PGDM, 12-14

Modelling the Supply Chain (DM-403)

Trimester-IV, End Term Examination, September 2014

Time allowed: 2 hr 30 min Max Marks: 50

Roll No: _____

Instruction: Students are required to write Roll No on every page of the question paper, writing anything except the Roll No will be treated as **Unfair Means**. In case of rough work, please use answer sheet.

Section A: Short answer questions (Five marks each. Attempt three; total marks 15)

A1. Discuss the impact on Bullwhip Effect if supply lead time is reduced to zero (ideal JIT) at all supply channels. Assume all other variables remain unchanged.

A2. You intend to start your own business and propose to open a Gift Shop with range of gifts carrying per unit price tags varying from Rs 500 to Rs 10,000 at margins of 50 to over 100%. Develop procurement policy.

A3. A company engaged in production and marketing of ladies shoe-wear has sought your advice on Decoupling strategy to be adopted for its variety. In specific, the manufacturer desires to know where the decoupling point(s) should be located in the supply chain. Provide logic.

A4. Discuss application of Push-pull strategy in case of two products or service operations from your experience of Indian economic environment, highlighting advantages of this strategy.

A5. You have been appointed Manager in a company which operates on an Efficient Supply Chain. Using your knowledge of SCOR please develop five most important performance metrics (Level 1) for monitoring the performance.

Section B: 10 marks each. Attempt any 2; total marks 20

B1. Assume that Dell is to manufacture 27 different PCs with three different components: processor, memory and hard drive. In the disaggregate option, Dell designs specific component for each PC, resulting in 3 x 27 = 81 distinct components. In the common component option, Dell designs three distinct processors, three distinct memory units, three distinct hard drives that can be combined to create 27 different PCs. Each component is thus used in nine different PCs. Monthly demand for each of the 27 PCs is independent and normally distributed with a mean of 5000 and a standard deviation of 3000. The replenishment lead time for each component is one month. Dell is targeting a CSL of 95 percent for component inventory. Evaluate the safety inventory requirements with and without the use of component commonality. Also evaluate the reduction in safety inventory

requirements as the number of finished products of which a component is a part varies from one to nine. Please present your results in tabular form.

B2. A distributor of inverter sets is trying to set inventory policies at the warehouse for one of the models of inverter. Assume that the fixed ordering cost is Rs. 2500 which is independent of the order size. The cost of an inverter is Rs. 12000. The monthly carrying cost is 1.5 percent. The lead time is two weeks.

The average monthly demand is 190 and the standard deviation of monthly demand is 66. If the distributor wishes to ensure 95% (One tail Z value 1.65: Two tail Z value is 1.96) service level

(a) What will be the order up to level for a Periodic review policy if the distributor places order for inverters every three weeks. How much to order if the current inventory is 50.
(b) What will be the order quantity and Reorder point for a Continuous replenishment policy?

B3. Explain the four approaches of mass customization. How do product modularity, component commonality and postponement help Mass customization? Explain with examples.

Section C: Case study; 15 marks

HP DeskJet Printer Supply Chain

Brent Cartier, Manager for Special Projects in the Materials Department of Hewlett-Packard (HP) Company's Vancouver Division preparing for Monday's meeting with Group Management on worldwide inventory levels for the DeskJet Printer product line.

The DeskJet printer was introduced in 1988 and had become one of HP's most successful products. Sales had grown steadily, reaching a level of over 600,000 units in 1990 ($400 million). Unfortunately, inventory growth had tracked sales growth closely. Already, HP's distribution centres had been filled with pallets of the DeskJet printer. Worse yet, the organization in Europe was claiming that inventory levels there needed to be raised even further to maintain satisfactory product availability.

The situation was especially urgent in Europe. His mind was still filled with the faxed picture that he had received the previous day, showing the dip in product availability levels for some versions of the product at the European Distribution Centre (DC), yet he was sure that loads and loads of DeskJets have been shipped to Europe in the past months. His voicemail had been filled with angry messages from the sales offices, and yet the European DC was telling Vancouver that they had run out of space to store Vancouver's products.

The DeskJet Supply Chain

The DeskJet printer supply chain is represented in Exhibit 1. Manufacturing was done by HP in Vancouver. There were two key stages in the manufacturing process: (1) printed circuit assembly and test (PCAT) and (2) final assembly and test (FAT). The components needed for PCAT and FAT were sourced from other HP divisions as well as from external suppliers worldwide.

Selling the DeskJet in Europe required customizing the printer to meet the language and power supply requirements of the local countries, a process known as "localization." Specifically, the localization of the DeskJet for different countries involved assembling the appropriate power supply module, which reflected the correct voltage requirements (110 or 220) and power cord terminator (plug), and packaging it with the working printer and a manual written in the appropriate language. The design of the product was such that the assembly of the power supply module had to be done as part of the final assembly and test process, and therefore the localization of the printer was performed at the factory at Vancouver. Hence, the finished products of the factory consisted of printers destined for all of the different countries. These products were then sorted into three groups destined for the three distribution centres: North America, Europe and Asia-Pacific.

The total factory cycle time through the PCAT and FAT stages was about a week. The transportation time from Vancouver to the US DC, located in San Jose, California, was about a day, whereas it took 4-5 weeks to ship the printers to Europe and Asia. The long shipment time to the DCs in Europe and Asia was due to ocean transit and the time to clear customs and duties at port of entry.

The Inventory and Service Crisis

The magnitude of demand imbalances was especially alarming in Europe. It was becoming quite common to have product shortages for model demands from some countries, while inventory of some other models kept piling up. In the past, the target inventory levels at the DCs were based on safety stocks that were a result of some judgmental rule of thumb. It seemed like the increasing difficulty of getting the right balance of inventory for the various production options meant that the safety stock rules would have to be revisited.

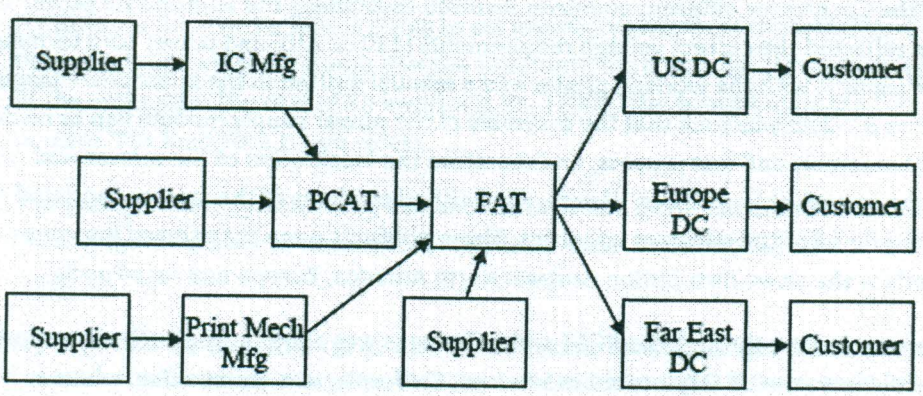
David Arkadia had solicited the help of a young inventory expert from Corporate HP, Dr. Billy Corrington to help him put in place a scientifically based safety stock system which would be responsive to demand uncertainties and replenishment lead times. Billy had formed a team consisting of Laura Rock, an industrial engineer, Jim Bailey, the planning supervisor and Jose Fernandez, the purchasing supervisor from Vancouver to rehaul the safety stock management system. They were to recommend a method for calculating appropriate safety stock levels for the various models and options at the European DC. Gathering appropriate data turned out to be a task that the team spent a lot of time at. They now felt that they had a good sample of demand data (Exhibit 2). Brent was hoping that this new methodology would solve the inventory and service problem.

C1. Take a look at the demand data at Exhibit 2. Using this data, determine the safety stock for each of the six variants of the DeskJet printer.

C2. One of the proposals that the HP management is evaluating is to modify the printer design so that the 'localization' can be done at the European DC. This would result in a generic printer model that gets shipped from Vancouver to the European DC and customization is done in Europe based on local demand. Determine the safety stock needed for this generic model at the European DC.

HP wants to maintain a CSL of 95% for the printers (Value of Z at 95% if the rejection area is only on right tail is 1.64 and if the rejection area is split equally on both the tails the value of Z is 1.96).

Exhibit 1. The DeskJet printer supply chain



Key: IC Mfg: Integrated Circuit Manufacturing
PCAT: Printed Circuit Board Assembly and Test
FAT: Final Assembly and Test
Print Mech Mfg: Print Mechanism Manufacturing

Exhibit 2.

Demand Data for Europe by Product Variant

Europe Variants	Monthly Mean	Monthly Std Dev
A	42.3	32.4
AA	420.2	203.9
AB	15830.1	5624.6
AQ	2301.2	1168.5
AU	4208.0	2204.6
AY	306.8	103.1
Total*	23108.6	6244.0

*Total figures are for all the variants taken together.