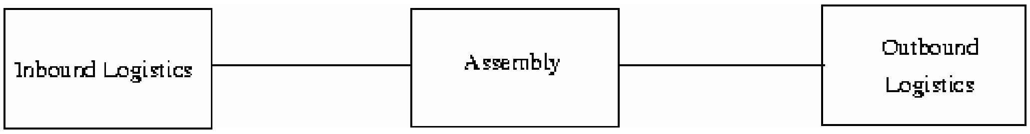
August 30, 2000

E1 234 SUPPLY CHAIN MANAGEMENT : Problem Set 1

The first eight questions are general but important questions which will enable you to understand supply chains better. These are not important from an examination viewpoint, but are certainly needed for better conceptual understanding.

1. Attempt definitions for the following important terms: enterprise, supply chain network, supply chain management, supply chain process, business process, order-to-delivery process
2. Understand the difference between the supply chain process and the order-to-delivery process.
3. List various business processes embedded inside the supply chain process.
4. Write down the advantages and disadvantages of make-to-stock and make-to-order policies.
5. Argue in favour of process performance measures over functional performance measures.
6. Understand the relation between non-financial performance measures and financial performance measures in the supply chain context.
7. Investigate the relation between supply chain management and B2B commerce.
8. Understand the role of the following technologies in supply chain management: web-EDI, POS-tracking, Internet auctions, agent technology, object and component technology, XML, on-line exchanges, MRP II, ERP, CRM, DRP, data mining, web-order processing, Internet embedding, pervasive computing, epayment, workflow management, etc.
9. In a particular organization, a typical customer order, when served from the finished goods inventory has a lead time of 2 days. If it is served by assembling to order, packed, and transported, the lead time is 8 days. Finally, if it has to be made to order through the entire supply chain, the lead time is 30 days. Assume that on an average, only half the orders can be fulfilled from the finished goods inventory. What is the maximum percentage of orders that should be required to be made-to-order, to achieve an average order-to-delivery lead time of 5 days?
10. Consider the following three stage, linear supply chain process:

Figure 1: A linear supply chain process



Assume the cycle time process in the individual stages to be normally distributed with parameters $(\mu_1, \sigma_1), (\mu_1, \sigma_1), and (\mu_1, \sigma_1)$ respectively. Let the cycle times be denoted as X_1, X_2, *and* X_3, respectively. Let Y be the supply chain lead time, i.e. $Y = X_1 + X_2 + X_3$. Let Z be the order-to-delivery lead time, i.e. $Z = p_1(X_1 + X_2 + X_3) + p_2(X_2 + X_3) + p_3X_3$ where p_3 is the probability of fulfilling customer orders from the finished goods inventory, etc. Assume $p_3 = 0.5$; $p_2 = 0.4$; *and* $p_1 = 0.1$. Assume the following nominals and tolerances for the processes:

	Nominals (T_i)	Tolerances (T_i)
X1	10	2
X2	20	3
X3	5	1

(a) Answer the following questions, assuming that X_1, X_2, *and* X_3 are three sigma processes:

i. What are the lower and upper limits for which the supply chain process is three sigma? six sigma?

ii. What are the lower and upper limits for which the order-to-delivery process is three sigma? six sigma?

(b) Answer the following questions, assuming that X_1, X_2, *and* X_3 are six sigma processes:

   i. What are the lower and upper limits for which the supply chain process is three sigma? six sigma?

   ii. What are the lower and upper limits for which the order-to-delivery process is three sigma? six sigma?

(c) Answer the following questions, assuming that X_1 and X_3 are three sigma processes, while X_2 is a six sigma process:

   i. What are the lower and upper limits for which the supply chain process is three sigma? six sigma?

   ii. What are the lower and upper limits for which the order-to-delivery process is three sigma? six sigma?

(d) Answer the following questions, assuming that X_1 and X_3 are six sigma processes, while X_2 is a three sigma process:

   i. What are the lower and upper limits for which the supply chain process is three sigma? six sigma?

   ii. What are the lower and upper limits for which the order-to-delivery process is three sigma? six sigma?

(e) Given the limits (30, 40) for the supply chain process and that X_2 is a six sigma process, what capabilities would X_1 and X_3 need to have to make the overall supply chain process six sigma?

(f) Given the limits (14, 18) for the order-to-delivery process, and that the processes X_1 and X_3 are three sigma, what should be the capability of X_2 process for achieving a six sigma delivery process?