16.660 / 16.853 / ESD.62J Introduction to Lean Six Sigma Methods
January (IAP) 2008

Instructions for Using the Variability Simulation Spreadsheet

The spreadsheet file "vari_sim3-2.xls" accompanies Slides 14-18
in Module 3-2 and may be used for live simulations of the performance of the accounts payable system due to variation of input arrivals and process performance. The sim tracks inventory at each in-box. It calculates average jobs complete per day, WIP, and cycle time after 20 and 216 days. The plot shows the Inventory at each station by day for the 216 days. Note that every result is different and there is no steady pattern.

1. Open the spreadsheet.
2. Hit the Control or Command & = buttons to execute a simulation
3. The pink cells have pull down menus that allow you to change the die table

The notes below go with each slide:

Slide 14 – Usually, the sort of pattern seen here appears - jobs/day climb as the WIP grows (intuitively, as all of the inboxes fill, no capacity is ever lost to the die roll being greater than the inventory) but the cycle time gets terrible. The "luck" box is just a check on the random number generator - in this case, at 20 days, luck may make some difference (the computer generated die rolls have run 10% below expected average); by 216 days the bad luck continues but only accounts for 4% of the results, not enough to say that the mess we are seeing is due to "bad luck". Usually the luck factor is even less significant (1-2%) as the computer rolls A LOT of simulated dice.

Slide 15 - A bottleneck is created by having PFR Check use the 0,1,2,3,4,5 die. Masses of inventory accumulate there; WIP and Cycle Time grow without limit. Note this is unsubtle; Accounts Payable indeed does not have this sort of monster bottleneck.

Slide 16 - Reducing input variation helps a little… Its also worth trying a fully predictable input (all 3s) and a random but lower input level 0,1,2,3,4,5 - these help even more, but do not make the variability go away.

Slide 17 - Reducing variability EVERYWERE helps A LOT

Slide 18 - Finally, when customer demand is leveled AND variability is low, "perfection" is reached - a flow system!