

THE ONDEMA GUIDE TO PRODUCTION SCHEDULING

CHEAT SHEET

Info flow in a manufacturing system

Components of production scheduling

Priority sequencing rules

- Shortest job first (SJF)
- Earliest due date (EDD)
- Earliest release date (ERD)
- First-come, first-served (FCFS)
- Least flexible job first (LFJ)
- Last-in, first-out (LIFO)
- Shortest queue (SQ)
- Shortest setup time (SST)

Retention rules principles for better flow

1. Take an economic view
2. Manage queues
3. Exploit variability
4. Reduce batch size
5. Apply FIFO constraints
6. Control flow under uncertainty
7. Use last feedback
8. Achieve decentralized control

Economic principles

- Select actions based on overall economic impact.
- We can't limit change on flow.
- If you only quantify one thing, quantify cost of delay.
- Watch the work process, not the worker.
- Every decision has its own economic timing.
- Always compare marginal cost and marginal value.
- Do not consider money already spent.

Batch size principles

- Reducing batch size reduces cycle time, reduces variability in flow, accelerates feedback, reduces risk, reduces inventory, allows for fine tuning of capacity utilization, and increases efficiency.
- Large batch sizes cause exponential cost and schedule growth.
- Reducing transaction cost per batch lowers overall costs.
- The most important batch is the transport batch.
- Inventory creates small batch sizes.
- Small lots require smaller orders.
- Smaller batch sizes before achieving full benefits.
- Adapt batch size continuously to respond to changing economics.

Queue principles

- Capacity utilization increases queues exponentially.
- Variability increases queue length.
- Operating at high levels of capacity utilization increases variability.
- Operating queue size is an economic trade-off.
- Use FIFO to manage queues.
- Don't control capacity utilization or cycle time, control queue size.

Scheduling models

- Job shop optimization
- Linear optimization
- Genetic algorithms
- Simulated annealing
- Tabu search

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A RESOURCE COMPILED BY ONDEMA

CHAPTER 3 PAGE 3-4

Bees algorithm

Focus algorithm (fba) is built on the behavior of scout bees foraging for pollen. Scout bees leave the hive in multiple random directions to search of flower patches. When they return and deposit the pollen and/or nectar, they perform a "waggle dance" that contains information on the direction, distance, and quality of the flower patch. The scout bee then leads a "recruitment" of follower bees to the flower patch. The number of follower bees is determined by the distance and quality of the flower patch, more flowers bees are dispatched for closer, higher quality or "nicer" flower patches. This, like the ant colony, is a demonstration of emergent intelligence.

The behavior has been adapted for scheduling optimization. The algorithm performs searches of "waggle" schedules (i.e., for routes of the various machines) as well as groupings of unscheduled machines. Heuristic functions are deployed to assess the quality of the schedule. They return and do their own version of the "waggle dance" based on the quality of the grouping of schedules, and follower functions on their own return the best iterations and return them to the hive.

DAN SAYS...
Remember they make honey. They produce flowers. They'll commit suicide to sting me. Scout bees search for flowers and return to the hive to tell others what they've found. Then a quorum forms to find the best location in the patch. This has something to do with scheduling but I'm not prepared to say.

FIGURE 3 General fba flow chart (Foa et al. 2003)

Reader,

First things first - introducing [The Ondema Guide to Production Scheduling!](#) We scoured publications, journals, and the deepest corners of the web to bring you All Things Helpful about scheduling. **Good news:** we're giving it away for free. **Bad news:** Dan wrote it and he's a #weirdo. Check it out and let us know what you think!

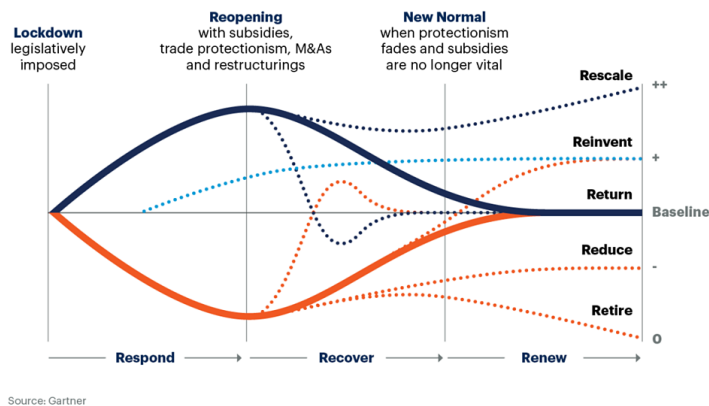
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Our Favorite Reads

New year, new opportunities. Here are a few resources that resonated with us, and might help you travel the road ahead.

- [No turning back.](#) The McChrystal Group provides an excellent resource for business leaders tasked with planning and building organizational resiliency in times of change and uncertainty. See graphic below.

Postpandemic Planning Framework



- [Trends that will dominate manufacturing in 2021.](#) Hitachi Solutions summarizes the the forces that they believe will drive manufacturing this year - from employee safety to post-pandemic planning to predictive maintenance.
- [Minimizing makespan, explained using AH-1W Super Cobras.](#) Because who doesn't enjoy using attack helicopters to break down complex manufacturing concepts?
- [Manufacturing business models continue to change.](#) IndustryWeek writes how evolving customer preferences, integrating marketing/sales/service, and

other strategic initiatives will give rise to new manufacturing business models in 2021.

Your Monthly Dose of Randomness

Who wins when 20 T-Rexes Fight 10,000 angry chickens? **We do!** Thanks to the Ultimate Epic Battle Simulator for [putting the debate to rest](#).



The infamous Interspecies Battle of Blood Gulch. WWNF.

Until next time,

The Ondema Team



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