ENGINEERING TRIPOS PART IIA

Module 3E10: Operations Management for Engineers

Examples Paper IV

Examples class: March 15, 2016 (4pm-6pm, Engineering LT1)

Question 1: How do the philosophies and implementation steps differ between Six Sigma, Lean Thinking and the Theory of Constraints?

Question 2: A manufacturing process has a defect rate of 5 percent, based upon 10 samples of 20 data points each. Calculate the control limits for a p-chart, and explain how it would be used to detect changes in the process performance. *[Answer: UCL and LCL are 0.196 and 0, respectively.]*

Question 3: Given the table of coating weights shown here for samples of size $n = 4$:

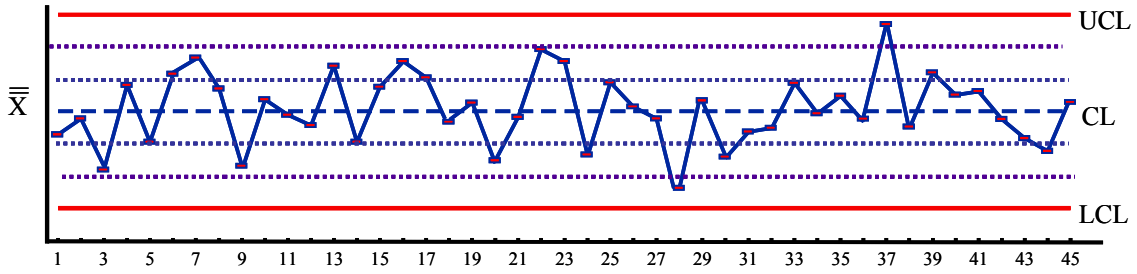
a) Calculate the $\bar{X}$'s and R's for samples 2 to 8.

b) Calculate the $\bar{\bar{X}}$ and $\bar{R}$ values based on all eight samples. *[Answer: UCL and LCL are 0.196 and 0, respectively.]*

c) Determine the appropriate constant (using Table 1 in the Appendix) that would be used with these data to construct $\bar{X}$ and R control chars, and calculate the control limits. *[Answer: For Xbar chart: UCL = 21.99; CL = 20.40; LCL = 18.80; For the R chart: UCL = 5.04; CL = 2.21; LCL = 0]*

Sample	X1	X2	X3	X4	$\bar{X}$	Range
1	18.5	21.2	19.4	16.5	18.90	4.7
2	17.9	19.0	20.3	21.2		
3	19.6	19.8	20.4	20.5		
4	22.2	21.5	20.8	20.3		
5	19.1	20.6	20.8	21.6		
6	22.8	22.2	23.2	23.0		
7	19.0	20.5	20.3	19.2		
8	20.7	21.0	20.5	19.1		

Question 4: Interpret the following control chart, explaining whether or not the process is in control. Give any recommendations for action.



Question 5: Wize Beers UK has 3 beer factories and 5 distribution centres. Their supply capacities, demand data, and the cost of delivery between each location are presented in the table below. Find a policy that matches demand and supply at the minimum cost. *[Answer: Final optimal distribution cost = £2446; AV = 27; AX=18; AY=1; BY=9; BZ=11; CW=16; CZ=18]*

	Aberdeen (V)	Preston (W)	Sheffield (X)	Ipswich (Y)	Winchester (Z)	**Supply**
Glasgow (A)	18	16	12	28	54	**46**
Leeds (B)	24	40	36	30	42	**20**
Swindon (C)	22	12	16	48	44	**34**
Demand	**27**	**16**	**18**	**10**	**29**	**100**

Question 6:

(i) Which of the following is NOT a key idea of supply chain management?

a) Procurement decisions should be guided by total cost rather than purchase price.
b) Organisations should devolve technological responsibility to the parties in the chain with the greatest expertise.
c) Organisations must collaborate on business process design with customers and

suppliers.

d) Organisations should engage in a competitive struggle with their suppliers and customers over the profit to be made in the extended value chain.
e) Organisations need to formulate strategies for managing quality across organisational boundaries.

(ii) Which of the following are NOT common interpretations of supply chain management? (Check all that apply)

a) The management of operations and commerce at customer and supplier interfaces.
b) The management of the flow of goods from earth to the end-consumer.
c) The management of organisations with complex bills-of-materials.
d) The management of organisations with multiple retail outlets.

(iii) What is the difference between agile and lean supply chains? Can they co-exist?

(iv) What is the bullwhip effect?

Feryal Erhun
March 2016