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Modelling minicab drivers' disordered behaviour for choosing passenger and destination in Akure, Nigeria

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ABSTRACT

This study investigated the disordered behaviour of minicab drivers for choosing passenger and destination in Akure using the multinomial model and nested logit model respectively. Information was gathered by the distribution of questionnaires to minicab drivers plying the Federal University of Technology Akure (FUTA) North gate to the Oja-Oba axis in Akure, Nigeria. The objectives were to validate the performance of logit models; to identify the major parameters for selecting passenger and destination by disordered minicab drivers, and to examine the interrelationships of variables employed. Primary data was obtained from 314 respondents. The study found that the nested logit model gives a better utility value than the multinomial logit model with ρ_0^2 = 0.48 more than ρ_c^2 = 0.46 which justifies the assertion. Also, the major parameters for selecting passengers and destination by disordered minicab drivers in Akure are transport rates variable, distance variable, and travel time variable. The study recommends that an accurate pricing policy of minicab operation should be efficiently formulated, implemented, and enacted to prevent overcharging and undercharging.

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1. INTRODUCTION

Just as the circulation (movement) of blood is essential to the human system, so also is mobility essential for human survival. The historical remark of a renowned Greek philosopher Heraclitos (fl. c. 500 B. C. E) of the late 6th century is commonly noted "everything is in motion, excluding the motion itself. Although, because of the level of advancement during his era, it can be said that his perception may not have considered the present status of mobility experienced in the highly complex society; however, he acknowledged the happenings of unending motion.

Regarding the past and future pattern of mobility, there were interpolations: for the year 1800 interpolation, it was revealed that the average distance that could be easily traveled was 12 miles per day; for the year 1900 interpolation, it was revealed that the average distance that could conveniently be traveled increased from 12 miles per day to 60 miles per day; for the year 2000 interpolation, it was revealed that the average distance that could conveniently be traveled increased from 60 miles per day to 300 miles per day [1]. Apart from the earlier interpolations, there were extrapolations for the years 2100 and 2200 which revealed a travel distance to be 1500 miles per day and 7500 miles per day respectively [1].

From the forecast, it is pertinent to note that mobility is increasing daily, and this may go beyond the extrapolations because of the increasing dominance of human beings on the planet earth. Mobility is a means to eradicate extreme poverty and hunger that was itemized by the sustainable development goals (SDGs). This connotes the axiom of Wilfred Owen, a renowned transport analyst who states that immobility perpetuates poverty [2]. The demand for mobility in the modern era is quite increasing because of the increasing purposes that are being fulfilled with transportation. In the actual sense, the geographical flow of people, goods, and information is ever-increasing. This increase is a result of the significant improvement in the global economy which results in increasing regional complementarity of trade, intervening opportunities, and spatial transferability. The level of mobility development has significant implications on accessibility.

Increasing functional accessibility does not automatically equate to increasing travel demand, but it implies that transport is among the major dimensions of accessibility [3]. Generally, accessibility is defined as the ability to fulfill desired activities and reach desired destinations. It is the potential of opportunities for interaction [4]. It is dependent on several components such as land use, trip purpose, spatial location (workplaces, residential areas), period of the day, transport systems, among others [5]. This study concentrated on public transport which is a means to achieving rural and urban mobility.

The most adopted means (carrying capacity and operation) of public transportation are metro, tram, bus, and minicab. Among all, the minicab is a suitable model because of its peculiar attributes such as door-to-door operation, comfort, privacy, speed, lengthy operation, and less designated parking charges [6]. It is a means of public transportation that is mainly employed for short distant trips within the urban areas particularly the cities for conveying few passengers. The minicab transportation system is greatly influenced by a variety of factors which oftentimes results in changes in its accessibility and availability. The factors are mostly encapsulated in seasonal factors and environmental factors. The seasonal factors include an event such as parties, conferences, rallies among others which are usually held during weekends, and most facilitate consolidated demand and traffic at a particular location.

Apart from the above, there is also a peak and off-peak period of the day. The peak period (7 to 9 am) usually generates high demand for minicab operations most especially Monday to Thursday and demand is normally consolidated in the residential areas or bus stops that are close to the residential area (trip generating zones). Also, during the evening (4 to 7 pm), demand is usually consolidated in the trip attracting zones. Environmental factor has to do with rainfall and during the period people who should have a walk or used motorcycles, are motivated to use minicab. This condition generates a scattered demand whereby users are concentrated in a definite location. Each of the minicabs is operated by an independent driver, thereby making continuous decisions on their own. Such a decision may be weak as it is usually influenced by the level of exposure, education of such drivers, and other internal and external factors.

The efficiency of minicab operation is usually at a substandard level which is unsatisfactory. The cause of this awkward situation is attached to the unstructured and uninformed dynamics of minicab operations [7]. Based on the level of minicab operations, there are three categories which are private, line, and disordered minicabs. The first category is the private minicabs that are usually operated by private companies and are highly found in the populous cities of the world. Through this method, the passengers can call and request the service of minicab companies. This is not usually common in Akure. The second category is the line minicabs that usually have a predetermined starting point and the terminating point. The third category is disordered minicabs. In this group, it was noted that the passengers who are dominant and be able to rent the minicabs if and only if there is the harmonization between the minicab driver and the passenger [8] such that the destination of the trip is preferred based on the agreement of driver and passenger [9]. This type of minicab operation dominates the public transport services in Akure, Nigeria.

There is no doubt that the majority of the cities of the world have benefited from minicab operation most especially through the effective enhancement of complementarity of demand and supply between locations, facilitation of intervening opportunities, and a significant means of transferring goods and services through door-to-door service over the spatial formation. From the literature search as shown in Table 1, there seem to be limited research on minicabs and vehicle characteristics of the minicab [9], [10]. Among the limited studies, Yang and Wong [11] conducted a study on the network analysis of taxi operations in the urban area. In the study, a framework for the taxi networks was designed as the basis for research and further investigations at the University of Science and Technology, Hong Kong. The status of minicab services was examined in a few countries; examined in Canada [12], examined in Wales [13], examined in Australia [14]. Another study was conducted on the importance of compressed natural gas (CNG) Taxis in Kensington [15] which compared the of CNG powered taxis and gasoline-powered taxis using the indices of operational costs, maintenance costs, purchasing cost, and other costs associated with sustainability issues such as pollution.

Also, a model study of urban taxi services in congested road networks (heavy traffic) with elastic demand was conducted [16]. The balance of passenger demand and taxi supply in a regular market was carried out in Hong Kong using a network model for description [10]. A similar study was conducted in England [17]. Model research was conducted and applied based on vehicle capacity, navigation size, and the quality-of-service delivery for demand [18]. Similar studies were conducted in Ireland and England [19] in the United States of America (USA) [20] and Hong Kong [21].

There was a suggestion for nonlinear modeling of pricing taxi services [22]. A value study on taxicab license and market regulation was conducted and concluded that the value of taxicab license is depreciating with the higher number of taxi ownerships [23]. The lines of the taxi in the province of Tehran were assessed [24]. A study on the profitability and efficiency of the taxi sector in Barcelona, Spain was also conducted [25]. The effects of disordered taxis in the developed cities were carried out and found that if drivers own a license for taxi passenger operation beyond the stations, there will be increased passengers' satisfaction [26].

A study on location-based service (LBS) was carried out to reduce the waiting time for taxi services and to choose the most suitable vehicle available to meet the demand of passengers [27]. In their study, three different algorithms were evaluated to define and identify the most suitable taxi that meets the request. The user's smallest waiting time and the computational cost criterion were employed in the tests. The tests performed in a stationary system revealed that the proposed LBS algorithm presents a minimal waiting time and travel distance when compared to broadcasting methods and euclidean distance algorithms [27].

The dynamics for taxi drivers' decision-making for plying the airport route was modeled, and the essence of critical decision-making among taxi drivers along this route was attributed to the business nature and competitiveness of the airport environment [28]. They simulated the decision of taxi drivers, was analyzed it with the logit model, and was revealed that some indicators such as hot temperate condition and work shift nature are the most significant factors for taxi drivers' decision making. In Beijing, the patterns of taxi trips were examined [29]. This examination was conducted for three weeks using primary data that was obtained from 11880 taxis, and the result revealed a homogenous pattern and condition of taxi trips. The summary of the literature is shown in Table 1.

Table 1. Selected literature on minicab drivers' behavior

Year	Author(s)	Topics
2019	[8]	Modeling the behavior of disordered taxi drivers of Tehran for choosing passenger and destination
2016	[28]	Modeling taxi drivers’ decisions for improving airport ground access: John F. Kennedy airport case
2016	[29]	Understanding taxi travel patterns
2015	[27]	Location-based service to reduce the waiting time for taxi services
2014	[25]	Assessment of the taxi sector efficiency and profitability based on continuous monitoring and methodology to review fares
2011	[30]	Where to find my next passenger?
2011	[31]	Towards reducing taxicab cruising time using Spatio-temporal profitability maps
2011	[6]	A review of the modeling of taxi services
2010	[22]	Nonlinear pricing of taxi services
2010	[32]	Influence of real-time information provision to the vacant taxi driver on taxi system performance
2005	[33]	Regulating taxi services in the presence of congestion externality.
2005	[34]	Effect of taxi information system on efficiency and quality of taxi services
2004	[35]	Waiting strategies for the dynamic pickup and delivery problem with time windows
2002	[10]	Demand-supply equilibrium of taxi services in a network under competition and regulation
2001	[16]	Modeling urban taxi services in congested road networks with elastic demand
1998	[11]	A network model of urban taxi services

Source: Author’s compilation (2020)

The study of [9] in Tehran is most recent as evidenced by the literature search. Hence, the approach adopted in their study will be replicated in Akure, Nigeria. The major gaps identified in their study were: i) The study was conducted in Tehran, Iran. The social, political, and environmental norms in Iran may not be the same with other countries like Nigeria (Location gap); ii) The study was conducted in the year 2019. There may be changes in the pattern of Minicab drivers' disordered behavior for choosing passenger and destination If conducted in subsequent years (time gap); iii) Primary data was collected through questionnaire from 157 respondents. If the sample size was increased, a better result may be obtained (sample size gap).

Given all these identified gaps, it is believed that the lacunas will be improved upon. The passenger dynamics for choosing minicabs and vehicular capacity often intermingle with the frequency of service offerings and the privacy level. Furthermore, a few indicators such as the vehicle headway, the average waiting time, traveling time, adoption of navigation facilities, among others are used for modeling. Among the logit models, there may not be studies that established which gives better utility. Also, the basic factors that should be considered by disordered minicab drivers for selecting passengers and destinations by disordered minicab drivers may be unknown, especially in Akure, Nigeria. On this note, the study is aimed at modeling the minicab drivers' disordered behavior for choosing passengers and destination in Akure, particularly, along with FUTA north gate to Oja-Oba, Akure, Nigeria, and to validate the performance of logit models. Assertion: nested logit model gives better performance than the multinomial logit model.

2. RESEARCH METHOD

This study dwells on a random utility model. It is known to be the theoretical foundation for discrete choice models. The discrete choice model includes; logit models which mostly include the multinomial logit model and nested logit model. Others are a generalized extreme value, and probit, as well as more recent developments such as hybrid logit and the latent class choice model [36], [37]. For this study, logit models were employed to show the behavioral pattern of individual drivers in their decision choices. Both models are families of generalized extreme value models (GEVMs), which is a class of random utility models. There is a need to find out the most suitable among the two GEVMs which gives better utility value.

This study employed survey research in the form of a questionnaire to elicit information from minicab drivers in Akure. The data employed for this model study are retrieved from the outcome of the survey of origin-destination (O-D) drivers who drives minicabs. The information embedded in the survey is divided into two main categories: i) Information about the driver's characteristics such as gender, age, and years of experience in the profession and ii) Information about driver's socioeconomic characteristics such as the residential area, the number of passengers conveyed at the origin point, and transport rate charged.

The location understudy was Akure, particularly, along with the FUTA North gate through Oja-Oba, Ondo State, Nigeria. At a point, the origin point can be FUTA north gate while the destination point can be Oja-Oba. Otherwise, the origin point can be Oja-Oba while the destination point can be FUTA north gate. Akure is the capital of Ondo state and it is believed to be a good sample representation of the entire population in Ondo state. Figure 1 shows the map of Nigeria from which Ondo state was coined out and the study area was mapped out.

Figure 1. Map of ondo state in Nigeria

The survey was conducted for 10 days through a personal interview in February 2020. Since the researcher is uncertain about the exact number of minicab population that plies the route at a particular time, judgment was made about the confidence level and the error allowance. The error allowance was 0.05 based on the discretion of the researcher. The formulae for achieving sample size $n=z^2/4E^2$ [38]. Where; n = Sample size; Z = Z score for the confidence interval 1.96; and E = Error allowance 0.05.

The sample size was approximated to three hundred and eighty-four (384) respondents; hence, 384 questionnaires were distributed to minicab drivers. From the questionnaire distributed, 314 questionnaires were retrieved and validated for data analysis and reporting to examine the behavior of minicab drivers [39].

During the process of administering the questionnaires, it was discovered that some new entrants into to minicab driving market are indecisive because of their shallow experience with the nature of the transportation business. Also, passengers are usually time conscious especially during the peak period, this hindered some drivers from carefully filling the questionnaires. The harsh behavior of some passengers made some drivers not show interest in participating.

From the descriptive analysis, all the 314 respondents representing 100% are men. However, there were reports that less than 1% of women also take part in minicab driving occupation in Akure but were not reflected in this study. Also, 17.2% (representing 54 respondents) are primary school leavers, 12.1% (representing 38 respondents) are holders of National diploma, 47.1% (representing 148 respondents) are holders of higher national diploma (HND), and 23.6% (representing 74 respondents) are holders of bachelor degree or more.

Multinomial and nested logit was employed for modeling. In logit models, n person (decision maker) can choose between j options. Utility derived for each person at j option is classified into two parts: i) In the first category, v_{nj} can be observed by the researcher and will influence the behavior of the decision-maker; and ii) The second category is an invisible or unknown category that can be represented with ε_{nj}, and is assumed to be random.

If decision-makers have several options to make a choice, the model probability of selected objects can be calculated and employed as shown in (1), utility function.

$$P_A = \frac{\exp(U_A)}{\sum_j \exp(U_j)} \quad (1)$$

Whereby, P_A is the possibility of selecting an option; U_A is the utility function of selecting A; and U_j is the utility function of selecting j.

It is important to note that the ratio of two choices is highly dependent on the utility function, and the utility derived from the two choices is not dependent on other choices. The entire formation of the logit with two choices is tagged binary logit and with multiple options is referred to as the multinomial logit model. There are basic principles or underlying steps to follow as a guide when evaluating logit models, they are: i) T-statistic, this is like many other process-oriented models that are usually employed to determine the significance or importance of each explanatory variable on the model using different trust levels at 1%, 5%, and 10%, or in another way round at different confidence levels at 99%, 95%, and 90%; ii) ρ^2 index, this denotes the goodness of fit test and it has similar characteristics with R^2 in the linear models. The by attributes: ρ_0^2 and ρ_c^2 can be obtained in (2) and (3).

$$\rho_0^2 = \frac{1-LL(\beta)}{LL(0)} \quad (2)$$

$$\rho_c^2 = \frac{1-LL(\beta)}{LL(c)} \quad (3)$$

Where LL (0) emanates when the model gives zero coefficients all through and the portion of all happenings are said to be homogenous; LL (C) emanates when the utility function of each minicab conveying passengers is said to be constant, or the utility function of each minicab conveying passengers is the same with its proportion. In the situation whereby the coefficients of the utility functions are estimated based on the estimated inclination, (4) and (5) are formed, in general:

$$LL\ (0) \leq LL(c) \leq LL\ (\beta) \leq 0 \quad (4)$$

$$0 \leq \rho_0^2, \rho_c^2 \leq 1 \quad (5)$$

It was revealed that the coefficient measures of ρ_0^2 will improve the logit model [40].

3. RESULTS AND DISCUSSION

The formation of the multinomial logit model is revealed in Figure 2 and it shows the choices that were made concerning nine options based on minicab passengers and their destinations in Akure. It enhanced the calibration of logit models when minicab drivers want to choose between destination and passenger concurrently.

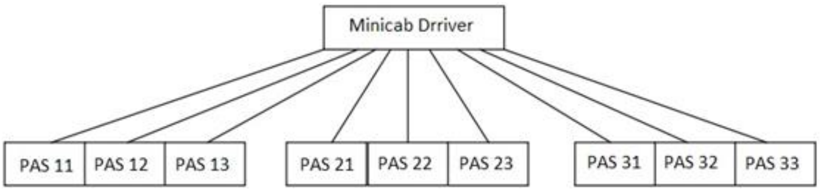

Figure 2. Coding method for nine options

The clue of this study was presented in Figure 3, a table on the formation that is needed for calibration of the most suitable logit model when minicab drivers want to choose between destination and passenger concurrently. In the first layer of Figure 2, in the first layer, each of the minicab drivers can choose one of three destinations and in level two can choose between three options, therefore, traveling with 1, 2, or 3 passengers. SPSS version 21 was employed for analysis. After careful examination of the correlation values, there was the exclusion of extremely high correlation variables to enhance acceptable correlation and more plausible results.

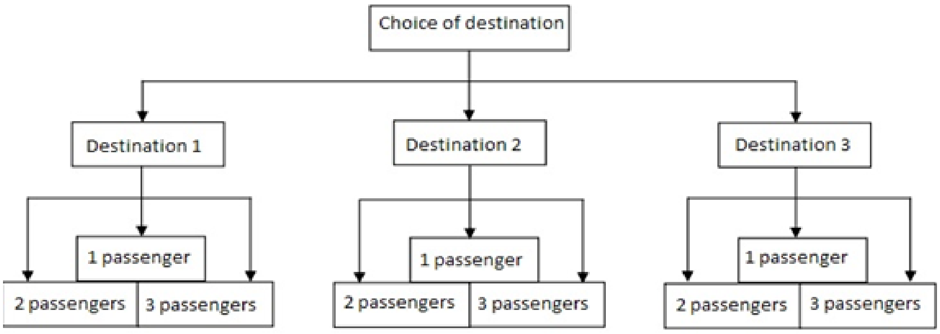

Figure 3. Formation of nested logit model

In the calibrated model for minicab drivers' disordered behavior during the process of deciding for choosing between passenger and destination in Akure (FUTA north gate to Oja-Oba route and Oja-Oba to FUTA north gate route), there is evidence of the highest correlation between the distance variable and the time travel variable at 0.36. The formation of the proposed models is depicted in Figure 2 and Figure 3. Table 2 consists of the variables that were adopted in the exercise. The nested logit model was also calibrated, and the correlation values and significant values for relationships were examined and compared with the result generated from the multinomial logit model. The variables employed in the analytical model are shown in Table 3, the result of the multinomial logit model and nested logit model were shown in Table 3 and Table 4 respectively.

After the calibration of the multinomial logit model, the logarithmic value of probability function with zero coefficients, the parameters, and the agreed coefficient at constant levels are-260.98, -256.67, and -171.02 respectively. From 2 and 3 where ρ_c^2 and ρ_0^2 were expressed: $\rho_c^2 = 0.46$, and $\rho_0^2 = 0.48$.

After the calibration of the nested logit model, the logarithmic value of probability function with zero coefficients, the parameters, and the agreed coefficient at constant levels are -260.98, -256.67, and -146.75 respectively. From 2 and 3 where ρ_c^2 and ρ_0^2 were expressed: $\rho_c^2 = 0.56$, and $\rho_0^2 = 0.58$.

From the comparison of the calibrated values obtained in the multinomial logit model and nested logit model, it was revealed that the nested logit model has a higher constant level (highest utility) than the other, hence the nested logit model was preferred, and the standard error (SE) factor of nested logit model was determined. In this study, it is assumed that for one of the coefficients to be normal to 1, the other coefficients will be calculated by a T-statistic. hence, the needed tests are the Wald test and T-statistic. As shown in Table 5, the standard error and the amount of IV for the nested logit model are shown.

Table 2. Variables employed in the analytical model

Variable order	Variable name	Variable representation	Variable scale
1	Constant	A	Dummy
2	Search time	ST	Ratio
3	Distance	DT	Ratio
4	Travel time	TT	Ratio
5	Work time	WT	Dummy
6	Transport rate	TR	Ratio

Table 3. Result of multinomial logit model

Variables	Constant		ST		DT		TT		WT		TR	
Passenger and Destination	Coeff	T-value	Coeff	T-value	Coeff	T-value	Coeff	T-value	Coeff	T-value	Coeff	T-value
Pas 11	-0.73	-3.04	2.03	5.99	-0.81	-3.31	-0.58	-1.99	0.97	2.02	-	-
Pas 12	-1.33	-4.79	-2.86	-2.83	-	-	-1.95	-2.52	-	-	-	-
Pas 13	-5.43	-4.88	-2.22	-3.43	-0.95	-3.51	-	-	2.06	2.46	0.64	1.94
Pas 21	-	-	-1.29	-3.42	-	-	-1.21	-3.43	0.51	2.09	-	-
Pas 22	-1.92	-1.72	0.97	2.52	-0.82	-2.28	-0.74	-2.35	1.79	5.35	0.88	1.65
Pas 23	4.03	4.06	-0.75	-2.16	-	-	-	-	3.74	3.27	1.02	4.86
Pas 31	3.16	5.73	-	-	-1.08	-4.09	-0.11	-2.18	0.91	3.09	-	-
Pas 32	-4.11	-5.16	-1.81	-5.01	-2.11	-4.88	-0.68	-1.77	3.45	2.07	-	-
Pas 33	3.47	4.79	-0.69	-5.01	-	-	-4.05	-2.02	1.05	2.31	0.96	2.22

Table 4. Result of nested logit model

Variables	Constant		ST		DT		TT		WT		TR	
Passenger and Destination	Coeff	T-value	Coeff	T-value	Coeff	T-value	Coeff	T-value	Coeff	T-value	Coeff	T-value
Pas 11	0.50	3.24	-0.71	-5.47	0.59	1.72	-	-	1.54	2.47	-0.33	-6.88
Pas 12	-1.66	-1.91	0.72	3.31	-	-	-0.11	-2.40	-0.45	-3.77	-	-
Pas 13	-	-	-1.16	-0.09	-	-	0.61	-3.45	-	-	-2.71	-3.36
Pas 21	1.91	2.96	-	-	-1.86	-3.58	-0.99	-3.14	-	-	-	-
Pas 22	-	-	-4.01	-3.79	1.21	3.96	-	-	-1.96	-3.88	-0.72	-2.23
Pas 23	-0.791	-3.77	2.34	3.60	-	-	2.23	3.46	-	-	0.81	1.89
Pas 31	-	-	2.70	2.13	-	-	2.76	1.86	-1.56	-5.32	-0.06	-1.93
Pas 32	0.93	4.15	-1.13	-2.30	-	-	-0.83	-3.79	-0.80	-3.49	-	-
Pas 33	3.92	4.98	-	-	0.96	4.89	-0.74	-5.32	-	-	-1.49	-5.18

Table 5. T-statistic and the Wald test for the nested logit model

Destinations	IV	SE
1	1.00	-
2	0.76	0.06
3	0.85	0.07

Note: Wald-testdes1=-5.56, Wald-testdes1=-3.81

From the study, the multinomial logit model computed has $\rho_c^2 = 0.46$ and $\rho_0^2 = 0.48$, while that of the nested logit model computed has $\rho_c^2 = 0.56$and $\rho_0^2 = 0.58$. The result obtained through of Wald test reveals that the absolute numbers derived for destination 2 (-5.56) and destination 3 (-3.81) are higher than 1.96 (Z score at 5% significance level) which is significant. The constant values stand for the effect of variables that is uncared for in the modeling.

Following the critical examination of the cause-and-effect relationship, as shown in Table 6, the search time variable has the lowest correlation with the work time variable as 0.032 and the highest correlation with the transport rate variable as 0.621. This implies that in a situation whereby passengers spent more time searching for minicabs on a particular location, the transport rate for such a destination will be higher. This is mostly experienced during the peak period. It is pertinent to note that in a situation whereby passengers spent less time searching for minicabs on a particular location, the transport rate for such a destination will be lesser. This is mostly experienced on the route between FUTA north gate and roadblock which is shorter than Oja-Oba. Roadblock is a junction along the route of FUTA north gate and Oja-Oba.

Furthermore, distance (dt) has the lowest correlation with the work time (wt) as 0.03 and the highest correlation with the transport rate (tr) as 0.59 whereby the negative sign implies that as the distance is decreasing, the tendency of minicab driver along with the route increases. This is corroborated in the studies of [41], [42] that distance is a trip deterring factor in the sense that longer distance discourages traffic (i.e. the longer the distance the less traffic experience). Another noticeable relationship is the high correlation of distance with the travel time at 0.873. It is pertinent to understand that the longer the distance, the longer the travel time, and the shorter the distance, the shorter the travel time. It is reasonable to have in mind that factors such as transport costs and level of demand are oftentimes influenced by distance traveled, and is influencing transport rates [27]. When there is an increase in the distance traveled, there will be a corresponding increase in transport rates which is also justified in the correlation of travel time variable with transport rate as 0.457. When there is an increase in the travel time, there will be a corresponding increase in transport rates, and when there is a decrease in travel time, there will be a corresponding decrease in transport rates. The most noticeable is the significant correlation between the distance variable and travel time. Hence, travel time can be used to determine distance, and distance can be used to determine travel time.

The major parameters that seem effective in selecting passengers and destinations by disordered minicab drivers plying the routes of FUTA north gate and Oja-Oba in Akure are transported rate variable, distance variable, and travel time variable. When compared with the study of [9] which found that searching time variable, work time variable, and travel time variable were the most significant indices (parameters) in the selection of destination and passenger by drivers in Tehran, travel time is the only variable that is in common with this current study. Since a significant number of variables correlate with transport rates, it is therefore recommended that an accurate pricing policy of minicab operation should be formulated, implemented, and enacted to prevent overcharge and undercharge by minicab drivers.

Table 6. Correlation analysis of variables employed in the analytical model

	ST	DT	TT	WT	TR
ST	1.000				
DT	0.135	1.000			
TT	0.249	0.873	1.000		
WT	0.032	0.030	0.063	1.000	
TR	0.621	-0.590	0.457	0.131	1.000

3.1. Implication of findings

From the study, it was revealed that the nested logit model has a higher utility than the multinomial logit model. This implies that the assumptions of the multinomial logit model may not be true regarding decision-making. Hence, the decision-making outcome analyzed by the nested logit model can be true and reliable.

From the study, the major parameters that disordered minicab drivers can take into consideration before deciding to select between passengers and destination along FUTA north gate and Oja-Oba in Akure are transported rate, distance, and travel time. These three will give a better prediction on how the driver will maximize profit and minimize cost, and be able to fulfill passengers' satisfaction. Because of this, policymakers (government and private should develop a scientific or technological method of charging transport fare that is transparent, uniform, and acceptable to the public as it is been practiced in developed nations.

3.2. Limitation of the study

This study was limited to disordered minicab drivers. It was limited to minicab drivers shuttling between FUTA north gate and Oja-Oba in Akure. Also, it was targeted at three hundred and eighty-four respondents. Finally, the analytical techniques were limited to the nested logit model and multinomial logit model; this was because the Logit models are widely used for decision making.

However, other recent utility models such as generalized extreme value, hybrid logit, and the latent Class choice model can be validated by future research. Also, the sample size can be more than 384, and future studies can be carried out in other urban locations.

4. CONCLUSION

This study aimed to identify major parameters/indicators that seem effective in selecting passengers and destinations by disordered minicab drivers. Also, there was an attempt to investigate minicab drivers' behavior based on the selection of passenger and destination from FUTA north gate (constant point) to Oja-Oba for O-D trip, and Oja-Oba (constant point) to FUTA north gate for another O-D trip in Akure. To achieve the aim, the multinomial logit model and nested logit model were adopted because they are mostly used as decision tools.

The study found that the nested logit model gives higher utility (better performance) than the multinomial logit model with $\rho_0^2 = 0.48$ more than $\rho_c^2 = 0.46$ which justifies the assertion. From the models, the major parameters that seem effective in selecting passengers and destinations by disordered minicab drivers plying the routes of FUTA north gate and Oja-Oba in Akure are transport rates variable, distance variable, and travel time variable.

Since a significant number of variables have a correlation with transport rates, such as search time with transport rates at 0.621, distance and transport rates at -0.590, and travel time and transport rates at 0.457, it is therefore recommended that accurate pricing policy of minicab operation should be efficiently formulated, implemented and enacted to prevent overcharge and undercharge.

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