The supply chain is experiencing a period of significant change. Changing business and customer requirements are putting new and greater pressures on the business, and emerging technologies are offering intriguing new ways of working.

The Path to a Thinking Supply Chain

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Introduction

Digital transformation is poised to change the supply chain more profoundly than any other functional area and more dramatically than at any point in its history in terms of driving efficiency and resiliency to disruption. In the context of the challenges facing supply chains, both now and in the future, it becomes clear that the old ways of working will not suffice. Even best-in-class performance today is unlikely to be good enough in the future. It is the view of IDC that the supply chain must become a "thinking" supply chain, one that is intimately connected to all data sources, enabled with comprehensive and fast analytics, openly collaborative through cloud-based commerce networks, conscious of cyberthreats, and cognitively interwoven. According to IDC supply chain research, technology is emerging as a prime driver of change, particularly artificial intelligence, blockchain, and the Internet of Things (IoT).

AT A GLANCE

KEY STATS

According to IDC:

» In 2020, supply chains have over 50 times more data available to them than five years ago.

» 45% of supply chain organizations believe themselves to be past the midpoint of digital maturity.

» 13% of supply chain organizations say they are at the most advanced stage of digital maturity.

Data is also a driver of change. As of 2020, supply chains have over 50 times more data available to them than just five years ago, with less than a quarter of that data being analyzed in near real time for value; and it is not just structured enterprise data that the company "owns" but also a mixture of both structured and unstructured data from myriad sources such as IoT, social media, news feeds, weather, and even emerging blockchain-enabled networks. IDC expects that by 2023, over half of all supply chain applications will have embedded cognitive capabilities — making them able to do things better and faster and that simply could not have been done before. According to IDC's 2020 *Supply Chain Survey*, 45% of supply chain organizations believe themselves to be past the midpoint of digital maturity, with 13% saying they are at the most advanced stage. While we might justifiably suspect a case of "rose-colored glasses," the reality is that leading companies are moving quickly to digitally transform their supply chains and laggards will soon find themselves uncompetitive.

Supply chains are expected to be more customer centric, with direct selling to individual consumers a real near-term possibility for many. Supply chains must be both dynamic and agile to meet customer needs, with the ability to respond more quickly than ever while maintaining accuracy and integrity. Supply chains also must increasingly be always "on." The most capable supply chains are data driven and demand aware, and they must have access to disparate data sources and the ability to analyze those sources in the time frames required, with profound implications for business-to-business (B2B) processes and underpinning technology. In addition, supply chains must be resilient in the face of external disruptions such as weather, war, workers, and regulation.

Indeed, the notion of "disruption" is now central to discussions of supply chain strategy and the necessary capabilities required to be competitive in the future. Disruption exists along two dimensions. First are the more traditional disruptions — the "black swan" events that cannot be easily planned for and that present opportunities to make critical decisions. These events can be broad reaching, such as earthquakes or tsunamis that affect strategic decisions; they can also be more tactical, such as when a storm imperils a critical shipment. Although these tactical events may be less newsworthy, they are often, in aggregate, more disruptive than the big or rare events. Either way, the supply chain must be able to either anticipate or react quickly to mitigate any disruptions.

In many ways, COVID-19 is a disruption unto itself. The global magnitude of the disruption has affected both supply and demand, which means that even businesses that believed their supply chains to be resilient have experienced profound impact. In IDC's 2020 *Supply Chain Survey,* almost 85% of companies either have already seen or are expecting to see a major impact from COVID-19.

Second are the disruptions related to the emerging wave of revolutionary technology available to the supply chain that is likely to be a key element of competitive differentiation. While technology must ultimately serve the interest of the business, it is critically important to understand that these technologies will enable new capabilities or new business models — across all industries and all regions — that are not currently possible. Indeed, 58% of survey respondents felt that their business would be disrupted by either an existing competitor or a new market entry within the next year, with a further 19% expecting to be disrupted within five years. It is happening now!

The Impact of COVID-19 on the Supply Chain

The supply chain has been struggling to adapt to the global COVID-19 pandemic. Although most discussions about the supply chain have focused on supply disruptions — automotive parts factories closing in Wuhan or meat packing plants closing in the United States — demand disruptions are more worrisome. If demand does not return, the restoration of supply will not matter. It's not that simple of course; some demand issues can be traced directly back to supply interruption. Yet a lot of the demand has been driven by the shuttering of business activities. Consumer confidence can be a delicate thing, and predictions that consumers will quickly flock back to their previously favored businesses may be a bridge too far.

Just as COVID-19 rolled sequentially across regions, so will supply chain recovery. Supply chain recovery *will* happen; it is just the timing that is unclear. When considering supply versus demand, we expect to see a relatively quick resolution to most of the supply disruptions. Yet several senior supply chain executives IDC has spoken with recently have expressed their frustrations with demand issues — not just the decline in demand across many different product categories but also their inability to forecast future demand given the range of market uncertainty. One supply chain executive noted, *"We simply cannot accurately forecast demand right now. Even though our demand planning capabilities are quite advanced, forecasting still relies heavily on using the past to predict the future. A global pandemic has no prior precedence, so we are largely flying blind."*
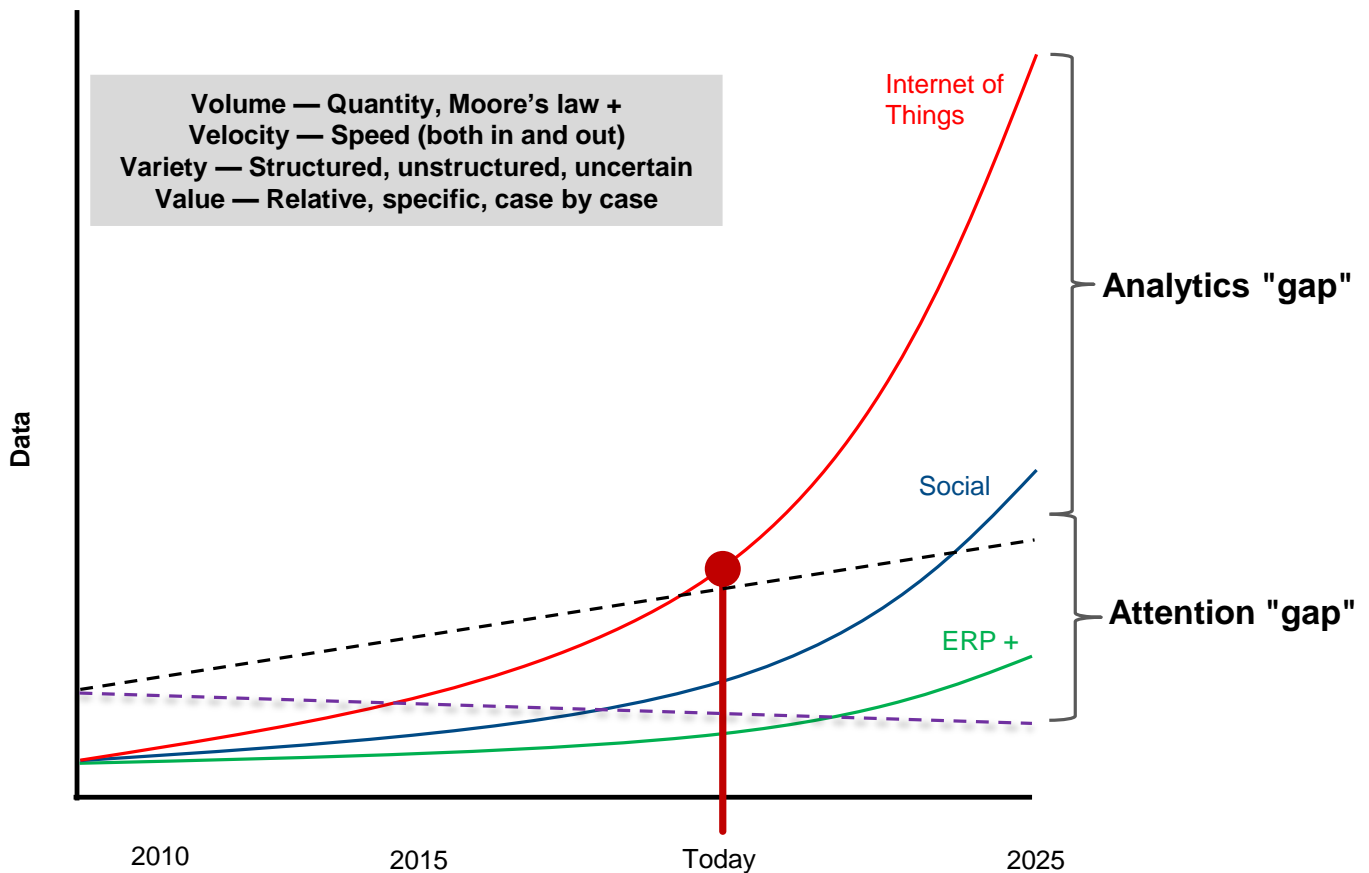
The "next normal" will not be the same for all industries and thus, by extension, all supply chains. The world's largest movie chain recently expressed pessimism about whether it could stay in business because revenue has essentially dropped to zero. Movie theaters are not a manufacturing business certainly, but they are a big part of a food service business that has largely disappeared. It is easy to overlook the ripple effects of industries struggling as a consequence of COVID-19 and the implications of both backward and forward linkages. Closed movie theaters have implications for both.

Backward linkages mean that candy manufacturers have lost a sizable percentage of their addressable market (one that is unlikely to be made up with home streaming) and that cleaning and maintenance supplies are no longer needed. Forward linkages impact the economic sectors where movie theater employees would have spent their income.

Benefits of a Digitally Enabled "Thinking" Supply Chain

In the context of the challenges facing supply chains, it becomes clear that the old ways of working will not suffice and that even a best-in-class performance today is unlikely to be good enough in the future. According to IDC, the supply chain must become a "thinking" supply chain, one that is intimately connected to disparate internal and external data sources such as social sentiment and IoT, enabled with comprehensive and fast artificial intelligence (AI)–driven analytics, openly collaborative through cloud-based commerce networks, conscious of cyberthreats, and cognitively interwoven. The notion of a thinking supply chain is a powerful one that offers the prospect of a self-learning, intervention-free system. Technologies such as AI have moved from the research lab to become practical for the supply chain, and in 2020 we are seeing investments in blockchain initiatives to elevate how companies collaborate with partners for accuracy, speed, and lower cost to serve. Indeed, the COVID-19 global supply chain disruptions have revealed, in no uncertain terms, the value of real-time visibility coupled with technology-enabled resiliency. It is not enough just to see what is happening in real time; the supply chain must have the ability to react quickly to those inputs, and this requires the right supply chain culture, processes, and technological foundation.

If we broadly assess the typical supply chain, two major "gaps" emerge, as articulated in Figure 1. The first gap is an analytics gap whereby available analytics and even AI capabilities are not keeping up with the growth and diversification of data and data sources. If a supply chain aspires to being best in class, or even above average, available data must be fully leveraged — whether it is traditional structured data that is easily searchable by basic algorithms or unstructured data more akin to human language. Unstructured data does not always fit nicely into relational databases, and searching it based on traditional algorithms ranges from difficult to impossible. Then there is also dark data, broadly defined as data that is not visible, or not yet visible, to an organization. Regardless of the nature of data, however, the thinking supply chain must have access to the data, and be able to analyze it for value, in real time.

FIGURE 1: *The Analytics and Attention Gaps*

Volume — Quantity, Moore's law +
Velocity — Speed (both in and out)
Variety — Structured, unstructured, uncertain
Value — Relative, specific, case by case

Internet of Things

Analytics "gap"

Social

Attention "gap"

ERP +

Data

2010   2015   Today   2025

Source: IDC, 2020

The second gap is one of attention and knowledge. Supply chain organizations have pursued cost reduction and traditional lean practices to the point that there are fewer people in the organization than at any time in the past, and as baby boomers retire, they take with them knowledge and practical experience that is not replaced by the millennials who succeed them. While this may be productive in the short term, as data analytics capabilities invariably grow in the supply chain, there likely will not be enough "eyeballs" available to act upon the resulting insights. Thus, the role of AI and machine learning becomes critical.

The imperative exists, therefore, for a digitally enabled thinking supply chain that can manage, in real time, massive amounts of structured and unstructured data from both internal and external sources, including data sets that might previously have been elusive. Imagine a thinking supply chain that could aggregate data across regions to both anticipate future demand accurately and manage current replenishment or that could manage asset, inventory, and shipments through real-time tracking and optimization and then configure and change orders even in the middle of production — all done automatically without direct human intervention. This supply chain would not replace people necessarily — they would have oversight, of course. Rather, the supply chain would enhance and augment the decision-making process, and a thinking supply chain could iterate decisions far faster than any human could.

The benefits of a thinking supply chain will be enormous. Data not previously utilized (or utilizable such as natural language) will now be analyzed in real time. Insight not previously acted upon will now be part of the decision-making process. Companies will have far broader supply chain intelligence, which will allow them to be more efficient and effective, avoid internal and external disruptions, and support new business models. The supply chain will better understand the risks and potential disruptions not only to itself but also to its suppliers and customers, and its executives will have greater insight into the bottom-line impact of their decisions. Another benefit of the thinking supply chain is prioritization. As analytics improve, both traditional and AI driven, they can recognize situations that are problematic and issue alerts, overwhelming human monitors. Cognitive allows for the prioritizing of alerts based on potential business impact. Supply chains are alerted to the meaningful and impactful problems rather than trying to sift through all issues.

> The benefits of a thinking supply chain will be enormous.

Key Technology Trends

Making the digitally enabled thinking supply chain a reality is not a trivial undertaking, yet it is a process that we now see playing out before us. If we consider this process to be an aspirational journey, with capabilities acquired over time, then many supply chains have already begun their transformation. According to a recent IDC survey of digital transformation, almost half of manufacturers believe themselves to be beyond the midpoint of digital maturity in their supply chain. This does not mean that they have a thinking supply chain yet — rather, they are on the journey to acquire the capabilities that will make such a system possible.

In our supply chain research, IDC has defined the thinking supply chain in the context of five "Cs": connected, collaborative, cyberaware, cognitively enabled, and possessed of comprehensive analytics. Each of these areas contributes critically to the thinking whole:

» **Connected.** Ultimately, the base of the thinking supply chain is data and the ability to access as much data as possible. Integration with all data sources is critical, as is automation of all documents across both internal functions and process and supply chain partners. A thinking supply chain cannot learn from data it does not have. Connected means being able to access unstructured data from social media, IoT (including structured, semistructured, and unstructured data), and structured data from traditional data sets available via traditional ERP and B2B integration tools.

» **Collaborative.** IDC has estimated that over 50% of the value creation in manufactured products comes from outside the traditional manufacturing enterprise. Much of the value comes from suppliers and ranges from simple contract manufacturing that specifies intellectual property contributions to new products. The value varies by subsegment, being higher in discrete manufacturing than in process manufacturing, yet all value creation is material across the full breadth of the industry. Improving collaboration with suppliers is critical, and in the digitally enabled thinking supply chain, this increasingly means the use of cloud-based commerce networks to enable multi-enterprise collaboration and engagement. Blockchain has a big role to play here with the promise of a trusted data layer, integrating multiple sources of data to provide greater transparency and efficiency into supply chain transactions.

» **Cyberaware.** The ability of the supply chain to harden its systems and databases from cyberintrusions and hacks is critical; it becomes only more important as we move into the era of the thinking supply chain. It is unrealistic to think that the supply chain will become a cybersecurity expert anytime soon, so this ends up being more of an enterprisewide concern.

» **Cognitively enabled.** The AI platform becomes the modern supply chain's control tower by collating, coordinating, and conducting decisions and next best actions across the chain in an automated and timely way to augment the role of people. It can understand the business impact of data and events and prioritize attention based on potential impact. Certain exceptions would require human intervention, but much of the supply chain could be automated and self-learning.

» **Comprehensive.** Analytics capabilities must be scaled with data and in real time. If the thinking supply chain is to perform better than humans could and support the required increases in supply chain speed, then insights must be comprehensive and fast. Latency is both unnecessary and unacceptable in the supply chain of the future.

If we accept these five "Cs" as critical to the thinking supply chain, then it becomes business critical to begin the process of acquiring these capabilities. Many supply chains have begun that process, with participation in cloud-based commerce networks at an all-time high and major efforts under way to bolster analytics capabilities. Although IoT implementations are growing, the ability to utilize sensor data is still in its relative infancy and must improve. Likewise, true cognitive/AI systems for the supply chain are the exception rather than the rule and represent the biggest opportunity moving forward to enable the thinking supply chain.

Last is the notion of platforms versus applications. Data and analytics exist in both places, and while IDC believes both have a role to play in the thinking supply chain, they must be integrated transparently. As noted, a thinking supply chain cannot act on, or learn from, data that it cannot see.

Digital capability, with cognitive enablement as a key element, is already defining the competitive edge. There are increasing examples of companies born into the digital age with a business model that would not have been possible just a few short years ago. Whether it is a Netflix content streaming model exposing the antiquity of physical movie rentals or a small business such as Mink enabling cosmetics personalization with 3D printer technology, the world of business is changing forever. And it is not just about innovative business models and disruption, though they get most of the press; it is also about innovating and improving business processes in ways that drive significant competitive edge. The digitally enabled thinking supply chain is not an "if" but a "when" — and that "when" increasingly appears to be now.

Supply chains that successfully enable enterprise visibility, adopt comprehensive analytics, participate in next-generation blockchain-enabled collaborative networks, and employ cognitive technologies will have a step up on competitors' supply chains that do not. Early adopters will find their supply chains more efficient and effective and more able to withstand market disruptions and embrace new business models.

Considering IBM

IBM Sterling Supply Chain Suite is an open, integrated platform with embedded Watson AI and IBM Blockchain that easily connects to an organization's supplier and customer ecosystem. It helps organizations address persistent supply challenges by providing end-to-end visibility, real-time insights, and recommended actions to turn disruptions into opportunities for customer engagement, growth, and profit.

IBM Sterling Supply Chain Business Network is a trusted, cloud-based business network that enables organizations to streamline connectivity with customers, suppliers, and trading partners across their supply chains by digitizing and automating B2B transactions. Organizations can rapidly engage with more than 800,000 preconnected trading partners exchanging billions of documents annually.

The network is designed to seamlessly scale to support the growing business needs of organizations, with trusted, rapid implementation and partner onboarding. The network provides always-on availability 24 x 7 x 365 and industry-leading uptime and reliability, plus around-the-clock white glove support through a designated technical expert acting as an extension of an organization's team to help deliver on the organization's business objectives.

IBM Sterling Supplier Collaboration Applications are designed to minimize the cost, complexity, and risk of supplier onboarding and collaboration. The applications automate manual B2B transaction processes and leverage embedded AI machine learning to get ahead of potential disruption. They also remove transaction blind spots with a shared multi-enterprise single version of the truth. This capability helps reduce the frequency of disputes, gain resource efficiencies, and increase supplier satisfaction for critical order-to-cash and procure-to-pay transactions.

» **IBM Sterling Business Transaction Intelligence** leverages AI and blockchain to make it easy to find out where a specific order is in its life cycle. IT and business users, regardless of skill level, can explore supply chain transaction data efficiently using natural language search. Anomaly detection, discrepancy alerts, and cycle time predictions will reveal even greater insights about potential problems so that organizations can get ahead of disruptions, while shared, multiparty visibility ensures supply chain partners see one version of the truth.

» **IBM Sterling Transaction Manager** automates manual B2B transactions to save time and money by reducing errors, cutting costs, and improving customer satisfaction by digitizing non–electronic data interchange (EDI) B2B transactions with suppliers, customers, and other trading partners.

» **IBM Sterling Catalog Manager** is a digital product catalog with a unified content management and distribution platform that provides complete control over product management, catalog data syndication, and marketplace selling. This catalog manager solution is secure and customizable to meet the needs of an organization's trading partners, large or small, in any geography or industry.

» **IBM Sterling Document Conversion Services** is a fax-to-EDI solution that converts faxes, emails, and postal mail into EDI or Extensible Markup Language (XML) format to eliminate paper-based transactions with a high level of efficiency and accuracy. Document conversion helps detect errors and handles them more efficiently. It can also help lower B2B costs and improve cycle times and supply chain visibility.

» **IBM Sterling eInvoicing** helps companies transform and optimize their international invoicing processes to reduce the risk, cost, and complexity associated with cross-border tax-compliant electronic invoicing by automating manual invoice processing, archiving, and auditing in accordance with tax regulations for multiple countries.

IBM Sterling Inventory Control Tower enabled with AI provides the insights organizations need to see their inventory wherever it is, identify and understand the impact of external events to predict disruptions, and take actions based on recommendations to mitigate the upstream and downstream effects. This allows organizations to respond faster to market changes and deliver better customer experiences while helping reduce costs.

Challenges

IBM Sterling is well known in the technology and EDI space but not as much in the supply chain space. It will be incumbent upon IBM to be very clear about the role IBM Sterling can play and the benefits that will result.

Conclusion

In an increasingly turbulent world, supply chains face enormous pressure to be more efficient and more effective — and to be enablers of new business models. While technology is not the only "lever" able to accomplish changing requirements, it is a powerful one. The notion of a digitally enabled thinking supply chain that acts on all available structured and unstructured data to prioritize actions and deliver superior results is something that can be a driver of sustainable competitive differentiation.

If we consider this shift to a thinking supply chain to be an aspirational journey, with capabilities acquired over time, then many supply chains have already begun their transformations. But they need to become digitally enabled quickly; otherwise that aspirational supply chain might become a reality somewhere else. Being digitally enabled means connecting and automating internally across functional areas or with end-to-end processes such as order to cash and with suppliers, customers, and consumers. There will be a "network" effect where value grows exponentially with the automation of transactions, documents, and key partner enablement.

According to IDC, companies should begin exploring the thinking supply chain now by considering the following steps:

» Understand what digital transformation means to your business and the role for the supply chain.

» Do a digital self-assessment of your supply chain. What can competitors do that we cannot?

» Educate yourself about the potential opportunities digital technologies can bring to the supply chain.

» Identify key technology partners to collaborate on the best way to begin adopting these new technologies.

The supply chain is the most obvious "face" of the business for customers and consumers. The better and more effective the supply chain is, the better it protects business reputation and long-term sustainability.

About the Analyst

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As a program vice president, Simon Ellis is responsible for providing research, analysis, and guidance on key business and IT issues for manufacturers. He currently leads the Supply Chain Strategies practices at IDC Manufacturing Insights, one of IDC's industry research companies that address the current market gap by providing fact-based research and analysis on best practices and the use of information technology to assist clients in improving their capabilities in critical process areas.

MESSAGE FROM THE SPONSOR

"Build a resilient and thinking supply chain that can quickly and seamlessly adapt to change to help mitigate the impact of disruptions to your business. IBM Sterling Supply Chain Business Network — with AI and blockchain capabilities — is a trusted, cloud-based business network built for today's supply chain." - Jeanette Barlow, Vice President, Strategy & Offering Management, IBM Sterling Supply Chain.

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