



Entering the Cognitive Era of Supply-Chain Optimization

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The word “cognitive” comes from the Greek word for “knowledge” (gnosis). Significantly, it has a “co” in the front, implying the notion of collaboration. In our current age of information, knowledge is most powerful when shared between multiple parties to arrive at good decisions.

There’s plenty of room for improvement in making those decisions. We need a cognitive approach when it comes to supply-chain optimization. If we get it right, there’s an opportunity to transform the business. If we embrace the revolutionary

possibilities presented by developments in artificial intelligence and machine learning, we can anticipate problems and manage disruptions before they even occur.

How Do We Get There?

It helps to realize just how much information humans produce in the form of data. A May, 2018 article in Forbes magazine stated that 90% of the data in the world was generated in the preceding **two years**. A Boeing 777 creates around 4 terabytes of telemetry data on a trans-Atlantic journey alone. According to the World Economic Forum, the entire

digital universe is expected to reach 44 zettabytes by 2020 — 40 times more bytes than there are stars in the observable universe.

Forward-thinking businesses realize that they can no longer rely solely on 2D maps and conventional geo-data. To effectively plan freight distribution from A to B and then on to Z, they need to gather far more information than where streets lead. They have to go off the roads and make maps of indoor spaces, airports and private yards. They have to include information about weather, traffic and how people flow around cities.

Then the customer has the opportunity to enrich that information with data about equipment performance, truck driver availability, and more.

Supply-chain managers, especially those in the retail space, know this. Yet data can't be collected with abandon. It must be collected and catalogued with the intent to be actionable.

In theory, the amount of available information is infinite. Companies are looking to enable predictive maintenance based on historical failure data drawn from thousands of data points, including temperature and vibration sensors across various parts of the engine. This type of intelligence can help planners to forecast failures accurately, and reduce downtime by applying maintenance to equipment as needed. Across our organization, we already ingest 28 terabytes of data every day.

That amount is going to continue to escalate by leaps and bounds, not least with the growth of the Internet of Things (IoT). Increasingly affordable devices, already in the billions, are capable of gathering and communicating information about their surroundings at a level of detail that simply wasn't available before — not just where a truck is, but the temperature and humidity inside the trailer, real-time road speed, fuel efficiency, and on and on.

Cognitive Approach Is Critical

AI is a powerful response to the question of what we do with all this data, but it's not enough on its own. As communications expert Stefan Nandzik said in a recent article: "Machines and humans are very good at many things.

But they are not very good at the same things."

In the cognitive era, supply-chain managers are recognizing that AI is not a cure-all. A cognitive supply chain is digitally led, but it must also be process-centric — and processes are best decided by humans. By combining predictive AI with smart human oversight and decision-making, cognitive-era technologies can transform the supply chain and day-to-day distribution operations. The Cognitive IoT (CIoT) has the ability to connect more than just IT systems. Entire supply chains — involving technology, people and disparate organizations — can now interconnect and make decisions together.

Many supply-chain managers already get this. IBM reported in a survey this year that, among outperforming supply chain executives:

- 86% said cognitive computing will transform their demand planning and forecasting capabilities.
- 92% said AI and cognitive computing will enhance performance in production planning.
- More than half said their top investments in the next three years will be cognitive or cloud.

Anticipated returns on these investments include better efficiency, higher revenues and a transformed operating model. In fact, 40% of chief procurement officers expect cognitive computing to add value in the form of risk mitigation, spend analysis and global logistics and distribution.

With this dazzling wealth of data married to AI and human capabil-

ities, amazing things can happen. Maintenance engineers can predict and prevent a truck breakdown by intelligently combining engine performance, telematics, and maintenance schedule information to perform preemptive maintenance. Companies can also use self-learning algorithms to rate suppliers, then renegotiate contracts based on actual performance data. The more data you have, the better your ability to use it, and the more intelligent things you can do.

No More 'Stage-Gate' Thinking

Cognitive supply-chain management not only creates a linear stream of data; the data can be three-dimensional. In traditional thinking, much of supply-chain management relies on a phase-gate (also referred to as stage-gate) process, where business processes are divided into distinct stages or phases, separated by decision-point "gates." At each gate, a human manager oversees the decision to continue. Often these decisions are delayed while waiting for inaccurate, incomplete, or inaccessible data. Cargo might move in many directions on a map, but its progress is a fundamentally a linear sequence. From manufacturer to port, from one port to another, from truck to railhead — each step depends on the one before it. A chain, after all, is a series of individual links. But as any professional knows all too well, the challenge lies in managing multiple moving parts that interact with one another in highly complex ways.

With cognitive supply-chain optimization, managers have access to a comprehensive, real-time network of information and analysis. Human intervention is more likely to be at the strategic level, such as deciding which steps to



take if a port closes, tariffs skyrocket due to a trade war, or there's a flu epidemic in a supplier's region.

Barriers to Adoption

Of course, leveraging this data introduces substantial challenges. One is **data integration**. Much of the data that will be useful to you resides in the servers of your supply-chain partners. There's often a problem of **data standardization** as well. The good news is that a lot of the larger players are forcing some degree of standardization by demanding that the companies that they work with give them data in a form that allows it to be easily fed into their own systems. Other companies rely on industry solutions to ingest and normalize data from multiple companies. Often the challenge now, in addition to getting the data integrated or standardized, is determining **who actually owns it**. Supply-chain

partners need to decide whether they should give a customer access to data, and figure out the monetary value of doing so. There are legal questions with data-sharing as well.

All of these are barriers to a cognitive supply-chain world. And these are businesses that aren't used to thinking of themselves as data companies — just those that have access to data. Large ocean carriers, for example, have a lot of disparate systems, often from different countries, many of them homegrown solutions built over decades. The truth is, they often don't even know what data they have.

Getting Smart About Data

A push is underway for major competitors in supply chain to get smart about data and how they use it. Many have hired chief data

scientists, but the businesses aren't themselves agile enough to immediately reap the rewards. It will take time to get to the required level of sophistication before they can truly change course.

A pure-tech company can help move things along. It can provide the owner of goods with complete supply-chain transparency, and maximal power to make smart decisions. The goal is to enable shippers and their supply-chain partners to understand the plan and how it will fare in the real world. In a field awash with complexity, certainty is a welcome touchstone.

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