Al-Mustaqbal University
Department: Medical Instrumentation Techniques Engineering
Class: 4th
Subject: Project Management
Lecturer: Lec. Hameed Nida Hameed
1st term / Lecture: Choice of Project Location 3

LEC. 12 : Part3

CHOICE OF PROJECT LOCATION (SITE SELECTION)

E-mail: hameed.nida.hameed@uomus.edu.iq

Unbalanced Transportation Problem

نموذج النقل غير المتزن

:

A transportation problem is unbalanced if sum of supplies from different sources is not equal to sum of requirements in various destinations

i.e. $\sum_{i=1}^{m} a_i \neq \sum_{j=1}^{n} b_j$

مشكلة (نموذج) النقل تكون غير متزنة اذا كان مجموع المتاح من مختلف المصادر لا يساوي مجموع الاحتياجات في مختلف الوجهات

(i) If $\sum_{i=1}^{m} a_i > \sum_{j=1}^{n} b_j$, add a dummy destination

اذا كان $\sum b_j < \sum a_i$ يتم إضافة وجهة (D) وهمية

(ii) If $\sum_{j=1}^{n} b_j > \sum_{i=1}^{m} a_i$, add a dummy source

اذا كان $\sum a_i < \sum b_j$ يتم إضافة مصدر (S) وهمي

	D1	D2	D3	Supply(b_j)
S1				
S2				
S3				
Demand(a_i)				$\sum b_j$ / $\sum a_i$

Ex 2: **Solve the following transportation problem , Where goods are to be transported from 3 factories to 4 warehouses.**

D / S	D1	D2	D3	D4	المتاح Supply
S1	4	2	1	2	20
S2	7	1	2	4	12
S3	2	6	5	3	22
الاحتياجات Demand	16	7	11	10	54 / 44

❖ بما ان مجموع الاحتياجات لا يساوي مجموع المتاح فان النموذج غير متوازن ولا يمكن ايجاد الحل الا بجعل النموذج متوازن بإضافة عمود وهمي يكون فيه الاحتياج يساوي مقدار الفرق بين الاحتياجات والمتاح وقيم الكلفة لجميع الخلايا تكون صفر.

Solution using Least Cost method:

D / S	D1	D2	D3	D4	D5	المتاح Supply
S1	4	2	1 10	2	0 10	20 10 0
S2	7	1 7	2 1	4 4	0	12 5 4 0
S3	2 16	6	5	3 6	0	22 6 0
الاحتياجات Demand	16 0	7 0	11 1 0	10 4 0	10 0	54 / 54

Total Cost = 10×1 + 10×0 + 7×1 + 1×2 + 4×4 + 16×2 + 6×3 = 85 unit cost

Ex 3: **Solve the following transportation problem , Where goods are to be transported from 3 factories to 4 warehouses.**

D / S	D1	D2	D3	D4	المتاح Supply
S1	10	13	22	7	200
S2	14	13	12	15	350
S3	9	20	23	10	150
الاحتياجات Demand	100	140	300	250	700 / 790

Solution using Least Cost method:

D / S	D1	D2	D3	D4	المتاح Supply
S1	10	13	22	7 200	200 0
S2	14	13 50	12 300	15	350 50 0
S3	9 10	20 90	23	10 50	150 140 90 0
S4	0 90	0	0	0	90 0
الاحتياجات Demand	100 10 0	140 90 0	300 0	250 50 0	790 790

TC = 200×7 + 50×13 + 300×12 + 10×9 + 90×20 +50×10 + 90×0 = 8040 unit cost

Ex 4: **An automobile manufacturing company with three automobile factories distributed in locations (D1, D2, D3), It has three tire factories distributed across the sites (S1, S2, S3), and it desires to achieve self-sufficiency and meet its needs, it decided to establish a new additional car factory and it was there two proposed locations for this factory are (Di, Dj).**

مصانع السيارات D / مصانع الإطارات S	D1	D2	D3	المتاح Supply
S1	4	2	1	20
S2	7	1	2	12
S3	2	6	5	12
الاحتياجات Demand	16	7	11	44 / 34

As the transportation costs for the two proposed locations are as shown below, find the best location from the two locations to fill the shortfall using the lowest cost method.

	Di	Dj
S1	7	2
S2	4	4
S3	1	3

Solution:

1- Calculate the total transportation cost if the location chosen is (Di):

D / S	D1	D2	D3	Di	المتاح Supply
S1	4 — 9	2	1 — 11	7	20 — 9 — 0
S2	7 — 5	1 — 7	2	4	12 — 5 — 0
S3	2 — 2	6	5	1 — 10	12 — 2 — 0
الاحتياجات Demand	16 — 14 — 5 — 0	7 — 0	11 — 0	10 — 0	44 — 44

$$TC = 9\times4 + 11\times1 + 5\times7 + 7\times1 + 2\times2 + 10\times1 = 103 \text{ unit cost}$$

2- Calculate the total transportation cost if the location chosen is (Dj):

D / S	D1	D2	D3	Dj	المتاح Supply
S1	4	2	1	2	20
			11	9	9 0
S2	7	1	2	4	12
	4	7		1	5 4 0
S3	2	6	5	3	12
	12				0
الاحتياجات Demand	16	7	11	10	44
	4 0	0	0	1 0	44

$$TC = 11\times1 + 9\times2 + 4\times7 + 7\times1 + 1\times4 + 12\times2 = 92 \text{ unit cost}$$

✓ It turns out that the total transportation cost if the location (Dj) is chosen is the lowest, so it is chosen.