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Inter-Trip Characteristics Model for Ado-Ekiti Township, Southwest Nigeria *(Pp. 1-14)*

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Abstract
Travel characteristics survey and the useful time spent on road by commuters were collected from the terminals and members of National Union of Road Transport Workers. The survey also gave the travel behaviour of commuters and socio-economic characteristics over a period of time across the population. The analysis shows that a total of 7,338 Trips/per were made in Ado-Ekiti to various urban and rural area in which trip to Iworoko-Ekiti has the largest with 3,000 Trips per day. The regression analysis of travel time as dependent variable with other variables (travel cost and travel distance) gives average value of R and R^2 as 93.1% and 86.6% respectively.

Keywords: Travel Behaviour, Terminals, Trips, and Socio-economic Characteristics

Introduction

Transport is an important element in the process of modernization, sometimes allowing and perhaps accelerating development and at other times acting as a brake in progress. Transport generally plays an important role for other factors of development i.e there is no escape from transport and this has

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helped in generating trips from one place to another. History makes it clear that demand for travel has been evident from primordial times when early man trekked from place to place for food gathering.

The heart of traffic and transportation planning is concerned with the design of circulation systems which maximize availability for essential movement between inter-related interacting activities giving due consideration to safety, amenity and cost. It is worthy to note that the need for transport is a derived need.

Owens (1989) stated that history makes it clear that transportation as a means to other ends has a pervasive impact on economic and social development and since it is acceptable that to attain and sustain economic and social development, contact must be made and there must be movement to conquer distance. In conquering distance and making contact, trip is been generated by the trip-makers i.e. the road-users. Trip is defined as a one-way person movement by one or more modes of travel and each have an origin and a destination.

Ogunlowo (2000) stated that the construction of transportation systems has a profound and far-reaching impact on land use and the socio-economic characteristics of citizens. In the transportation planning, an attempt is made to model in an abstract manner the transportation system and its domain. The three most prominent types of models are (a) those describing affected factors and their relation to transport, (b) those describing travel behaviour or the demand for transportation facilities and (c) those describing the characteristics of various forms of transportation technologies.

In describing the travel behaviour or the demand for transportation facilities, travel estimation building helps in determining both present and future travel patterns with respect to trip generation, trip distribution, modal split and traffic assignment. Trip generation according to O'Flaherty (1983) is concerned with the estimation of the number of trips into and out of various traffic zones, while Dickey (1983) described trip as the basic unit of movement.

Salter (1990) stated that land use is a major consideration in the generation of trips with other factors such as family size, income, motor vehicle ownership and the social economic status of the head of the household, while O'Flaherty opinioned that trips are based on the principle that land use generates trips and that the number and types of trips are influenced by location variables

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such as residential or population density, socio-economic variables such as car availability or ownership, household income and size, household composition, occupational status and public transport accessibility variables. Trip generation describes reasons why trips are made and the relation between trip making and the urban environment.

In analyzing trip-end generation, the number of variables considered could be very great and the purpose of the trip-end modeling process is to identify those variables which are meaningful determinants of trip-making behaviour. Three methods of developing the trip-end models are Expansion Factor method, Regression Analysis method and Category Analysis method. Thus, this research will focus on the trip generation from the study location to other urban or rural area and develop a linear regression model expressing travel time (dependent factor) as a function of other independent factors such as travel distance, travel cost among others.

The Study Area

Ado-Ekiti, the nucleus of the ancient Ewi kingdom is located on latitude 70^0 40^1 North of the equator and longitude 50^0 16^1 East of the Greenwich Meridian. It covers an approximate area of 265square kilometer. Its longest north-south extent is about 16km, and its longest east-west stretch is 20km. The town serves dual purposes as the Ekiti State capital and the Local Government headquarters. It has conurbation such as Ikere Ekiti in the south, Afao and Iworoko-Ekiti in the north, Iluomoba and Aisegba in the east and Ilawe – Ekiti in the west. The town presently enjoys good road network; however, poor town planning makes it difficult to differentiate the residential area from the business area. A number of retail shops, shopping complex and churches among others are located within the residential areas. Figure 1.0 below shows the geographical location of Ado-

Research Objective

The main objective of this research is to determine the trip pattern of the commuters from Ado-Ekiti Township with a view to developing a simple mathematical models having obtained accurate and detailed information on their travel characteristics.

Research Methodology

Travel survey were collected at six approved motor park in Ado-Ekiti township; these are: Ado-Akure park, New Motor park at Orilewu, Ado-Aramoko/Efon park at Basiri, Ado-Ilawe park at Falegan, Elemi park which comprises of Ado-Ifaki/Ido-Otun route and Ado-Ikare at Olokemeji.

Information was also collected from the member of National Union of Road Transport Workers (NURTW), Road Transport Employee Association of Nigeria (RTEAN) and other relevant transportation unions.

Result and Discussion

Table 1 shows the travel pattern of the commuters from the six selected motor terminals to different urban and rural areas. Travel distance and travel cost are major factors affecting travel time which in turn affect the number of trips to a particular route and the influences the mode of travel chosen by a traveler. The travel time was regressed against travel distance and travel cost while varying graphs as shown in figure 2.0 to 16.0 were plotted to obtained the relationships between the variables. The regression model shown in appendix 1.0 gives average value of R and R^2 as 93.1% and 86.6% respectively**.**

Trip Model

The model equation is given thus:

$T_t = 0.200 + 1.786x10^{-2}T_d - 6.48x10^{-4}Tc$ ----------(1)

Where: T_t = the travel time

T_d = the travel distance

T_c = travel cost

Also, varying equations were obtained from the graphs of the number of trips against travel time, travel distance and travel cost. Equations 2 & 3 were power series plot of the number of trips against the travel time and travel distance respectively.

$$N_t = \frac{44.991}{T_t^{0.3547}} - - - - - - - - - - - - - (2)$$

$$N_t = \frac{26.381}{T_d^{0.0538}} - - - - - - - - - - - - - - - - (3)$$

From Equation 2, it can be stated that the number of trips generated from the origin to a destination is inversely proportional to the square of travel time; while equation 3 shows that the trip generated from a zone and attracted to destination is inversely proportional to their spatial separation (travel

distance). Thus, the above relationship i.e equation 2 & 3 verify the trip distribution gravity model.

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Figure 1.0 Location Map of Study Area

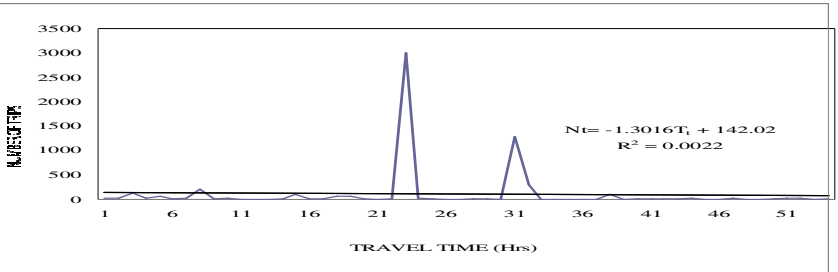

Figure 2.0 Linear Relationship Between the Number of Trips and Travel Time

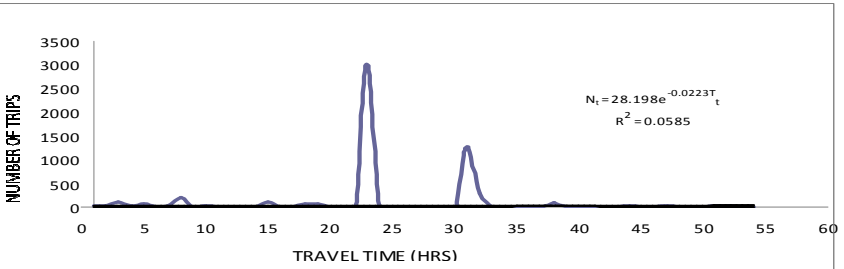

Figure 3.0 Exponential Relationship Between the Number of Trips and Travel Time

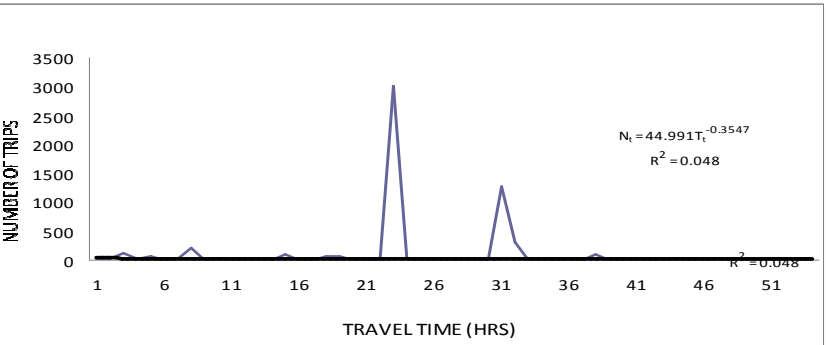

Figure 4.0 Power Series Relationship Between the Number of Trips and Travel Time

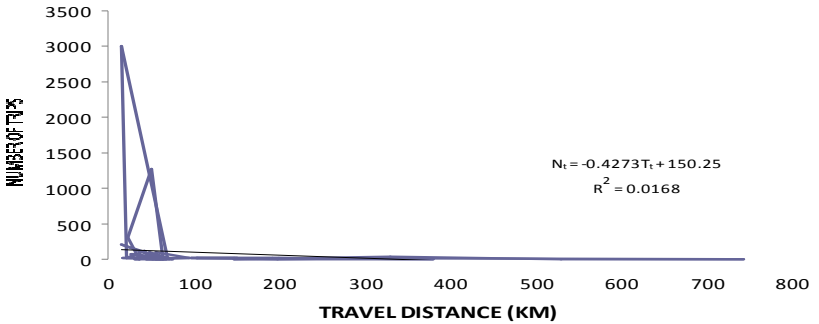

Figure 5.0 Linear Relationship Between the Number of Trips and Travel Distance

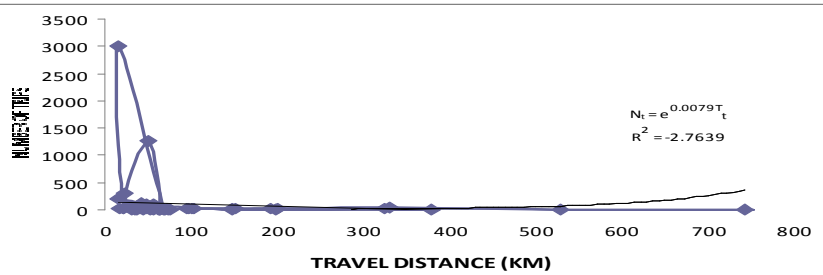

Figure 6.0 Exponential Relationship Between the Number of Trips and Travel Distance

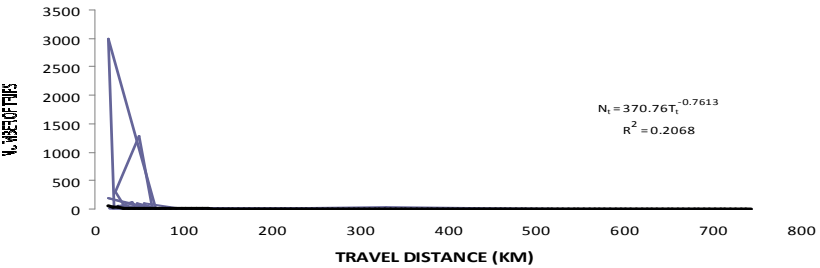

Figure 7.0 Power series Relationship Between the Number of Trips and Travel Distance

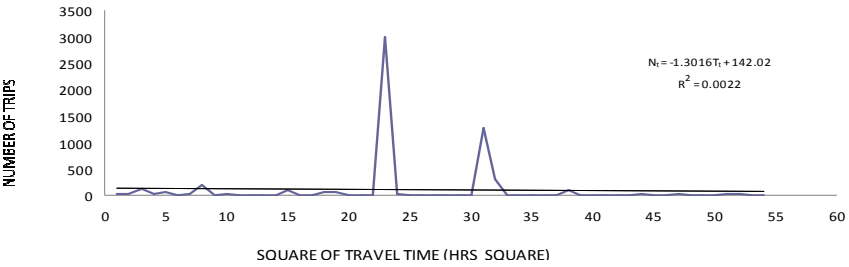

Figure 8.0 Linear Relationship between the number of Trips and the Square of Travel Time

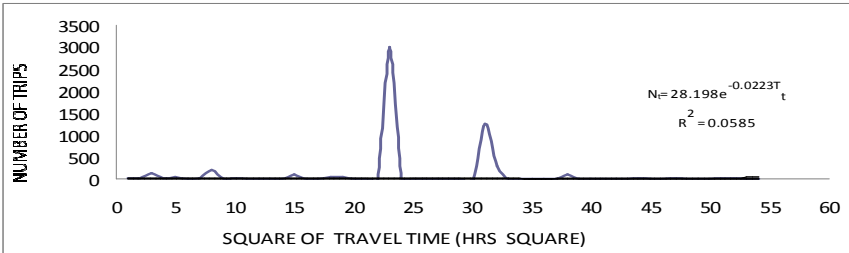

Figure 9.0 Exponential Relationship between the number of Trips and the Square of Travel Time

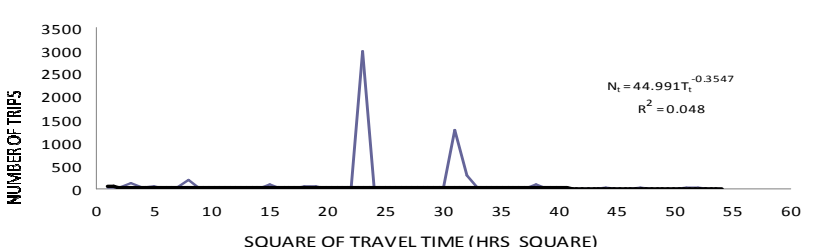

Figure 10.0 Power Series Relationship between the number of Trips and the Square of Travel Time

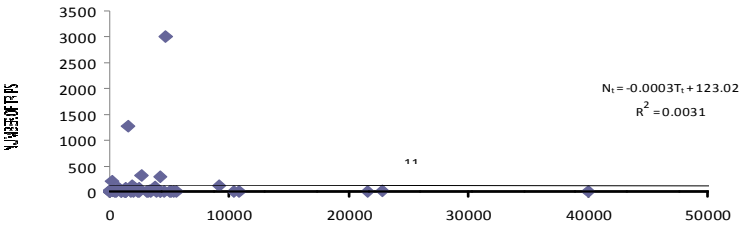

Figure 11.0 Linear Relationship Between the Number of Trips and the Square of the Travel Distance

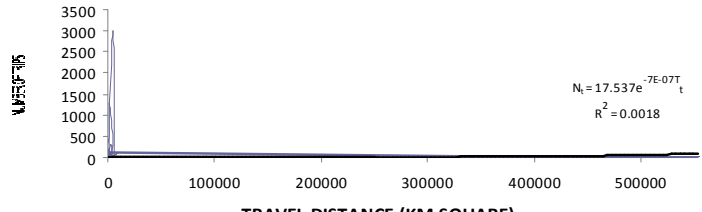

Figure 12.0 Exponential Relationship Between the Number of Trips and the Square of the Travel Distance

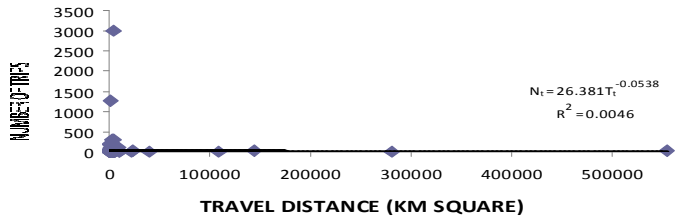

Figure 13.0 Power Series Relationship Between the Number of Trips and the Square of the Travel Distance

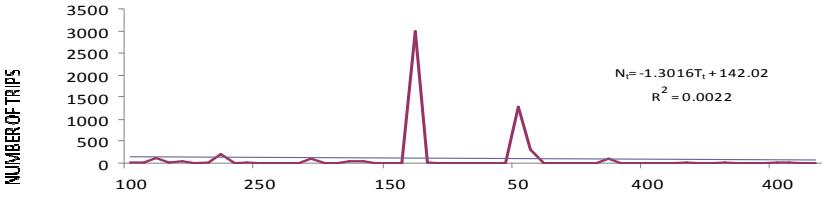

Figure 14.0 Linear Relationship Between the Number of Trips and the Cost Via available modes

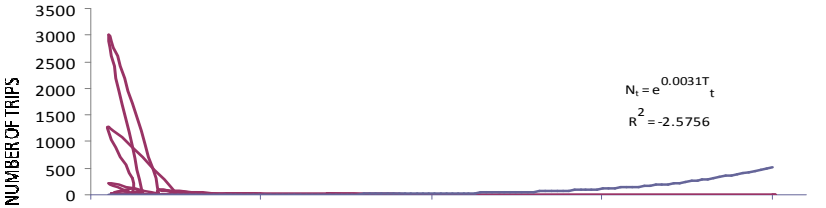

Figure 15.0 Exponential Relationship Between the Number of Trips and the Cost Via available modes

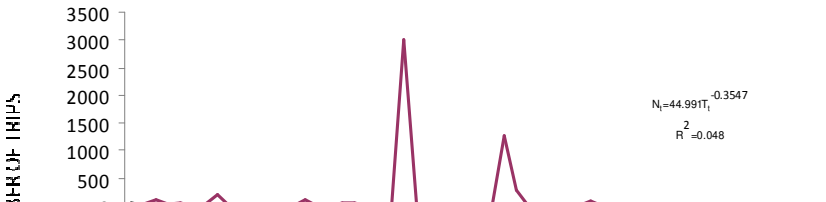

Figure 16.0 Power SeriesRelationship Between the Number of Trips and the Cost Via available modes

Table 1 Travel Inventory of Commuters to Different Available Route Outside Ado-Ekiti

Origin/Destination	No of Vehicle	TripRate/ Veh/Day	No. of Trips/Day	Travel Time (hr)	Travel distance (km)	Travel cost (N)
Ado Ekiti – Aramoko	10	2	20	0.6	36	100
Ado Ekiti – EfonAlaye	10	2	20	0.8	48	150
Ado Ekiti – Emure	30	4	120	0,7	43	120
Ado Ekiti – Ilawe	10	2	20	0.35	21	60
Ado Ekiti – Ise	30	2	60	0.62	37	100
Ado Ekiti – Ido	5	2	10	0.7	42	120
Ado Ekiti – Ijero	10	2	20	0.97	58	120
Ado Ekiti – Ikere	50	4	200	0.25	15	50
Ado Ekiti – Ikole	5	2	10	1.08	65	200
Ado Ekiti – Igede	10	2	20	0.3	18	60
Ado Ekiti – Iye	5	1	5	1.18	71	250
Ado Ekiti – Otun	5	1	5	1.08	65	300
Ado Ekiti – Oye	5	1	5	0.75	45	150
Ado Ekiti – Omuo	5	2	10	1.6	96	350
Ado Ekiti – Ode	5	2	105	0.93	56	200
Ado Ekiti – Ipole	5	2	10	0.98	59	200
Ado Ekiti – Ikogosi	5	2	10	0.83	50	150
Ado Ekiti – Iju	30	2	60	0.45	27	150
Ado Ekiti – Ita Ogbolu	30	2	60	0.52	31	150
Ado Ekiti – Igbara Odo	5	2	10	1.05	63	100
Ado Ekiti – Igbara Oke	5	1	5	1.22	73	150
Ado Ekiti – Ogotun	5	2	10	1.15	69	150
Ado Ekiti – Iworoko	200	15	3000	0.25	15	50
Ado Ekiti – Ifaki	10	2	20	0.37	22	200
Ado Ekiti – Usi	5	2	10	0.62	37	150
Ado Ekiti – Ayetoro	5	1	5	0.87	52	250
Ado Ekiti – Erinmope	3	1	3	1.13	68	300
Ado Ekiti – Ilupeju	5	2	10	0.58	35	140
Ado Ekiti – Itapa	5	2	10	0.67	40	150
Ado Ekiti – Ilasa	3	1	3	1.08	65	250

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Ado Ekiti – Aso Ayegunle	85	15	1275	0.83	50	50
Ado Ekiti – Ilu Omoba	60	5	300	0.4	24	120
Ado Ekiti – Ijesa Isu	3	2	6	0.6	36	120
Ado Ekiti – Aisegba	3	2	6	0.53	32	120
Ado Ekiti – Agbado	3	2	6	0.62	37	150
Ado Ekiti – Ogbagi	5	1	5	1.03	62	250
Ado Ekiti – Irun	5	1	5	0.95	57	300
Ado Ekiti –Akure	50	2	100	0.8	48	200
Ado Ekiti – Ikare	5	1	5	1.25	75	400
Ado Ekiti – Ilesa	10	1	10	1.2	72	350
Ado Ekiti – Ife	5	2	10	1.73	104	400
Ado Ekiti – Ilorin	10	1	10	2.51	151	500
Ado Ekiti – Osogbo	10	1	10	1.7	102	350
Ado Ekiti – Ibadan	10	2	20	3.33	200	500
Ado Ekiti – Abuja	5	1	5	6.33	380	900
Ado Ekiti – Okenne	5	1	5	2.45	147	900
Ado Ekiti – Lagos	30	1	30	5.5	330	700
Ado Ekiti – Kaduna	5	1	5	8.83	530	1200
Ado Ekiti – Kano	2	1	2	12.4	744	2000
Ado Ekiti – Benin	10	1	10	3.2	192	650
Ado Ekiti – Ore	20	1	20	2.47	148	400
Ado Ekiti – Ondo	20	1	20	1.63	98	300
Ado Ekiti – Okitipupa	5	1	5	3.3	198	700
Ado Ekiti – Onitsha	10	1	10	5.42	325	900

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Appendix 1.0 Regression Analysis of Travel Time against Travel Distance and Travel Cost

Descriptive Statistics

	Mean	Std. Deviation	N
TT	1.8331	2.3271	54
TD	103.0370	133.1214	54
TC	320.9259	343.2380	54

Correlations

		TT	TD	TC
Pearson Correlation	TT	1.000	.930	.884
	TD	.930	1.000	.958
	TC	.884	.958	1.000
Sig. (1-tailed)	TT	.	.000	.000
	TD	.000	.	.000
	TC	.000	.000	.
N	TT	54	54	54
	TD	54	54	54
	TC	54	54	54

Variables Entered/Removed

Model	Variables Entered	Variables Removed	Method
1	TC, TD	.	Enter

a All requested variables entered. b Dependent Variable: TT

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.931	.866	.861	.8676	.866	165.150	2	51	.000

a Predictors: (Constant), TC, TD

ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	248.622	2	124.311	165.150	.000
	Residual	38.389	51	.753		
	Total	287.011	53			

a Predictors: (Constant), TC, TD b Dependent Variable: TT

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients		Sig.	95% Confidence Interval for B		Correlations		
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part
1 (Constant)	.200	.170		1.178	.244	-.141	.542			
TD	1.786E-02	.003	1.022	5.699	.000	.012	.024	.930	.624	.292
TC	-6.483E-04	.001	-.096	-.533	.596	-.003	.002	.884	-.074	-.027

a Dependent Variable: TT

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