Solutions

Theory of Constraints: Manage Bottlenecks with SAP Solutions

August 10, 2018 by Andreas Schmitz

According to the theory of constraints, you should only produce as much as your resources allow. Productions planners using SAP ERP Central Component or SAP S/4HANA can now follow this approach thanks to a new package developed by SAP Consulting.

Traditional production planning has its flaws. For example, determining product demand at a given time often takes an armada of employees at a company.

"Real customer orders and forecasts are used to plan according to the traditional methodology," explains Ferenc Gulyássy, supply chain expert for SAP Consulting. Orders are then pushed through the production process based on presumed inventory levels and forecast sales figures. But the forecasts and probabilities are usually very vague.

In Gulyássy's experience, the numbers are correct 80 percent of the time at best. Usually, though, they are much less reliable: "Having to base production planning on such numbers is less than ideal."

Work Around the Weakest Link in the Chain

Put forward by Israeli physicist and management consultant Eliyahu M. Goldratt in1987, the theory of constraints offers a way around this predicament. The theory is a holistic approach that focuses on potential bottlenecks in the value chain. Examples include machines, which have limited levels of output, teams that are working on several projects, tools that need to be prepared before use, and the availability of raw materials and components that have to be delivered.

In its purest form, the theory does not rely on any forecasts.

"Bottlenecks slow down business processes, limit an organization's competitiveness and growth, and dampen employees' mood and motivation," explains Gulyássy, who thinks that production planning is a lot like road traffic. "Allowing lots of vehicles on to the highway at once just doesn't make sense because they will only get stuck in traffic."

Monitoring the impact of the bottleneck at every stage of the planning process by applying the theory of constraints enables planners to make informed decisions. That avoids production "traffic jams" from the outset and reduces lead times because the flow of orders is steady. If, for example, the bottleneck is a machine that produces 200units per week, the planner is limited to this level of output. Production experts use a "gating operation" in such cases whereby new orders only make it into production if the bottleneck machine can handle them. All resources involved in the process are programmed to produce the same amount as the bottleneck, even if they could potentially produce much more.

"Production resources and material availability are two of the most significant bottlenecks," adds Gulyássy.

Use the Bottleneck to Full Capacity

The theory of constraints therefore involves identifying a bottleneck, using its capacity to the full, and basing all other planning decisions on its level of output. Until recently, users of SAP solutions were not able to work according to the theory of constraints because the systems were not designed that way.

"Most other solutions were built by providers who were more active in consulting than in software development," says Gulyássy. Companies were therefore using theory of constraints solutions created by specialized third parties and that were not designed for organizations that process large volumes of data every day.

"Many companies have not applied theory of constraints to date because SAP solutions did not offer the methodology, and they did not want to introduce additional interfaces in sensitive areas," he says. If SAP changes its software, these other interfaces and solutions need adapting right away. This motivated some companies to build their own solutions, which, in Gulyássy's opinion, are relatively primitive.

But now, users working in version 6.0 or later of SAP ERP Central Component or SAP S/4HANA can also apply the methodology using the theory of constraints package offered by SAP Consulting. Developed with support from a theory of constraints specialist and in collaboration with three mechanical engineering companies, a conglomerate, and a technology company, the package gives companies an opportunity to rethink their traditional approach to planning.

Closer Look at the Package from SAP Consulting

Scheduling delivery dates for customer order confirmations is the main factor that determines the bottleneck machine's workload. In reality, companies often allow too many orders through to production.

"An availability check can be carried out beforehand to establish whether the bottleneck machine has enough capacity. This prevents the machine from being flooded with orders," says Gulyássy. This step, which is known as capable-to-promise, is not supported in SAP S/4HANA and SAP Integrated Business Planning solutions. Instead, the theory of constraints planning approach in SAP solutions for supply chain management consulting features a *rough-cut sales order check* that enables planners to check capacity. Whenever a delivery date is needed, the system first checks whether there is enough capacity (people and machines) and materials available, which prevents any order backlogs from building up in the chain.

The solution also includes the following features:

- A capacity planning cockpit identifies bottlenecks when the user checks capacity.
- A buffer that is sufficient enough covers requirements in case the bottleneck machine breaks down. "I have to ensure that the component limiting my output is always producing as much as it can," adds Gulyássy. Planners can adjust the size of the buffers as needed.
- Priority descriptors are available for the order processing sequence: which orders are accepted and which are sent through the bottleneck and "onto the highway" first.
- Methodology for material requirements planning includes historical data and, to some extent, forecasts on availability, and theory of constraints numbers to monitor the process.

Tags: ERP, SAP S/4HANA