



IoT shines light  
on contract  
manufacturing supply  
chain visibility



The outsourcing of manufacturing that made Southeast Asia the world's factory for decades is evolving to nearshore manufacturing as factories crop up across Mexico in response to demand from U.S. manufacturers. This tactical shift, however, does nothing to solve the longstanding challenge that manufacturers have grappled with: how to gain visibility into the supply chain once production is handed off to the contract manufacturer.

Contract manufacturing is like a black box. The order goes in, and the only cue the manufacturer has that the order has been fulfilled is when the goods are received at its dock, or at its customers' dock. If anything goes wrong at the plant—asset failures, scheduling delays, departures from best practices—the costs of outsourcing can add up. These include higher production costs, penalty payments for missed delivery deadlines, and low customer satisfaction that could lead to a loss of future business.

### Decoding the black box with data

The missing link in the supply chain visibility is the availability of data, and the Internet of Things (IoT) can unlock this data. Currently, most contract manufacturing plants don't capture data at the level of assets and material. Even when they do, without infrastructure in place to move data from the plant to the cloud securely, the data that is captured remains sequestered on the premises. The advent of the IoT presents new opportunities to lift the lid on the contract manufacturing black box. Businesses are poised to leverage IoT to solve their supply chain and logistics challenges as various forecasts suggest.

According to Gartner, Internet of Things endpoints will grow at a 32% CAGR from 2016 through 2021, reaching an installed base of 25.1 billion units. Total spending on endpoints and services will reach \$3.9 trillion in 2021<sup>1</sup>. As manufacturing becomes increasingly networked, companies must devise strategies for data acquisition, processing, and analytics that extend to their contract manufacturers.

### How the IoT will enable supply chain visibility

To maintain the benefits of outsourcing without incurring high costs, companies should work with contract manufacturers that are willing to equip their plants with IoT infrastructure. Technologies such as wired and wireless sensors, secure internet gateways, data staging and processing servers, and edge computing can provide visibility at all the following levels:

- 1. Asset:** Asset breakdown and variance have a major impact on production schedule and consequently on the entire supply chain. Equipping important assets with sensors to measure attributes like temperature, humidity, vibration, acceleration, optical light enables condition-based monitoring (CBM) and assessment to help determine overall equipment effectiveness (OEE).
- 2. Material:** A stoppage in the movement of materials through a plant due to unavailability of another raw material, lack of sufficient personnel, or asset breakdown also creates problems for the production schedule. Smart sensors can track material as it moves through the plant and signal the completion of a pre-defined step in the manufacturing execution system (MES).





Improving data acquisition, processing, and analytics through connected things has the potential to optimize manufacturing execution systems, business models, and revenue streams.

**3. Plant:** Once tracking is enabled for important assets and material movement, the entire plant becomes easier to visualize. This transparency allows companies to consider any issue that arises in the context of its impact on the entire plant and to calculate weighted plant OEE.

**4. Warehouse:** By putting sensors in the warehouse, companies can monitor the shipment of goods to the customer. A company can track any container up to the customer's dock by generating a geo-fence around the dock. Similarly, mobile gateway and sensors providing

real time GPS coordinates can track in-transit finished products.

**5. End-to-end supply chain:** Once the contract manufacturer's assets, material, plant, and warehouse visibility have been integrated with manufacturer's enterprise resource planning (ERP) system that generated the order, the manufacturer can monitor the entire order through fulfillment.

The image shows the entire value chain for supply chain visibility:

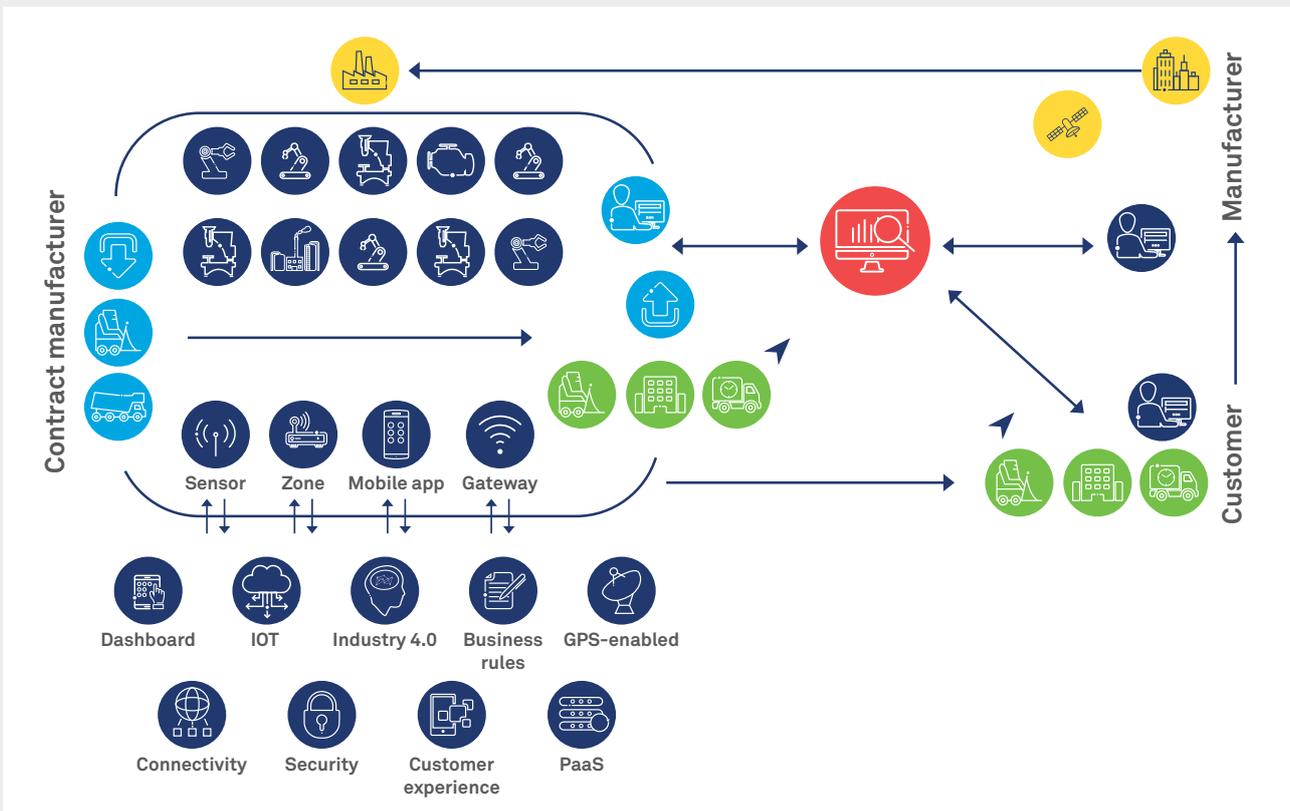


Figure 1: IOT-enabled supply chain visibility: The entire value chain.

## Making the shift to IoT-enabled visibility

Companies that want better supply chain visibility through the IoT should proceed methodically, using a 5-step process:

**1. Define the required visibility:** Clearly articulate the business benefits in terms of dollars.

**2. Partner with a collaborative, forward-thinking contract manufacturer:** Look for a contract manufacturer that is willing to invest time, money, and resources to equip the plant with IoT infrastructure and prerequisites.

**3. Study an important asset:** Identify an asset that falls on the critical path and put sensors on

it. Look at the asset's OEE and consider its impact on the overall schedule.

**4. Study a finished product:** Identify a finished product made from the designated critical-path asset and track it from shipment to delivery.

**5. Repeat:** Evaluate the results of the proof of concept and proof of technology. Expand the scope of the evaluation to include other assets and products. Enable the trucks or rail wagons with mobile gateway to get real-time visibility into the delivery of finished products.

Once this vision has been deployed, all stakeholders will have access to appropriate key performance indicators (KPIs).

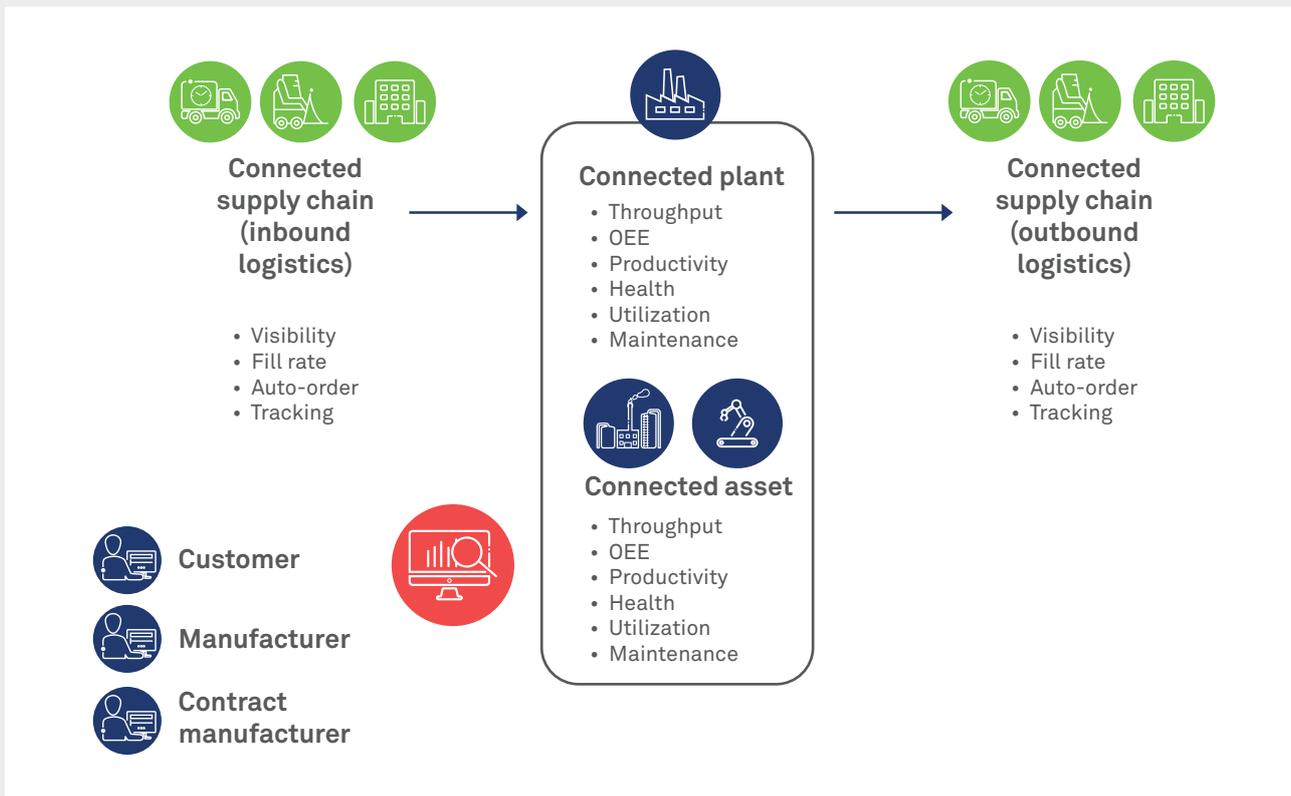


Figure 2: IOT-enabled supply chain visibility at a contract manufacturer: KPIs for all stakeholders

Supply-chain visibility has been a challenge for manufacturers for decades. Even truly digital manufacturers have yet to succeed in expanding their digital visibility to their contract manufacturers. The advantages that IoT offers in manufacturing don't end with visibility.

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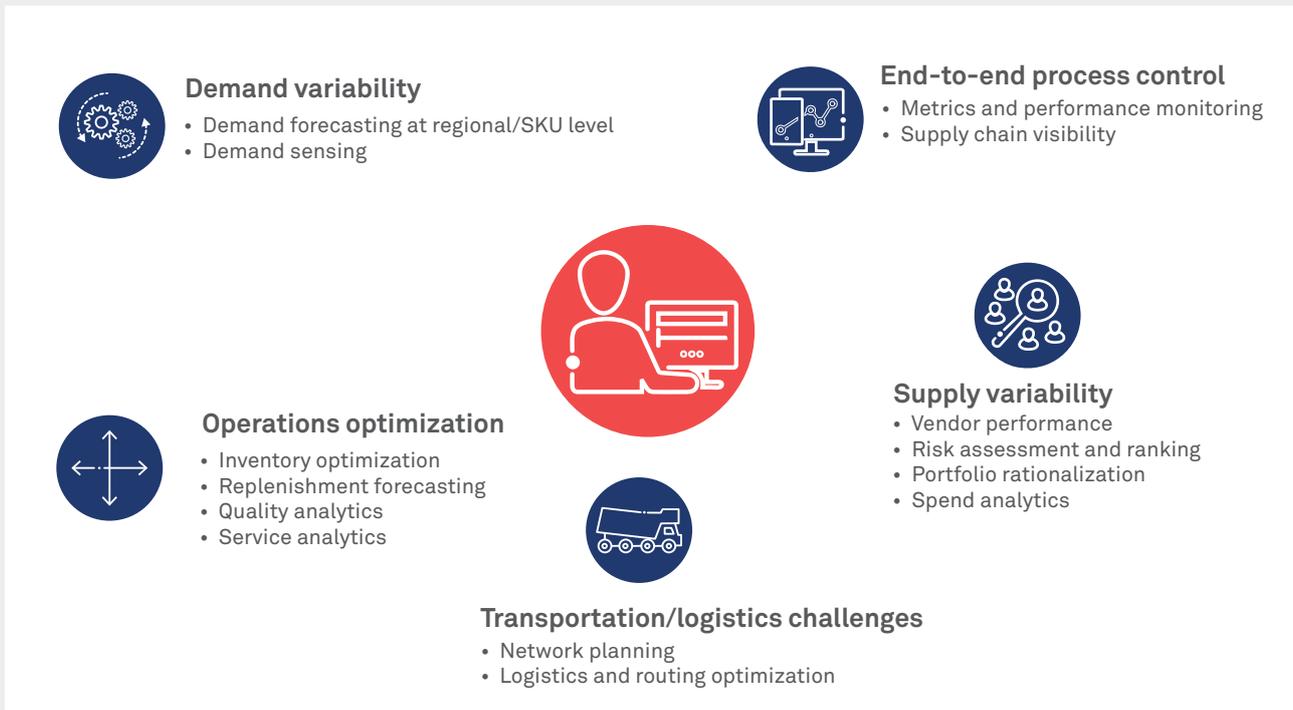
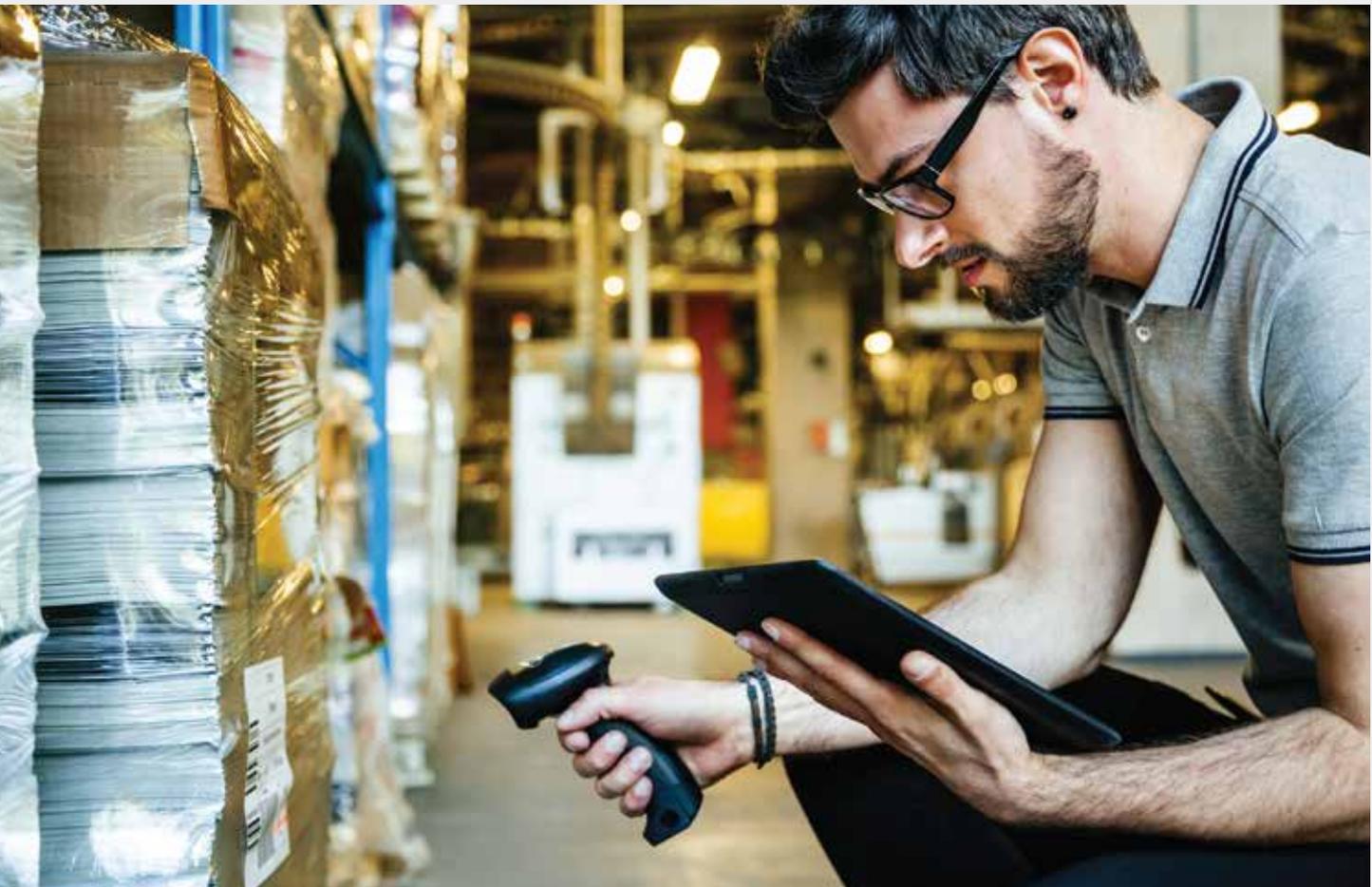


Figure 3: IOT-enabled supply chain visibility at a contract manufacturer: The complete journey.

## References

- <sup>1</sup>Forecast: Internet of Things — Endpoints and Associated Services, Worldwide, 21 December, 2017  
<https://www.gartner.com/document/3840665?ref=TypeAheadSearch&qid=aedceec9b9697e9f29e43>



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With over 20 years of international, cross-industry experience, Namit works with clients on “Connected” themes enabled by Industrial Internet of Things (IIOT) - Connected Worker, Connected Assets, Connected Plant, Connected Supply Chain and Connected Commerce. In Connected Commerce,

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