Job shop scheduling – the secret to getting on time and reducing lead times

By Dr. Lisa Lang

There's no question that scheduling a custom job shop has it challenges. And every time we encounter one of the many challenges, our schedule is out of date, and we need to update the schedule.

In fact, don't we spend a lot of time updating the schedule? Here are just a few of the common scheduling challenges that cause us to have to continually update the schedule:[1]

1. Clients change their mind
2. Vendors aren't always reliable
3. Mix can vary wildly and so our constraint moves
4. Employees do not always have the right skill and their discipline is lacking
5. Processes are not reliable
6. Machines & tools break
7. Quality is not near perfect
8. Data is not readily available nor accurate nor communicated
9. Communication between silos is difficult

But there is also no question that scheduling plays a big role in our on time delivery performance and our lead time. And, our on time delivery performance, along with our lead times, determine our competitive position within our industry. This is particularly true, as more and more, the shops that have survived have very good quality and lead the pack in expertise.

Industry Week reported that its 25 finalists for the "Best Plants" award reported an average on time delivery rate of 98.7%. And it's no surprise that on time delivery is a critical aspect in achieving customer satisfaction, loyalty and greater sales.

'but custom job shops are not 98.7% on time'

Custom job shops usually don't have the luxury of making the same parts over and over again. The mix of work and amount of repair/emergency work a shop has can change so dramatically week to week that their bottlenecks can move, making on time delivery a real challenge.

It's no wonder none of the 25 finalists were custom job shops or machine shops. So, unfortunately 1) it's very difficult to schedule a custom job shop; and 2) it's very important that we do it well to be 99%+ on time and to reduce our lead times. That's probably not 'new' news, and I'm sure you've tried a number of things to improve your on time delivery and to reduce your lead times. You may have updated your ERP or scheduling software or used some Lean [2] techniques, or maybe you've hired an expeditor.

But, whatever you may have tried, my guess is that it may have helped in some way, but not substantially. That's because the typical solutions address the various symptoms, but they don't address the root cause.

So now you might be thinking – okay, so how do we address the root cause, what's the secret? How can we dramatically improve our scheduling?

'the secret is ….to stop focusing on efficiency'

And when you are willing to do that, and put a better scheduling system in place, you create a buffer to better absorb all those sources of variability (those 9 Challenges we talked about because we can't totally remove them). It sounds like heresy I know – but that's the secret. The cool thing is that if you're willing to give it a try and your competitors continue to cling to efficiency – you can create an incredible competitive advantage.

What does it mean to be efficient? The definition from Dictionary.com is "performing or functioning in the best possible manner with the least waste of time and effort," so, I'd probably add money and cost to that.

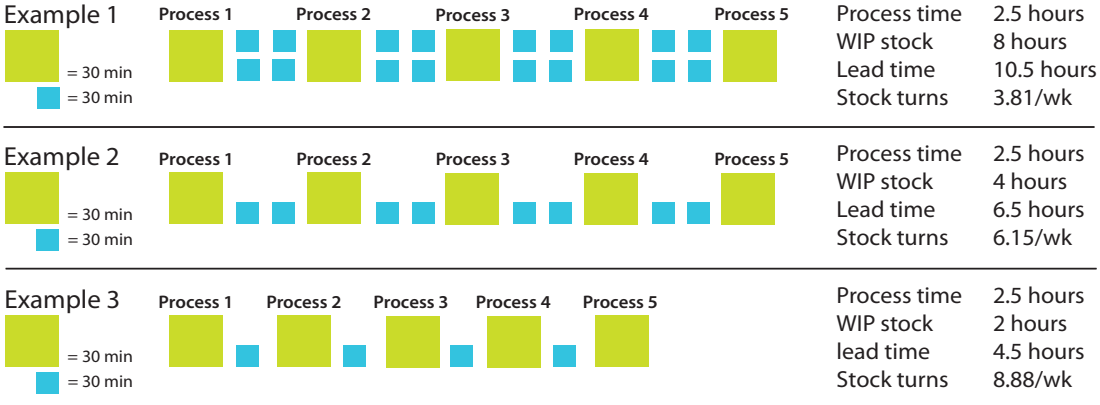
One of the ways we typically apply efficiency in a job shop, is by keeping all our equipment and/or people busy so that we don't waste any capacity and have the highest possible utilization.[3] Now, to keep our key resources busy they all have to have a job to work on. And to increase the likelihood that all resources have work, we typically make all jobs in house available to be worked on.

"Available to be worked on" means included in our work-in-process or WIP. This max's out your WIP and increases the pile of work at every work centre. That way all key resources have a very high probability of having something to work on. This is particularly relevant in job shops where the mix of work can change from week to week. It's one of the things we do in the name of efficiency. Now, let's talk about the negative effect from the actions that result from just this one thing we do in the name of efficiency. According to Little's Law there is a direct correlation between the amount of work-in-process we have and our lead time. The higher our WIP, the longer our lead times. Here's an illustration showing the relationship between WIP and lead time:

High WIP = Long Lead Time

The more jobs that wait for their turn, the longer the average queuing time, leading to longer production lead times. Example 1 has the most WIP and longest lead time. And, conversely Example 3 has the least WIP and the shortest lead time. So, as you increase WIP, you are also increasing your lead time, not to mention the amount of cash you have tied up in raw materials. But wait, there's more … on time delivery decreases

The diagram does not include the



Graph adapted from incremental improvements in Australia

effect of variability. But if it did, it would show that the variability of production lead time is increased as the queue grows. So the effect of high WIP just gets more dramatic the more variability you have – the more you battle the 9 Challenges. This directly reduces the on time delivery, because it is more difficult to predict the exact production lead time and to confirm orders accordingly.

High WIP can also have an impact on quality. Many production failures occur early in the routing, but are detected much later in the production process (usually at final inspection). If WIP is high, the average lead time is also high causing a long lag time between the production steps and the final inspection. That means that the final inspection step occurs a long time after the step that caused the failure. And because so much time has passed, it can be difficult to determine and correct the root cause of the quality problem, making improvement very difficult. Thus, the higher the WIP, the harder it is to detect and correct quality problems. All of this brings me to the conclusion, that you must …

'stop focusing on efficiency'

As you stop focusing on efficiency and reduce WIP, here's what happens:

- Queue time reduces
- Lead time reduces
- Lead time predictability increases
- On time delivery increases
- Quality increases
- Cash flow increases

As a result of these improvements, your production lead-time becomes much shorter (if you do it right) than your quoted lead-time. This difference can be used in 2 ways.

First, it creates a buffer allowing you to absorb a fair amount of variability and further enhancing your on time delivery performance. And second, the difference is so big that you can also afford to reduce the quoted lead time to customers. The combination of these things – a shorter quoted lead-time and 99%+ due date performance creates that competitive advantage I mentioned earlier

Now, all of that is fairly easy to say and much harder to do. It's not physically hard to do, but mentally challenging because we don't have intuition around this approach. I've only touched on one aspect of the negative effects an efficiency focus can have. There's more to understand to have a huge impact on your shop scheduling.

So I've put together a 47 minute webinar that explains the whole process – of specifically how to do this — nothing is held back. It's called How to Get More Jobs Done Faster and you can sign up at www.VelocitySchedulingSystem.com/webinar. There are 2 dates to choose from, so I'll see you there! And while you're waiting for the webinar, why not go put some of this into practice right now?!

Author Profile:

Dr. Lisa is the President of the Science of Business and has recently worked with Dr. Goldratt who is the father of Theory of Constraints and author of The Goal. Science of Business specializes in increasing profits of highly custom manufacturers and job shops by applying Theory of Constraints, Lean and Six Sigma to operations with Velocity Scheduling System and to engineering with Project Velocity System and to marketing with Mafia Offers.
In addition to consulting, Dr. Lisa is a highly sought after Vistage/TEC speaker on Maximizing Profitability. She also provides professional keynote speeches and workshops for organizations like TLMI, ASC, NTMA, NAPM and private events for corporations like: TESSCO, Bostik, GE, and Sandvik Coromant.