



IIT ROORKEE



NPTEL ONLINE
CERTIFICATION COURSE

SUPPLY CHAIN ANALYTICS

Multi echelon Inventory Management for four stations
(Numerical Example)

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Illustrative Example for Serial Multi-echelon System

Consider a case of four echelons with following parameters:

Installations	Setup Cost(k_i)	Holding Cost(h_i)
1	Rs 250	Rs 0.50
2	Rs 6	Rs 0.55
3	Rs 30	Rs 3.55
4	Rs 110	Rs 7.55

We will calculate echelon holding cost as follows:

Installations	Setup Cost(k_i)	Holding Cost(h_i)	Echelon Holding Cost(e_i)
1	Rs 250	Rs 0.50	$e_1 = h_1 = 0.50$
2	Rs 6	Rs 0.55	$e_2 = h_2 - h_1 = 0.05$
3	Rs 30	Rs 3.55	$e_3 = h_3 - h_2 = 3.00$
4	Rs 110	Rs 7.55	$e_4 = h_4 - h_3 = 4.00$

$$Q_i = \sqrt{2dk_i/e_i}$$

- The ratio k_i/e_i is very important to model the multi-echelon inventory system.
- $k_i/e_i \geq k_{i+1}/e_{i+1}$, if it is not so, we need to merge installations i and $i+1$.

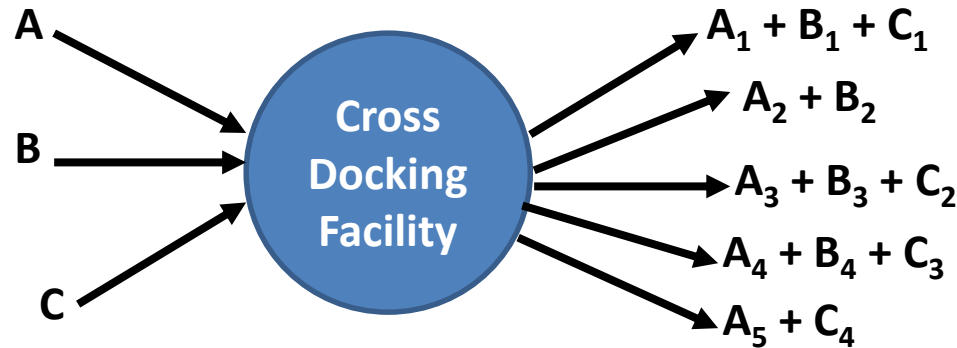


When stage i and $i+1$ are merged,

Then, $Q_i = Q_{i+1}$,

Otherwise, $Q_i > Q_{i+1}$.

If $Q_i = Q_{i+1}$, we can think of cross docking as follows:



Now, let us calculate k/e for four installations:

Installations	Setup Cost(k_i)	Holding Cost(h_i)	Echelon Holding Cost(e_i)	K_i / e_i
1	Rs 250	Rs 0.50	$e_1 = h_1 = 0.50$	500
2	Rs 6	Rs 0.55	$e_2 = h_2 - h_1 = 0.05$	120
3	Rs 30	Rs 3.55	$e_3 = h_3 - h_2 = 3.00$	10
4	Rs 110	Rs 7.55	$e_4 = h_4 - h_3 = 4.00$	27.5

These ratios decrease from top to down with the exception that

$$k_3 / e_3 = 10 < k_4 / e_4 = 27.5$$

So we need to treat installations 3 and 4 as a single merged installation for modelling purpose.

THANK YOU

