# The Evolution of the Digital Supply Chain

Everyone is talking about terms like digitization, Industry 4.0 and digital supply chain management, but what sort of technologies fall under these broad terms, and how will they change the management capabilities at our disposal? To find out, we talked to some noted supply chain analysts, consultants and technology executives and gathered six digital trends to watch.

BY **ROBERTO MICHEL**, EDITOR AT LARGE
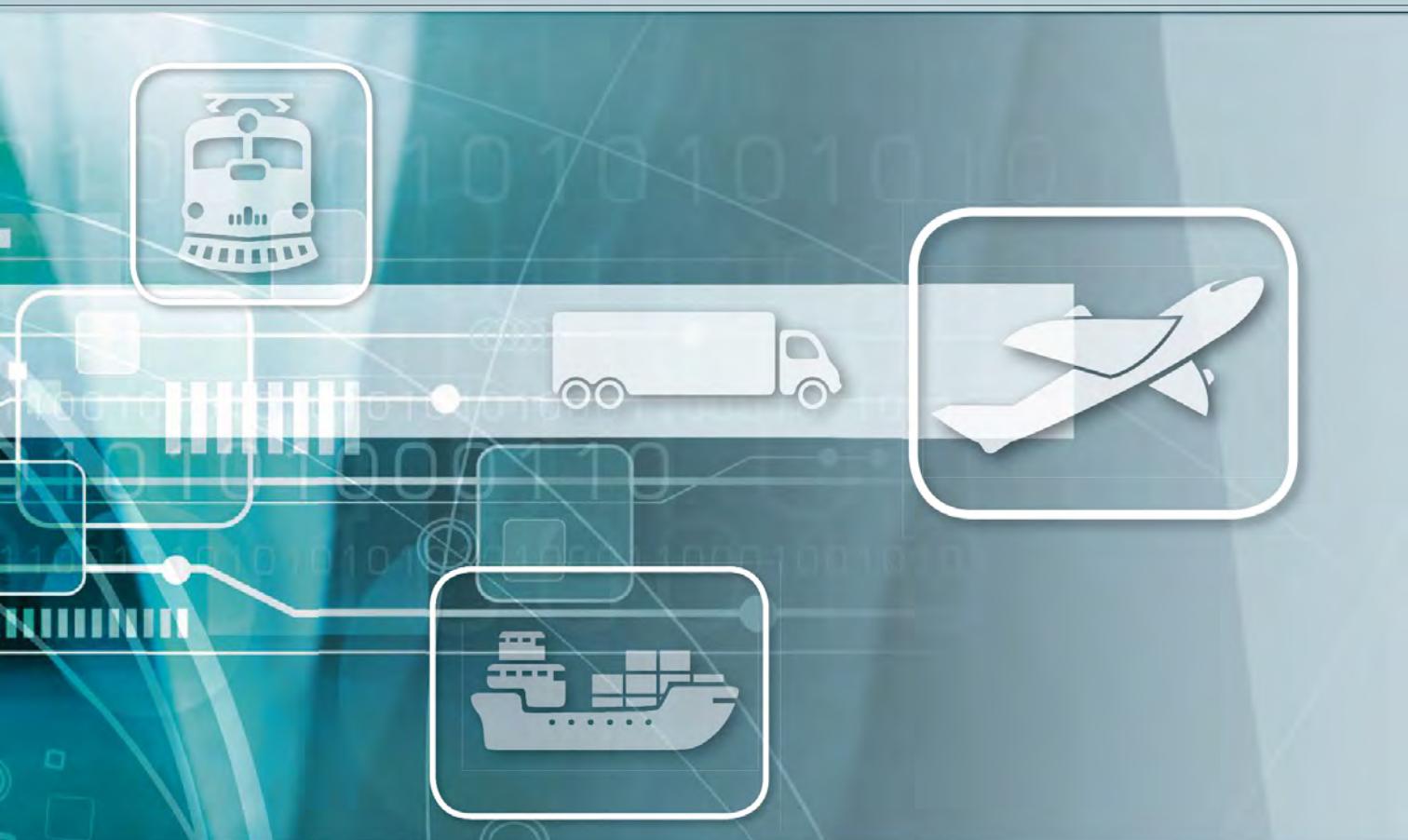
How digital supply chain management—the broad concept that Cloud-based systems, analytics and monitoring of goods, vehicles and other assets via the Internet of Things (IoT)—will improve the way supply chains run, is top of mind for many in logistics today. Also discussed under similar terms like digitalization or Industry 4.0, digital supply chain management spans multiple technologies and includes its fair share of buzzwords—but there is evidence it's more than hype.

According to MHI's 2017 annual survey on next generation supply chains, 80% of respondents believe that the digital supply chain will be the predominate model within the next five years—with just 16% saying it's happening today. Similarly, a 2016 survey from Capgemini found that 50% of those surveyed see "digital transformation" as "very important," yet only 5% were very satisfied with their progress toward it.

Clearly, digitalization will change supply chains, but our understanding of how it will play out is a work in progress. Breaking down some of the enabling technologies should help logistics managers figure out how to embrace this new era.

Technologies like predictive analytics, better visibility over the movement of goods, and robotics that help warehouses and distributions centers (DCs) keep pace will all play a role in digital supply chain management. So will the realization that the new technologies may often layer over existing systems as a means of trading partner communication.

"From my perspective, we've had a digital supply chain for a long time," says Steve Banker, vice president and head of supply chain management research at ARC Advisory Group. "If you use a warehouse management system with radio frequency guns, you're not executing processes with paper, you are doing things

digitally. The same holds true if you're using electronic data interchange, which also has been around a long time. What's new today are things like network-based, end-to-end visibility solutions."

There are other enablers of digital supply chain management, say analysts and technology executives. At the crux

2017 survey results:
Timeframe for next-generation supply chain

80%

16%
64%
16%
4%

- Already here
- Next 5 years
- 6+ years
- Unlikely to ever evolve to this level
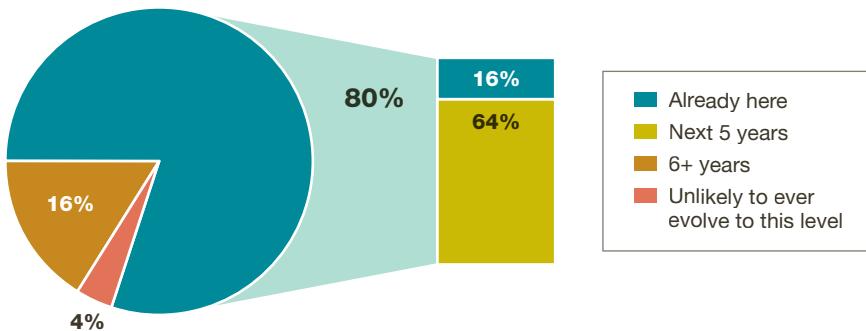
Source: The 2017 MHI Annual Industry Report

of these advances is the ability to reflect and react to what's going on in the real-world supply chain—to track the condition or location of goods, or crunch sensor or real-time traffic data to spot trends—and trigger appropriate changes.

Overall, the digital supply chain is about how systems can be much more aware of what is developing, and smart enough to change the chain's physical processes for optimal performance. According to some noted supply chain analysts, consultants and technology executives, here are the six digital supply chain trends to watch.

1 Network-focused visibility
One of the hallmarks of digital supply chains will be the ability to see and understand the activities and events of multiple players, notes ARC's Banker.

"We're going from inward-facing digital supply chains where optimization is defined internally by a particular company, to an end-to-end digital supply chain in which you're optimizing beyond the walls of one company, and instead optimizing across the walls of multiple key supply chain partners," says Banker.

These network-focused visibility solutions will come from technology suppliers who use terms like "global trading networks" or "global commerce hubs" to describe the inter-enterprise focus of their solutions, adds Banker.

2 Merge IoT with app processes
For the IoT data to be more useful within supply chain management software foundations, software vendors will need to do more to ensure that sensor data can be leveraged within applications, says Banker.

In effect, relevant data from the IoT needs to be made actionable within solutions such as transportation management systems (TMS). For example, IoT-based cold chain monitoring should be able to tie in with shipment information, says Banker. "What you need is to be able to append that digital sensor data to a shipment, if the shipment has gone out of a specified range," says Banker.

Because the IoT can stream large data volumes, it's also important that IoT platforms are able to separate relevant exceptions from the flood of data, adds Banker. By embedding the right exceptions or state changes from sensors, he explains, relevant changes "become part of the end-to-end process for the extended supply chain, ensuring the process proceeds with integrity."

3 Scenario-based planning
The IoT is great at using telematics, sensors and geo-positioning signals from devices to pinpoint location and condition of assets, but much of the IoT's value will come using that awareness to make better decisions, says Joe Vernon, senior manager of North America supply chain technologies for Capgemini.

"What's different in this digital age is all the awareness that can be achieved from all of the different points of information coming in," says Vernon. "In terms of benefitting from this awareness, one of the keys will be scenario-based contingency planning."

For example, says Vernon, if an IoT feed reveals that a refrigerated shipment has gone out of threshold, a planning and analytics platform would determine if the shipment will go bad, and scenario-based planning logic could figure out where an alternate shipment could be sent from. These tools would work in the background

as conditions change, he says, rather than having to wait for human planners to conduct a formal planning process.

"Transportation is already seeing a nice lift from tools that do things like watch for real-time feeds on weather and traffic data, and dynamically reroute a truck if it's not going to get from point A to point B on schedule," says Vernon. "That's just one example of scenario-based, contingency planning, enabled by an aware, digital supply chain."

The new analytics and scenario-planning engines might draw on some master data from conventional systems, but it will likely be distinct planning platforms that can take in IoT-based information and support planning, which crosses traditional departmental domains, says Vernon. "I believe that contingency-based scenario planning is going to be driven by specialized bundles of logic or software packages designed to think holistically about all the data that is available," he says.

4 IoT, smart roads and predictive analytics

Real-time monitoring of trucks, vehicles and goods in transit via the IoT has been around, says Timothy Leonard, executive vice president of technology for TMW Systems, and is only getting more capable as the number and sophistication of sensors and IoT infrastructure improves.

According to Leonard, formerly a technology executive with General Motors, as sensors on trucks and trailers are becoming more numerous, they're getting smarter and more capable of monitoring different conditions. Additionally, governments in places such as Ohio with its Smart Mobility Corridor program are embedding fiber optic cable and sensors right into roads to create "smart roads" that can help pinpoint congestion or weather trends.

Final-mile evolution

Nebraska Furniture Mart shares "final-mile" visibility with customers

Routing and scheduling for final-mile delivery of goods, along with real-time insight into delivery progress, can help retailers save on fuel costs and fleet efficiencies, but the larger benefits might just be customer-service focused. That's what Nebraska Furniture Mart (NFM) has discovered via implementation of final-mile routing software.

NFM is an Omaha, Neb.-based retailer of furniture, appliances and a wide variety of other goods including electronics and fitness equipment and operates a total of four stores in four locations: Des Moines, Iowa; Omaha, Neb.; Kansas City, Kan.; and Dallas-Fort Worth, Texas. Each store is assigned a fleet of vehicles to deliver merchandise to customers within a radius of approximately 400 miles.

To better plan and manage home deliveries, in late 2014 NFM implemented the Appian Final Mile routing application from TMW Systems. While the system helps NFM build and manage efficient routes, another key benefit of the solution is that it allows NFM to give customers a Web-based view into current estimated time of arrival (ETA) data, says Josh Parrish, the company's delivery operations assistant manager.

As each route progresses, NFM gives its customers real-time ETA information through its Website. The visibility is possible through an integration between the Appian Final Mile system and an app on drivers' handheld devices called D2Link, also from TMW. The app leverages the GPS signal from drivers' smart phones to gain location information.

Based on the real-time tracking from the app, along with estimates for how long each stop will take depending on the product being delivered, NFM is able share updated ETA information—accurate to within 25 minutes—with its customers via its Website.

Parrish says the software provider worked with NFM to make the ETA Website function possible. "We're able to give our customers visibility into the latest ETA information," says Parrish. "It is a similar view to what we see in the routing solution, so they are getting the best possible information."

As customers purchase goods in stores or online, the orders are grouped into designated geographical zones to begin the route planning process. The Appian Final Mile product designs the most economical routes for each zone based on road and street data, NFM's routing preferences, delivery constraints and other factors. Once Appian has designed the routes, NFM may alter the plan slightly by moving stops to another route should circumstances change due to labor constraints, or other factors such as a customer requesting a different delivery time or changing items on an order.

Frank Gappa, IT business analyst with NFM, says that the visual user interface of the final-mile solution makes it easy for NFM's operations people to work with, which helps them tweak routes to accommodate customer requests.

"The software is very visual," says Gappa. "It's shows our people every route, and you can easily see where each stop is, which helps with any fine routing adjustments we need to make. It also provides a dashboard function that tells us how complete each delivery truck is with its route. This visual nature helps us accommodate requests from customers, which is important to us."

—Roberto Michel, editor at large

As a result, there will be a richer data stream to draw on for predictive analytics. The onus will be on vendors to develop predictive analytics solutions that are adept at helping with specific transportation decisions. "With the advent of smart road networks and infrastructure, and smarter sensors in trucks, the evolution of what we can do is just getting better and faster for us," adds Leonard.

5 Mobile robotics change DCs

Digital supply chain management isn't all about the IoT and visibility into goods in transit—it will also involve mobile robotics at the DC level to reduce labor requirements and help DCs keep pace with e-commerce growth, says Dwight Klappich, a research vice president with Gartner.

"I believe we are going to see very rapid evolution toward use of what Gartner calls smart automated guided vehicles [AGVs], that are also known as autonomous mobile robots, within DCs," says Klappich. "They're going to have a dramatic effect on how you can operate a warehouse, and how you design and build warehouses."

Mobile robotics, contends Klappich, are more flexible than traditional automated materials handling systems that require extensive fixed infrastructure. Mobile robotics/smart AGVs that can carry or pull inventory to workstations—or function as smart, driverless lift trucks—would alleviate the labor needs at the DC level, and allow for DC automation that's quicker to install and reconfigure.

"There has always been this tradeoff with traditional automation in that while it can lower operating costs over the long term, it tends to be costly to acquire and involves a long time to install, implement or change," says Klappich. "Where we are at now is that smart AGVs/robotics are beginning to break that traditional tradeoffs between efficiency and agility, and that situation is only going to get better as robotics improve and industry gains experience with them."

6 Cloud TMS breaks silos

While Cloud-deployment of TMS eliminates many of the information technology (IT) headaches of on-premise deployment, the larger benefit of Cloud TMS is its network effect, says Dan Clark, founder and president of Kuebix. "Whereas TMS was once for the execution of specific processes within a company, what the Cloud has done is change TMS to being a tool that can connect to everybody."

While many application categories are adopting Cloud deployment, TMS is a natural for Cloud deployment, says Clark, because it transforms transportation management from a siloed, internal activity to a process that can easily link up with third-party logistics providers, carriers, or digital freight matching providers. "Under a Cloud model, TMS can become like a central marketplace where you are connected to all the various stakeholders in a supply chain," adds Clark.

Are you ready for digital?

Some of these digital technologies will be disruptive, requiring new skills and approaches from managers. Two related impacts of mobile robotics, notes Klappich, will be a loss of relatively unskilled jobs in warehouses and the subsequent need to build a DC workforce within DCs able to maintain and reap the most productivity from robotics.

"It will be a challenge to find enough people to maintain and configure these autonomous vehicles and figure out how to adapt processes and workflows that fully optimize their use," says Klappich. "It's not just about having enough technicians, but also having managers with more IT knowledge and expertise."

Finally, expect a rapid pace of change around digitization. MHI's annual survey about next generation supply chains has been asking respondents whether they see key technology enablers as either sources of opportunity or disruption. In 2015, only 39% viewed robotics and automation as such a driver for change, but now 61% see robotics as a source of opportunity or disruption. Similarly, predictive analytics went from 38% two years ago in the MHI study, conducted jointly with Deloitte Consulting, to 57% today.

Scott Sopher, a principal with Deloitte Consulting who works closely on the MHI survey, says it's clear that the pace of change around digital supply chain management will be rapid. The good news, says Sopher, is that supply chains are evolving from often poorly synchronized links in a chain into "a connected, harmonized network of trading partners" who can instantly share information around a "digital core" or foundation.

"If you just look at some of the numbers from the latest study, the pace of change is quick," says Sopher. "I think in five years, if you envision the state of increased adoption—it's going to be pretty dramatic." •

—Roberto Michel is editor at large for Logistics Management