INFLUENCE OF MOBILE PHONE (GSM) USAGE ON TRIP GENERATION IN A DEVELOPING CITY, LAGOS, NIGERIA

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Abstract

The effect of telecommunication on urban travel behaviour has not been empirically examined in Nigeria. The study therefore examined the differences in trip making among GSM-owners and non-owners in order to determine its substitution effects. The study sample consisted of 2,500 households in the study area. Systematic sampling technique was used to select every tenth building on the identified streets. In a multi-family dwelling, random sampling was used to select one household. The household head or his/her representative was interviewed on intra-city trip patterns of GSM-owners and non-owners of the household. The data collected were analysed using simple linear regression, multiple regression. The usage of GSM generated almost two (β=l.72) trips per call and there was a significant relationship between the volume of trips and there was no significant difference between trips made by GSM-owners and non- owners (t=0.54, p≤0.05). The paper revealed that the use of GSM is not a substitute for intra-city travels. There is a need therefore for further research into the influence of GSM on intra-city travels to include other variables that were not considered in this study. It is therefore recommended that transport planners in Lagos need to develop alternative intra-city transport systems. This can be achieved through a shift to the development of other land transport systems by policy maker

Keywords: Travel patterns, GSM, Intra-city, Trip generation, Lagos

Introduction

Spatial interaction in urban setting could be of at least two types namely; those that involve physical contacts like day-to-day movements of people and those that do not require such contact like telephoning. This is because they represent both a function and a process (Ayeni, 1979, Axhausen & Gariling, 1992). They functions as long as they perform the duty of maintaining the status quo in the spatial relation of different parts of the city, while they are processes when changes in their volume, intensity and direction come to determine the pattern of growth and organization of the spatial structure of the city. Transportation is very vital to urban life because it is an absolutely necessary means to an end. It allows people to carry out the diverse range of activities that made up daily life. (Filani, & Osayinmese, 1979, Filani, 1991, Filani, 1993). For the fact that cities consist of spatially separated, highly specialised land uses such as, food stores, hardware stores, banks, drug stores, hospitals, libraries, schools, post offices and so on, people must travel if they want to obtain necessary goods and services.

Urban travel takes place when inhabitants of urban centres carry out their different activities in different places whether by necessity or by choice. Studies (Ayeni, 1974; Adeniji, 1981; 1998; Ojo, 1990) have shown that in general, people tend to travel in order to obtain access to a variety of other people, services and facilities that are not available at the origins of their journeys. To what extent, how far and by what means they travel is a result of a complex interaction of socio-economic, political and physical factors (Adeniji, 1991). The nature and degree of influence of these factors however vary from city to city and even within a given urban

centre. (Hausa and Schwab, 1987, Gordon et al, 1988, Rimmer, 1986 White 1990; Garling et.al, 1994, Bhat and Koppelman, 1999).

The socio-economic and cultural growth of any nation can be measured through the efficiency of its transportation network and its judicious provision of telecommunication facilities. There exists a strong relationship between movement pattern and the locational distribution of activities over geographic space (Goddard, 1970). However, what is unclear is the relationship between telephone interaction pattern and the location of activities within the urban or sub-urban centres. Fundamental to this relationship is the role and impact of telecommuting technologies such as the telephone (Cherry, 1970 and Clark, 1973). This relationship, however, is determined by certain underlying variables, which are neither similar nor transferable from the developed areas of the world to the developing areas, particularly, the African countries (Adeniji-Soji, 1996, 2000). Abler (1968), Clark (1973) and Elliot-Hurst (1974) recognised the geographical and socio-economic importance of communication flow and its role as agent of change within the spatial system.

Short-term or daily movement consists of trips involving such activities as work, shopping and recreation, whereas long-term, or more permanent movement involves changing residence. With recent advancement in telecommuting technologies, movement patterns of urban residents might have changed considerably.

With the Federal Government of Nigeria in March 2001 granting licenses to three GSM operators in the country, it is believed that telecommunication and transportation would improve considerably. Lagos, the commercial capital of Nigeria, stands to benefit from this development and to ease the city of ever growing transportation complexities and problems. It is believed that this new technology would help to shape the movement pattern of people in the city thereby easing traffic congestion and delay in transit. All too often, telecommunications facilities are treated as an alternative to transportation systems and as a substitute for the physical movement of people and service. The growing use of telecommunications facilities like global system for Mobile Communication (GSM) is doing far more than influence where people work and live. It is likely to change the character of activities that occur in the home, workplace, social activities and business activities.

Lagos metropolis is being considered as a study area because it has an increasing demand of intra-city travel pattern. This has contributed to the highest rate of traffic congestion in Nigeria and the expectation is that the use of GSM will reduce this congestion by affecting the travel behaviour of people. Also, it is the commercial capital of Nigeria and it stands to benefit from the development of telecommunication especially GSM which can ease the ever-growing transportation complexities and problems.

There is need to understand the correlation or relationship between GSM and the socio-economic characteristics of GSM owners. The justification for this study is that GSM is a notable innovation in information communication technology, ICT, industry and its effect on spatial interactions needs to be examined.

The trip pattern of urban residents in Lagos metropolis is haphazardly characterized between different activities in the city. This had led to unnecessary delay, long travel time, evasion of traffic rules/law and traffic congestion because of lack of necessary information to aid pre-

arrange contacts to ease traffic flow and ensure smooth traveling and mobility. Productive use of time is also inhibited as a result of long journey or travel time that characterize the transport situation in Lagos metropolis. Intra-city trips are more pronounced and haphazard in Lagos metropolis.

Study Area and Methodology

Study Area: Nigeria is located in the Western part of Africa, bordering the Gulf of Guinea, lying between latitudes 4^{o} 20^{1} and 14^{o} 30^{1} east of Greenwich (Adeleke, 2003). Lagos State lies approximately between longitudes 2^{o} 42 E and 3^{o} 42 E and latitudes 6^{o}22 N and 6^{o} 52 N. The 180 km long Atlantic coastline forms the Southern boundary of the state while its Northern and Eastern boundaries are shared with Ogun State. On the western side, the Republic of Benin borders the boundary (Balogun et al, 1999).

Lagos Metropolis occupies, 2,910sq.km out of the 3,577 sq. km land area of Lagos State. Fifteen of the 20 local governments in Lagos State are located within the Lagos Metropolitan Area. The local governments are – Agege, Alimosho, Apapa, Amuwo-Odofin, Eti-Osa, Ikeja, Ifako-Ijaiye, Kosofe, Lagos Island, Lagos Mainland, Surulere, Mushin, Oshodi-Isolo, Ojo and Somolu (Lagos State 2003 Digest).

5.7 million people or 6.4 percent of the population of Nigeria (88.5 million people in 1991) live in Lagos State (Nigeria National Population Census, 1991). In 1997, Lagos State population was estimated at 6.9 million out of which Lagos Metropolitan Area has 5.2 million (Nigeria National Population Commission, 1997). By projection the population of Lagos Metropolitan Area was estimated to be 12.9 million by 2000 and 24.5 million by 2015 (UN, 1996).

Transportation and communication facilities are poorly developed in Lagos metropolis. According to the metropolitan Lagos Master Plan, year 2000, the transportation land areas occupy 3202 hectares (18.6%). The figure alone can be traced to the beginning of transportation problem in the metropolis. An ideal transportation land use areas should be 25% of the total land use area (Lagos Master Plan, 2000).

Despite the fact that Lagos metropolis is the largest commercial, economic and industrial centre in the country, its transportation and communication do not commensurate with its status, as it has the worst in terms of mobility and communication problems in Nigeria. There is no adequate, effective, efficient and inexpensive communications and means of mobility. And where available they are often too expensive, inefficient and considered as elitist affair. Less than 10% of its population have access to efficient telecommunication facilities. In most cases and places where available it is grossly inefficient. Nigeria with GDP of US$527 has a total teledensity penetration of 0.43% (fixed line generation is 0.4% for mobile line). Thirty percent of this alone is in the metropolis, yet inefficient and unreliable (source: Policy News magazine, vol. 6, No.16, April 16-22, 2001).

Methodology

Data were collected from primary and secondary sources. The study sample consisted of 2,500 households respondents were used for this study. The questionnaire was administered in direct proportion to the population size of each of Local Government Areas (LGAs). Systematic sampling technique was used to select every tenth building on the identified streets. In a multi-

family dwelling, random sampling was used to select one household. Multiple regression analysis and simple correlation techniques were used to explain the relationship between level of mobile phone usage and number of trip generated.

Theoretical and Conceptual Underpinnings

Telecommunication and Travel Behaviour: The concept of telecommuting and travel gives a better understanding of the telecommunication technology in respect to transport in most of the literatures. Conventional wisdom about social and economic behaviour holds that the use of telecommunications is a natural substitute for transportation. For instance, telephone calls can replace travel to meetings and electronic messages can substitute for courier or postal delivery. Thus, the moving of information can replace the moving of people and goods. Vehicle traffic on national transportation infrastructure can be replaced by digital traffic on what is now called the National Information Technology (NIT).

This means using telecommunications to replace commuting between home and work. Giuliano, (2001) viewed telecommuting as consisting of those who have a regular workplace provided by the employer but who work at home or somewhere else part of the time using electronic technology or telephone. Jack (1973) invented the term telecommuting to describe home or neighborhood based working using computers and telecommunications technology. Tele based communication was seen as solution to the problem of congested urban environments and problem of congested urban environments and long commuters to centralized offices. It was assumed that telecommunications would simply substitute electronic flow for the transportation of people and freight along more polluting road, rail and air networks. An attempt to apply this concept of telecommuting in U.S. shows that telecommuting has a potential to save between 1.3% national energy consumption.

To be precise, the most emphasized relationship between transportation (travel) and telecommunication is substitution and complementarity. It is therefore likely that communication serves as both substitute and complement to transportation at the same time. However, while the substitution is direct, the complementarity is due to a reduction of the constrained resource, the time available for non-work travel.

Urban Travel-Forecasting Models

Urban transport or mobility is wherewithal for travel within urban areas. It involves not only the physical elements such as roads, vehicles, etc but also the systemic elements such as the legal, institutional financial and other frameworks for its provision. Perhaps more importantly, it also includes the political will and policy direction which, together condition the form and nature of the other elements. The world at large is witnessing rapid changes in information technology; adoption of the intelligent transport system as well as improvement in telecommunication technologies are facilitating the exchange of information as well as influencing or deciding the mobility pattern over space. Therefore, with the presence and wide adoption of the GSM in the metropolitan city of Lagos, the decision to embark on travel or work trip can be modelled or structured on four interrelated transport forecasting sub models:

(i) Trip Generation and attraction
(ii) Trip distribution
(iii) Modal choice
(iv) Trip assignment

(i) Trip Generation and attraction: Transportation studies have found that 80 to 90 percent of all trips made by residents of an urban area originate and end at home. Trip generation models are used to estimate the total number of trip originating in each zone, and the total number of trips, which will terminate in each zone, by trip purpose. Moreso, trip generation models typically estimate the number of trips by purpose on the basis of kind of mode used or socio economic characteristics of each zone. Examining, Lagos metropolis which is the economic nerve centre of Nigeria it forms a center of attraction for most people and thus generate virtually all types of trips (commercial/shopping, educational, recreational etc). However, the trip generation mechanisms of mobile telecommunication in particular tend to operate at the long term, "Macro" level of socio economic pattern changes; mobile telecommunication makes people aware of additional general audience events and opportunities that are reached through travel, such as political rallies, professional conference, entertainment events, and shopping opportunities. Also, the economy grows telecommunications, expands the number and geographic scope of economic and social relationships in which people and organizations engage. These relationships sometimes generate travel in addition to telecommunications volume. Such relationships include, selling, buying, servicing, employment, membership, friendship and family.

Above all, telecommunications, in particular, cellular phones speed up the pace of economic activity. The acceleration of commerce tends to generate customized, single purpose trips that leave immediately and go by the fastest means. The quickest modes of door-to door surface transportation in most metropolitan areas are single occupancy vehicles and small trucks. These modes generate more traffic congestion than moving the same volumes in mass transit vehicles and large trucks.

(ii) Trip Distribution: The basic objective of trip distribution is to distribute or allocate the total number of trips originating in each zone among all possible destination zones. This phase of travel forecasting builds directly upon the output of the trip generation phase. As it is necessary in transport planning to analyze in-flow and out-flow of traffic in a given zone, so it is pertinent in city of Lagos to equally obtain estimates of the direction of travel and the length of the trip from the metropolitan areas. Most notable model used in this regard includes the gravity model, and the intervening opportunity model.

The gravity model adopts the gravitational concepts, as advanced by Newton in 1866, to the problem of distributing traffic throughout urban areas. The model says that "trip interchange between zones is directly proportional to the relative attraction of each of the zones and inversely proportional to some function of the spatial separation between zones". This function of spatial separation adjusts the relative attraction of each zone for the ability, desire, or necessity of the trip maker to overcome the spatial separation involved.

Telecommunications can cause the route of a work trip to change over time. Good information about traffic conditions generated by mobile phone or advanced traveller information system can be the motivation for staying off of a crowded corridor in peak, or driving into a crowded corridor that would typically be avoided in the absence of an information system that can now reveal that the traffic is free flowing. Above all, trip distribution is an important and complex phase of the transportation planning process. It provides the planners with a systematic procedure capable of estimating zonal trip interchanges for alternate plans of both landuse and transportation facilities. These

zonal interchanges constitute a basic part for the travel information necessary for transportation planning. Telecommuting application affects trip distribution because of the long run propensity of workers to choose residential locations based on the journey-to-work pattern. Consistent worker location data implicate telecommuting as a source of metropolitan sprawl because people can now exercise residential preference without a long daily commuting to a central office during peak traffic periods (Niles, 2001).

(iii) Modal Choice: Once the total number of trips from each origin to each destination has been estimated for each trip purpose, the next step is to estimate the number of travellers who will use each of the available modes. Apportioning person trips between mass transit and private transportation is referred to as modal split. In the metropolitan city of Lagos for instance, a vast number of travel modes is available, but preference to use a particular mode depends to a great extent on the level of satisfaction to be derived from it in terms of cost effectiveness, time, safety and comfortability. Thus, the use of GSM or telecommunications can cause the mode of travel to change. An information system that provides accurate, real time information on the exact time when a bus will arrive at a nearby bus stop, or a system that enables buses to make front door pick-ups, could cause more people to ride the bus rather than use their private automobiles. Teleworking in the broadest sense, however, is likely to make mass transit and ridesharing relatively less appealing than private vehicle modes because of the prospect of changes in economic structure, business processes and land use in the direction of more temporary employment, just in time behaviour, and geographic dispersion (Niles, 2001).

Invariably, modal choice attempts to predict which mode of transportation will be chosen for particular journeys. For example, Daniels and Warnes (1980, 1999) identified five sets of variables that influence the choice of travel mode for the journey to work. First, the location of the person with respect to his workplace will obviously make a difference. If the person lives only a few blocks away from work, he or she might walk or ride a bicycle. Secondly, and related to the location factor, are a set of trip factors. These factors include the trip length, travel cost and the travel-time ratio. The travel time ratio is often particularly significant as it compares the travel times associated with different modes of transportation. Third, there are a number of private transportation factors. Parking facilities near the workplace and the cost of parking are of primary concern. Also, the availability of suitable car pools will influence the decision of whether to use private transportation. Fourth, a set of public transportation factors are involved. These factors include the accessibility of the person to public transportation facilities, such as buses and trains and the inconveniences associated with using public transportation. For example, during cold weather, the decision to sue mass transit systems is often dependent on the availability of bus shelters and the likes.

Modal choice is influenced by a set of socio-economic factors. In particular, automobile ownership rates and economic status are important. Areas characterized by high economic status tend to be dependent on public transportation than areas characterized by low economic status. *(Fig. 2.1).*

(iv) Trip Assignment: This involves the assignment of trips to particular modes or routes. This is important as it helps to note or make available freeways in a city road

network. It gives cognizance to type of route, number of lanes, capacity, travel speed, environmental area (CBD, Urban, Suburban, etc) and length etc. Likewise, trip file contains origin-destination of trips, number of trips, types of trips etc.

Conclusively with the advent of the GSM, individual road users can tell or give information about road condition to other road users. This is done with the aim of smoothening the travel condition of others.

Findings and Discussion

Influence of Mobile Phone (GSM) Usage on Trip Generation among Lagos Residents: It is interesting to note that most people still make work-related trips every week for the purpose of maintaining certain frequency of face-to-face interaction while some people make use of telecommunication facilities like GSM to make contact. Furthermore, many residents make trips to their workplace from time to time because some of their tasks require special facilities or close interaction with co-workers. Telephone facilities are regular and provide immediate contact between friends and relations, and they reduce and replace the need for visiting, in essence providing a substitution for face-to-face contacts for social and discretionary trips.

Attempt is therefore made in this section to examine the impact of mobile phone (GSM) usage on trip generation among Lagos residents and the significant differences in trips made by GSM-owners and non-owners. These trips are classified into five, namely: social trips, work trips, recreational trips, shopping trips and business trips while the student's t-test of means is computed to analyse the significance of the differences in trips between GSM-owner and non-owner respondents.

Table 4.1 shows that in spite of using GSM, the owners still depend mostly on physical movement for their various activities even more than non-GSM owners.

Table 4.1 Test for the significance of difference between trips making among GSM owners and Non-GSM owners with respect to business trip

	Number of LGAS	Mean Trip	Mean Difference	Standard deviation of Trip	t-Value	Observed significance value	Degree of freedom (df)
GSM owners	15	91.87		65.46			
			28		1.28	0.21	26.91
Non-GSM owners	15	63.87		53.40			

Table 4.1 shows the significance in the mean trips by GSM owners and Non-GSM owners in Lagos metropolis. The trip data was collected from the fifteen Local Government Areas as shown in column two of table 4.1 above. It is shown that the mean trips by GSM owners is 91.87, while that by Non-GSM owners is 63.87. There is a difference of 28 between trips by the GSM owners and Non-GSM owners.

The student's t-test has been computed to test if the mean difference of 28 between business trips by GSM owners and Non-GSM owners is significant or not. The t-value computed is given as 1.28 with a degree of freedom of 26.91. The t-value is however not significant at 5% (0.05%) level of significance, since the computed observed significance value is 0.21 (see table 4.1). Hence, it means that there is no significant difference in the number of business trips by GSM owners and Non-GSM owners. It implies that business activities or transactions, delivery of goods and more services still involve face-to-face contact requiring physical movement between places which involve both GSM-owners and non-owners despite the usage of GSM. It reveals that business activities are not amenable to GSM usage in metropolitan Lagos.

Table 4.2 Test for the significance of difference between trips making among GSM owners and Non-GSM owners with respect to recreational trips

	Number of LGAS	Mean Trip	Mean Difference	Standard deviation of Trip	t-Value	Observed significance value	Degree of freedom (df)
GSM owners	15	42.07		49.24			
			5.07		0.31	0.76	26.58
Non-GSM owners	15	37.00		38.92			

In testing for the significance in the mean trips by GSM owners and Non-GSM owners in Lagos metropolis, the trip data was collected from the fifteen Local Government areas as shown in column two of table 4.2 above. It is shown that the mean trips of GSM owners is 42.07, while that by Non-GSM owners is 37.00. There is a mean difference of 5.07 between trips by the GSM owners and Non-GSM owners.

The student's t-test has been computed to test if the mean difference of 5.07 between recreational trips by GSM owners and Non-GSM owners is significant or not. The t-value computed is given as 0.31 with a degree of freedom of 26.58. The t-table is however not significant at 5% (0.05) level of significance, since the computed observed significance value is 0.76 (see table 4.2). Hence, it means that there is no significant difference in the number of recreational trips by GSM owners and Non-GSM owners. It implies that recreation is a way of life of respondents in Lagos metropolis which requires physical contact rather than GSM usage. It reveals that with the socio-cultural background of the people, they do appreciate physical presence in any of the tourism activities in their areas.

Table 4.3 Test for the significance of difference between trips making among GSM owners and Non-GSM owners with respect to shopping trips

	Number of LGAS	Mean Trip	Mean Difference	Standard deviation of Trip	t-Value	Observed significance value	Degree of freedom (df)
GSM owners	15	66.00		50.66			
			3.93		0.22	0.83	27.95
Non-GSM owners	15	62.07		48.49			

In testing for the significance in the mean trips by GSM owners and Non-GSM owners in Lagos metropolis, the trip data was collected from the fifteen Local Government areas as shown in column two of table 4.3 above. It is shown that the mean trips of GSM owners is 66.00 while that by Non-GSM owners is 62.07. There is a difference of 3.93 between trips by the GSM owners and Non-GSM owners.

The student's t-test was computed to test if the mean difference of 3.93 between shopping trips by GSM owners and Non-GSM owners is significant or not. The t-value computed is given as 0.22 with a degree of freedom of 27.95. The t-value is however not significant at 55 (0.05) level of significance, since the computed observed significance value is 0.83 (see table 4.3). Hence, it means that there is no significant difference in the number of shopping trips by GSM owners and Non-GSM owners. It implies that shopping activities involves physical contacts among Lagos metropolis residents. This is as a result of great emphasis residents place on traditional market places which require face-to-face contacts rather than GSM usage.

Table 4.4 Test for the significance of difference between trip making among GSM owners and Non-GSM owners with respect to social trips

	Number of LGAS	Mean Trip	Mean Difference	Standard deviation of Trip	t-Value	Observed significance value	Degree of freedom (df)
GSM owners	15	389.07		245.41			
			58.53		0.76	0.45	24.82
Non-GSM owners	15	330.53		168.75			

In testing for the significance in the mean trips by GSM owners and Non-GSM owners in Lagos metropolis, the trip data was collected from the fifteen Local Government areas as shown in column two of table 4.4 above. It is shown that the mean trips of GSM owners is 389.07, while that by Non-GSM owners is 330.53. There is a difference of 58.53 between trips by the GSM owners and Non-GSM owners. The student's t-test was computed to test if the mean difference of 58.53 between social trips by GSM owners and Non-GSM owners is significant or not. The t-value computed is given as 0.76 with a degree of freedom of 27.95. The t-value is however not significant at 5% (0.05) level of significance, since the computed observed significance value is 0.45 (see table 4.4). Hence, it means that there is no significant difference in the number of social trips by GSM owners and Non-GSM owners. It implies that social engagement activities involving respondents in Lagos metropolis require face to face contacts rather than GSM usage. It reveals that socio-cultural background of the people in our society is such that physical presence of friends and relatives at gatherings is often very much appreciated.

Table 4.5: Test for the significance of difference between trip making among GSM owners and Non-GSM owners with respect to work trips

	Number of LGAS	Mean Trip	Mean Difference	Standard deviation of Trip	t-Value	Observed significance value	Degree of freedom (df)
GSM owners	15	275.80		223.72			
			8.20		0.10	0.92	27.96
Non-GSM owners	15	267.60		215.18			

In testing for the significance in the mean trips by GSM owners and Non-GSM owners in Lagos metropolis, the trip data was collected from the fifteen Local Government areas as shown in column two of table 4.5 above. It is shown that the mean trips of GSM owners is 275.80, while that by non-GSM owners is 267.60. There is a difference of 8.20 between trips by the GSM owners and Non-GSM owners.

The student's t-test was computed to test if the mean difference of 8.20 between work trips by GSM owners and Non-GSM owners is significant or not. The t-value computed is given as 0.10 with degree of freedom of 24.82. The t-value is however not significant at 5% (0.05) level of significance, since the computed observed significance value is 0.92 (see table 4.5). Hence, it means that there is no significant difference in the number of work trips by GSM owners and Non-GSM owners. It implies that respondents in Lagos metropolis are involved in physical contacts in their various work activities. It reveals that with the low level of technological development in developing countries like Nigeria, work activities can not be substituted for GSM usage.

The hypothesis is that there is a significant difference in trip making among GSM owners and

Non-GSM owners in the Lagos metropolis. (Hypothesis 4) sub-section heading.

In this section, all the trips are combined, irrespective of the purpose for the GSM owners and Non-GSM owners. The student's t-test is then used to examine if the difference between the two groups is significant.

Table 4.6: Test for the significance of difference between trip making among GSM owners and Non-GSM owners in Lagos metropolis

	Number of LGAS	Mean Trip	Mean Difference	Standard deviation of Trip	t-Value	Observed significance value	Degree of freedom (df)
GSM owners	15	864.80		582.55			
			103.73		0.54	0.60	26.80
Non-GSM owners	15	761.07		469.69			

In testing for the significance in the mean trips by GSM owners and Non-GSM owners in Lagos metropolis, the trip data was collected from the fifteen Local Governments Areas as shown in column two of table 4.6 above. It is shown that the mean trips of GSM owners is 864.80, while that of Non-GSM owners is 761.07. There is a difference of 103.73 between trips by GSM owners and Non-GSM owners.

The student's t-test was computed to test if the mean difference of 103.73 between all trips (that is, business, recreational, shopping, social and work trips) by GSM owners and Non-GSM owners is significant or not.

The t-value computed is given as 0.54 with a degree of freedom of 26.80. The t-value is however not significant at 5% (0.05) level of significance, since the computed observed significance value is 0.60 (see table 4.6). Hence, it means that there is no significant difference in the number of trips by GSM owners and Non-GSM owners. The table shows that the postulated hypothesis that there is a significant difference in trip making among GSM owners and Non-GSM owners is rejected.

Conclusion

The finding of this study is that telecommunication measure by GSM owners does not substitute for intra-city trips. Residents having GSM phones significantly made more business, work, social, shopping and recreational trips as well as overall trips than residents having no GSM phones in the area under study. This implies that, despite the usage of GSM, GSM-owners still depend mostly on physical movement or personal contact for their various activities while all the trips type (business, recreation, shopping, social and work trips) cannot be replaced with GSM-usage. This can be attributed by the fact that low-level of technological development and couple with that of socio-cultural background of the people in our society in such that physical presence of friends and relatives at gathering is often very much appreciated.

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