Throughput simulation: learning points

We have simulated a perfectly balanced department (where each person or function has the same average output) where the output of each person varies. This is fairly like real life, except that in real life there are greater variations: the variations come from sickness, variation in daily performance, some jobs being harder to do in some departments and easier to do in others, some people working consistently faster than others, etc.

We saw the following effects:

1.   The work in progress builds into waves, so some people run out of work while others were swamped.

2.   The waves never seemed to come out of the end of the process, yet we often looked as if a big pile would come out in a day or two.

3.   Low output on the first operation will starve the rest of the organisation.

4.   Low output on the final operation means all the previous efforts were wasted.

5.   Low output on the middle operations: in theory this could be caught up, but in practice this doesn't seem to happen. This is because a 1 always means 1 moves forward, but a 6 can result in only 1 moving forward if that's all there is. So you can lose but never win. Lost time is lost for ever and will not be caught up.

6.   The only time lost time would be caught up is when the operation is averaging faster than the next one. We did not have this situation in our simulation. In our simulation every operation is effectively a bottleneck.

7.   Because we can lose but never gain, the average output is not 3.5, or even 3, but more like 1.5. The more stages we have, the more it reduces.

8.   So: in setting up capacity we have to be careful about using theoretical average throughputs. And we also have to be careful about blaming section managers for lower throughputs than expected.

9.   The initial buffer of work helped for a few days, but soon became unevenly spread. In fact, since the first operation is pulling in an average of 3.5 but the final operation is only putting out about 1.5, the system must be filling up at about 2 jobs per day. But this still doesn't seem to help!

10.   So: buffers of work are not the answer to a smooth flow.

11.   Work in progress (i.e.paperwork on everybody's desks) tends to increase, even in a balanced system!