

Telephone Usage and Travel Behaviour in Nigeria

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Abstract

The application of telecommunications to travel has changed people's daily lifestyles by diminishing the time-space constraints and giving virtual accessibility to activity centres. However, the effect of telecommunications on travel behaviour has been a main concern on whether it has complementary or substitution effects. This study explores the relationship between telephone usage and travel behaviour among the staff of Obafemi Awolowo University, Ile-Ife, Nigeria. The information for this study was obtained from primary data through the use of structured questionnaire. From the population of 2620 staff, 5% sample size comprising of 131 staff was randomly selected for the questionnaire survey. The findings reveal that most of the staff travels less than 10km for work, shopping and social trips, spend less than 20 minutes journey time and mostly used private cars for commuting to the activities. Furthermore, there is high telephone usage among the staff as about 33% make more than 15 telephone calls per day. The hypothesis test of the relationship between telephone usage and travel shows that the correlation coefficient of 0.181 is significant at 0.047 for substituted trips and 0.226 at 0.013 for complemented trips. The study concludes that there is net substitution and strong complementary effect of telephone usage on travel among the staff.

Keywords: Telephone usage, Travel behaviour, Telecommunications, Complementary, Substitution

1. Introduction

The need for people to move from one place to another is necessitated by the spatial spread of activities within the geographical space (Fadare and Salami, 2004). This has led to high use of automobile and result to longer trip distances and greater reliance on the car (Handy *et al.*, 2005). As travel demand increases there is need to provide transport infrastructures to cater for the growth. The 'predict and provide' model which had hitherto been adopted by transport planners especially in the United Kingdom and elsewhere in the world had failed to address the problem of increasing transport demand (Vicar, 2001). The resultant effect of this transport problem has led to serious traffic congestion, accident, pollution and delay which have affected cost, productivity and supply chain operations (Raney *et al.*, 2000; European Commission, 2013). Effort to address this problem has focused at reducing car use while enhancing the attractiveness of alternatives such as cycling, walking, telecommuting, teleworking, car sharing and public transport (Cairns *et al.*, 2004). However, telecommunications have the potentials to reduce the need to travel which is one of the main aims of sustainable transport.

Telecommunications and transportation share similar trait as both help to overcome space (Yuan *et al.*, 2012) and share information among people (Choo and Mokhtarian, 2007). The introduction of information and communications technologies (ICTs) have changed people's daily lifestyles as well as travel behaviour (Zimmerman *et al.*, 2001; Choo and Mokhtarian, 2007) hence transforming our society from industrial era to information age. The internet and mobile technologies diminish time-space constraints and give people virtual accessibility to activity centres. The level of spatial and temporal flexibility afforded by the internet and mobile technologies render obsolete the notion of distance as an organizing principle of human behaviour and urban structure (Cairncross, 2001). As noted by Couclelis (2004), internet and mobile technologies have weakened the association inactivity, place and time. However, in a contrary opinion, Zook *et al.*, (2004) argue that space-time constraints are still relevant in information age as most of the ICTs and mobile technology activities is still accommodated in the physical space and virtual spaces are grounded in social and physical spaces. Hence, physical travel of goods, information and people are still important aspects in interaction and communication.

There has been an established relationship between information and communication technologies and travel behaviour of people (Salomon, 1986; Mokhtarian, 2009). The development of the internet and electronic gadgets such as computers, mobile telephones and personal digital assistants has changed the travel pattern of individual in cities across the world (Aguilera, *et al.*, 2012). The use of ICTs has altered the way we conduct business, work, bank, shop, education and health delivery (Golob and Regan, 2001). It is now possible to engage in most of these activities from a remote location without necessarily travelling. Similarly, Yuan *et al.* (2012) reiterated that these technologies provide their users with more flexibility with respect to when, where, and how to travel. The use of ICTs has the potential of reducing individual travel demand, hence reducing traffic on the highways. De Souza

(2007) noted that the understanding of the influence of ICTs on our society is essential for updating environmental policies and maintaining sustainable mobility and transportation.

The use of ICTs may lead to the relaxation of some of the space-time constraints that limit people's spatial mobility and activity space. In other words, more time may be available to undertake other activities and more flexible spatial and temporal arrangements of activities and travel may become possible (Kwan, 2007). On the contrary, ICT may reduce the time available for people to engage in other activities and they may spend less time on social activities and shopping trips to stores in the physical world (Kwan, 2002). This suggests that the potential impact of ICT on travel is complex and difficult to understand. Thus, the use of ICTs has the capability of complementing or substituting physical travel.

The use of telecommunications devices has the potential of modifying the urban movement patterns. The main issue is that of the effect of telecommunications on travel behaviour whether they have complementary or substitution effects and ultimately if they stimulate or reduce travel demand. This study focuses on understanding the relationship between telephone usage and travel behaviour of members of staff in a higher institution in Nigeria. The interest here is to investigate whether the relationship between telecommunications and travel is substitution or complimentary.

2. Literature Review

2.1 Conceptual Issues

There exists a complex relationship between telecommunication and travel behaviour (Kwan *et al*, 2007) and they can take different forms (Mokhtarian, 1990). Mokhtarian (1990) categorised communication into three major modes to understand the conceptual relationships between telecommunications on travel (and vice versa). They are: face-to-face communication that involves the transportation of passengers; the transfer of an object containing information e.g book or letter which has to do with freight transportation; and telecommunications which involves the transportation of electrons over cables or radio waves through the air. The relationships that are possible between telecommunication and physical travel as identified by (Salomon, 1986; Mokhtarian, 1990; Mokhtarian and Salomon, 2002; and Nobis and Lenz, 2009) include substitution, complementarity, modification and neutrality.

Substitution occurs when the use of a mode reduces or eliminates the use of other modes. Some examples of telecommunications applications that are believed to replace travel include telecommuting, teleconferencing, teleshopping, telebanking, tele-education (distance learning) and telemedicine. However, as reported in the study of Yuan *et al.*, (2012), Mokhtarian (2009) explained that transportation problems are becoming worse in spite of the substitution of telecommunication due to the following reasons: (i) not all activities have an ICT counterpart; (ii) ICT is not always a feasible alternative to physical travel e.g the limitation of cyber-infrastructures; (iii) ICT is not always a desirable substitute e.g hanging out with friends in a bar; (iv) travel carries some positive utility; (v) not all ICT activities can replace travel.

Complementarity occurs when the use of one mode of communication increases the use of another mode. Complementarity can be grouped into "enhancement" and "efficiency". Enhancement occurs when the use of one mode directly facilitates the use of another mode. For example, a telephone call has the capability of generating additional travel for face-to-face interaction such as social or business meeting. Efficiency occurs when the use of one mode increases the efficiency or performance of the other mode. For example, the intelligent transportation system (ITS) provides real-time traffic information and route guidance to a driver making it possible to avoid congestion routes or providing real-time arrival and travel time information to transit users. This eliminates the uncertainty associated with taking transit and thereby increasing its attractiveness (Mokhtarian, 2002). Complementarity therefore leads to increase in demand for transport resulting from the enhanced use of telecommunications.

Modification occurs when the use of one mode of communication alters or modify the use of another mode. For instance, a telephone call can alter or change the departure time or destination with respect to a trip or communication that would have occurred. Hence, the trip is neither substituted nor generated but rather modified.

Neutrality occurs when the use of one mode has no impact on the other modes. For example, a routine trip to grocery store may not create any need for telephone calls.

2.2 Telecommunications and Travel Behaviour

The empirical studies on the relationship of telecommunications and travel behaviour can be classified into aggregate and disaggregate level.

2.2.1 The Aggregate Level

The study carried out by Selvanathan and Selvanathan (1994) estimated a simultaneous equation system of consumer demand of transportation and communications services with the 1960-1986 time series data in the United Kingdom and Australia using the Rotterdam Demand System. They used the per capita consumption expenditures on private transportation, public transportation and communications. The findings revealed a pairwise substitution relationship among the three variables which indicate that an increase in the price of one of them increases the consumption of the other. In another study, Plaut (1997) examined the roles of transportation and communications services as intermediate inputs used by industry in the integration of the European economy in nine countries (Belgium, Denmark, France, Germany, Italy, the Netherlands, Portugal, Spain and the United Kingdom) using an input-output analysis for 1980 data. The result revealed that there existed positive correlations indicating a complementary effect between the transportation and communications sectors. This implies that as communications inputs in a given industry category increases, transportation inputs also tend to increase and vice versa. The use of telecommunications causes additional travel that would not have occurred in the absence of the augmented use of communications and the use of one of the two services contributes to the efficiency of the other. These studies focused on economic views e.g consumer and industry consumption rather than the actual travel and telecommunications usage and establish no causal relationships between transportation and telecommunications.

In more recent studies, Choo *et al* (2005) estimated the impact of teleworking on personal transportation using the number of telecommuters and vehicle miles travelled (VMT) and airline passenger miles travelled from time series analysis of 1966-1999 data and 1988-1998 data for teleworking in the United States. They found that telecommuting reduces travel by a small margin (0.34% of the observed vehicle miles travelled in 1998) while teleworking has no impact on airline passenger miles travelled. The results revealed that teleworking has a net substitution effect on travel. This study also failed to fully explore the causal relationships between teleworking and transportation but showed an association between them.

Choo and Mokhtarian (2007) employed structural equation modelling (SEM) on national time series data 1950-2000 in the United States to establish causal relationship between passenger vehicle-miles travelled (VMT) as measure of transport and local telephone calls. The result revealed that VMT and number of local telephone calls positively and significantly affect each other, implying that as VMT increases, the number of local telephone calls also increases and vice versa. This indicates complementary relationship between telecommunications and travel. It is important to note that the magnitude of the total effect of the local telephone calls on VMT is higher than that in the other direction. Thus, far from replacing travel, telecommunication appears to be vigorously stimulating it. This is not surprising due to the central role of telephone in facilitating economic and social activity and face-to-face meetings. However, there is no causal relationship between telecommunications and transportation supply which implies that expanding lane mile might have no significant impact on adding telephone wires. The land use variable (suburbanization rate) positively affects VMT because suburban residents have to commute longer distances than those in central cities.

The finding of aggregate studies has shown that the relationship between telecommunications and travel is either substitution or complementarity. This is determined by factors such as the methodology employed, data used, time study was conducted, transport condition and telecommunication contexts.

2.2.2 The Disaggregate Level

Zumkeller (1996) examined the relationship between communication and travel using the data obtained from 166 employees of the University of Karlsruhe in Germany with the aid of diary for a day in 1994. He found that the relationship between communication and travel has stronger complementary effects than substitution effect. This is due to the fact that as the number of communication increases so also the trips increase.

In another study, Mokhtarian and Meenakshisundaram (1999) analysed the interrelationships among various modes of communication in Davis, California, United States using the structural equation model. The study found that complementarity is more dominant than substitution when checking for across-mode impacts. However, the relationships between electronic forms of communication and personal meetings or trips were not significant in either direction for the final models on the transformed variables. The suggestion here is that telecommunications is not likely to reduce travel at a system level. From the finding the fastest-growing communication mode is e-mail which is followed by travel, indicating that travel is not giving way to telecommunications. The shortcoming is the small sample size which affects the result by reducing the precision with which effects could be estimated.

Helminen and Ristimäki (2007) sought to ascertain whether teleworking reduces commuting kilometres as well as the relationship between commuting frequency and commuting distance among labour forces in Finland. The survey employed a sample of 838 teleworkers which was used to estimate the characteristics of the telework

population. The result indicated that 4.7% of the employees sampled were teleworkers which mean that about 102,000 people were teleworking in Finland and their commuting trip was 3.9 km longer than that of non-teleworkers. It was found that home-based telework (about 12,000 persons nationwide) reduced the total amount of commuting kilometre by 0.7%. This may appear to be marginal reduction in distance travelled but it means about 1.35 million kilometre is saved per week. The result of the relationship between commuting frequency and commuting distance showed that most people commute on daily basis when the commuting trip is below 80km. However, between 80km and 100km telecommuting has an effect while a second apartment is considered when the distance is more than 100km.

Nobis and Lenz (2009) examined the influence between telecommunications and travel on individuals in Germany. The changes in ICT use and travel behaviour on interpersonal level effects was based on the division of the participants into three main groups with increasing, decreasing or unchanged mobile telephone use from 2003 to 2007. The groups with decreasing mobile telephone use showed a stronger decline in travel than was the case for the average of panellists. On the other hand, the decline in travel was much lower than average among those participants who showed an increase in mobile telephone use during the same period. The frequency of use of mobile telephones generally shows a clear connection to socio-demographic characteristics and life-phase-indicators. The finding according to them is believed to show complementary relationship between telecommunications and travel.

The few studies on telecommunications and travel behaviour in Nigeria focus on individuals. The study conducted by Fadare and Salami (2004) focused on the effect of telephone usage on the travel behaviour of households in Osogbo, Nigeria. The study randomly selected 203 respondents from the 2987 functioning telephone line owners and conducted a face-to-face interview. It was found that substitution effect of telephone contacts on travel behaviour is not effective in the study area. Thus, implying a complementary relationship between telecommunication and travel. For example, most business-based calls stimulate travel because they are not conclusive, hence face-to-face contacts become necessary.

However, Ubogu (2008) examined the impact of mobile telephone usage on intra-urban trip pattern within Zaria, Nigeria. The study found that the relationship between telecommunication and intra-urban travel is substitution. The temporal analysis revealed that majority of the trips in the afternoon and evening were substituted which suggests that telecommunication could be used to substitute off-peak discretionary trips rather than morning peak non-discretionary trips. He reiterated that telephone use does not eliminate physical movement entirely. In a similar vein, Ogunbodede (2010) found that the majority of the people in six major towns in Ondo State now use mobile telephone to conduct social and economic activities rather than physical travel which had been used earlier. The finding further indicated that the use of mobile telephone has increased inter-urban interaction and has reduced physical movement of people to activity areas. For instance, he noted that trips for social visits and official assignments have been reduced due to the use of telecommunications instead of physical travel.

From the studies, it can be deduced that the relationship that exist between telecommunication and travel depend on factors such as transport system, telecommunication technologies used, period of survey, research conditions and social relations in different locations. It is observed from the reviewed studies that there is little information on the relationship between telecommunications and travel behaviour in the University community. The study of Zumkeller (1996) provided an insight when he studied the University of Karlsruhe, Germany. This leaves a gap in study which necessitated the need for this study.

2.3 Telecommunications Development in Nigeria

Telecommunication facilities in Nigeria were first established in 1886 by the colonial administration. At independence in 1960, there were 18,724 telephone lines in the country which was reserved for the exclusive use of government functionaries and multi-national companies. Between 1960 and 1985 the telecommunication sector consisted of the Department of Posts and Telecommunications (DPT) and a limited liability company, the Nigerian External Telecommunication (NET) Limited. In 1985, the erstwhile Posts and Telecommunications Department was split into Postal and Telecommunications Divisions. The later was merged with NET to form Nigerian Telecommunications Limited (NITEL) to harmonise the planning and co-ordination of the internal and external telecommunications services. During the 1980s, Nigeria embraced Digital Technology with the introduction of Digital Switches and Transmission Systems (Radio and Optic fibre) into the network. Furthermore, the early 1990s saw the introduction of Mobile Telephone Services (Cellular), Paging and Electronic Mail and card phone as part of the services offered by NITEL.

In 1992, the telecommunications industry in Nigeria was deregulated in two phases. The first was the commercialisation of NITEL and the second was the establishment of Nigerian Communications Commission (NCC). The establishment of NCC under Decree No. 75 on 24 November 1992 marked the turning point in telecommunication in Nigeria. The Commission commenced full market liberalisation and sector reform in 2000

when it released the National Telecommunication Policy (NTP) in September 2001. This eventually led to the major auctioning of 2G digital mobile licenses in 2001 to service providers such as MTN, Econet Wireless Nigeria (now Airtel) and later to Globacom and Etisalat. NCC who is the independent regulatory body for the Nigerian telecommunications industry is charged with the responsibility of regulating the supply of telecommunications facilities and services; promoting fair competition; protection of consumers' rights; and setting performance standards for telephone services in Nigeria.

The use of mobile telephone that was launched in August 2001 has developed rapidly to become the most popular method of voice communication in Nigeria to the extent that it has been described as one of the fastest growing Global System for Communications (GSM) markets in the world. According to official record, there were about 450,000 working lines operated by NITEL in 2001. By the end of 2002, GSM subscribers alone have reached 1,569,050 which rose to 127, 246,092 by 2013 (see figure 1). The market share of the telephone technology revealed that Global System for Communications (GSM) account for 98.12% of the total telephone lines in operation in the country. The Code Division Multiple Access (CDMA) has a share of 1.74% while the fixed wired/wireless networks account for the remaining 0.14%. Teledensity is the number of telephone connections for every hundred individuals living in an area. The mobile telephone services which grow rapidly over the years have increased the teledensity from 1 per 100 persons in 2002 to 91 per 100 persons by 2013 as shown in figure 1. This revealed that the introduction of mobile telephone has been a huge success in the country.

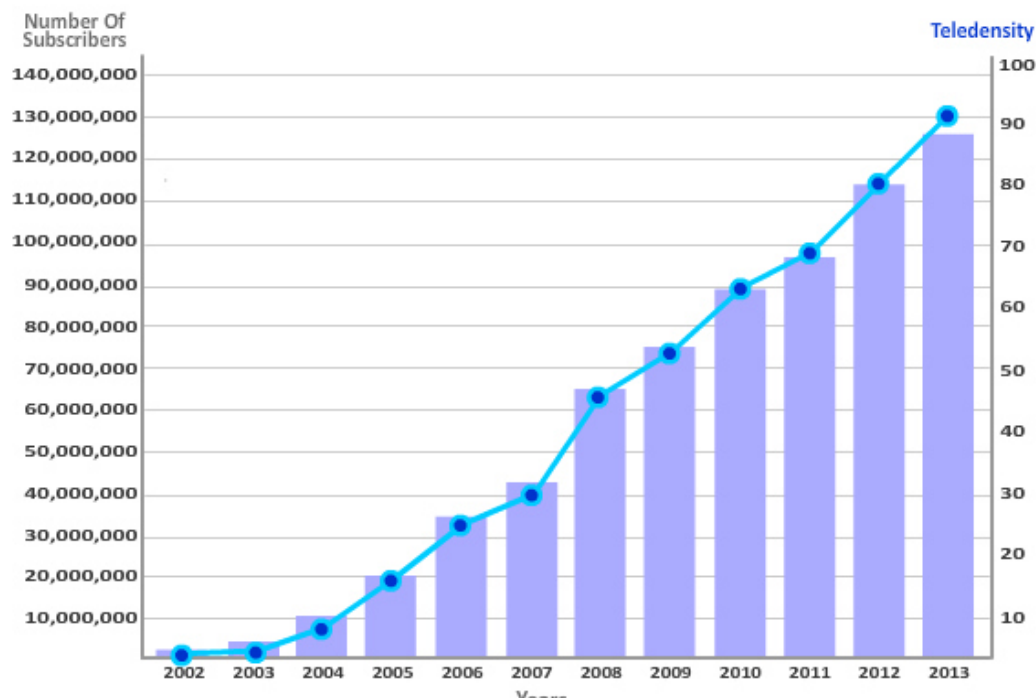


Figure 1: Annual subscribers and teledensity data

Source: Nigerian Communications Commission, 2014 [Online] Available: http://www.ncc.gov.ng/index.php?option=com_content&view=article&id=68&Itemid=67 (July 16, 2014)

The telecommunication industry has provided employment opportunities and contributed significantly to the Gross Domestic Product (GDP) in Nigeria making it the fourth highest contributor to the economy. The market share of telecommunications sector to the Nigerian economy that was as low as 0.62% in 2001 has grown over the years to 7.76% as at September 2013 (see figure 2).

The contract line payment tariff which is common practice in Europe and America is not in operation in Nigeria. The reasons for this are lack of bank account and credit history, unemployment and the economy is not credit driven but cash domineering. As a result, the pre-paid cards referred to as vouchers are used by the mobile operators. The pre-paid option makes it possible for those who would otherwise not qualify for telephone under contract system to have access to it. This also provides the opportunity for individuals to manage their telephone expenses since the number of calls that can be made is restricted to the amount of voucher loaded on the line.

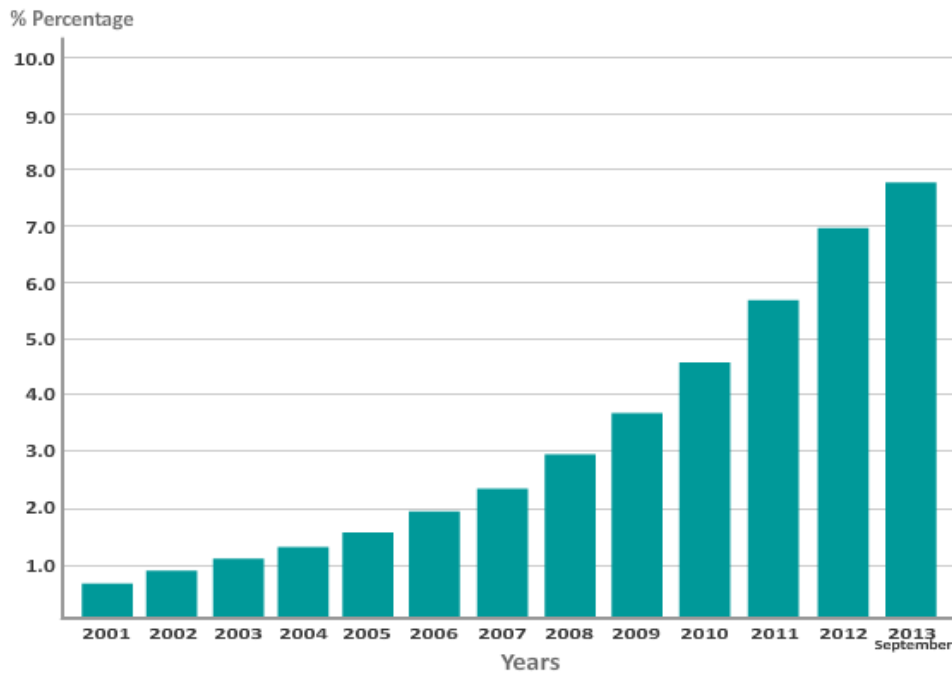


Figure2: Contribution of telecoms to GDP (2001- Sep. 2013)

Source: Nigerian Communications Commission, 2014 [Online] Available:

http://www.ncc.gov.ng/index.php?option=com_content&view=article&id=68&Itemid=67 (July 16, 2014)

3. Research Methodology

The study area is Obafemi Awolowo University, Ile-Ife, Nigeria. The town is located between latitudes 7°28' and 7°45' North of the Equator and longitudes 4°30' and 4°34' East of Greenwich Meridian (see figure 3.1). The town has about 276 km² land area and a population density of about 1290 persons/km² (Ajala and Olayiwola, 2013). In regional setting, it is located at a distance of 218km from Lagos (commercial centre of the country), 74km from Ibadan and 585km from Abuja, the Federal Capital Territory. Ile-Ife town has two local governments: Ife Central and Ife East with a total population of 355,818 (NPC, 2007). Ile-Ife has attracted large population because it performs educational and historical functions. The educational institutions located within the town include ObafemiAwolowo University, Oduduwa University, The Polytechnic Ife and ObafemiAwolowo University Teaching Hospital Complex. Ile-Ife as an ancient settlement in the Southwest Nigeria believed to be the cradle of Yoruba Kingdom accommodates the National History Museum and Ife Museum of Antiquities.

The Obafemi Awolowo University which is the study area was founded in 1962. It was initially known as University of Ife but renamed by Federal Military Government as Obafemi Awolowo University on 12th May 1987 in honour of its most distinguished founding father and former Chancellor, Chief Jeremiah Obafemi Awolowo. The University has thirteen faculties and a postgraduate college. The administrative units include the registry, bursary, library, maintenance, health centre, sports centre, bookshop, press, conference centre and guest houses among others (OAU, 2013).

The purpose of the survey is to understand the relationship between telephone usage and travel behaviour among the staff. The information required was obtained through primary data because there is no documented data on travel behaviour and telephone usage on the respondents. The sampling frame for this study is the total population of senior staff in the University which comprises 1200 academic/technical and 1420 administrative staff. For representativeness, 5% sample size was adopted for the questionnaire survey which gives a total of 131 staffs. Three faculties and administrative units each were randomly selected within which four departments were randomly selected for the questionnaire survey. In the academic departments selected, five staff each was randomly selected while six staff each was randomly selected among the administrative units making a total of 132 staff which comprises 60 academic and 72 administrative staff. The face-to-face survey method was used to administer the structured questionnaire which increased the response rate. The response rate for academic staff is 100% and 83.3% for the administrative staffs. The data was analysed using both univariate and bivariate analysis. The study advanced and tested two hypotheses which were stated in the null and alternative form:

H₀ There is no significant relationship between telephone usage and the substituted trips.

H₁ There is significant relationship between telephone usage and the substituted trips.

- H₀ There is no significant relationship between telephone usage and the complemented trips.
 H₁ There is significant relationship between telephone usage and the complemented trips.

4. Result and Analysis

The result obtained from the survey conducted on the staff is discussed under threesub-sections which include: travel behaviour, telephone usage and hypotheses testing on the relationship between telephone usage and travel behaviour.

4.1 Travel behaviour of Staff for trip purposes

The travel behaviour of the staff to work, shopping and social places is as shown in table 1. The findings indicate that most of the staff lives within a short distance from the University. It is observed from the table that majority 72.5% travel less than 10 km, while 20.0% travel a distance of 10.1-20 km. Those who travel more than 20 km (7.5%) are the staff residing in the surrounding towns like Osogbo, Ilesa, Ipetumodu and Sekona. Those who live on the campus in staff quarters travel the shortest distance to work. The journey time to work justifies the short distance travelled by most of the staff to work. The result reveals that majority (41.7%) spend less than 10 minutes. Most of the staff in this category are those who reside in the staff quarters which require only a short commute to work. Further result indicates 50.8% spend 10.1-30 minutes while the remaining 7.5% spend more than 30 minutes on trip to work.

The mode of transport used to commute to work indicates that majority of them (84.2%) use private car. The high car use to work is a reflection of their income status. Those that use public transport (motorcycle, mini bus and taxi) account for 13.3% while the remaining 2.5% walk to work daily. It can be deduced from the findings that there is high use of car for work trips by majority of the staff which is a reflection of their income status. The frequency of trips to work as shown in the table reveal that 90.8% of the staff go to their workplace 5 days in a week. Though teleworking is not officially approved by the University Management, however those who make less than 5 days trips to work account for 9.2% are likely to be staff on shift schedule and academic staff who work at home on some days. This can be referred to as some sort of teleworking because they exchange mails and make telephone contacts with the office when necessary.

Table 1: Travel behaviour of Staff for trip purposes

	Work		Shopping		Social	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Distance travelled						
Below 10 km	87	72.5	102	85.0	76	63.3
10.1-20 km	24	20.0	13	10.8	20	16.7
20.1-30 km	4	3.3	1	0.8	5	4.2
Above 30 km	5	4.2	4	3.3	19	15.8
Total	120	100.0	120	100.0	120	100.0
Travel Time						
Below 10 mins	50	41.7	47	39.2	52	43.3
10.1-20 mins	45	37.5	54	45.0	26	21.7
20.1-30 mins	16	13.3	14	11.7	14	11.7
Above 30 mins	9	7.5	5	4.2	28	23.3
Total	120	100.0	120	120	120	100.0
Mode of Transport						
Car	101	84.2	89	74.2	81	67.5
Motorcycle	4	3.3	12	10.0	2	1.7
Minibus	10	8.3	12	10.0	7	5.8
Taxi	2	1.7	2	1.7	4	3.3
Walk	3	2.5	5	4.2	26	21.7
Total	120	100.0	120	100	120	100.0
Trip Frequency						
5 days a week	109	90.8	2	1.7	6	5.0
3-4 days a week	8	6.7	3	2.5	2	1.7
2 days a week	3	2.5	18	15.0	8	6.7
once a week	-	-	42	35.0	32	26.7
few times a month	-	-	55	45.8	72	60.0
Total	120	100.0	120	100.0	120	100.0

The distance travelled to shopping centres as documented in the table indicates that 85.0% travel less than 10 km. This result implies that majority of the staff shop within their local area. Furthermore, 10.8% travel 10.1-20km, while the remaining 4.1% travel more than 20 km for shopping. However, those who travel more than 20 km to shop are likely shopping at the periodic markets around the town. The finding further reveals that more than 80% of the staff has access to shopping centres within 20 minutes travel while, those who spend more than 20 minutes account for 15.9%. The majority of the staff (74.2%) uses their private cars to commute for shopping trips. On the contrary, those who use public transport increase slightly above work trip as this account for 21.7% while 4.2% walk to the shopping centre.

The result of the frequency of trips to shopping centres clearly shows that most of the staffs are not frequent shoppers. As shown in the table, 45.8% shop few times in a month, while 35.0% do so once in a week. The reason for this is that majority of the staff are male who culturally do not shop for daily needs as this is generally regarded as women's duty. The remaining 19.2% shop more than once in a week.

The information on the distance travelled for social trips such as leisure and visit to family and friends show that majority (63.3%) travel less than 10 km. The result further reveals that 20.9% travel 10.1-30 km, while the remaining 15.8% travel more than 30 km for social trips. The finding further indicates that majority (43.3%) of the staff spend less than 10 minutes for social trips. Those who travel for 10.1-20 minutes account for 21.7%, while 35.0% of the staff travels for more than 20 minutes for leisure and visit to friends and family members.

The result reveals that private car and walking dominate the mode of transport used to commute for social trips. This shows that 67.5% use their private cars, while those that walk account for 21.7%. The frequency of making social trips in the table shows that majority (60.0%) of the staff engage in leisure or visit to friends and family members a few times in a month. On the other hand, 26.7% make the same trip once in a week while 13.4% engage in social trips more than once in a week. The reason for low involvement in social activities among the staff is probably because they are professionals who have little time at their disposal to recreate especially during the week days.

4.2 Telecommunications usage by the Staff

Finding of the study reveals that all the staff has access to mobile telephone. Also, there is high level of telephone usage among the staff. The majority (32.5%) of them make over 15 telephone calls per day as shown in table 2. It can be deduced from the result that more than 80% of the staff make 7 telephone calls per day. This is surprising as it has been shown in earlier result that there is high car usage.

Table 2: Frequency of telephone usage per day

	Frequency	Percent
1-3	3	2.5
4-6	14	11.7
7-9	27	22.5
10-12	27	22.5
13-15	10	8.3
Over 15	39	32.5
Total	120	100.0

The reasons for the use of mobile telephone are explored in figure 3. It is observed that the cost factor is not a major determinant for using a mobile telephone. For instance, only 36.7% of the staff uses the mobile telephone because it is cheap whereas the remaining 63.3% hold a contrary opinion. There is a sharp division on whether telephone usage reduces trips or not among the staff as 50.8% indicate that it reduces their trips, while 49.2% think otherwise. The cost factor of using mobile telephone is further downplayed as only 17.5% of the staff indicates that affordability is the main reason for using telephone while 82.5% hold a contrary opinion. The issue of affordability may be related to the income of the staff. However, all the respondents are senior staff who are well paid and as such can afford the use of mobile telephone.

The most important reason why the staff use mobile telephone is for its convenience. The result indicates that 55.8% of them use their telephone because it is convenient for them to organise their travel pattern and communication with others. Furthermore, the result reveals that the use of telephone for social contact is not an important factor as only 25.0% of the staff use it for this purpose. This indicates that the staff prefer face-to-face

interaction. This result implies that telephone usage has not been substituted for physical travel totally. Similarly, business transaction is not an important reason as only 16.7% indicate that they use their telephone for this purpose. This is not surprising because the respondents are government workers and not business owners. On a general note, the implication of this result is that the staffs do not use their mobile telephone for commercial purposes but for their personal convenience.

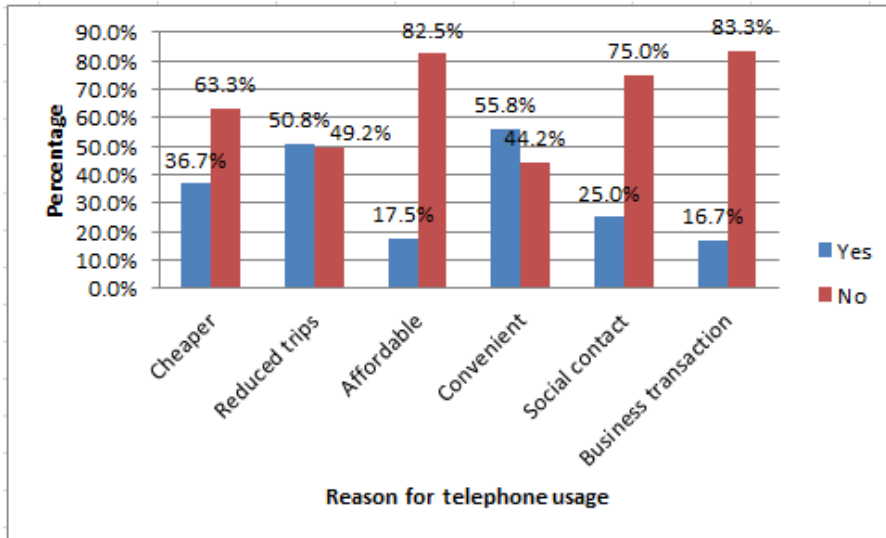


Figure 3: Reason(s) for the use of mobile telephone

The information on the physical trips that were substituted for telephone use by the staff is as shown in figure 4. For work trip, majority (79.2%) of the staff indicated that they did not substitute physical travel to work with telephone use while 20.8% confirmed that mobile telephone replaced their travel to work. The shopping trip show a similar trend to work trip as vast majority (80.0%) of the staff indicate that they prefer physical travel to shopping centres rather than using telecommunication to shop. Though shopping is a discretionary trip which ordinarily could be substituted for telecommunication. However, this result is expected as online shopping is relatively new to the study area. The decision to substitute physical travel for social trips is determined by the activity involved. For instance, leisure activities such as going to movies, museum and zoo can only be satisfied by physical travel. Therefore, the use of telephone as substitute for travel to leisure activities may be unnecessary. However, trip to friends and family is a discretionary trip which can be easily substituted for telephone usage. The finding reveals that majority (85.0%) of the staff substituted physical travel with telephone usage for social trips while only 15.0% did not do so. The staff barely has little time left after work to visit family and friends as a result they seize the opportunity offered by telephone to interact with their loved ones.

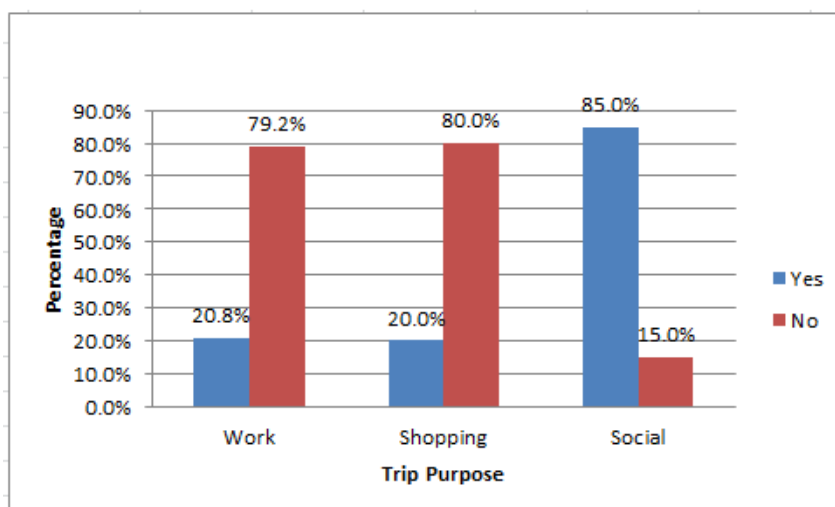


Figure 4: Trips substituted for telephone use by purposes

The finding of trips that was complemented as a result of telephone usage is shown in figure 5. As observed, 44.2% of the staff indicates that telephone usage makes them to embark on unscheduled work trips. It may be that they were called from work to proceed on an official trip or it required that they worked outside the official working hour e.g on weekends. The result of the telephone usage on shopping trips reveals that only 18.3% engage on additional trips whereas majority (81.7%) do not do so. This result is expected due to the fact that teleshopping is relatively new to the study area as mentioned earlier, so it is not likely to generate the need to travel. The influence of telephone usage for social trips indicates that 76.7% of the staff embarks on additional trips whereas for 23.3% telephone usage does stimulate any additional trip. This result implies that interaction over the telephone cannot be conclusive. Thus, the need for face-to-face interaction becomes imperative. This looks contrary to the earlier findings on substitution effects of telephone usage. However, the issue of substitution and complementary effects of telephone usage go hand in hand. At some time one is likely to substitute some trips while at another time trips can be complemented. This implies that there is no static position on the issue of effect of telecommunications and travel behaviour.

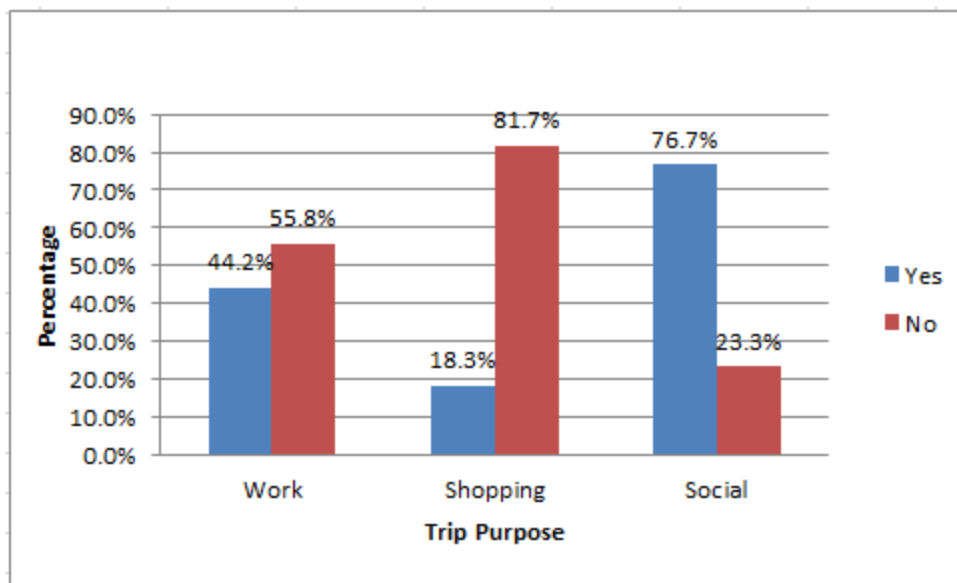


Figure 5: Trips complemented by telephone use for different purposes

4.3 Hypotheses testing

The hypotheses stated under research methodology are tested in this section to ascertain the relationship between telephone usage and substituted or complemented trips. The result of the hypotheses test in table 3 indicates that the correlation coefficient for the relationship between telephone usage and substituted trips is 0.181 which is significant at 0.047. Thus, the null (H_0) hypothesis is therefore rejected and the alternative (H_1) hypothesis accepted. This implies that there is significant relationship between telephone usage and the substituted trips among the staff in the study area. The result shows a weak positive relationship between telephone usage and travel of the staff. This means that there is net reduction in trips as a result of telephone usage. This result corroborates the findings of (Choo *et al*, 2005 and Ubugu, 2008) who found substitution effect in their studies.

Table 3: Correlation result of hypotheses testing

Hypotheses	Correlation coefficient	Significance level
Hypothesis I	0.181	0.047
Hypothesis II	0.226	0.013

The correlation coefficient for the relationship between telephone use and the complemented trips is 0.226 which is significant at 0.013. The null (H_0) hypothesis is therefore rejected and alternative (H_1) hypothesis accepted. This means that there is significant relationship between telephone usage and the complemented trips in the study area. The result shows a strong positive correlation between telephone usage and travel. This result implies that the use of telephone in the study area stimulates the need for travel among the staff. Salomon and Schafer (1988) noted that new and additional trips are made as a result of frequent interaction through the use of telecommunication which leads to increase in travel demand. This result corroborate the findings of Mokhtarian

and Meenakshisundaram, 1999; Fadare and Salami, 2004; Choo and Mokhtarian, 2007) whose studies found that there are complementary effects in the relationship between telecommunication use and travel behaviour.

The result of the hypotheses suggests that weak substitution effects on trips for telephone use and a stronger complementary effect leading to additional travel due to telephone use among the staffs in the study area. This finding is similar to the study of Zumkeller (1996) who found stronger complementary effects than substitution effects in the relationship between telephone usage and travel behaviour among the employees of University of Karlsruhe, Germany in 1994.

5. Conclusion

This study has focused on the relationship between telephone usage and travel behaviour. It has been established that the staff travel short distances for the trip purposes. The frequency of visit is low except for work trip and there is high use of private car for commuting to most of the journey purposes. Furthermore, the journey time indicated that most of the staff travel for less than 20 minutes to activities area. On the other hand, there has been high telephone usage among the staff which has led to high complemented trips although some trips were substituted as well.

Based on the findings, this study concludes that there is weak positive substitution effect and strong positive complementary effect in the relationship between telephone usage and travel behaviour of the staff of ObafemiAwolowo University, Ile-Ife, Nigeria.

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