

Passengers Transportation Model in Nigeria

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Abstract: *This work modeled, analyzed and solved the transportation problem of five prominent and reputable transportation companies that travels or has routes across the six geopolitical zones in Nigeria; AkwaIbom Transport Company Limited (AKTC), Young Shall Grow Transport Limited (YSG), ABC Transport PLC (ABC), Peace Mass Transit (PMT) and Chisco Transportation Limited (C.T). The data on the amount each of the companies charge per person to a particular destination and the number of persons transported per day were collected from the above mentioned companies, and analyzed using TORA 2013. The result output as shown in table 6.2 indicated that the total minimum cost is to be reduced to ₦1,031,535,260 per day if the transport output table is strictly adhered to. The result showed that it is less expensive to travel to Enugu using AKTC, irrespective of rival competing companies such as YSG, ABC, and PMT. It was also observed that, although AKTC is the best company to use in going to Enugu out of the five companies under review, YSG, ABC and PMT were equally good and competing. Peace Mass Transit and Chisco Transport Limited were the best to use when travelling to PH. AKTC has no rival competitor when travelling to Lagos, Abuja, Kaduna, and Ibadan, and thus, it is the best company to consider for any trip in Nigeria by road.*

Keywords: Passengers, Transportation, Modeling, Nigeria

1. Introduction

Transportation simply means movement from one area to another. It can also be seen as the act of moving thing from one place to another using different types of vehicles across different infrastructure systems.

Transportation infrastructure consists of the fixed installations including roads, railways, airways, waterways, canals and pipelines and terminals such as airports, railway stations, bus stations, warehouses trucking terminals, refueling depots (including fueling docks and fuel stations) and seaports. Terminals may be used for both interchange of passengers and cargo and for maintenance.

Owing to economic climate in the past years, specially in business sector resulting in interest rate going up thereby making it difficult for businesses to function with ease, and also since Nigeria is these company's primary geographical segment, over 99% of these company's travels are made in Nigeria.

The federal government has shown a conscious effort to deal with economic issues with the setting up of the presidential committee on global economic crisis and the reinvigoration of the national economic management team to aid in reinstating or restoring ease and confidence in the business environment specifically and also to improve the economy of the country as a whole.

In this research work, the focus is mainly on modeling passenger transportation cost. This involves the total movement of passengers using five major inland transport companies in Nigeria that covers at least one state in each of the six geopolitical zones, and the main aim is to minimize the cost spent on transportation in Nigeria by determining the best transport company to use when travelling.

That is, to solve the transportation problem and determine which of the companies under review is cheaper and more efficient to travel with.

Section two, three and four covers the scope of this research work, brief history of the six geopolitical zones, and brief

histories of the transportation companies considered respectively. The methodology and data collection, analyses and interpretation of results are presented in section five, six and seven respectively, whereas summary, conclusions and recommendations are presented in section eight, nine and ten respectively.

2. Scope and Delimitation of Study

This research work is restricted to modelling and solving the transportation problem in well known five transportation companies; AkwaIbom Transport company Limited (AKTC), Young Shall Grow Transport Company (YSG), ABC Transport Limited (ABC), Peace Mass Transit (PMT) and Chisco Transport Company Limited (C.T) all located in AkwaIbom State. They have routes in AkwaIbom and travels to at least one major city in each geopolitical zones. The major cities across the zones considered are Lagos, Kaduna, Ibadan, PH and Enugu, whereas the duration covered in this research study is twelve calendar months, (January – December) of 2015. The average cost of transportation as charged by each of the company to different destination per person were collected. The number of buses that goes from each of the transport line to various destinations, alongside with its capacity which makes up the number of persons transported (per month) is collected and the average per person in a day calculated.

3. Brief History of the Six Geopolitical Zones

Nigeria is divided into six zones which consist of states with similar cultures, history, background and close territories, otherwise known as geopolitical zones. This was created during the regime of President Ibrahim Badamsi Babangida, and they are;

- NORTH CENTRAL otherwise known as Middle Belt. It consists of 7 States and they are Niger, Kogi, Benue, Plateau, Nassarawa, Kwara and FCT.
- NORTH EAST is made up of 6 States and they are Bauchi, Borno, Taraba, Adamawa, Gombe and Yobe.
- NORTH WEST comprises of 7 States and they are Zamfara, Sokoto, Kaduna, Kebbi, Katsina, Kano and Jigawa.

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- SOUTH EAST consists of 5 States and they are Enugu, Imo, Ebonyi, Abia and Anambra
- SOUTH SOUTH is made up of 6 States which includes Bayelsa, AkwaIbom, Edo, Rivers, Cross Rivers and Delta.
- SOUTH WEST includes Oyo, Ekiti, Osun, Ondo, Lagos and Ogun.

However, in order to touch all the six geopolitical zones, one major city in each category is considered. The major cities across the zones considered are Lagos, Kaduna, Ibadan, PH and Enugu. The source or point of movement and the destinations covered in this work are carefully selected to cover the six main regions of the country.

4. Histories of the Five Transport Companies

In order that the above objectives may be achieved, five major transport companies; AkwaIbom Transport Company Limited (AKTC), Young Shall Grow Transport Limited (YSG), ABC Transport PLC (ABC), Peace Mass Transit (PMT) and Chisco Transportation Limited (CT); all located in AkwaIbom State of Nigeria and spread in the six geopolitical zones are considered. The destinations covered are Lagos, Kaduna, Ibadan, PH and Enugu which are all located in Nigeria. The history of each company is summarized below.

4.1 A Brief History of Akwa Ibom Transport Company Limited (AKTC)

Akwa Ibom Transport Company Limited generally called known as (AKTC) started operation in 1988 after the creation of the state in September 23, 1987. (Akwaibom yellowpages.com.)

In 2005, Akwa Ibom transport Company Limited became the official transport company of Nsik Motors Limited with over thirty (30) stations in Nigeria.

AKTC provides services such as; interstate services and group booking. The offices are located in the six-geopolitical zones in Nigeria. Her branches include, Lagos, Benin, Abakaliki, Port Harcourt, Uyo, Calabar, Asaba, Enugu, Onistha, Kaduna, Jos, Abuja, Warri, Akure, Ibadan, Aba, Eket, Oron and many more. The head office is located at Itam Industrial Layout, Itam, Itu, AkwaIbom State of Nigeria.

4.2 Brief History of Young Shall Grow Transport Company

The Transport Company known as the Young Shall Grow (YSG) was founded by Chief Dr. V. A. Obianodo in 1972. It initially started its activities as a mini-bus transport operator with routes from Enugu – Onistha.

The YSG relocated from Onistha to Lagos and grew into city transport company business in 1973 which expanded from two (2) locally built Mercedes Benz 911 buses to more than forty within an interval of seven (7) years.

The Young Shall Grow Transport started into inter – state transit services in 1978 with a new Brazilian made Mercedes

Benz 0362 luxury bus which operated along Lagos – Onistha – Owerri route. (www.ysgtransport.com).

4.3 History of ABC Transport PLC

ABC Transport PLC started functioning as a road passenger transportation company in 1993 according to accepted International Standards of road transportation. The operations of this company is both national and international as in various cities such as Lagos (Jibowu and Amuwo – Odofin), Aba, Owerri, Port Harcourt, Abuja, Enugu, Onistha, Umuahia, Jos, Mbaise, Ibadan, Bolande and Accra (Ghana), Benin Republic and Togo. ABC buses are has a company's trademark the Reindeer, an animal known for its strength, speed and movement in herds.. (www.abctransport.com).

4.4 Peace Mass Transit Limited (PMT)

Peace Mass Transit known as PMT came into existence in 1995 to render transport services to the general public . It started its operations with two buses at Nsukka to Enugu and Onitsha.

PMT has over two thousand (20000) buses in its company as at 2015. Now Peace Mass Transit has routes all over the major cities in Nigeria such as Lagos to Abuja, Lagos to Nsukka, Uyo to Lagos, Enugu, Ibadan and Kaduna. , Nsukka to Enugu, Enugu to Abaliliki. Enugu to Onistha, Nsukka to Enugu – Ezike.

4.5 Chisco Transport Limited

Chisco Transport Limited started functioning in Lagos in 1981 by Chief C. Anya-ebu. It has routes in major cities in the six geopolitical zones such as in Lagos, Abuja, Aba, Owerri, Enugu, Port Harcourt, Onistha, Umuahia, Nnewi, Amichi and Uyo. The company also operates in Accra, Ghana.

5. The Methodology: Transportation Problem

The method to be used is called transportation model. The transportation problem entails obtaining a smallest cost plan for movement from many sources to many destinations or to determine how to distribute goods and services to several locations such that total transport cost is minimised. In this case, the variables in the model to be built will have a linear relationship and represented in a transportation table. The table will have a list of origins (take off point which is the transport companies stations) and each one's capacity or supply quantity period. It will also show a list of destinations and their respective demands per period, a list of destinations and their respective demands per period, and the unit cost of transportation from each transport company to their various destination as shown in section 5.1 below;

5.1 Transportation Model

The transportation model comprises of source of the supply, Destination of the supply, and the unit cost of transportation. Therefore, we use the following notation to develop the mathematical model of a transportation problem for this problem; Recall that In this work, the sources are the

different transportation companies Akwalbom Transport Company Limited (AKTC), Young Shall Grow Transport Limited (YSG), ABC Transport PLC (ABC), Peace Mass Transit (PMT) and Chisco Transportation Limited (CT); the products transported are human beings and the several destinations are Lagos, Abuja, Kaduna, Enugu, Yola and PH.

Let x_{ij} be the number of passengers to be transported from various transport company i to the different destination of these six geopolitical zones (location) j such that ($i= 1, 2, 3,4,5$ and $j= 1, 2, 3,4,5,6$)

s_i the total number of passengers from transport company i ,
 d_j be demand at location j ;
 c_{ij} is the cost per person transported from transport company i to location j ;
 x_{ij} is the decision variables representing the total number of passengers transported from transport company i to each location j .

Let Z be total transportation cost from all the five (m) transport companies to the 6 (n) destinations. Then, the transportation table is represented thus;

Table 5.1: General Transportation table

	locations 1 2 . . . n	SUPPLY
Companies 1	$C_{11}x_{11} C_{12}x_{12} \dots C_{1n}x_{1n}$	S_1
2	$C_{21}x_{21} C_{22}x_{22} \dots C_{2n}x_{2n}$	S_2
.	\vdots	\vdots
.	\vdots	\vdots
m	$C_{m1}x_{m1} C_{m2}x_{m2} \dots C_{mn}x_{mn}$	S_m
DEMAND	$d_1 d_2 \dots d_m$	$S=D$

And the model is written as

$$\text{Minimize } \sum_i^m \sum_j^n c_{ij}x_{ij} \quad (5.1)$$

$$s.t \sum_{j=1}^n x_{ij} = s_i \quad (5.2)$$

$$\sum_{i=1}^m x_{ij} = d_j \quad (5.3)$$

$$x_{ij} \geq 0 \quad \forall ij$$

The major assumptions of the transportation model are the following;

- 1) The transport cost of one passenger from company i to location j is directly proportional to the number of passengers transported. i.e transport cost per person is the same no matter how many passengers transported.
- 2) Only one route is used from place of take off to the destination.

Therefore, the transport table for this problem becomes;

Table 5.2: The transportation table of the passengers transportation problem

	LAGOS	ABUJA	ENUGU	KADUNA	IBADAN	PH	SUPPLY
AKTC	$[C_{11}]$ X_{11}	$[C_{12}]$ X_{12}	$[C_{13}]$ X_{13}	$[C_{14}]$ X_{14}	$[C_{15}]$ X_{15}	$[C_{16}]$ X_{16}	S_1
YSG	$[C_{21}]$ X_{21}	$[C_{22}]$ X_{22}	$[C_{23}]$ X_{23}	$[C_{24}]$ X_{24}	$[C_{25}]$ X_{25}	$[C_{26}]$ X_{26}	S_2
ABC	$[C_{31}]$ X_{31}	$[C_{32}]$ X_{32}	$[C_{33}]$ X_{33}	$[C_{34}]$ X_{34}	$[C_{35}]$ X_{35}	$[C_{36}]$ X_{36}	S_3
PMT	$[C_{41}]$ X_{41}	$[C_{42}]$ X_{42}	$[C_{43}]$ X_{43}	$[C_{44}]$ X_{44}	$[C_{45}]$ X_{45}	$[C_{46}]$ X_{46}	S_4
C.T	$[C_{51}]$ X_{51}	$[C_{52}]$ X_{52}	$[C_{53}]$ X_{53}	$[C_{54}]$ X_{54}	$[C_{55}]$ X_{55}	$[C_{56}]$ X_{56}	S_5
DEMAND	D_1	D_2	D_3	D_4	D_5	D_6	

Such that;

c_{11} is the cost of transporting one person from AKTC transport company to LAGOS.
 c_{12} is the cost of transporting one person from AKTC transport company to ABUJA.
 c_{13} is the cost of transporting one person from AKTC transport company to ENUGU.
 c_{14} is cost of transporting one person from AKTC transport company to KADUNA.
 c_{15} is cost of transporting one person from AKTC transport company to IBADAN .
 c_{16} is the cost of transporting one person from AKTC transport company to PH
 c_{21} is the cost of transporting one person from YSG transport company to LAGOS.

c_{22} is the cost of transporting one person from YSG transport company to ABUJA.
 c_{23} is the cost of transporting one person from YSG transport company to ENUGU.
 c_{24} is the cost of transporting one person from YSG transport company to KADUNA.
 c_{25} is the cost of transporting one person from YSG transport company to IBADAN .
 c_{26} is the cost of transporting one person from YSG transport company to PH.
 c_{31} is the cost of transporting one person from ABC transport company to LAGOS.
 c_{32} is the cost of transporting one person from ABC transport company to ABUJA.

c_{33} is the cost of transporting one person from ABC transport company to ENUGU.
 c_{34} is the cost of transporting one person from ABC transport company to KADUNA.
 c_{35} is the cost of transporting one person from ABC transport company to IBADAN .
 c_{36} is the cost of transporting one person from ABC transport company to PH.
 c_{41} is the cost of transporting one person from PMT transport company to LAGOS.
 c_{42} is the cost of transporting one person from PMT transport company to ABUJA.
 c_{43} is the cost of transporting one person from PMT transport company to ENUGU.
 c_{44} is the cost of transporting one person from PMT transport company to KADUNA.
 c_{45} is the cost of transporting one person from PMT transport company to IBADAN.
 c_{46} is the cost of transporting one person PMT transport company to PH.
 c_{51} is the cost of transporting one person from CT transport company to LAGOS.
 c_{52} is the cost of transporting one person from CT transport company to ABUJA.
 c_{53} is the cost of transporting one person from CT transport company to ENUGU.
 c_{54} is the cost of transporting one person from CT transport company to KADUNA.
 c_{55} is the cost of transporting one person from CT transport company to IBADAN.
 c_{56} is the cost of transporting one person from CT transport company to PH
 and;
 x_{11} is the number of passengers to be transported from AKTC transport company to LAGOS.
 x_{12} is the number of passengers to be transported from AKTC transport company to ABUJA.
 x_{13} is the number of passengers to be transported from AKTC transport company to ENUGU.
 x_{14} is the number of passengers to be transported from AKTC transport company to KADUNA.
 x_{15} is the number of passengers to be transported from AKTC transport company to IBADAN .
 x_{16} is the number of passengers to be transported from AKTC transport company to PH
 x_{21} is the number of passengers to be transported from YSG transport company to LAGOS.
 x_{22} is the number of passengers to be transported from YSG transport company to ABUJA.
 x_{23} is the number of passengers to be transported from YSG transport company to ENUGU.
 x_{24} is the number of passengers to be transported from YSG transport company to KADUNA.

x_{25} is the number of passengers to be transported from YSG transport company to IBADAN .
 x_{26} is the number of passengers to be transported from YSG transport company to PH.
 x_{31} is the number of passengers to be transported from ABC transport company to LAGOS.
 x_{32} is the number of passengers to be transported from ABC transport company to ABUJA.
 x_{33} is the number of passengers to be transported from ABC transport company to ENUGU.
 x_{34} is the number of passengers to be transported from ABC transport company to KADUNA.
 x_{35} is the number of passengers to be transported from ABC transport company to IBADAN .
 x_{36} is the number of passengers to be transported from ABC transport company to PH.
 x_{41} is the number of passengers to be transported from PMT transport company to LAGOS.
 x_{42} is the number of passengers to be transported from PMT transport company to ABUJA.
 x_{43} is the number of passengers to be transported from PMT transport company to ENUGU.
 x_{44} is the number of passengers to be transported from PMT transport company to KADUNA.
 x_{45} is the number of passengers to be transported from PMT transport company to IBADAN.
 x_{46} is the number of passengers to be transported from PMT transport company to PH.
 x_{51} is the number of passengers to be transported from CT transport company to LAGOS.
 x_{52} is the number of passengers to be transported from CT transport company to ABUJA.
 x_{53} is the number of passengers to be transported from CT transport company to ENUGU.
 x_{54} is the number of passengers to be transported from CT transport company to KADUNA.
 x_{55} is the number of passengers to be transported from CT transport company to IBADAN.
 x_{56} is the number of passengers to be transported from CT transport company to PH.

Therefore, the model become; With the model

$$\text{Minimize } \sum_{i=1}^5 \sum_{j=1}^6 c_{ij} x_{ij} \quad (5.4)$$

$$\text{s.t } \sum_{j=1}^6 x_{ij} = s_i \quad (5.5)$$

$$\sum_{i=1}^5 x_{ij} = d_j \quad (5.6)$$

$$x_{ij} \geq 0 \quad \forall ij$$

That is

$$\begin{aligned} \text{minz} = & c_{11}x_{11} + c_{12}x_{12} + c_{13}x_{13} + c_{14}x_{14} + c_{15}x_{15} + c_{16}x_{16} + c_{21}x_{21} + c_{22}x_{22} + c_{23}x_{23} + c_{24}x_{24} + c_{25}x_{25} \\ & + c_{26}x_{26} + c_{31}x_{31} + c_{32}x_{32} + c_{33}x_{33} + c_{34}x_{34} + c_{35}x_{35} + c_{36}x_{36} + c_{41}x_{41} + c_{42}x_{42} + c_{43}x_{43} + c_{44}x_{44} \\ & + c_{45}x_{45} + c_{46}x_{46} + c_{51}x_{51} + c_{52}x_{52} + c_{53}x_{53} + c_{54}x_{54} + c_{55}x_{55} + c_{56}x_{56} \end{aligned}$$

s.t

$$\left. \begin{aligned} x_{11} + x_{12} + x_{13} + x_{14} + x_{15} + x_{16} &= S_1 \\ x_{21} + x_{22} + x_{23} + x_{24} + x_{25} + x_{26} &= S_2 \\ x_{31} + x_{32} + x_{33} + x_{34} + x_{35} + x_{36} &= S_3 \\ x_{41} + x_{42} + x_{43} + x_{44} + x_{45} + x_{46} &= S_4 \\ x_{51} + x_{52} + x_{53} + x_{54} + x_{55} + x_{56} &= S_5 \end{aligned} \right\} \text{supply constraints}$$

$$\left. \begin{aligned} x_{11} + x_{21} + x_{31} + x_{41} + x_{51} + x_{61} &= D_1 \\ x_{12} + x_{22} + x_{32} + x_{42} + x_{52} + x_{62} &= D_2 \\ x_{13} + x_{23} + x_{33} + x_{43} + x_{53} + x_{63} &= D_3 \\ x_{14} + x_{24} + x_{34} + x_{44} + x_{54} + x_{64} &= D_4 \\ x_{15} + x_{25} + x_{35} + x_{45} + x_{55} + x_{65} &= D_5 \\ x_{16} + x_{26} + x_{36} + x_{46} + x_{56} + x_{66} &= D_6 \end{aligned} \right\} \text{demand constraints}$$

5.2 Data Collection

The method of data collection in this research work is secondary data collected from the official records of the companies under study; Akwalbom Transport Company Limitd, Young Shall Grow Transport Company, ABC Transport PLC, Peace Mass Transit Limited and Chisco Transport Company. The data is specifically the amount each of the above transport company chargefor the passengers transportation to various destinations for the period of 12 months and average cost per person taken as shown in the table 5.1 below:

Table 5.3: Unit Cost of Transportation in the Five Companies(Average)

Transport Companies	LAGOS	ABUJA	ENUGU	KADUNA	IBADAN	PH	TOTAL
AKTC	4,650	4,650	1,610	4,150	4,650	1,300	
YSG	4,800	4,850	1,650	4,500	4,850	1,300	
ABC	5,000	5,500	1,700	6,050	5,500	1,400	
PMT	5,000	6,000	1,800	6,500	5,500	1,400	
C.T	4,850	5,850	1,850	6,000	5,000	1,400	
TOTAL							

6. Analysis of Data

In this section, the cost of transportation from each of the transport companies as shown on the transportation table

will be represented graphically, alongside with bar chart, and solve the problem using the Tora 2003.

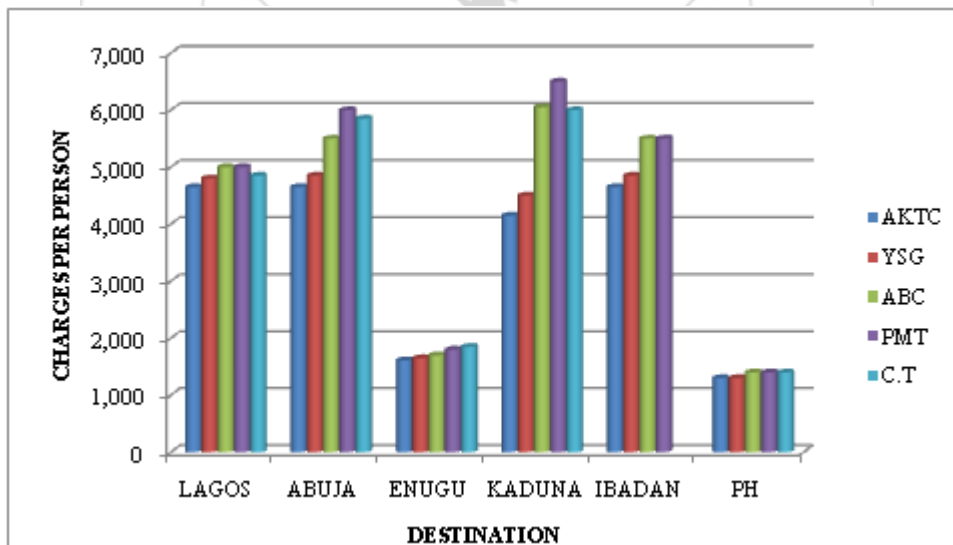


Figure 1: Bar Chat Representation of Unit Cost of Transportation in the Five Companies(Average Amount Paid Per Person)

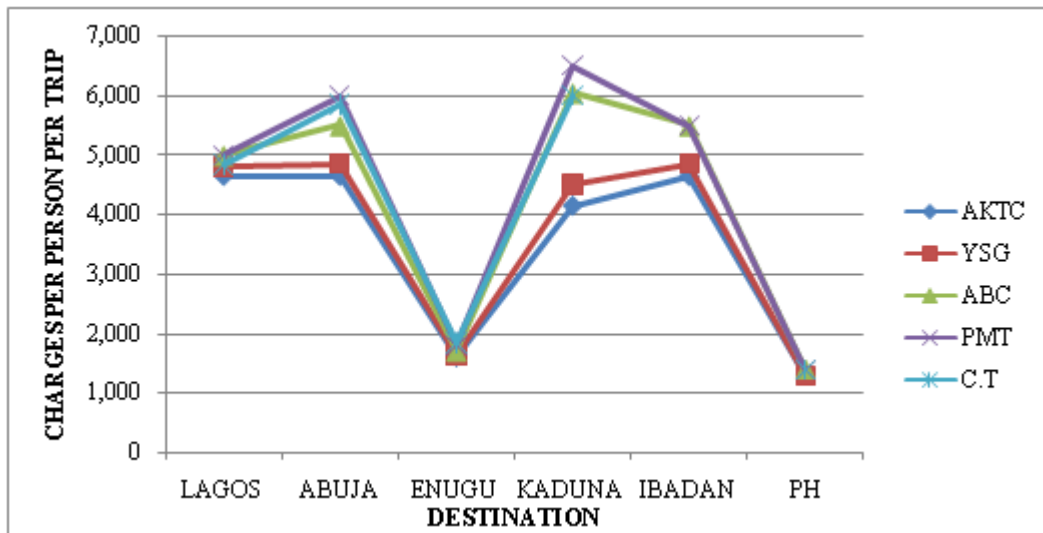


Figure 2: Graphical Representation of Unit Cost of Transportation in the Five Companies (Average Amount Paid Per Person)

Table 6.1: Passengers Transportation Input Table of the Five Companies

TORA File EditGrid

TRANSPORTATION MODEL

Problem Title: PASSENGERS TRANSPORTATION MODEL

No. of Sources: 5

No. of Dest'ns: 6

Editing Grid:
 >>To DELETE, INSERT, COPY, or PASTE a column(row), click heading cell of target column(row), then invoke pull-down EditGrid menu
 >>For INSERT mode, a single(double) click of target row/column will place new row/column after(before) target row/column.

INPUT GRID - TRANSPORTATION

		D1	D2	D3	D4	D5	D6	Supply
	S/D Name	LAGOS	ABUJA	ENUGU	KADUNA	IBADAN	PH	
S1	AKTC	4650.00	4650.00	1610.00	4150.00	4650.00	1300.00	168532
S2	YSG	4800.00	4850.00	1650.00	4500.00	4850.00	1300.00	51030
S3	ABC	5000.00	5500.00	1700.00	6050.00	5500.00	1400.00	37548
S4	PMT	5000.00	6000.00	1800.00	6500.00	5500.00	1400.00	70714
S5	CT	4850.00	5850.00	1850.00	6000.00	5000.00	1400.00	70532
	Demand	26795	65604	128730	20958	25088	131181	

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Activate Windows
Go to Settings to activate Windows.

17:45 05/06/2016

The transportation problem of table 6.1 above is represented thus;

$$\begin{aligned} \text{Min } z = & 4650x_{11} + 4650x_{12} + 1610x_{13} + 4150x_{14} + 4650x_{15} + 1300x_{16} + 4800x_{21} + 4850x_{22} + 1650x_{23} \\ & + 4500x_{24} + 4850x_{25} + 1300x_{26} + 5000x_{31} + 5500x_{32} + 1700x_{33} + 6050x_{34} + 5500x_{35} + 1400x_{36} \\ & + 5000x_{41} + 6000x_{42} + 1800x_{43} + 6500x_{44} + 5500x_{45} + 1400x_{46} + 4850x_{51} + 5850x_{52} + 1850x_{53} \\ & + 6000x_{54} + 5000x_{55} + 1400x_{56} \end{aligned}$$

s.t

$$\left. \begin{aligned} x_{11} + x_{12} + x_{13} + x_{14} + x_{15} + x_{16} &= 168532 \\ x_{21} + x_{22} + x_{23} + x_{24} + x_{25} + x_{26} &= 51030 \\ x_{31} + x_{32} + x_{33} + x_{34} + x_{35} + x_{36} &= 37548 \\ x_{41} + x_{42} + x_{43} + x_{44} + x_{45} + x_{46} &= 70714 \\ x_{51} + x_{52} + x_{53} + x_{54} + x_{55} + x_{56} &= 70532 \end{aligned} \right\} \text{supply constraints}$$

$$\left. \begin{aligned} x_{11} + x_{21} + x_{31} + x_{41} + x_{51} + x_{61} &= 26795 \\ x_{12} + x_{22} + x_{32} + x_{42} + x_{52} + x_{62} &= 65604 \\ x_{13} + x_{23} + x_{33} + x_{43} + x_{53} + x_{63} &= 128730 \\ x_{14} + x_{24} + x_{34} + x_{44} + x_{54} + x_{64} &= 20958 \\ x_{15} + x_{25} + x_{35} + x_{45} + x_{55} + x_{65} &= 25088 \\ x_{16} + x_{26} + x_{36} + x_{46} + x_{56} + x_{66} &= 131181 \end{aligned} \right\} \text{demand constraint } s$$

And $\sum_{i=1}^5 s_i = \sum_{i=1}^6 d_i = 398356$ which indicates that the transportation is a balanced type. Solving the above using Tora 2003 gives the result in table 6.2 below

Table 6.2: Passengers Transportation Output Result Table of the Five Companies to their Various Destinations From Table 6.1

From	To	Amt Shipped	Obj Coeff	Obj Contrib
S1: AKTC	D1: LAGOS	26795	4650.00	124596750.00
S1: AKTC	D2: ABUJA	65604	4650.00	305058600.00
S1: AKTC	D3: ENUGU	30087	1610.00	48440070.00
S1: AKTC	D4: KADUNA	20958	4150.00	86975700.00
S1: AKTC	D5: IBADAN	25088	4650.00	116659200.00
S2: YSG	D3: ENUGU	51030	1650.00	84199500.00
S3: ABC	D3: ENUGU	37548	1700.00	63831600.00
S4: PMT	D3: ENUGU	10065	1800.00	18117000.00
S4: PMT	D6: PH	60649	1400.00	84908800.00
S5: CT	D6: PH	70532	1400.00	98744800.00

The above gave:

$$\begin{aligned} z &= c_{11}x_{11} + c_{12}x_{12} + c_{13}x_{13} + c_{14}x_{14} + c_{15}x_{15} + c_{23}x_{23} + c_{33}x_{33} + c_{43}x_{43} + c_{46}x_{46} + c_{56}x_{56} \\ &= 4650x_{11} + 4650x_{12} + 1610x_{13} + 4150x_{14} + 4650x_{15} + 1650x_{23} + 1700x_{33} + 1800x_{43} + 1400x_{46} + 1400x_{56} \\ &= 4650 * 26795 + 4650 * 65604 + 1610 * 30087 + 4150 * 20958 + 4650 * 25088 + 1650 * 51030 + 1700 * 37548 \\ &\quad + 1800 * 10065 + 1400 * 60649 + 1400 * 70532 \\ &= \text{₦}1031531820 \end{aligned}$$

7. Interpretation of the Result

The result output for the transportation costs (summary) at transportation companies: AkwaIbom Transport Company Limited (AKTC), Young Shall Grow Transport Limited (YSG), ABC Transport PLC (ABC), Peace Mass Transit (PMT) and Chisco Transport Limited (C.T) to their various destinations as shown in table 6.2 above can be interpreted and summarized as follows;

After the eight iteration using Tora 2013, an optimum solution of the input data on table 6.1 was obtained which shows that the total transportation cost will be minimized to **₦103,153,182.00**, if ;

AKTC ships a total of **26795** passengers to Lagos with an objective coefficient (unit cost) of **₦4650.00** amounting to an objective contribution (total cost) of **₦124,596,750.00**.

It shipped a total of **65604** passengers to Abuja with an objective coefficient (unit cost) of **₦4650.00** amounting to an objective contribution (total cost) of **₦305,058,600.00**, whereas a total of 30087 passengers were shifted to Enugu with an objective coefficient (unit cost) of **₦1610.00** amounting to an objective contribution (total cost) of **₦48,440,070.00**.

AKTC shipped a total of **20958** passengers to Kaduna with an objective coefficient (unit cost) of **₦4150.00** amounting to an objective contribution (total cost) of **₦86,975,700.00**.

AKTC shipped a total of **25088** passengers to Ibadan with an objective coefficient (unit cost) of **₦4650.00** amounting to an objective contribution (total cost) of **₦116,659,200.00**.

YSG transported 51030 persons to Enugu with a unit cost of **₦1650.00** resulting in a total cost of **₦84,199,500.00**. whereas a total number of 37548 passengers were shifted to Enugu

with the unit cost of ₦1700 resulting in an objective contribution of ₦63831600.00.

PMT transported total number of 10065 passengers to Enugu with the unit cost of ₦1800 resulting in an objective contribution of ₦18117000.00. Also it transported total number of 60649 passengers to PH with the unit cost of ₦1400 resulting in an objective contribution of ₦84908600.00.

A total of 70532 passengers were also transported to PH by CT with the unit cost of ₦1400.00 resulting in an objective contribution of ₦98744800.00.

8. Summary of the Result

From the above it is noted that in order to minimize cost of transportation, AKTC's company should be used when travelling to other parts of the country except when travelling to PH. It also has other competing company in Enugu routes such as YSG, ABC and PMT but still the cheapest.

YSG should be considered only when travelling to Enugu and also ABC is only considered when travelling to Enugu. PMT is considered when travelling to Enugu and PH. Other companies such as ABC, AKTC and YSG competes with PMT when travelling to Enugu, whereas he competes with CT when travelling to PH at the same cost. CT is considered only when travelling to PH. It has a competitor PMT at the same charge.

9. Conclusion

On the completion of this work, the following conclusions are made. In order that passengers may spend less when travelling or in transportation, Akwalbomis considered when travelling to other part of the country except PH. YSG Transport Company is considered only when travelling to Enugu only. ABC goes to Enugu only. PMT goes to Enugu and PH. CT should be considered only when travelling to PH.

10. Recommendation

YSG, CT, PMT and ABC should possibly reduce their transport cost in order to compete with other companies to enhance speedy and safe services.

Travellers should consider AKTC when travelling to any part of the country

Travellers should consider either PMT or CT when travelling to PH since their charges are the same.

Travellers should consider AKTC when travelling to Abuja kaduna, and Ibadan since it has no rival

Finally, another OR technique such as an assignment problem should be applied to check which company is suitable for a particular route to avoid being biased.

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