

1(a)(i)

$$S^* = S + S_A + S_B + S_C$$

$$= 1000 + 300 + 300 + 300$$

$$= \$1900$$

$$n^* = \sqrt{\frac{D_A h C_A + D_B h C_B + D_C h C_C}{2S^*}} = \sqrt{\frac{(70 \times 0.2 \times 10000) + (25 \times 0.2 \times 10000) + (6 \times 0.2 \times 10000)}{2(1900)}}$$

$$Q_A = D_A \div n^* = 70 \div 7.291 = 9.60 \text{ tonnes } \#$$

$$Q_B = D_B \div n^* = 25 \div 7.291 = 3.43 \text{ tonnes } \#$$

$$Q_C = D_C \div n^* = 6 \div 7.291 = 0.823 \text{ tonnes } \#$$

Assumptions: Demand for A, B and C is independent of each other.  
There is no minimum lot size.

(ii)

$$Q_A = \frac{70}{70+25+6} \times 10 \text{ tonnes} = 6.93 \text{ tonnes } \#$$

$$Q_B = \frac{25}{101} \times 10 \text{ tonnes} = 2.48 \text{ tonnes } \#$$

$$Q_C = \frac{6}{101} \times 10 \text{ tonnes} = \frac{0.59 \text{ tonnes } \#}{10 \text{ tonnes}}$$

Annual holding cost =  $\frac{D_A h C_A}{2n} + \frac{D_B h C_B}{2n} + \frac{D_C h C_C}{2n}$

$$= \frac{(70 \times 0.2 \times 10000)}{2(7.291)} + \frac{(25 \times 0.2 \times 10000)}{2(7.291)} + \frac{(6 \times 0.2 \times 10000)}{2(7.291)}$$

$$= \$13852.70$$

Annual order cost =  $S^* n$

$$= 1900(7.291)$$

$$= \$13852.90$$

Total cost =  $13852.70 + 13852.90$

$$= \$27705.60 \#$$

**1(bi)**

With a retailer now accounting for 30% of sales, the variability of the order sizes will be more volatile. This is because the order sizes will see significant ups and downs as the new retailer will also experience similar ups and downs due to bullwhip effect propagating upstream. Thus, the retailer will sometimes order a huge quantity, but sometimes at a lower quantity, resulting in even more volatility for the retailer.

**1(bii)**

The cost of overstocking has increased and thus the retailers are unlikely to order in larger quantities from the distributor. This will decrease the volatility.

**1(biii)**

Because the replenishment lead time has increased, the retailer will have to forecast for a longer period of time, thus increasing the number of quantities order per lot size from the distributor, thus increasing the OUL. This will cause the volatility to increase as bullwhip propagates upstream.

**2(a)**

Useful in a supply chain for the following:

- Products of short life span or its value drops with time
- Demand is uncertain and/or seasonal
- Capacity is fixed over selling period

Value of product or service perceived by buyers varies in different market segments.

**2(b)**

Customer's inability to benefit in same degree from improvement at higher service levels – limited by other factors (branding, price, quality, etc.)

Limited by market size

Customer's policy to obtain supplies from more than one supplier ("spreading" of risks)

**2(c)**

<b>Risks</b>	<b>Definition</b>	<b>Mitigating Strategies</b>
Forecast Risks	mismatch between forecasted demand and actual demand	Higher inventory level Higher capacity (production and/or transportation)
Procurement Risks	Unexpected surges in acquisition costs	Against exchange rate volatility: e.g., currency hedging Against price surge: contract to "lock in" prices, multiple suppliers or holding inventories
Supply Chain Disruptions	Supply disruptions due to force majeure	Higher inventory level Multiple suppliers (upstream disruption)

### **3(a)**

- i) The international distribution network has become more integrated and the traditional seaport-to-seaport operation is no longer acceptable.
- ii) The supply chain has become more extensive. Companies are offshoring manufacturing and sourcing for component from different countries. Overall operations has to be integrated and efficient involving many parties such as carriers, suppliers/manufacturers, consignor and consignee and different countries.
- iii) Many companies operate their global schedules on the 'just in time' basis requiring dedicated and integrated schedules within the shippers warehouses and distribution arrangements. Multi-modalism is ideal for this arrangement
- iv) The enlargement of the EU to 29 member states has resulted in a harmonized customs procedures with virtually no trade barriers. The same applies to NAFTA. Such trading areas favour development of multi-national networks and remove international boundaries as impediments to market driven operations
- v) Documentation are more harmonized and standardized. Those involving the carrier's liability and code of practice relative to multimodalism are now in place. And the combined transport bill of lading involving one through rate and a common code of conditions are available. This makes this multi-modal easier.
- vi) The shipping market in recent years has shifted from a product-driven to a consumer-led strategy whereby the shipper is the dominant factor. The shipper is always looking for better value and this can serve them better.
- vii) Multi-modalism is market-driven in its development. It brings the buyer and seller closer together and enables international business to grow. It develops new markets, improves product quality, lowers transit times, reduces packing and increase the growth of high-tech fast-moving consumer products.
- viii) The growth of non-vessel operating common carrier NVOCC has accelerated the growth. These companies can provide comprehensive services at very competitive price.
- ix) Governments are encouraging global trade and providing the infrastructure to facilitate this objective. There is tremendous development in air/rail/sea/canal/ports to facilitate trade development.
- x) Growth of IT and EDI has enabled better information management across the SC. This has encouraged growth in international distribution logistics. Better tracking of cargo and security.

### **3(b)**

- i) Multi-modal services are very competitive offering through rates: door to door/warehouse to warehouse rates. The service is reliable, frequent and competitively priced. Goods arrive on time by a transport arrangement which the supplier can best arrange.
- ii) Shippers need not spend time on activities that they are not very good in. They also do not need to invest in physical assets such as trucks and other transportation equipment, reducing the amount of capital tied up and do not need to bother about logistics arrangements in international operations. This will allow shippers to concentrate on their core businesses.
- iii) 3PL maximizes the use of infrastructure such as warehouses, transportation and carrier operations and their expertise in documentation and government clearances in serving different customers. In this way they can offer competitive rates and reliable services.

iv) It offers a global operation, round the clock with no time barriers. Shippers can make full use of this 24/7 facility

v) The system is flexible as it caters for both the large and small shipper and the full load or consolidated consignment.

#### **4(a)**

##### The Seven Types of Waste

- **DEFECTIVE** or substandard production: deficiency in products or services. Fixing product is not worth. All material and resources used are wasted
- **OVERPRODUCTION** of products/services not demanded by actual customers : Production must match customer demand
- **IDLE TIME**: resources have no material to work on
- **MOTION**: Unnecessary motion/movement of employees
- **PROCESSING TRANSACTIONS**. Unnecessary over-processing (for example, relying on inspections rather than designing the process to eliminate problems)
- **TRANSPORTATION**. Unnecessary transport and handling of goods
- **WAITING** for an upstream process to deliver, or for a machine to finish processing, or for a supporting function to be completed, or for an interrupted worker to get back to work. Have to study the critical paths so that no time is waited on waiting

#### **4(b)**

(i) Loss of control

- Shipper's can lose control over his logistics activities
- Logistics is key to good customer service
- Poor 3PL Performance will damage customer relationship

(ii) 3PL performance failure

- 3PL may overpromise its capabilities
- 3PL does not understand your industry & logistics requirements well
- The whole idea is to first secure the business by promising everything, and then work to try to deliver the promises

#### **5)**

Strategic fit:

- Consistency between customer priorities of competitive strategy and supply chain capabilities specified by the supply chain strategy
- Competitive and supply chain strategies have the same goals

How is Strategic Fit Achieved?

- Step 1: Understanding the customer and supply chain uncertainty
- Step 2: Understanding the supply chain capabilities
- Step 3: Achieving strategic fit

A company may fail because of a lack of strategic fit or because its processes and resources do not provide the capabilities to execute the desired strategy.

One example is Maersk's Premium Line.

- Step 1: Maersk understands that their customers want high service level but does not mind paying a higher price.
- Step 2: Maersk understands that with its dedicated terminals littered across the world and its alliance will ensure ships are less likely to be late.
- Step 3: Maersk is able to match what the customer wants and what the supply chain does well. Thus Maersk is still going strong despite the shipping downturn.

Done by:

A handwritten signature in black ink, appearing to be 'L. O. O.', written over a horizontal line.