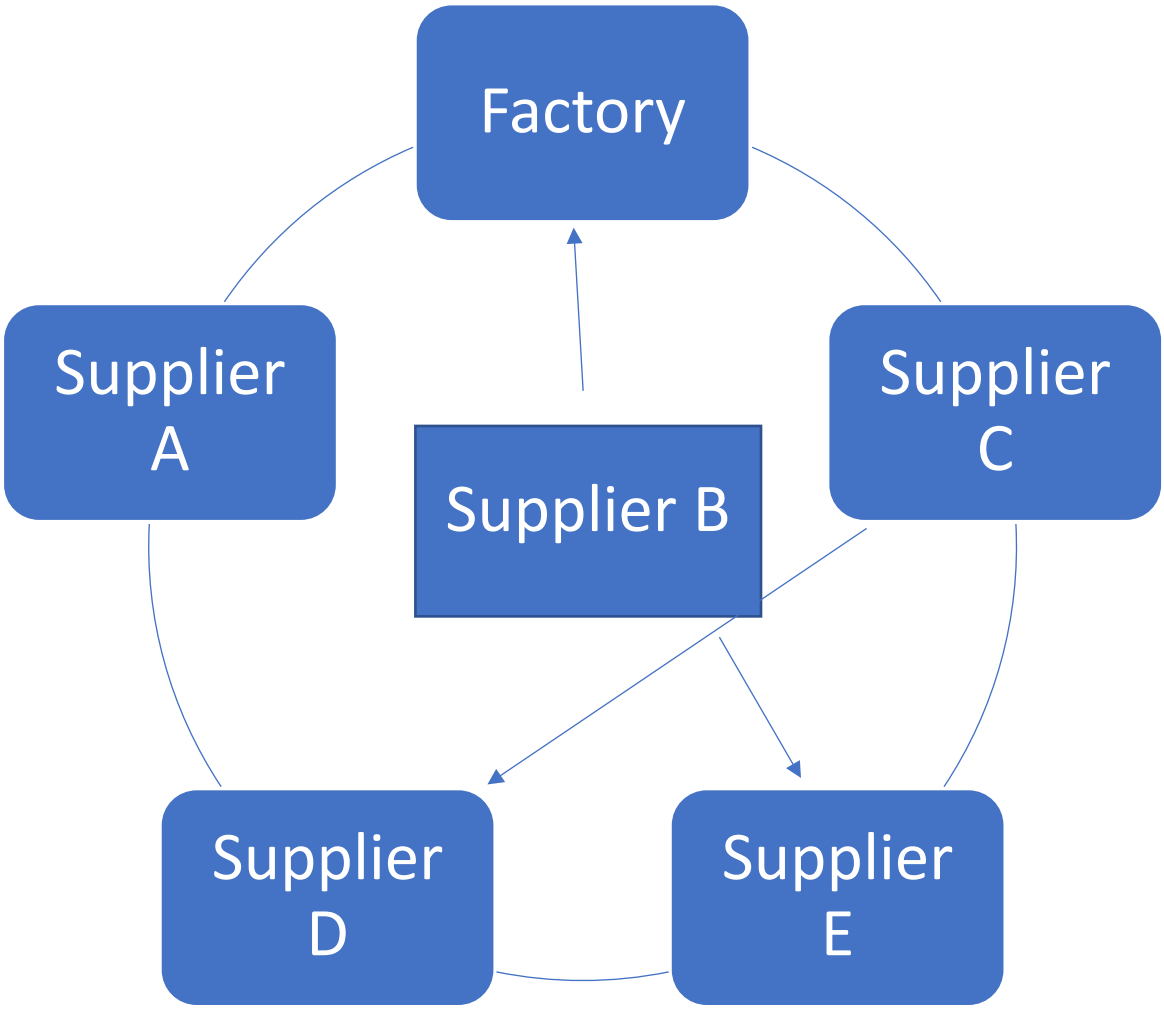
Supply Chain Management

- Objective: Having the ability to use a stack, list, queue, and priority queue in real-life problem.

Nowadays, most supermarket aisles are empty since COVID-19 has impacted them. Let us see a way to solve this problem. We need to increase the number of suppliers in the market which leads to an increase in products. Here is a diagram.



- The main Suppliers are A, B, and C which sends it to the Factory.
- The <u>Substitute Suppliers for</u>
    - A -> D, E
    - B -> E
    - C -> E, D

| Supplier | Production type | Production Rate | Capacity |
|---|---|---|---|
| A | Type I | .5 per step | 5 |
| B | Type II | .5 per step | 5 |
| C | Type III | .5 per step | 5 |
| D | Type I or III | .5 per step | 3 |
| E | Type I, II or III | .5 per step | 3 |
| Factory | | 1, stack size: 20 | |
| | | | |

Suppliers A, B, C will accept delay orders

Suppliers D,E will only accept an order for current stock

Suppliers D,E will produce alternate type components, e.g. D will make type 1 then two time steps later will produce a Type 3. Where E will create a type 1, two

Steps later a type 2, and two steps later a type 3.

Any components from C sent to D or E will be used by D or E.

Factory requires components I, II, III  needs one of each

A→ I

B→II

C→III

Senarios:

Factory F has 0,0,0

Supplier A 0

Supplier B has ~~3~~ 0

Supplier C has ~~10~~

Supplier D has ~~2,~~ 0

Supplier E has 0

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F queries A fails

F queries D,  D sends 2 to F

F queries B, B sends 3 to F

F queries C, C sends 10 to F

A starts time delay, 5 ready in 10 steps

B  “

C  “

D starts time delay, 3 ready in 5 time steps

E, 3 ready in 4 time steps

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Factory has 3, 10, 2  produces 1, → 2,9,1 inventory

Factory queries fail

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… more time goes by until

Factory 1, 7, 0  produces 0

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Factory queries

…

E has 3 ready (type I, 2, or 3)

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Etc etc etc…..

component class, for us just a type, I, II, III but in theory could have expiration data etc.

supplier class, type, production rate, time delay

factory class, warehouse consists of a number of component stacks, these are reduced when a product is manufactured, they are added to when deliveries are made by suppliers.

- Check warehouse status
- New “orders” if stacks are “low” or empty.
    - If stack is < tolerance
        - Check primary suppliers for components
        - If primary supply is 0, then check alternate suppliers
        - If alternate is avail then order
        - Else place a delayed order with soonest availability, if same delay order then order primary supplier
- Purchasing Agent
    - Check factory for needs, if any stack.size < 10, orders are needed.
    - Check primary suppliers (may have inventory of up to 5)
    - Check secondary suppliers if secondary inventory = 3 , randomly determine delivery destination
- Factory will check for components, if yes, product and pop the stacks

<u>Possible fidelity enhancements</u>

adding variable delays to each supplier

consider dramatic fluctuation in supply, eg. If one or more suppliers are no longer accessible.

for back up suppliers D and E, all Factory unpurchased supplies are sold every time step