

THE EFFICIENT METHOD OF SOLVING THE TRANSPORTATION PROBLEM OF COCA-COLA MUBI DEPOTS IN ADAMAWA STATE, NIGERIA.

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Abstract: The Application of transportation problem to our society is very important aspect especially distribution and improving profit the Company and also giving customers' satisfaction. Transportation problem basically helps to minimize the cost of transportation of products or minimize the time taken to distribute the products from the factories where they are produced to various distribution centers or destinations. In real life situation many transportation problems have simulated to obtain reliable results as such the problem will be subjected to improved North West Corner Rule, Least Cost Method and Vogel's Approximation Method. The results obtained will be reliable and less costly.

Keywords: transportation, optimization, minimization, scheduling, linear programming and balanced. Introduction

Introduction

The transportation problem received its name because many of its applications involve determining how to optimally transport goods. The transportation problem is a logical problem for organizations, especially for manufacturing and transport companies that deal with goods' demand and supply. In general, the transportation problem deals with the distribution of goods from several factories (sources) to some warehouses (destinations). Each source is able to supply a fixed number of units of products, usually the capacity or availability, and each destination has a fixed number of demand, usually as a requirement, (Brandao and Mercer, 2006).

The transportation, distribution or shipping costs must be minimized in a transportation model. The objective of the transportation problem is to determine the transportation schedules that will minimize the total transportation cost while maintaining supply and demand limits. Businesses are continuously attempting to innovate and advance their organizational effectiveness by introducing changes that will motivate them improve their level of performance (Uwarani and Mastin, 2022).

The heuristics approach will always find a feasible solution to the problem at hand, but sometimes, the heuristic can be easily adapted to accommodate many additional problem complexities (Mallia et al, 2021).

The three depots (New Park, Lokuwa Round About and Yelwa) are located in Mubi Town in the North Senatorial District of Adamawa State. Mubi Town shares a border with Hong Local Government, UbaBorno State, Michika Local Government, Gela Local Government, Maiha Local Government, Madagali Local Government and Cameroon on the other side. These five distribution centers (Michika, Gela, Maiha, Uba and Madagali) and the Coca-Cola products are identical and interchangeable, and the methods to be used will be practicable and reliable in real- life situations

Literature Review

A transportation problem is a special type of linear programming problem or network problem that is capable of transporting produced goods from the factories where they are produced to the destination where they are demanded or needed for consumption. This type of problem depends on demand and supply rules where should be violated regardless of the circumstances of the demand and supply. (Innocent, 2021).

The application of the simulation optimization approach has solved the sugar cane transportation problem in Cuba, which involves thousands of workers, dozens of cutting machines, hundreds of tractors, and several hundred trucks and trailers(Khan, 2014 and Brandao and Mercer, 2006). A model for the routing problem of land transportation and air-Cargo flight in Hong Kong was developed, which allows time windows, backhauls, heterogeneous vehicles, and multiple trips per vehicle ad penalty for early arrival at customer sites (Chanhan et al, 2023, and Chopra and Meindi, 2016).

The formulated problem was to minimize the travelling and waiting costs subject to demand and capacity constraints. Taha, (2017) developed an optimization- based approach forpoint-to- point route planning that arise in many large scale delivery systems, such as communication, rail, mail, and package delivery systems.Ugbe et al, (2015) solved the problem of how to distribute and transport the imported coal to each of the power plants on time in the required amount and at the required condition of stable and supply with least delay. The development of three different mixed integer linear programming (MILP) models where each model represented specific constraints, an exhaustive mathematical and an adaptable enormous neighborhood search to solve a two-tiered transportation problem that happened in the distribution of goods in an overcrowded city chores (Aliand Mustapha,2013 and Sojobi et al, 2022).

Methodology

The approach seeks to address the transportation problem in Mubi Metropolis in order to minimize the total cost of transporting soft drinks from m origin (supply S_i) to n destination (demand D_j) A is New Park Depot, B is Lokowa Round About Depot,and C is Yelwa depot,D is Gela , E is Maiha, F is Uba, G is Michika, and H is Madagali,

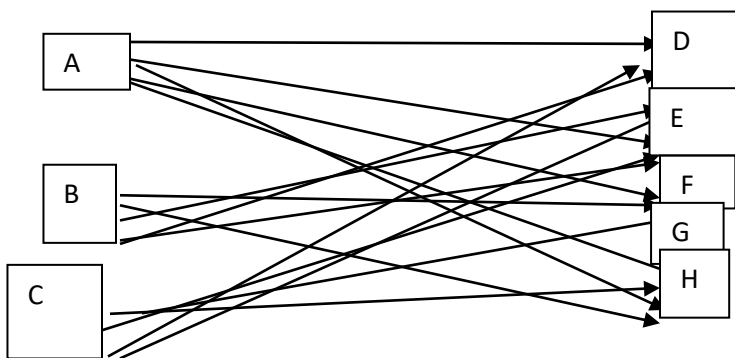


Figure1: Distribution diagram of the transportation problem

Table1

Depot/Distribution centers	Gela(D)	Maiha(E)	Uba(F)	Michika(G)	Madagali(H)	Supply
New Park(A)	11	13	17	19	19	2500
Lokuwa Round	16	18	14	15	20	30000

About(B)						
Yelwa(C)	21	24	13	20	22	4000
Demand	2000	2250	2750	1500	1000	95000

Transportation cost table with balanced demand and supply

Table 2

Depot/Distribution centers	Gela(D)	Maiha(E)	Uba(F)	Michika(G)	Madagali(H)	Supply
New Park(A)		500				2500
Lokuwa Round About(B)	2000	1750	1250			30000
Yelwa(C)			1500	1500	1000	4000
Demand	2000	2250	2750	1500	1000	95000

Total minimum cost using NWCR ₦149000

Table 3

Depot/Distribution centers	Gela(D)	Maiha(E)	Uba(F)	Michika(G)	Madagali(H)	Supply
New Park(A)	2000	500				2500
Lokuwa Round About(B)		1500		1500		30000
Yelwa(C)		250	2750		1000	4000
Demand	2000	2250	2750	1500	1000	95000

Using the Least Cost Method the total minimum cost is ₦141750

Table 4

Depot/Distribution centers	Gela(D)	Maiha(E)	Uba(F)	Michika(G)	Madagali(H)	Supply
New Park(A)	250	2250				2500
Lokuwa Round About(B)	1750			1250		30000
Yelwa(C)			2750	250	1000	4000
Demand	2000	2250	2750	1500	1000	95000

Using the Vogel approximation Method, the total minimum cost is is ₦126500

Results and Analysis

In this work used the North West Corner Rule, Least Cost, and Vogel's Approximation methods were used to obtain different total costs and associated schedules.

The analysis yielded different transportation total cost figures. The North West Corner Rule method gave the total cost as ₦149000, the least cost method produced the total cost as ₦141750 and the Vogel's Approximation method gave the total cost of transportation as ₦126500.

These findings suggest that by the following allocations provided by Vogel's Approximation Method, the management of Coca-Cola Company Mubi can effectively minimize their transportation expenses.

Assuming that the transportation costs outlined in the dataset remains applicable and the leadership of Coca-Cola Company Mubi should consider the following schedules:

- 1 Allocate 250 units of New Park to Gela.
- 2 Allocate 2250 units of products from New Park to Maiha.
- 3 Allocate 1250 units of products from Lokuwa Round About to Michika.
- 4 Allocate 1750 units of products from Lokuwa Round About to Gela.
- 5 Allocate 2750 units of products from Yelwa to Uba.
- 6 Allocate 250 units of products from Yelwa to Michika.
- 7 Allocate 1000 units of products from Yelwa to Madagali.

In order to achieve the total minimum transportation cost of ₦126500 which is even the least cost among the computed total costs.

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