Damietta University
Faculty of Commerce
English Program

Production and Operations Management

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Location Strategies
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Location Strategies

Transportation Models

Outline

- Transportation Modeling
- Developing an Initial Solution
- The Stepping-Stone Method
- Special Issues in Modeling

Special Issues in Modeling

- Demand not equal to supply
  - Called an unbalanced problem
  - Common situation in the real world
  - Resolved by introducing dummy sources or dummy destinations as necessary with cost coefficients of zero

Virtual Trial for Dummy Variable

Total Cost = 250($5) + 50($8) + 200($4) + 50($3) + 150($5) + 150(0)
= $3,350

From \ To	(A) Albuquerque	(B) Boston	(C) Cleveland	Dummy	Factory capacity
(D) Des Moines	250 $5	$4	$3	0	250
(E) Evansville	50 $8	200 $4	50 $3	0	300
(F) Fort Lauderdale	$9	$7	150 $5	150 0	300
Warehouse requirement	300	200	200	150	850

New Des Moines capacity

Special Issues in Modeling

- Degeneracy
  - To use the stepping-stone methodology, the number of occupied squares in any solution must be equal to the number of rows in the table plus the number of columns minus 1
  - If a solution does not satisfy this rule it is called degenerate

Test of degeneracy in our example:
Occupied squares = (No. Columns + No. Rows) – 1
= 6 – 1 = 5, *was no degeneracy*

What to do if there is Degeneracy?

Total Cost = \$8(100) + \$9(100) + \$9(20) + \$7(80) = \$2,440

From \ To	Customer 1	Customer 2	Customer 3	Warehouse supply
Warehouse 1	100 \$8	\$2	\$6	100
Warehouse 2	0 \$10	100 \$9	20 \$9	120
Warehouse 3	\$7	\$10	80 \$7	80
Customer demand	100	100	100	300

Initial solution is degenerate

Place a zero quantity in a proper unused square and proceed computing improvement indices

Proper unused cell meets two criteria!!!

What to do if there is Degeneracy?

From \ To	Customer 1	Customer 2	Customer 3	Warehouse supply
Warehouse 1	100 $8	$2	$6	100
Warehouse 2	0 $10	100 $9	20 $9	120
Warehouse 3	$7	$10	80 $7	80
Customer demand				

W1C2 index = $2 – $9 + $10 – $8 = -$5

W1C3 index = $6 – $9 + $10 – $8 = -$1

W3C1 index = $7 – $7 + $9 – $10 = -$1

W3C2 index = $10 – $7 + $9 – $9 = +$3

What to do if there is Degeneracy?

Total Cost = \$2(100) + \$10(100) + \$9(20) + \$7(80) = \$1,940

From \ To	Customer 1	Customer 2	Customer 3	Warehouse supply
Warehouse 1	\$8	100 \$2	\$6	100
Warehouse 2	100 \$10	0 \$9	20 \$9	120
Warehouse 3	\$7	\$10	80 \$7	80
Customer demand	100	100	100	300

This solution is also degenerate

Place a zero quantity in a proper unused square and proceed computing improvement indices

What to do if there is Degeneracy?

From \ To	Customer 1	Customer 2	Customer 3	Warehouse supply
Warehouse 1	$8	100 $2	$6	100
Warehouse 2	100 $10	0 $9	20 $9	120
Warehouse 3	$7	$10	80 $7	80
Customer demand				

W1C1 index = \$8 – \$2 + \$9 – \$10 = +\$5

W1C3 index = \$6 – \$9 + \$9 – \$2 = +\$4

W3C1 index = \$7 – \$7 + \$9 – \$10 = -\$1

W3C2 index = \$10 – \$7 + \$9 – \$9 = +\$3

What to do if there is Degeneracy?

Total Cost = $2(100) + $10(20) + $9(100) + $7(80)= $1,860

From \ To	Customer 1	Customer 2	Customer 3	Warehouse supply
Warehouse 1	$8	100 $2	$6	100
Warehouse 2	20 $10	0 $9	100 $9	120
Warehouse 3	80 $7	$10	$7	80
Customer demand	100	100	100	300

This solution is also degenerate

Place a zero quantity in a proper unused square and proceed computing improvement indices

What to do if there is Degeneracy?

Since all indices are positive, thus, this solution is the optimal solution with a total cost of $1,860

From \ To	Customer 1	Customer 2	Customer 3	Warehouse supply
Warehouse 1	$8	100 $2	$6	100
Warehouse 2	20 $10	0 $9	100 $9	120
Warehouse 3	80 $7	$10	$7	80
Customer demand				

W1C1 index = $8 – $2 + $9 – $10 = +$5

W1C3 index = $6 – $9 + $9 – $2 = +$4

W3C2 index = $10 – $7 + $10 – $9 = +$4

W3C3 index = $7 – $7 + $10 – $9 = +$1


Thank you