GOLDRATT group

Efrat's Nuggets

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Efrat's nugget -13: Reaching the plateau of the U-curve, or: When the 4 colors are not enough

(RRR)

The audit process is based on investigating "mysteries"; or as Eli Schragenheim had called them in his landmark presentation in Cambridge - surprises. A mystery is an effect in reality that contradicts a predicted effect of the S&T tree. In a recent audit of an MTO company (producing metal cables of the kind that is used for holding elevators), two mysteries were evident. But first a little background:

The company had already implemented, to the letter, the left part of the RRR tree and had quickly improved its DDP from around 50% (which is typical to its industry) to the satisfactory level of 98%. They proceeded by properly exploiting the resulting competitive edge of this extreme reliability, to the extent that the market is no longer the constraint. Actually they are winning so many orders that the "load control" pushed their promised due-dates to be later than the market lead time. Since it takes a long time to add capacity (about a year) they are now contemplating a mechanism that would enable them to safeguard their preferred clients ("When given delivery lead times are (much) longer than the industry standard lead time, not only may orders be lost, but clients may be lost." - RRR S&T step 4.13.2 - Capacity Elevation).

One mystery was that even though both DBR and BM were properly implemented (WIP had been cut into half and DDP had jumped) the amount of revealed capacity was much less than predicted. The company's environment is on the one hand an "I" environment (all products are passing through the same departments in the same sequence) and on the other hand an "A" environment (most products are cables that are assembled - stranded - from many drawn wires). For such an environment one would expect that the amount of revealed capacity will be somewhere between 50% (as typical to type A) and 30% (as typical to type I). But in this company's case the amount of revealed capacity was barely 10% (though it is difficult to get a good estimation since the mix have changed relative to the mix that gave the highest tons/month prior to the implementation).

Another mystery was that contrary to what the theory predicts and vast experience verifies, even though the number of black orders is very small (about 2%) the number of red orders is not, as expected, considerably under 15%, but somewhere in the sky (touching 30%). This strange combination of very few blacks with exceptionally high number of red orders on the floor was not a one-time event, but lasted for months.

How come?

The way to decipher a mystery is to look for something unique in our environment; something that is intuitively connected to one of the mysteries and is so unique that it certainly wasn't considered when the S&T tree was constructed.

In our case there is something unique that drastically impacts the lead time of the orders (and therefore can be related to the disproportional number of red orders). The assembled cable contains 7-25 different types of wires, all produced by the same drawing department, hence it is not possible to process them simultaneously. That means that the lead time to start assembly is not dictated by the lead time to draw a single wire but by the time passes from drawing the first wire needed for the cable until the last wire is drawn (since the assembly cannot start if one of the required wires is missing). If the wire-drawing department is not given the information about which wires are going to be stranded together (which is the case here) then the time to start assembly is not just the summation of the times required for drawing all the wires required for that cable, but also includes the time to process other wires that happened to be in the queue. That will certainly elongate the lead time, but since the touch time is very small relative to the lead time, it is unreasonable that the impact will be so big as to cause such inflation of red orders.

But before dismissing it, let's remind ourselves that the bigger the queue in front of the drawing department the higher is the impact on the resulting lead time - simply, a large queue means that many unrelated wires interfere in the drawing sequence of the wires for any single cable. In our case there is a unique factor that drastically enlarges the queue in front of the drawing department, namely: the drawing department is the bottleneck of the plant (and therefore there is always a large queue in front of that department). If that is not enough, the queue is much larger than expected since almost 50% of the load on the drawing department is not related to cables production but to wires that are sold as single wires.

Now the high number of red orders is no longer a mystery. The real question is: how come that such high number of red orders leads to only 2% of the orders shipped after their promised due-date?

And the answer is: high management attention. Expediting had become so frequent that as for now there is a daily meeting in which a list of the missing wires that prevent stranding of the most-urgent orders is compiled (orders which are supposed to be shipped in the next two or three days) and then given to the drawing operators with the instruction to drop everything and first process these wires.

Now we understand the specific circumstances that caused the second mystery - the disproportion between black and red orders. But before continuing to derive the needed corrective actions, it behooves to examine whether or not our new understanding also advances us in deciphering the first mystery, namely: how come that so little capacity was revealed by implementing DBR and BM?

First, let's remind ourselves the reason for the fact that in so many environments that claim to have no excess capacity, once DBR (and more so when BM) is implemented a considerable amount of capacity is revealed. The answer is that in the conventional mode of operation, which is dominated by the desire of people to look busy (and the need for high level of management interventions), the free capacity cannot be estimated by observing - or even measuring - the time that the relevant resources are standing idle. The only effective way to reveal the capacity is to change the mode of operation from pushing to be on the right hand side of the "U curve", to operating within the plateau.

What we are now realizing is that, due to the extraordinary composition of the plant, even though the orders release was chocked according to half the historical lead time, the plant is still operating on the right wall of the "U curve": management attention is very high and the number of open orders is still very high (most orders are not closed being in the yellow but deeply in the red). No wonder that the amount of revealed capacity is considerably less than expected.

What should be done is also clear. We have to deal with the root reason that elongates the actual lead times; with the too broad priorities given to the drawing department. The system should calculate, based on the inventory in front of the stranding, the incomplete kits - which wires in what quantities are still required for completing the cable (and which wires have already been delivered to the stranding). This information should be given to the drawing department to refine the color code priorities. There is no need to go to the extreme of prioritizing according to due dates since such information will unnecessarily limit the freedom of the drawing department.

It is now expected that:

1. The number of reds will drop to a reasonable level;
2. The average lead time will be significantly reduced; And
3. Substantially more capacity will be revealed.

The combination of all these three improvements will enable the company to safely move into the next part of the S&T tree; to the delighting stage of offering the market the Rapid Response offer.