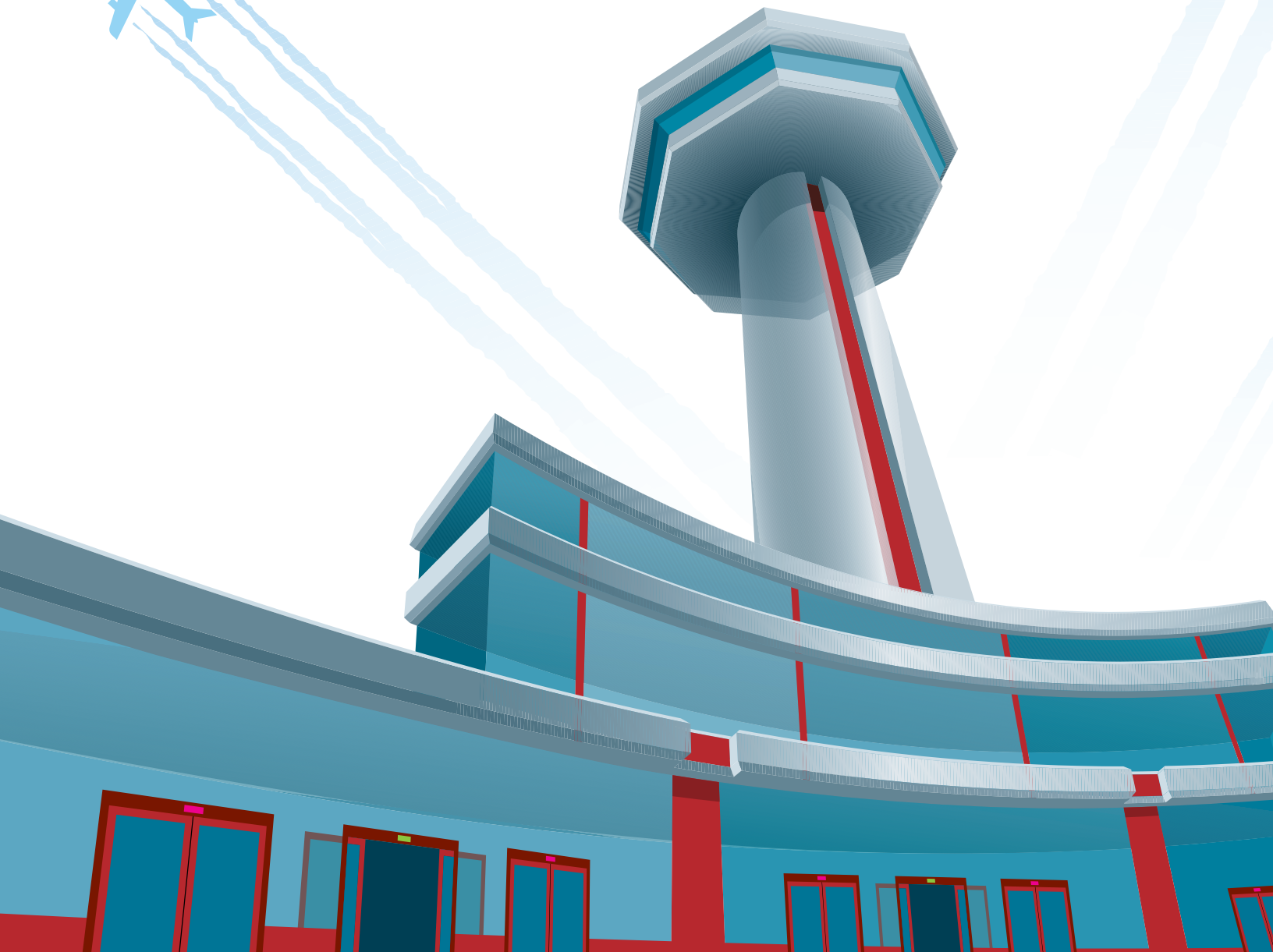



The *power* of a control tower





Agilent Technologies' "control tower"—an information hub linking the instrument maker with its suppliers to provide inventory visibility—has helped the company deftly model parts availability, manage order promising, and counteract parts shortages during a natural disaster.

IN 2011, WHEN THE WORST FLOODING in decades swamped Thailand, many of the manufacturing plants that produce electronic parts and components in that country were forced to suspend operations. That left many of their customers—mostly large international manufacturers—without critical parts needed to fill orders. But not Agilent Technologies Inc. Although Agilent's contract manufacturer in Thailand was out of commission, the testing-equipment maker was able to fill most of the orders that normally would have included items produced by that supplier. That's because Agilent had a resource its competitors didn't have: a "control tower" it had installed a year earlier for its Electronic Measurement Group (EMG).



The control tower is an information hub that links Agilent with its suppliers to provide visibility of the inventory in its supply chain, at both the company's own locations and at the sites of its contract manufacturers and their suppliers. The control tower's staff uses simulation software to model the impact of parts shortages on production and devise a plan to solve any problems. In the case of the Thai floods, the company used that software to find alternative sources for parts, or in some cases to permit the redesign of products using similar parts that were on hand. "The control tower helps us to be able to capture all components during a shortage so we can come up with risk-mitigation actions," says Michael Tan, Agilent's Singapore-based supply chain operations director.

Inventory unknowns

Agilent Technologies was created in 1999 when Hewlett-Packard spun off its test and measurement instrument business from its computer business. Headquartered in Santa Clara, California, Agilent Technologies reported US \$6.9 billion in revenue in 2012. The Electronic Measurement Group (EMG) is one of four groups within the company, and it's the most profitable one, with US \$3.3 billion

in revenue in 2012. EMG sells products like oscilloscopes, spectrum analyzers, and network analyzers that are used in such industries as aerospace, defense, communications, and computers. The group has 9,000 customers worldwide. (In September 2013, Agilent Technologies announced plans to make the Electronic Measurement Group a separate, publicly traded company.)

To make 5,000 different types of electronic instruments, EMG works with 1,100 suppliers, 52 percent of which are based in Asia. Although the measurement group operates some of its own factories, it relies on strategic contract manufacturers to make 70 percent of its products. On average EMG ships 70,000 units each month to customers.

Agilent's inbound supply chain spans the globe and requires the coordination of parts flows between its own factories and those of its contract manufacturers. For example, Agilent technology centers in the United States and Germany make integrated circuits. Contract manufacturers in Asia incorporate those components into what Tan refers to as printed-circuit assembly boxes. But Agilent's main manufacturing plant, in Penang, Malaysia, also incorporates the integrated circuits into microcircuit assemblies found in electronic instruments.

All of those factories, both in-house and contract, keep their own inventories of parts to support production. Each plant also has its own suppliers, which keep their own stockpiles of inventory.

The whereabouts and availability of inventory in Agilent's extended global supply chain became a concern in 2009. That's when the economic downturn subsided and business began to pick up again. Cutbacks in production and the demise of some suppliers during the recession had led to parts shortages throughout the electronics industry. As a result, when Agilent needed to ramp up production, it "had some challenges" in locating parts that were in short supply, Tan says.

Compounding the problem was the fact that Agilent needed accurate information about parts availability from

[BY JAMES A. COOKE]



its suppliers in order to make delivery commitments to key customers and win business, yet it had no way to get that critical information quickly. One reason was that Agilent, its contract manufacturers, and their suppliers were using different information systems. While Agilent relies on Oracle's technology to keep tabs on production, many of its contract manufacturers and suppliers use enterprise resource planning software from SAP. Because the different information systems in the supply chain were not linked, if Agilent wanted to determine whether it had all the necessary inventory to make an order delivery-time commitment to a customer, it could take three to four weeks to get an answer from all the parties involved.

Simulation saves the day

To solve this problem, Agilent decided to construct a control tower that would give the instrument maker visibility into inventory holdings down to the supplier level in as many nodes in its supply chain as possible. For this vertical supply chain integration project, it bought RapidResponse software from Kinaxis, a vendor of enterprise supply chain software solutions. Besides facilitating supply chain visibility, the software handles demand, supply, and inventory planning as well as what-if analyses, among other functions.

In 2010, Agilent got the control tower up and running with three contract manufacturers and two of its own technology center facilities. Since that time, the control tower's scope has expanded in stages. Currently, it extends to five contract manufacturers and five Agilent-owned sites. Three of the contract manufacturers are in Malaysia, one is in Thailand, and one is in California. Agilent's own facilities linked to the tower include its plants in Penang, Malaysia, and in Santa Clara, California. The tower is also linked to technology centers located in California and Colorado in the United States, and one in Germany.

Staff members who oversee the control tower's operation work out of Agilent's main facility in Penang. There are two teams involved: one conducts the analysis, while the other manages data governance to ensure that all linked locations provide correct, high-quality information.

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The suppliers transmit information to the tower on a daily basis. As of this writing, the control tower has visibility of more than 94 percent of all parts used in the EMG supply chain. The tower uses this information

to create a complete picture of Agilent's supply chain, which the company employs to manage both daily operations and crisis situations. The information is displayed on computer screens formatted in customized worksheets that show purchase orders, plan, and supply allocation. Tan says the customized worksheets allow Agilent to monitor part-by-part shortages throughout different levels of the supply chain via weekly projected balances based on demand.

The control tower is routinely used to simulate the impact of a major sales event on production. "Our sales engineers want to be able within a half day to come back to a customer and say whether we can support them and get the product in a four-

week shipment time," Tan explains.

Whenever a major customer deal is in the offing, the control tower helps Agilent to determine an accurate commitment date for product delivery. It does so by simulating the parts requirements. The simulation allows Agilent to check with its manufacturers and suppliers to determine parts availability, including whether production would encounter any parts shortages. If the simulation reveals possible problems with the availability of components, Agilent can then work with its suppliers to source the part on the open market or obtain it from other distributors. In some cases, the company has re-engineered the product to use an alternative part when the original version was unavailable.

Tan says that the control tower can very quickly predict the revenue impact from any possible deal as well as the company's ability to meet a delivery date before promising it to a customer. "Because of the wide range of products, it was quite a challenge to do this manually in the past within a short time," he says. "The control tower lets you know how much you have on hand and how fast you can get these parts into the factory that produces the product for the final customer."

Since setting up the control tower, Agilent has speeded up its response time for customer order promises. In the past, turnaround time for demand propagation took three to four weeks, as the instrument

maker had to contact manufacturers and suppliers involved in a particular order and wait for their responses to determine parts availability for production. Now turnaround time is a week or less.

The control tower also helps Agilent with crisis management, such as when the floods in Thailand affected its contract manufacturer there. The tower simulates the constraints facing a manufacturer or supplier when an unforeseen event disrupts the supply chain. It enables a bottoms-up modeling through the supplier levels to identify the total impact of a disruption on sales orders, forecasts, and safety stock for the various products. It also lets Agilent prioritize the allocation of constrained materials to meet critical demand on the basis of the greatest business benefit. "Because of this tool we are able to quickly simulate gaps [in supply]," said Tan.

As a result of this capability, Agilent was able to minimize disruption for its customers during and after the floods. In some cases it found other sources for parts that it normally would buy from its Thai supplier. In other cases, it redesigned the product or engaged in "value engineering," a technique that involves identifying acceptable substitute parts.

A winning concept

For the control tower to provide inventory visibility, Agilent's supply chain partners must furnish clean, accurate data. The original owner of the data—whether it's Agilent's procurement team or a supplier—is responsible for accuracy and timely updates. "When new products are introduced, the bill of mate-

rials needs to be set up correctly at each level," Tan says. "That's why governance is important. Any change needs to be communicated throughout all levels of the supply chain."

Because the control tower needs accurate data for its parts calculations, Tan says, the company must work closely with contract manufacturers and their suppliers. For any data-sharing effort to succeed, he adds, all parties involved must benefit. "It is very important to collaborate to ensure that the data sharing will help [manufacturers and suppliers] as well," he says. "They have to realize that they are linking to systems to let them know their shortages. Then they can see the benefits of linking to the control tower."

Given Agilent's positive experience, would Tan recommend that other companies with complex supply chains consider the use of a control tower to manage inbound supply? He's a firm believer in the concept. For one thing, he says, end-to-end supply chain visibility on a single platform will give companies the ability to manage their supply chains across regions and across time zones. "This will help the company to perform proactive and effective collaboration with suppliers and also enable speed in decision making in the shortest turnaround time," he says. That's key for avoiding unnecessary inventory and expediting costs. But just as importantly, he adds, "it will enable the company to win deals as well as provide customers the best customer experience in terms of delivery responsiveness." △

JAMES COOKE IS EDITOR OF CSCMP'S SUPPLY CHAIN QUARTERLY.

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