the university environment. Also, bicycle lanes should be incorporated into the design of universities' road network. In an effort to decrease global emissions of greenhouse gases and with the compactness between origins and destinations, bicycling and walking should be ideal modes of transportation among university's population.

Further studies should focus on the assessment of the BRT potential of government owned universities in Nigeria.

REFERENCES

(1)   Busari, A.A., Owolabi, A., Modupe A., 2015, "Modeling the effect of income and car ownership on recreational trip in Akure, Nigeria". International Journal of Scientific Engineering and Technology. Vol No 4.Issue No 3 pp 228-230

(2)   Limanond, T., Butsingkorn, T., Chermkhunthod, C., 2011, "Travel behaviour of University students who live on campus: a case study of a rural university in Asia". Transport Policy 18, 163-171.

(3)   Lovejoy, K., Handy, S.L. 2011, "Mixed methods of bike counting for better cycling statistics: the example of bicycle use, abandonment, and theft on the UC Davis campus". 90th Annual Meeting of the Transportation Research Board, Washington, D.C.

(4)   Miller, J., 2001, " Transportationon College and University Campuses: Synthesis of Transit Practice", Transportation Research Board, Washington, DC,.

(5)   National Universities Commission, 2013 "igerian Education Profile". United States Diplomatic Mission to Nigeria. Retrieved 15 October 2013.

(6)   Muromachi, Y., 2008, "Commuting mode choice and health". International Association of Traffic and Safety Sciences Review 33 (3), 36-41.

(7)   Oja, P., Vuori, I., Paronen, O., 1998, "Daily walking and cycling to work: their utility as health-enhancing physical activity", Patient Education and Counseling 33, 87-94.

(8)   Oyedepo, O. J. and Makinde, O. O., 2009, "Regression Model of Household Trip Generation of Ado-Ekiti Township in Nigeria", European Journal of Scientific Research, Vol. 28 No. 1; Pp 132-140.

(9)   Owolabi A., 2009, "Trip pattern in Akure, Nigeria: A land use Analytical Approach", Journal of Transport Management, Vol. 21, No 2A, pp63-71

10)   Polat C. 2012, "The demand determinants for urban public transport service: review of the literature", Journal of Applied Sciences, Vol. 12 No. 12, pp. 1211-1231.

(11)   Rodriguez, D., Joo, J., 2004, " The relationship between non-motorized mode choice and the local physical environment". Transportation Research Part A 9, 151-173.

(12)   Shannon, T., Giles-Corti, B., Pikora, T., Bulsara, M., Shilton, T., Bull, F., 2006, " Active commuting in a university setting: assessing commuting habits and potential for modal change" Transport Policy 13, 240-253.

(13)   Solanke, M.O., 2013, "Intra-Urban work and school trips characteristics in Ogun state, Nigeria"International Journal of Development and sustainability, Vol. 2 No. 2,

(14)   Tolley, R., 1996, " Green campuses: cutting the environmental cost of commuting", Journal of Transport Geography 4, 213-217.

(15)   Toor, W., Havlick, S.W., 2004, "Transportation and Sustainable CampusCommunities.Issues, Examples, Solutions" Island Press, Washington, DC.