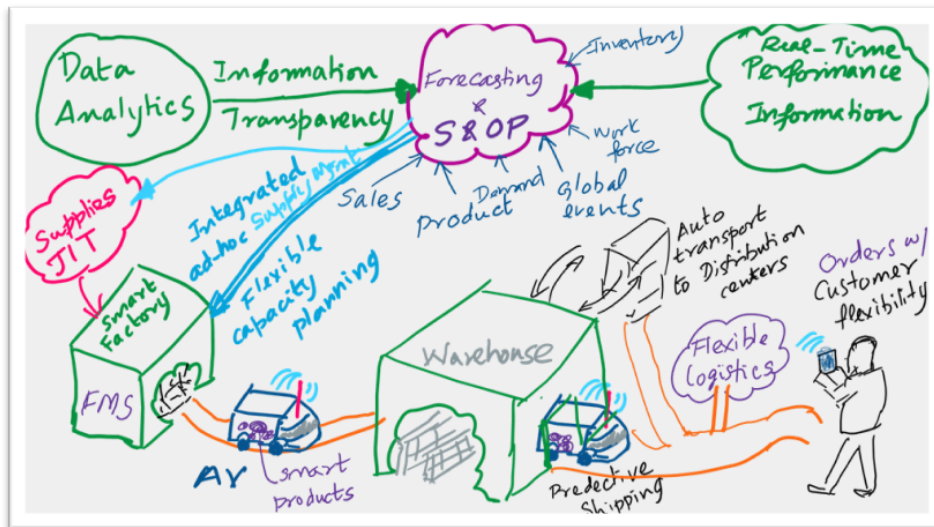


The Future Digital Smart Factory

Volume 2 Issue 10, October 2023

In the previous newsletter, we discussed the six dimensions and the Five Cs of Digital Supply Chain (DSC). The six dimensions of DSC consist of digital suppliers, digital production systems, digital logistics, digital customers aided by digital technologies and digital resources. The Five "Cs" of DSC include **c**onnected, **c**ollaborative, **c**yberware, **c**ognitively enabled, and possessed of **c**omprehensive analytics. We will continue the discussion on DSC in this newsletter. Let us take a peek into a future smart factory.



Adapted from Alicke, K., Rachor, J., & Seyfert, A. (2016), Supply Chain 4.0 – the next-generation digital supply chain, McKinsey.com, <https://www.mckinsey.com/capabilities/operations/our-insights/supply-chain-40--the-next-generation-digital-supply-chain>.

Future Digital Supply Chains and Operations

As shown in the above figure, the digital supply chain starts with information transparency. Data from all sources is extracted, cleansed, and analyzed. Global events, economic conditions, and new product development are also included in the analysis. Analyzed information with real-time operations and supply chain performance information is used to form ad hoc, real-time, and accurate demand forecasting using advanced technologies such as artificial intelligence (AI) and simulations.

Real-Time performance information of smart machines, equipment, products, and services is added to digital models and analyzed for future production capacity and development of smart products and associated services. The forecasted information with capacity, inventory, workforce data, and other relevant data is fed in simulation and AI models to prepare real-time and reliable sales, operations, and aggregate plans for operations strategy. These plans are prepared for daily, weekly, and monthly timeframe implementations.

An integrated supply chain plan and flexible capacity planning from the operations strategy is used in a smart factory. A digital horizontal and vertical system integration to produce smart products with services forms the lifeline of a digital smart factory¹. Smart factories employ flexible manufacturing systems aided by digital inventory, digital twins, robots, and autonomous vehicles (AV). All machines and equipment are digitally connected to each other and to a central network, allowing them to communicate and share performance data in real-time to be flexible—to respond quickly to changing conditions and customer demands. Smart products continue to be in contact with smart factory digitization throughout the lifecycle of the product for potential maintenance and future product development.

Practical Insight

Predictive Shipping at Amazon

"It was revealed recently that Amazon.com has obtained a patent for what it calls "anticipatory shipping" — a system of delivering products to customers before they place an order. As the Wall Street Journal reported, "Amazon says it may box and ship products it expects customers in a specific area will want—based on previous orders and other factors... According to the patent, the packages could wait at the shippers' hubs or on trucks until an order arrives." If implemented well, this strategy has the potential to take predictive analytics to the next level, allowing the data-savvy company to greatly expand its base of loyal customers.

Amazon is wildly popular because it does three things very well: it provides the convenience of a nearly one-stop shopping experience from the comfort of your home; it remembers what you bought and when you bought it; and it recommends other products you might like, based on your shopping history. Along the way, Amazon collects troves of valuable data about its customers' preferences and habits. With anticipatory shipping, the idea is to use that data to predict what customers want and then ship the products automatically."

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quick assessment and how your
business can be ready for
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Autonomous vehicles (AV) are used to reduce logistics, transportation, and environmental costs. Such vehicles enhance the handling of smart products. Automated guided vehicles (AGV) With sensor fusion for functions such as navigation, guidance, safety, material handling, and obstacle avoidance are used in warehouses to further reduce costs and boost order fulfillment accuracy. Smart products are distributed using AVs or even drones. On certain occasions, the smart products are shipped to the regions of customers even before customers place an order and then rerouted to the exact customers once the order fulfillments are matched. This is called predictive shipping. Of course, customers have the flexibility to reroute shipments to the most convenient destination on the fly!

Future Supply Chains: Predictions

In a recent Gartner survey, 61% of respondents said that technology is a source of competitive advantage². Many of those respondents identified several emerging technologies as critical investment areas, with 20% investing in robotics. The summary of the predictions as a result of the survey is that in the next three to five years, we will see an increase in the adoption of digital supply chain technologies, as well as technologies that improve human decision making. The pertinent predictions from the survey are as follows:

1. By 2026, 75% of large enterprises will have adopted some form of smart robots in their warehouse operations. These robots will address the need to automate certain processes to supplement the human workforce. The implementation of these robots will be faster and less expensive than more traditional means of automation such as automated guided vehicles.
2. By 2026, more than 75% of commercial supply chain management application vendors will deliver embedded advanced analytics, AI, and data science for improved decision making in the supply chains. The interesting fact here is that many application vendors now offer such capabilities embedded within their applications and are continuing to expand these areas.
3. By 2026, 25% of supply chain vendors will have rewritten their core application to a microservices architecture, but only 5% of supply chain organizations will have adapted to true composability. Microservices allow a large application to be separated into smaller independent parts, with each part having its own realm of responsibility. As companies become more agile, traditional applications built around aging architectures, are not fit anymore and the way to build supply chain technology is to switch to microservices-based and composable application architectures. However, for most organizations, this is a costly and time-consuming process.
4. Through 2025, 25% of supply chain decisions will be made across intelligent edge ecosystems. Edges are physical locations where things, people and data connect — such as operators, machines, sensors, and devices that are located across the supply chain network. Edge ecosystems allow decision making to take place close to the original source of information as they deliver the infrastructure for automated network tools, devices, and applications to work in tandem with each other — be it drones, robots or connected vehicles.
5. Through 2026, 80% of companies will suffer significant value loss due to a failure to merge their digital supply chain twin and control tower initiatives. Digital supply chain twins approach the problem by enabling end-to-end decision making. Control towers improve execution visibility and answer resulting questions, such as “what should I do now that I can see this shipment is delayed?”. Both digital supply chain twins and control towers help unlock quality insights needed from technology investments. These two initiatives are closely related and should be merged. Prepare for significant value loss from underperformance and missed opportunities if these initiatives are kept separate.

References:

¹Vaidyanathan, G. & Ordóñez, R. (2023). Operations and Supply Chain Management. Kendall Hunt Publishing Company.

²Hippold, S. (2022). Gartner Predicts the Future of Supply Chain Technology. <https://www.gartner.com/smarterwithgartner/gartner-predicts-the-future-of-supply-chain-technology>.

Tech Briefs

Digital Inventory

"Digital inventory uses digital technology to track and manage inventory levels. It involves using software and hardware to automate the process of inventory management, from tracking the movement of goods to monitoring stock levels in real time.

A digital inventory system provides supply chain managers with a wealth of information that can be used to improve supply chain resilience. Improving supply chain resilience is crucial in today's business environment, where disruptions and uncertainties are commonplace. With a digital inventory system, you can improve supply chain resilience in the following ways:

- Accurate inventory tracking,
- Efficient order fulfillment,
- Improved forecasting, and
- Enhanced supply chain optimization."

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