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Application of a New Transportation Algorithm for Cost Minimization

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Abstract— *Transportation cost is a significant factor in business field. In Operation Research (OR), we utilize a few customary strategies to reduce the transportation cost. Another strategy to reduce the transportation cost through activities on a moderate Transportation Table (TT) called Total Opportunity Cost Table (TOCT) is introduced in this. The Distribution Indicators (DI) are determined by the distinction of biggest unit cost and average values of complete unit cost. Minimal section of the TOCT along the most elevated DI is taken as the fundamental cell. At long last, loads have been forced on the first TT relating to the fundamental cells of the TOCT. The technique has been outlined with a guide to legitimize its productivity. It is seen that the strategy exhibited in this is appropriate on TP with equivalent obligation.*

Keywords— *Transportation Table, Total Opportunity Cost Table, Distribution Indicator, Average values of complete unit cost, Biggest unit cost and Transportation Problem etc.*

I. INTRODUCTION

Transportation model assumes an imperative job to guarantee the productive development and in-time accessibility of crude materials and completed merchandise from sources to goals. Transportation Problem (TP) is a Linear Programming Problem (LPP) originated from a system structure. Comprising of a limited number of hubs and bends appended to them [14]. The target of the TP is to decide the transportation plan that limits the absolute transportation cost while fulfilling the demand and supply limit [3, 10 and 12]. In writing, a great number of looks into [6, 2, 1, 14 and 11] are accessible to get the essential doable answer for TP with equivalent imperatives. Transportation issue displays the common issue of single item to be moved from m origins (factories) to n destinations (distribution centers/showrooms) wherein and are the capacities of the origins and destinations respectively. There is a constant called per unit transportation cost from the origin i to the destination j . There is a variable representing the obscure amount to be transported from the origin i to the destination j.

The new formula has been connected on TOCT [2, 4, 6] in this paper to settle the TP. A few strategies are accessible to accomplish the objective. The notable strategies are: Vogel's Approximation Method (VAM) [1, 6] Balakrishnan's variant of VAM [4], Shore's utilization of VAM [14], H.S. Kasana. The new method for Transportation [3,14]. In this paper, we present a technique which gives preferable limited transportation cost over given by the strategies just referenced.

II. FORMATION OF TOCT

Stage 1: Subtract the littlest entrance from every one of the components of each line of the TT and Place them on the right-top of analogous component.
Stage 2: Apply a similar activity on every one of the segment and spot them on the right-base of the analogous component.
Stage 3: Form the TOCT whose sections are the summation of right- top and right-base components of Step 1 and 2.

III. ALGORITHM OF PRESENTED METHOD

Step 1: Put the row and the column allocation markers just after and underneath the supply limits and request necessities respectively inside first brackets. These are the distinction among the biggest unit cost and average values of complete unit cost of each row and column of TT
Step 2: Identify the largest distribution indicator and choose the smallest cost element along the largest distribution indicator. If there is more than one smallest element, choose any one of them arbitrarily.
Step 3: Allocate x_{ij} = min (a_i , b_j) on the left-top of the smallest entry in the cell (i, j) of the TOCT.
Step 4: If $a_i < b_j$, leave the $i-th$ row and readjust b_j as $b_j^l = b_j - a_i$
If $a_i > b_j$, leave the $j-th$ column and readjust a_i as $a_i^l = a_i - b_j$
If $a_i = b_j$, leave either $i-th$ row or $j-th$ column but not both.
Step 5: Repeat Step 1 to 4 until the capacity limit and demand requirement are satisfied.
Step 6: Calculate W $= \sum_{i=1}^{m} \sum_{j=1}^{n} c_{ij} x_{ij}$, c_{ij} being the cost elements of the TT corresponding to the basic cells of the TOCT where loads have been made.

IV. EXAMPLE

A company manufactures motor cars and it has three factories F_1, F_2 and F_3 whose weekly production capacities are 22, 15 and 8 pieces respectively. The company supplies motor cars to its four showrooms located at D_1, D2, D3 and D_4 whose weekly demands are 7, 12, 17, and 9 pieces respectively. The transportation costs per piece of motor car are given below in the Transportation Table (TT).

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TABLE I. Demand vs. Capacity of supply

Factories	Showrooms				Supply
	D_1	D_2	D_3	D_4	
F_1	6	3	5	4	22
F_2	5	9	2	7	15
F_3	5	7	8	6	8
Demand	7	12	17	9	45

We want to schedule the shifting of motor cars from factories to showrooms with the minimum cost.

Now the row differences and the column differences are shown on the right- top and right- bottom respectively to each of the elements.

TABLE II. Demand vs. Capacity of supply

Factories	Showrooms				Supply
	D_1	D_2	D_3	D_4	
F_1	6_1^3	3_0^0	5_3^2	4_0^1	22
F_2	5_0^3	9_6^7	2_0^0	7_3^5	15
F_3	5_0^0	7_4^2	8_6^3	6_2^1	8
Demand	7	12	17	9	45

Therefore, the Total Opportunity Cost Table (TOCT) is

TABLE III. Demand vs. Capacity of supply

Factories	Showrooms				Supply
	D_1	D_2	D_3	D_4	
F_1	4	0	5	1	22
F_2	3	13	0	8	15
F_3	0	6	9	3	8
Demand	7	12	17	9	45

The allocation shaped by the distinction among the biggest unit cost and average value of total unit cost.

TABLE IV. Row and column distribution indicator

Factories	Showrooms				Supply	Row distribution indicator					
	D_1	D_2	D_3	D_4							
F_1	4	12_0	2_5	8_1	22	0.66	.66	.66	0.34	3.34	
F_2	3	15_0	0	8	15	8.66					
F_3	7_0	6	9	1_2	8	4.66	4.66	4.66	1.34	1.34	1.34
Demand	7	12	17	9	45						
Column distribution indicator	0.34	8.66	4.66	3.66							
	0.34	8.66	4.66	3.66							
	0.34		4.66	1.34							
	0.34			1.34							
				1.34							
				1.34							

The transportation allocation to the original TT is as follows:

TABLE V. Demand vs. Capacity of supply

Factories	Showrooms				Supply
	D_1	D_2	D_3	D_4	
F_1	6	12_3	2_5	8_4	22
F_2	5	9	15_2	7	15
F_3	7_5	7	8		8
Demand	7	12	17	9	45

Therefore the transportation cost is:
W=(12*3)+(5*2)+(8*4)+(15*2)+(7*5)+(1*6)=149.

TABLE VI. Comparison of Transportation Cost Obtained By New Methods

METHODS	TRANSPORTATION COST
New Method	149
NWCR	176
Column minima Method	149
Matrix minima Method	150
VAM	149
Raw minima Method	150

We may demonstrate the transportation cost acquired in various strategies by the Bar- diagram as below in Fig. 1.

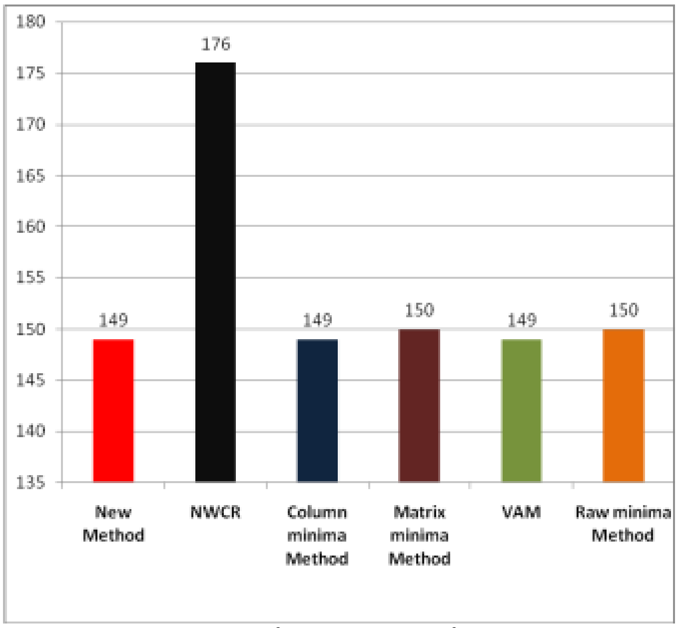

Fig. 1. Comparison of Cost minimization for TABLE - VI

V. CONCLUSION

Cost minimization is a technique to show the best optimal result. In this research, we consider that method, which shows the less transportation cost. Our introduced new method shows more similar result like previous optimal solutions which are considered as standard. So we can consider this method is good for cost minimization as this is nearer to best fitted solutions that are 149. We didn't consider NWCR method as transportation cost is most and far away from the best fitted solutions. Note that, this new method can be applicable for any types of company who wants to minimize their transportation cost for transferring goods from source to destination.

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