Digitally Perfecting the Supply Chain

AI, Blockchain, and Digital Technology Are Unleashing a New Era of Efficiency, Visibility, and Traceability, Thereby Creating Tomorrow's Leaders in Manufacturing and Logistics

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The manufacturing industry has a history of being changed and reinvented by technological advances in process and communications. Now, new solutions that leverage artificial intelligence (AI), blockchain, and the Internet of Things (IoT) are being leveraged by the leading and fastest growing companies in the industry to transform the manufacturing supply chain and related transport and logistics. Reliance on paper forms and the clashing of disparate systems can give way to better transparency across the value chain to help reduce, mitigate, and even eliminate, transport mistakes and delays.

Avoid Disruptions

Disruptions in Logistics Can Be Detrimental to a Business

IMAGINE: You receive a call at 5pm from a supplier saying that the container you need this week is not going to make it, thanks to an equipment failure at the port of Los Angeles. You're never going to make next week's launch without those parts.

Your assembly line will grind to a halt in 3, 2, 1.

In our global economy, disruptions in logistics—whether upstream supply chain or downstream delivery—can be detrimental to a business. Delayed part shipments can wreak havoc on manufacturing plans, and have ramifications that reverberate both down to the customer and across to other product lines. Errors in the logistics networks, equipment failures, parts shortages, customs delays at ports or border crossings, inclement weather, and even political disruptions can cause a domino effect across the factory floor, possibly affecting an entire business ecosystem.

Thanks to an advanced, artificial intelligence (AI)-based data and analytics logistics program, the manufacturer noted above was notified of the possibility of the shipment delay the day before, and was able to initiate a resolution, allowing the company to get ahead of the disruption. **But it took diligence and trust in a new technology to create a better system.**

By now, most companies in the industrial space are aware that information from their process and operations can help guard against failures, and make production more efficient. For example, Frost & Sullivan estimates that, on average, 35 percent of global automotive plants will be "smart factories" by 2025[2]—meaning that automotive OEMs will need to spend 8 to 10 percent of their revenues on these new or upgraded facilities.

AI-based Solutions Pave the Way

An increasing number are also learning that they can apply these benefits across the logistics space—however,

More than

85%

of CSCOs say it is already **exceedingly difficult to predict and proactively manage these disruptions and risks.**[1]

involving suppliers, customers, and other entities complicates an already daunting concept. Adding to the perceived challenge is how rapidly technology is evolving, with features such as AI and blockchain providing new and changing opportunities.

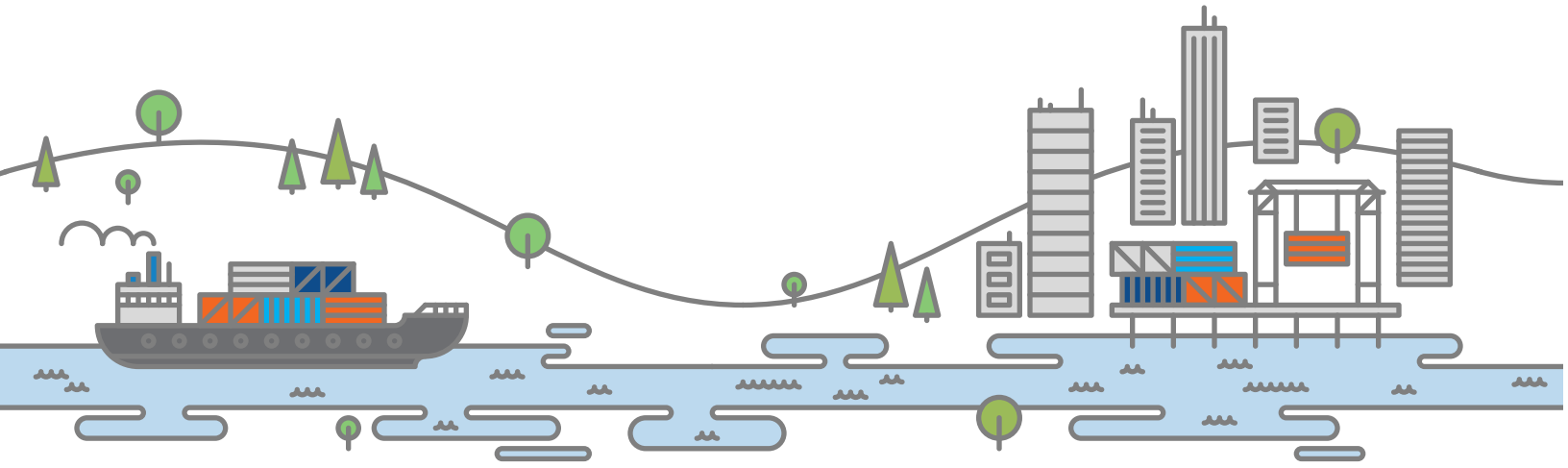
Interestingly, these very technologies that are providing some heartburn to industrial businesses are the same solutions that will smooth the road, improving the return from data, analytics, and overall digitization implementation. AI-based solutions can focus on avoiding disruptions as much as possible, and mitigating those that do arise. For example, providing advanced warning to a plant when a shipment is delayed can be predicted through AI-based tools that look at weather conditions, out-of-stock inventory, social trends, news, related shipping delays, border crossing times based on time of day and day of the week, and numerous other factors.

Predictions Matter

Weather is a good starting point to show how an AI solution can provide insights where human-based trend analysis falls short. A logistics operator can see the weather forecast for the part's origination, and likely path to its destination; and then make an educated guess as to whether there will be delay. For example, there may be a snowstorm impacting Midwestern airports the same week as the delivery. With this information, a logistics coordinator can try to predict the delay; then, communicate the information to the manufacturing floor, which can manually check inventory, other parts sources within the network, and possibly alter the coming month's production schedule accordingly.

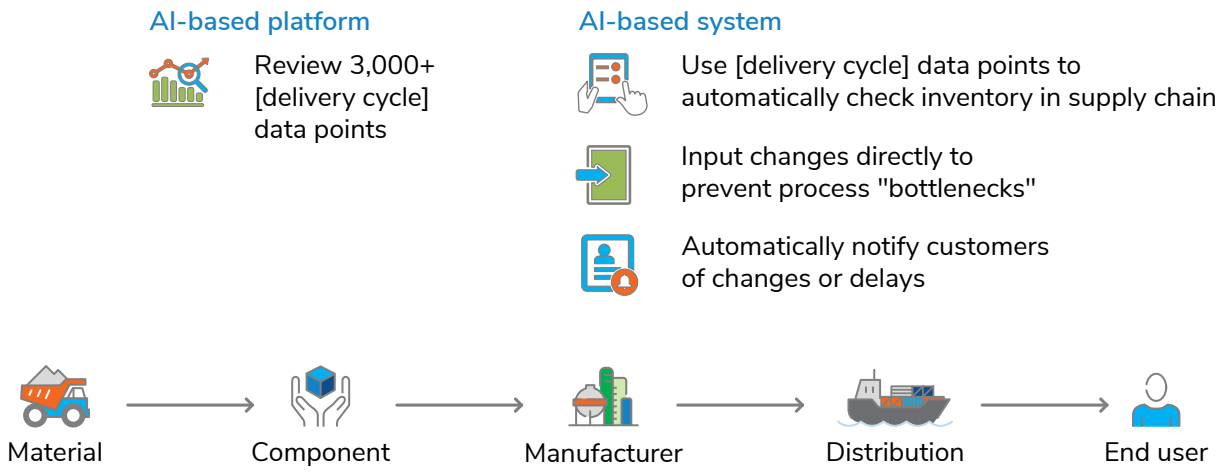
> **35 PERCENT** OF GLOBAL AUTOMOTIVE PLANTS WILL BE "SMART FACTORIES" BY 2025.

AI-based predictive analytics provide better accuracy and significantly more functionality within a much shorter time frame. For example, an AI-based platform can review more than 3,000 weather and transportation data points across the delivery cycle, rather than relying on the forecast for one or two locations. An AI-based system can use that information to help mitigate delayed parts by *automatically* checking inventory, partner inventory, and other suppliers; and then advising the user, and recommending a resolution. A comprehensive system can also input the changes directly, re-configuring the manufacturing process for the



coming days or months; thus avoiding the dreaded "bottlenecks" for the product. Such a solution can also benefit other product manufacturing processes that may use the same facilities. Additionally, as noted in Chart 1, AI-based systems can automatically notify customers of potential changes or delays, which can then help those downstream of the plant make their own assessments and changes accordingly.

CHART 1: AI-BASED PLATFORM VERSUS AI-BASED SYSTEM IN SUPPLY CHAIN AND LOGISTICS FOR MANUFACTURING



These tools, by and large, already exist in the market, and their success rates are telling.

Expose Valuable Insights

For example, a global PC manufacturer's extensive supply chain generates vast amounts of data daily. It needed to establish greater visibility across systems and data sources, minimize disruptions, and facilitate accelerated customer service, in order to maintain its industry-leading position. Hidden in the data were valuable insights that could help the company improve the efficiency of its processes—but the sheer volume of information made it almost impossible to analyze manually. By leveraging an AI-powered approach to risk management, the company can shrink its average response time to supply chain disruptions from days to minutes—up to 90 percent faster than before.[3]

> BY LEVERAGING AN AI-POWERED APPROACH TO RISK MANAGEMENT, THE COMPANY CAN SHRINK ITS AVERAGE RESPONSE TIME TO SUPPLY CHAIN DISRUPTIONS FROM DAYS TO MINUTES—UP TO 90 PERCENT FASTER THAN BEFORE.

The company went through the Watson Supply Chain Fast Start program. Within just five weeks, it was able to complete its AI-driven use-case analyses using supply chain data from its production system. Through this program, the company realized that it could harness IBM Watson Supply Chain Insights to gain greater visibility across its supply chain. If a key link

in the supply chain is disrupted, the company can drill down to identify which of its orders are affected, determine the potential financial implications, and start taking action to mitigate the impact.

IBM HAS DESIGNED A "FAST START" PROCESS TO THE JOURNEY—IN WHICH A KEY CHALLENGE IS DISCOVERED, DEFINED, VETTED, AND ADDRESSED, WITHIN A MATTER OF WEEKS

The company used a Fast Start process that involved analyzing elements of the business through interviewing divisions, people, and existing data. Then, using IBM Watson, its process integrates these viewpoints and data into a solution that continuously learns and improves over time. This enables quicker and easier usage of the overall system. For example, a manager can now inquire, "what is the impact to the customer delivery if the supply order is delayed?" and, all in one place, insights are gathered, analyzed and used to answer the question. In the previous process, that manager would have had to query multiple departments, such as manufacturing, shipping, purchasing, and customer orders. The new process also automatically configures key performance indicators (KPIs) to enable future planning, purchasing, and financing decisions to be quicker and more accurate as well. Lastly, it also provides insights into processes that are running over budget before the situation becomes too dire.

Simplify through Digitization

Companies—especially in the manufacturing space—find the journey to AI intimidating. Key technology partners such as IBM have found ways to improve upon this transformation. IBM has designed a "fast start" process to the journey—in which a key challenge is discovered, defined, vetted, and addressed, within a matter of weeks. This way of "prototyping" a solution puts significant onus and initial cost on the vendor to show a return on investment very quickly. Thanks to the strength of AI, this process has been shown to be effective. By proving that these advanced technologies can simplify, rather than overly complicate, the manufacturer's business, the promise of digitization becomes rapid, and leads to expanding such solutions across the enterprise.

Step into the Future with IBM

IBM also leverages professionals with decades of manufacturing and industry experience, so as to better understand its customers' challenges. Full visibility into a supply chain is a journey that requires months of data and experiences in an on-going process, and every company will experience a different learning curve. However, as technical improvements accelerate over time, and more industrial partners (suppliers, customers, shipping companies, governments and regulators) become i integrated into the system through cloud, IoT and blockchain, this road will become easier and more fruitful for the manufacturer embarking on that journey.

READ MORE ABOUT **THE AI JOURNEY** »

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IMAGINE: Coordinating a large and critical shipment from overseas. This shipment requires sign-off from 30 unique organizations and up to 200 communications—not an unusual occurrence. However, **one of these organizations has lost a form and, suddenly, a single weak spot has resulted in a month's delay** while those parts are stuck at a port.

Receiving the message "shipment on hold," without knowing "why?" is a normal, though distressing, experience for many companies.

What if you could leverage a technology that removed the mystery behind the weak spots, a technology that provided traceability and transparency of the entire shipping process? What if the question of "why" could be answered immediately through automation so that a resolution could be provided swiftly? Blockchain is the answer to these pain points in the supply chain process.

While many aspects of the supply chain process seem the same, the use of blockchain can radically alter results. In the scenario above, the parts supplier readies its product for international shipping and the shipment is added to blockchain. As the container awaits transfer to a port, officials submit approvals electronically. Blockchain confirms the transaction and self-executes the smart contract, releasing the shipment. The container is loaded on to the ship and is on its way. All parties have end-to-end visibility of the container's progress through the supply chain. The container arrives at the destination port and clears customs. You receive your parts on time and sign electronically. Crisis averted.

The ocean freight industry accounts for 90% of goods in global trade, but transport remains highly dependent on a flood of paperwork that is never digitized.[4] Manual and inefficient processes in the supply chain can lead to significant delays and mistakes with dire and expensive

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consequences for many companies and their customers. On the whole, platforms, systems, and designations remain firmly entrenched in old silos. For example, a freight forwarder may use a different ERP system than a port or the end producer. Each participant may use different database structures and terminology or may take records with different levels of detail. Spreadsheets and paper-based record keeping are still prominent across many aspects of supply and logistics. Because of this, as soon as one party emails a spreadsheet to a counterpart, the information is already out of date and difficult to trace, confirm, and secure.

THE INSIGHTS INTO THE SUPPLY CHAIN MUST BE TRUSTED, COMPLETE, AND PROVIDE VISIBILITY BEYOND POINT-TO-POINT.

Challenges are Cultural and Technical

These challenges are cultural as much as they are technical, and they make it extremely difficult for supply chain professionals to have visibility across their ecosystem. Whether affected by container shipment issues, customs challenges, flight delays due to weather, or even political unrest, supply chain professionals need to immediately understand the challenges and impacts several layers deep into the process. It is no longer sufficient to only understand their direct suppliers, but to also understand the forces and entities up-stream and across the ecosystem. The insights into the supply chain must be trusted, complete, and provide visibility beyond point-to-point. Blockchain enables technology that provides multi-party visibility and infuses trust, transparency, and traceability into the supply chain.

Blockchain Solutions are Here

Blockchain solutions do exist and are beginning to percolate into the industry. Those who take the early mover steps to improve their accuracy and visibility across the value chain will have a significant competitive advantage over companies who wait and see without transaction visibility and trust. In the mining industry, for example, one leading platform provider is already

able to trace an asset across the supply chain—from the mine all the way through to the final end user. This solution solves the challenges of the error-prone spreadsheet-and-clipboard system by being transparent, auditable, and efficient. It can enable automation across the supply chain, further providing cost savings and greater accuracy.

Because this mining solution is blockchain-based, the data platform is significantly more secure than an emailed spreadsheet. It creates a decentralized network that reduces the need for a third-party intermediary, allowing ecosystem participants to own and manage their own data. Due to blockchain's ability to gather, record, and securely transmit vast amounts of data in real time, it can also feed into an AI system for additional automation and insights. Blockchain enables the solution to bridge disparate systems and provide need-to-know transaction visibility while retaining company security and confidentiality.

Blockchain is Revolutionary

While blockchain is rapidly adopted as a mainstay for the business and financial services industry, it is expected to revolutionize the industrial supply chain in the coming decade due to the vast opportunities it can provide. It can step in and solve the problems of discordant platforms and communication. With blockchain, individual and digitally coded transactions, or "blocks," are given unique digital identifiers. Each block of data is unchangeable and traceable. Blocks are then linked together in a manner that is traceable and transparent to permissioned blockchain members. For instance, the information about a component's build, transportation, and usage in a finished good can be visible to parties in the blockchain through permissions. This makes it possible for an automaker with a part recall to quickly and comprehensively track all the vehicles with that part, or for a food supplier to trace a bag of lettuce or a steak back to the farm where it originated.

Blockchain advantages go well beyond the occasional need to find and replace a product. Blockchain provides the valuable capability to update data across the supply chain much faster and more efficiently than manual aggregation and analysis. Blockchain's near-real-time, comprehensive, and immutable capabilities help diminish the risk of poor version control.

Blockchain Can Manage Suppliers

Another blockchain use case that will become more prevalent as adoption increases is managing trusted suppliers. For example, suppliers can be pre-verified through data stored on a blockchain to provide immutable auditability of a supplier's status and business. The verified, immutable supplier profile data can then be used to streamline supplier evaluation and reduce the time to onboard a new supplier registration from weeks to days.

Blockchain is unique in its ability to build a network across value chain participants while still controlling the type and security of data shared. It addresses the challenges of data

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integrity, confidentiality, value, and relevance that would otherwise hinder cross-market networks composed of competitors, regulators, suppliers, and customers.

- **Data integrity:** Any information that is shared, either within or across companies, needs to be fully secured and traceable. Any hint of a cyber-related risk makes a solution indefensible.
- **Data confidentiality:** Limiting the information between blockchain participants to specific need-to-know details enables better data confidentiality while also increasing trusted visibility. For example, by electing to share only a client's related shipping schedules for a particular bill of materials (BOM), participants can feel secure that the control of information sharing remains proprietary.
- **Value and relevance:** Companies participating in a blockchain network around supply chain and logistics want a clear and relevant return on investment. Even the mere time and effort required to join a multi-enterprise, cross-industry network has to have a clear and rapid return. Factors driving adoption include customizing data and outputs according to the individual company. With all the streams of information coming across a diverse value chain, companies want to be assured that they are focusing on the most critical elements. This can also help enable predictive tools that lead to additional business value.

Enabling information sharing across enterprises in a way that everyone can understand and use is critical to success. Collaboration and co-opetition are buzz phrases in all industries, but the skill and effort needed to show the value of potential collaborators participating is often underappreciated. It can be excruciatingly complicated to convince a dozen interrelated, but wholly separate, organizations to find common ground and establish trust. Manufacturers who want to create a network that provides multi-enterprise visibility and transparency can employ the following:

- Leverage existing industry groups and organizations or an ecosystem of participants who are willing to collaborate for every member's benefit
- Demonstrate the value of shared, permission data visibility across the value chain in such a way that the desire to participate is considerably stronger than the inertia that keeps enterprises siloed
- Partner with an open and neutral platform supplier with the industry background and understanding of the challenges across the value chain

Chart 2 shows the relationship across these areas.

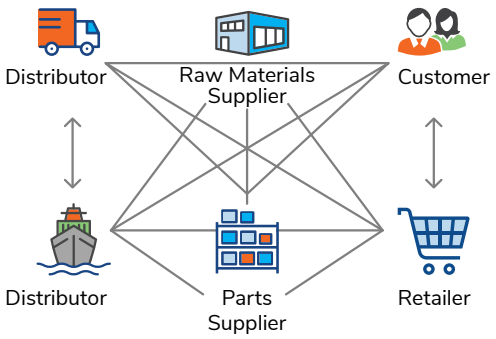
CHART 2: BEFORE AND AFTER BLOCKCHAIN

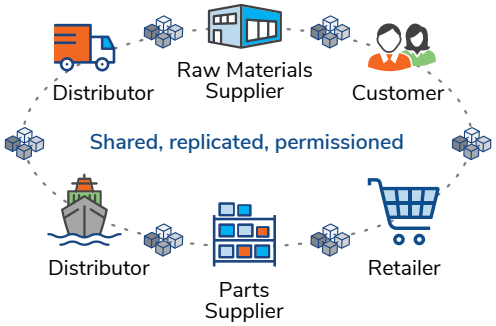
Before blockchain:

- A manual and time-consuming process creating extensive paper trail
- Platforms, systems and designations remain siloed with participants using different database structures, terminology and record keeping
- Emailed spreadsheets are out of date and difficult to trace, confirm and secure

With blockchain:

- A shared, secure and synchronized record of transactions
- Permissioned parties have end-to-end visibility into one centralized, trusted and transparent record
- Real-time traceability across supply chain minimizes delays





In the near future, the necessity to immediately see, manage, and predict supply chain issues will render blockchain ubiquitous in the industry. The companies that will win in this space will be the ones who make blockchain an essential tool of managing their supply chain. These innovators will understand that trusting blockchain will provide more visibility and security, helping reduce risks and reduce and mitigate disruptions when they occur. Early supply chain adopters will reap significant rewards from blockchain compared to those who still struggle with disparate platforms and ERP systems, error-prone spreadsheets, and paper-fueled processes.

READ MORE ABOUT **BLOCKCHAIN** »

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Build a Better Supply Chain

Unlock your Supply Chain Data to Deliver Better Client Experiences

IMAGINE: At any given time, you have six thousand parts being shipped or in transit from Los Angeles, Shanghai, Denver, and Rotterdam. Your suppliers, customers, and executive management are expecting flawless transportation. If communication is lost to just one of the trading partners, **a domino effect ensnares the entire system and brings it to a grinding halt**.

Blockchain enables multi-party visibility in the supply chain with trust, transparency, and traceability. Yet, line of business users struggle to access and interpret supply chain data. Because of this, it is important to realize how new technologies will modernize the business network and unlock supply chain data, delivering better client experiences.

The huge disruptions that could arise from logistics glitches keep the above scenario top of mind. According to a key survey of the industrial market, 84% of Chief Information Security Officers stated that "lack of visibility" across their supply chain was the "biggest challenge" they are currently facing.[5]

Digital business networks have long been tasked with securely transferring high volumes of business data from one company to another. Purchase orders, invoices, shipping notices, and the like need to move from supplier to customer, across many supply and logistics channels. The volume of such data is immense, particularly in the industrial space. Transmitting information electronically greatly reduces the time and inaccuracy associated with manually gathering, sending, cataloging, and acting on business information. Although digitally transferring business data has been in place since the early days of the technology, the market has not evolved significantly in the last few decades.

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Transmitted data is still typically in its raw form, and users of this information need technical experts to understand it.

> A KEY DIFFERENTIATOR IS THE ABILITY TO APPLY ANALYTICS, AND EVEN AI, TO CREATE MORE USEFUL INSIGHTS

The line of business data users—such as those in accounting, purchasing, or customer service—rarely have the access or training to directly get the information they need from traditional business networks. For example, details on a specific component within a much larger order that is in transit or the payment status of multiple invoices in the same project, often still require the IT department to translate this information the business user. This extra step is an obvious inefficiency in the process that requires time, fallible human interaction, and an intermediary department that does not need the information. The market is now responding to these challenges with advanced systems that give users the real-time information they need. For example, IBM's Supply Chain Business Network (SCBN) enables data to be automatically translated for the user, in real time and across systems, as with a traditional network. Leveraging Business Transaction Intelligence (BTI) for SCBN, users can directly query the system with their needs and receive outputs that are clear and actionable right away, without having to go through what is essentially an internal third party. The solution also enables the user to see documents in the context of the larger picture, such as across the transaction life cycle or across similar documents. This is a great advantage over older systems that only allow viewing individual documents one at a time.

Another key differentiator of an advanced business network system is its ability to apply analytics, and even AI, to create more useful insights. Across the board, the benefits for advanced business networks far outweigh older technologies, as shown on Chart 3.

Numerous examples already exist in industry from early movers on the solution. For instance, one of the world's leading providers of logistics services is able to prepare for massive spikes during the busy holiday shopping season. With 1,400 trading partners, the logistics company does over one million transactions, totaling six gigabytes of data flow, over its EDI systems

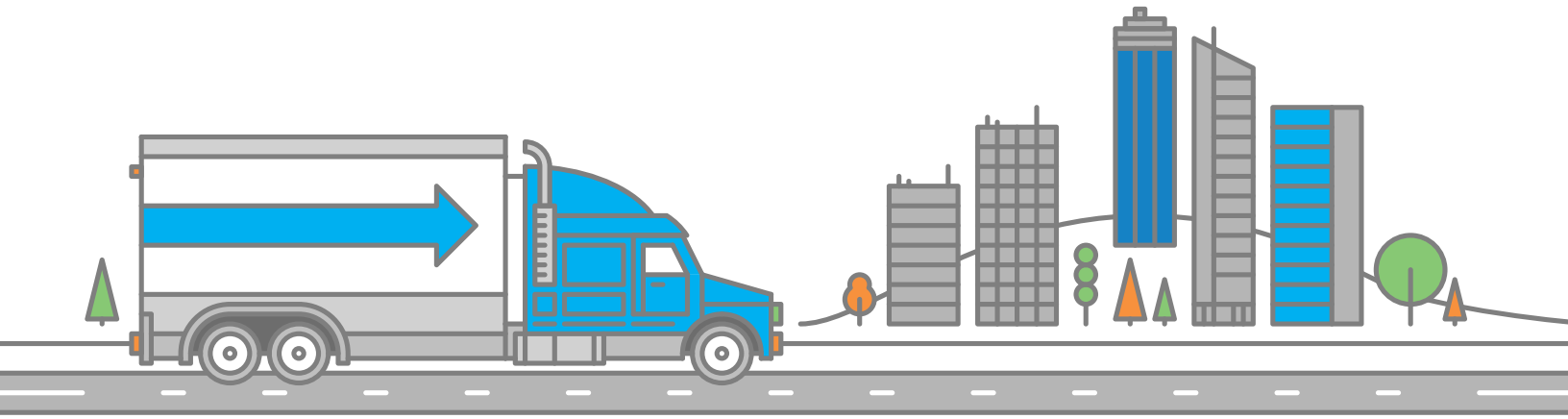

CHART 3: BENEFITS FOR ADVANCED BUSINESS NETWORKS

Providing line of business users **direct access to the data** they require, in a format they can understand and use

Reducing, even eliminating, the extraneous step of having the tech team interpret data, run reports, and answer specific data related questions

Lowering time and increasing accuracy in response to customers or internal stakeholders regarding payments, invoicing, POs, bills of materials, transportation of goods and other business information

Allowing for analysis and **reporting at a "big picture" level**, such as seeing relevant invoices or payments within a certain transaction lifecycle, or POs across transactions

Expanding benefits beyond the enterprise by giving customers and suppliers **instant visibility to timely events** such as PO receipt acknowledgement, automated time to fill agreement, and shipping information

Providing analytics and artificial intelligence for additional benefits from understanding the full breadth of business data, such as predictive insights and anomaly detection

Improving business metrics with automated PO acknowledgement to reduce disputes and charge backs, or reducing the time to create advanced shipping notices from several hours to a few minutes

Using a managed service to save the capital costs of building a solution in-house, and also saving on long term software costs by leveraging the cloud

daily—a number that is expected to triple over the next five years. However, this amount of data transfer can easily double on Black Friday or Cyber Monday at the launch of the shopping season. Using multiple systems further complicates this scenario, so the company began to look for ways to handle this growth. The company engaged IBM's Supply Chain Business Network to provide a flexible and dynamic solution to expand its EDI needs. It also found that the solution came to roughly half the capital cost of having to build a new EDI platform in-house, and being cloud-based, it did away with long-term software upgrade costs. In terms of flexibility, the company can scale up its EDI service levels for its customers with a

click of a button and have the system online in days, not weeks—90% faster than previously possible. Because the solution offers a truly elastic capacity, the company only pays for the compute resources needed.

The real results are in client satisfaction. For example, the company switched over one of its largest clients to the platform in time for Black Friday. The solution handled the spike in EDI volume flawlessly—helping it surpass expectations and nurture customer loyalty. This solution even helped the logistics company win the prestigious supplier-of-the-year award from one of its largest automotive clients.[6]

Business network systems have been a necessary component of the highly complex industrial supply and logistics market for many years. Modern industry would never have developed to the extent it has without its ability to rapidly transmit reams of information quickly and accurately across the value chain. Thanks to data analytics and AI, the industry now needs to upgrade from just being rapid in transmission to being rapid in usage. It also has to evolve from providing accurate data to usable insights. Information needs to be found, understood, and applied quickly by the users—it should no longer be delayed or constrained by having to rely on another department to fetch and translate it. This would release both that department and the user and allow them to focus on core competencies. Additionally, it should leverage the vast ocean of information that has been gathered for decades to improve functions, such as predictive analytics and anomaly detection, through AI and analytics, as is being done across countless other aspects of the industrial space.

READ MORE ABOUT **EDI** »

ibm.biz/The-Future-of-EDI

1, 5 IBM eBook, The Future is Here, November 2018

2 Frost and Sullivan, Automotive Industrial Internet of Things (IIoT) Growth Insights, October 2018

3 IBM case study, Lenovo, July 2018

4 IBM infographic, The paper trail of a shipping container, 2017

6 IBM case study, CEVA Logistics, June 2017

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