Production | Aerospace and defense | Improved process performance | Network analysis

# Improving Factory Performance through Controlled Order Release

BOEING

## BUSINESS PROBLEM

Boeing Fabrication is composed of 12 different business units with different sources of demand and different manufacturing characteristics. Demand is mainly generated by an MRP system that schedules operations backwards from a customer delivery date based on standard work times. The resulting scheduling processes result in a high degree of variability on the shop floor with respect to flow times, WIP levels, and use of available resources. Fabrication is looking for a way to stabilize the load on the shop floor so that system health can be tracked against an achievable output target.

## APPROACH

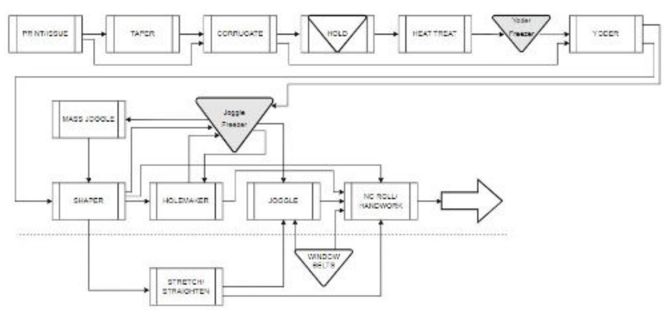
I started by measuring through interviews, observations, and data visualization to understand how operations are planned by IEs and executed on the shop floor. I also assessed how those realities benchmark against best practices. Then I worked with the shop to implement processes to release work at the rate orders were completed while creating visibility of the shop's schedule position.

## DATA SOURCES

The data architecture at Boeing has been slowly built and modified over many years. There is a complex interconnected system of data warehouses, web-based and server-based folders, enterprise programs, and locally developed visualization tools.

### Data Types and Format

Teradata: SQL with operation completion and direct labor charging. ERPMart: SQL with demand, material, and plan information. Production Artifacts: Various local tools developed for production control.




Author: David D Covell

## IMPACT

The proposed solution has the potential to fundamentally change the way that the schedule is consumed. Current metrics are focused on how closely operations are being completed relative to when the schedule says they should be. The solution is focused on how closely operations are being completed relative to when the schedule says they should be. The solution is focused on ensuring throughput is matched to the demand placed on the factory, and in the event that throughput is not able to keep up prevents WIP from backing up onto the factory floor. If fully implemented, the business would pivot from being a push-oriented company to a pull-oriented company. It would also decrease the load on controlling the company's many factories, as they only have to directly manage a handful of critical operations instead of every individual operation per factory.

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| **DRIVERS** | A common refrain on the shop floor was that there was too much variability in order routings to be able to effectively control. I also saw a cyclical buildup of WIP on the shop floor to levels that overloaded some areas and caused work stoppage in others. Together, this indicated to me that a method for limiting total WIP which doesn't explicitly control location of work orders within the system could be effective. |
| **BARRIERS** | The metrics used to track and manage operations incentivized the over-release of orders and of processing orders before downstream operations were ready to receive them. Additionally, decision making for order processing once orders were released was decentralized and effectively left to operator discretion. Finally, an aversion to change combined with the lack of a clear change impetus limited the effectiveness of the project. |
| **ENABLERS** | My team's trust provided me freedom to recommend a somewhat unorthodox method for changing the way that work was released. Their willingness to try something new that promised tangible benefits helped ensure that the recommendation was implemented on the shop floor. The managerial support ensured that I had the mentorship and backing necessary to keep the project progressing at a consistent rate. |
| **ACTIONS** | I conducted database queries and data transformations to gain a clearer view into how work traveled through the system. I worked closely with subject matter experts to develop a process that supported their current statement of work. I spent a significant amount of time working with individuals on the shop floor to gain their insight into daily operations, their feedback on the developing solution, and garnering support for the final solution. |
| **INNOVATION** | Instead of replacing the schedule completely in the implementation of CONWIP, the schedule was used to set relative priorities for work in queue. Schedule data for the bottleneck process could then be used to determine when to optimally employ overtime in order to meet throughput requirements. |
| **IMPROVEMENT** | Average WIP level in the shop was reduced by 27%. Average cycle time was reduced by 1.2 days per order. Orders completions improved from an average of 0.5 days late to schedule to 0.4 days early to schedule. Productivity on the capacity constrained resource increased by 13%. |
| **BEST PRACTICES** | Definitively identify which operation or set of operations are the system bottlenecks. Ensure that you have a robust method for determining how much work has been completed and processed out of the system. Identify an intermediate point between the level of WIP that currently exists in the system and the minimum required to feed the bottleneck daily. Finally, ensure all affected parties are included in designing the new process. |
| **OTHER APPLICATIONS** | This solution is useful in any manufacturing environment that has a high quantity of variability in routing, product mix, or both. |