Don't let "planning bullwhip" sting your performance

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Though most industrial companies adopt hierarchical planning systems, doing so often results in longer lead times, order backlogs and general unpredictability.

On-time delivery is one of the most common and serious problems to beset manufacturing companies. Despite concerted efforts by planners to reschedule open orders and update lead times, all too often order fulfillment remains stubbornly low.

This was certainly the case at the beginning for the Swiss defence supplier, Oerlikon Contraves, whose attempts to overhaul its planning system form the basis of the paper, "An Empirical Study on Reducing Planning Instability in Hierarchical Planning Systems," by Philip G. Moscoso (IESE), Jan C. Fransoo (Technische Universiteit Eindhoven, Netherlands) and Dieter Fischer (University of Applied Sciences of Northwestern Switzerland).

Meeting deadlines is highly critical for Oerlikon Contraves, as its products are typically sub-assemblies of even larger defence systems. Although 60 percent of the products it produces are standardized, they are highly complex due to the number of components involved.

Until 2002, Oerlikon Contraves had used a computer-based Enterprise Resource Planning (ERP) system to determine which parts must be built and which materials must be procured by a certain date. Production planning was done end-to-end, but organizationally followed a highly decentralized approach.

The planning tasks were distributed across four organizational levels:

1. Dispatchers would draw up a rough production plan, determining key start and end dates for a client order.
2. These plans were reviewed by the work preparation unit, and adjusted whenever necessary for the different working units on the shop floor.
3. Operational production units made last-minute adjustments in the production plans as required.
4. Order chasers helped to ensure that the agreed due dates for client orders were met.

Thanks to the work of these chasers, Oerlikon Contraves was able to fulfill 87 percent of its due dates — but only by generating a significant order backlog of several thousand working hours.

The chasers had effectively created two types of order flows: high-priority orders were aggressively pushed through the shop floor, but at the expense of regular orders being repeatedly delayed.

For the most part, the rescheduling of orders was done on an informal basis and in a highly decentralized manner. Moreover, there were serious flaws in higher-level planning, since the ERP was not updated often enough to accurately reflect activity on the shop floor.

What is "planning bullwhip"?

The company was suffering from what the authors refer to in their paper as "planning bullwhip," to illustrate the similarities and differences with the well-known supply-chain phenomenon known as bullwhip. This occurs when frequent rescheduling and lead-time updating of open orders result in more erratic and drawn-out lead times, order backlog and failure to deliver on time.

According to the authors, "planning bullwhip" stems from a combination of factors. On the organizational side, the number of planning levels a company has and the structure of those levels are crucial. The more complex the structure and the more planning levels involved, the longer it will take to implement solutions.

Human factors also have a significant effect. When planners and operators observe a growing backlog, they try to reduce it by taking additional ad-hoc measures. These can exacerbate the "bullwhip" effect by further complicating the planning process.

By interviewing Oerlikon Contraves planners and managers, the authors were able to discern

ways that a company could effectively counter these effects.

Automation no substitute for human factor

In 2003, Oerlikon Contraves adopted a more centralized planning model, in which all decisions would be taken by a production control center manned by 10 qualified and experienced planners. Order chasers were discontinued, and all remaining operations units had to adhere strictly to the plans provided by the control center.

The company also installed an Advanced Planning System (APS) based on Human-Centered Planning Intelligence (HCPI), where human factors were taken into account. Automation would support the planner in his tasks, but it was always human operators, with their knowledge and experience, who took the decisions and controlled the whole process.

Through closer links with work units, the new system allowed planners to inform the shop floor of planned changes resulting from additional orders, malfunctioning machinery or delayed material deliveries. Crucially, this led to a complete overview of production performance, enabling key indicators to be regularly monitored in areas such as procurement, production, sales, distribution, inventory management, planning and quality.

Armed with more accurate information, planners were able to take decisions based on the actual production situation. They could anticipate problems and optimize resources while fulfilling their objectives. As a result, planning performance improved significantly, and in little more than two months, the backlog decreased from 30,000 to 2,500 working hours.

This study provides strong support for the authors' main contention that reducing the number of planning levels and finding a balance in the planning frequency are crucial for improving planning performance.

It also underscores that automation must support the planner, not vice versa, as human operators are far better placed to mitigate systemic instability, provided that it is done in a coordinated manner.

Most importantly, Oerlikon Contraves serves as a warning to manufacturing companies: If they do not have a highly coordinated planning system in place, which is being overseen by experienced planners, then they run a high risk of exposure to the stinging lashes of the planning bullwhip.