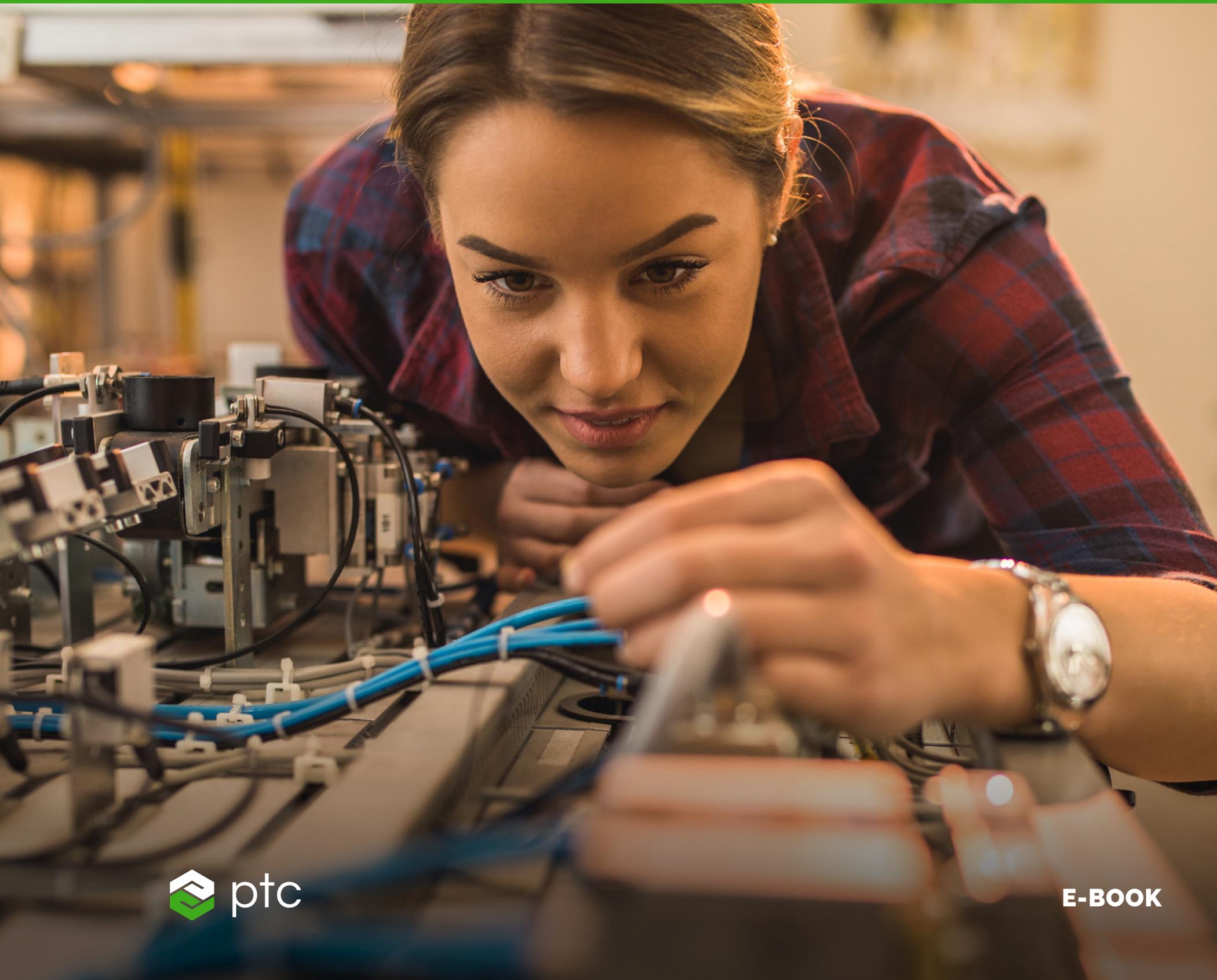
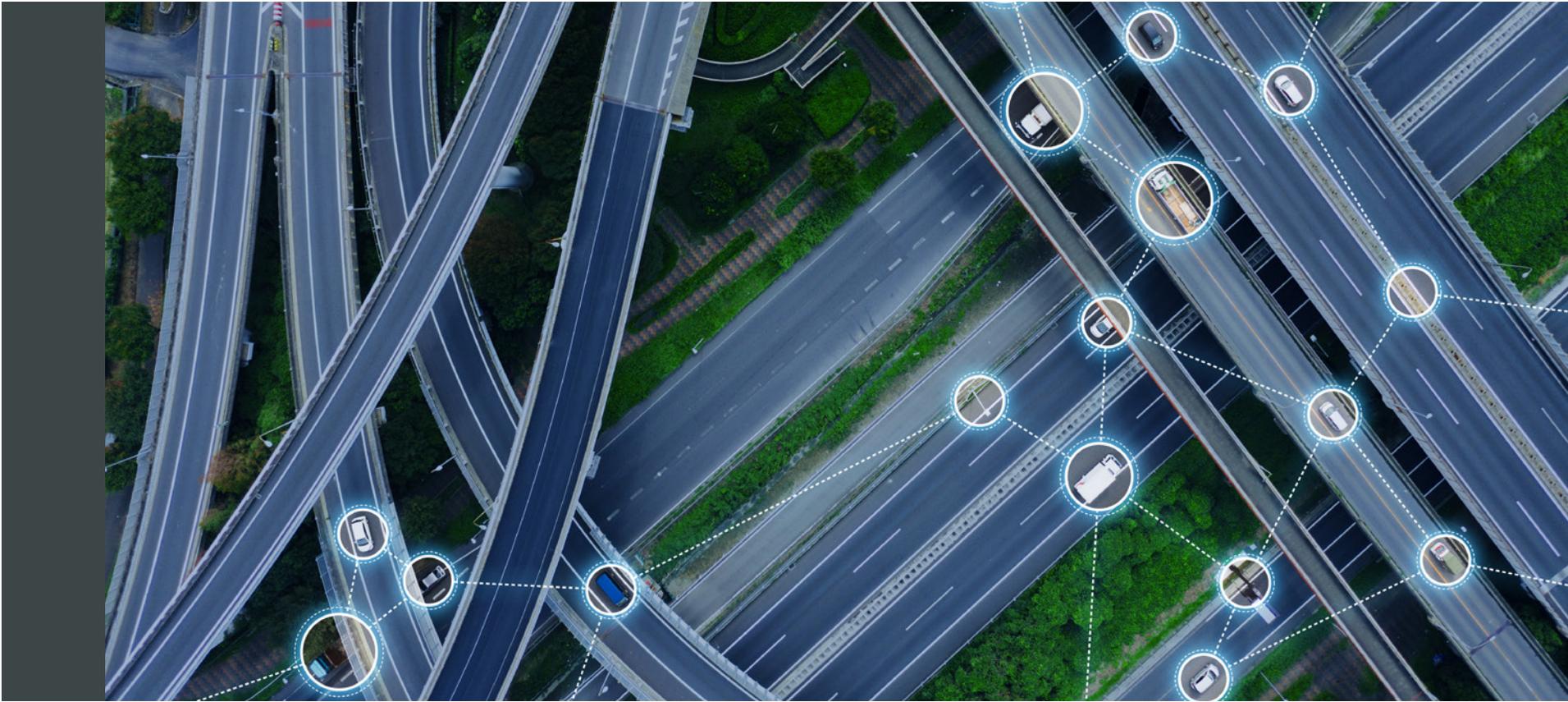


RETHINKING THE SUPPLY CHAIN

STAYING CONNECTED IN TIMES OF UNCERTAINTY





EXECUTIVE SUMMARY

Supply chains have always been subject to unexpected shocks. Sometimes these disruptions are local and relatively discreet: a particular supplier gets acquired or goes out of business; regional dynamics disrupt transportation or access to materials. Sometimes, as we're experiencing now or as we saw during the financial crisis of 2008, these disruptions are global in nature.

While companies have continually prepared for supply chain disruptions, their approach to this ongoing challenge has evolved over the past decade. This process has been driven by technology on many fronts—the Internet of Things (IoT), cloud and edge computing, and advanced data analytics in particular. These technologies have provided companies with powerful new tools for forging deeply collaborative relationships between supply partners.

Shared visibility and robust communication are the cornerstones of this collaboration. They are also key to helping companies anticipate and adapt to supply shocks, whatever the scale.



Thanks in part to the technological innovations just mentioned, supply chains have become increasingly complex. We have seen growing specialization across the supply chain, with more and more companies devoting themselves to specific niches in design, manufacturing, testing, assembly, and service.

On the one hand, this specialization actually means that companies have more flexibility in orchestrating their supply chains.

On the other hand, having multiple tiers of suppliers creates new challenges when it comes to keeping teams on the same page during the new product development (NPD) and new product introduction (NPI) processes. Communication and maintaining a single source of truth connecting all supply partners are key.

This brief examines how forward-thinking companies have created visibility across the supply chain, streamlining communications and fostering strategic collaboration by using connected technologies and cloud-based resources. These innovations in supply chains are even more relevant given the disruption caused by COVID-19.

We hope you will find it provides a framework for thinking through the current challenges we are facing and it offers practical guidance for overcoming them.



KEY ELEMENTS OF A COLLABORATIVE SUPPLY CHAIN

A collaborative supply chain requires, first and foremost, visibility. Each stakeholder needs to be able to track activity upstream and downstream to facilitate planning, optimize operations, and anticipate emerging issues.

What facilitates visibility? Continual, bidirectional communication. At the most basic level, teams need to be in regular communication around product design changes, material availability, compliance, lead times, and the like. But even as most manufacturers maintain regular communication on these and other issues, only a minority have adopted a system that allows supply chain partners, for example, access to the product record and product change or review processes.

Failing to implement such a system makes it harder for partners to track the latest revisions or identify product design issues throughout the NPD and NPI processes.

Shared visibility, and the proactive communication it entails, is only one side of the collaborative equation. The other side is empowerment. When supply chain partners not only raise concerns but are also encouraged to address them, the supply chain becomes truly collaborative. Indeed, it is this level of collaboration that makes it possible for the supply chain to quickly adapt to emerging challenges.

Joe Andrews at [Supply Technologies](#) has identified three levels of supply chain collaboration:

Transactional integration (*the most basic level*) focused on aggregating and providing visibility to purchase orders, work and sales orders, invoices, and payments.

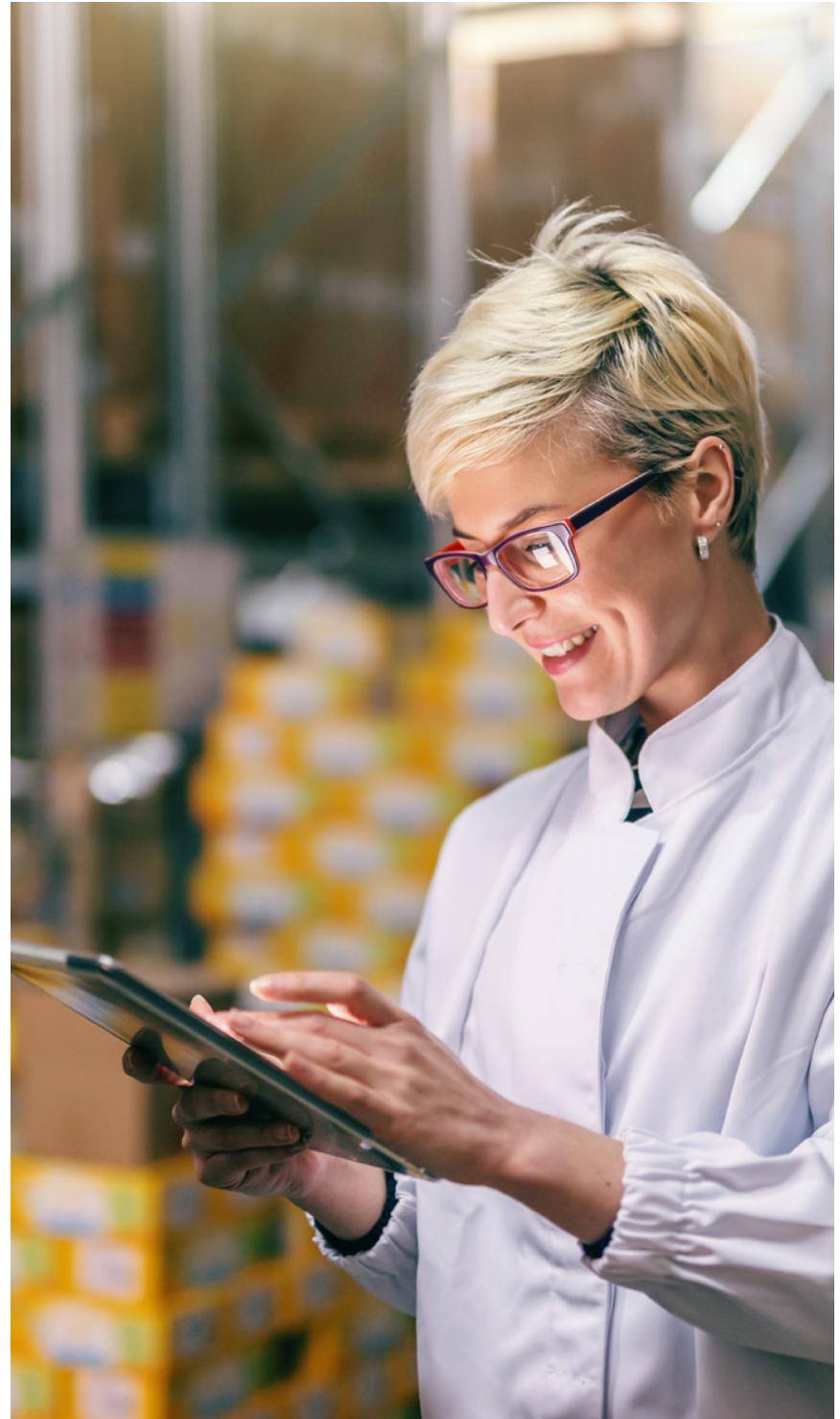
Supply chain information sharing (*the next level*) focused on production planning or component forecasting, manufacturing capacity and transportation planning, and product designs, including parts, assemblies or bills of materials (BOMs), and service levels.

Strategic collaboration (*the highest level*) features an improved ability to deliver the right products to meet demand with better forecast accuracy, profitability, enhanced sales and operations planning, production resourcing, and resolution of critical supply chain events.

When companies get to the highest level, they stand the best chance of weathering supply chain shocks. Andrews points out, they can also:

- Reduce costs by improving efficiency and eliminating errors, quality issues, and scrap/rework
- Deliver high-quality products faster
- Accelerate innovation through real-time interaction

The collaboration described here has become more common. In 2016, APQC's [Open Standards Benchmarking](#) research indicated that 66% of organizations were already involving their suppliers in new product or service development, including product improvements and extensions. While that figure may sound promising, the degree of supplier involvement was and remains quite variable. The same research indicated, for example, that only about 31% of organizations invited extensive participation of suppliers in their product development efforts.



So, how are companies creating better visibility and driving proactive methods of communication in order to foster deeper collaboration?

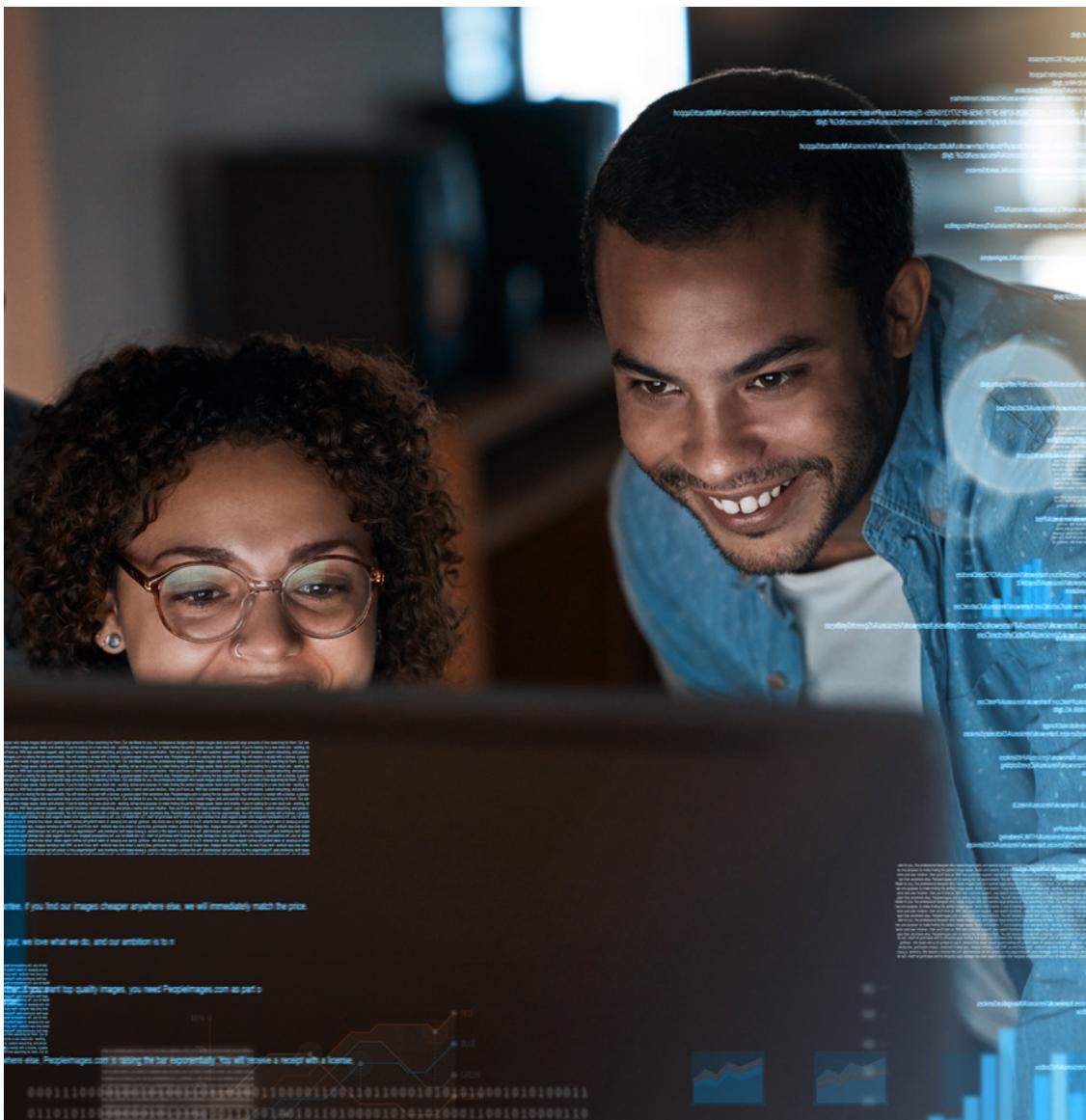
CONNECTED TECHNOLOGIES AND SUPPLY CHAIN VISIBILITY

In their [report on the future of supply chains](#), BSR's Tara Norton and Meghan Ryan talked about supply chains becoming "hyper-transparent" as product teams, suppliers, and customers use increasingly sophisticated technologies to create and share information about supply chain performance. A great example of this hyper-transparency can be found in the work that Pfizer did to increase visibility in its supply chain.

To give you a sense of the supply chain complexity that a company like Pfizer has to master, consider that they operate in 175 countries and support a product line featuring over 24,000 SKUs.

As part of their *Highly Orchestrated Supply Network* initiative, undertaken to address this complexity, Pfizer launched an "End-to-End In-Transit Visibility" project. The project included a hackathon to come up with a solution that would provide visibility to stakeholders by aggregating and displaying relevant data from multiple sources around the world. The result was the "TrackIt" app, which currently tracks the shipment of over 15,000 SKUs. Utilizing data from Pfizer and its supply chain partners, the app allows customers to access timely and accurate information on where things are from "end to end."

For apps like TrackIt, IoT devices are important sources of data. With sensors on everything from containers and trucks to pallets and individual packages, IoT already facilitates global tracking of assets from point of origin to the final destination. What's more, the visibility that IoT devices provide can feed right into supply chain automation. For example, a smart warehouse or factory can detect when inventory is low and automatically place an order to have parts restocked. More importantly, IoT-enabled assets can alert service providers of impending parts failure, allowing for rapid, preventive maintenance. At the same time, this type of data can feed future product development by providing insight into real-world performance.





DIGITIZATION OF PRODUCTS AND DESIGNS

These examples of using apps and IoT devices to increase visibility into the supply chain highlight one of the key trends in supply chain design and management: digitization. As the BSR researchers point out, at the heart of this digitization is the simple fact that product designs and information today exist digitally. On the one hand, the digitization of product designs and related documents accelerates the transfer of critical design information with partners, allowing for earlier collaborative iteration. On the other hand, this digitization accelerates product design and prototyping. For example, by creating 3D printed models from digital drawings and manufacturing instructions early in the design process, companies can quickly see finished, physical products without having to create or source materials.

A McKinsey report on “Supply Chain 4.0” provides other ways digitization impacts the supply chain:

Predictive shipping. Thanks to digitization across the supply chain, Amazon can ship products before the customer even places an order. They do this by matching a customer order with a shipment that is already in the logistics network (being transported toward the customer region), and the shipment is rerouted to the exact customer destination.

Continuous planning. Thanks to real-time production capacity feedback from machines, planning becomes a continuous process that is able to react dynamically to changing requirements or constraints.

Real-time performance management. End-to-end visibility across the supply chain helps customers and can also improve supply chain performance. Thanks to advanced digitization, including strategic deployment of IoT devices, organizations can track performance from the highest level (management KPIs and service levels) down to the lowest, including the throughput of machines and the speed and location of delivery vehicles.

Single source of truth. Cloud-based solutions allow customers, manufacturers, and suppliers to actively share information through a common logistics infrastructure system without having to install software. As we will discuss, this is essential for truly collaborative relationships in which any partner can easily engage with the system of record to advance product designs, manufacturing methods, cost reductions, best practices, and project details.

Supply Chain 4.0: “The application of IoT, the use of advanced robotics, and the application of advanced analytics of big data in supply chain management.”

STRATEGIC COLLABORATION REQUIRES A SINGLE SOURCE OF TRUTH

For ongoing communication to result in coordinated effort, there needs to be a single source of truth that ties everything together. Indeed, this is the only way to combat the uncertainty that can so easily interrupt and even disrupt supply chain function. Historically, however, manufacturers have struggled to create and maintain a single source of truth.

As the BSR researchers point out, the reliance on point solutions and systems that were only designed for a given aspect of the product development process is part of the problem. For instance, companies frequently create and manage mechanical designs in mechanical computer-aided design (mCAD) tools. If the relevant software and electrical designs live in a different system, you don't have a single source of truth.

Keeping track of multiple revisions and continual changes to product designs is extremely difficult when using disconnected tools (e.g., spreadsheets, email, chat solutions, CAD) or, even worse, manual processes. While this situation can already pose communication problems for internal teams, it becomes even more challenging when trying to collaborate with external supply chain teams.

Disconnected tools tend to create disconnected silos of information.

When data is distributed across multiple silos, it increases the chance that teams will iterate on the wrong design revision, which in turn can lead to quality or manufacturing issues. This in turn can lead to shipping either the wrong product or a faulty one to customers.

Cloud-based systems were designed in part to remedy this situation by providing internal and external teams access to the latest version of product design. With a shared space for collaboration, teams can avoid the need to pass information across multiple systems or implement complex integrations.

At the same time, a cloud-based single source of truth doesn't mean giving all partners full access to each aspect of every product design. OEMs need to protect their strategic intellectual property (IP). With the right cloud system in place and security roles properly configured, supply chain partners can be granted specific access to the information necessary to do their jobs, and nothing more.

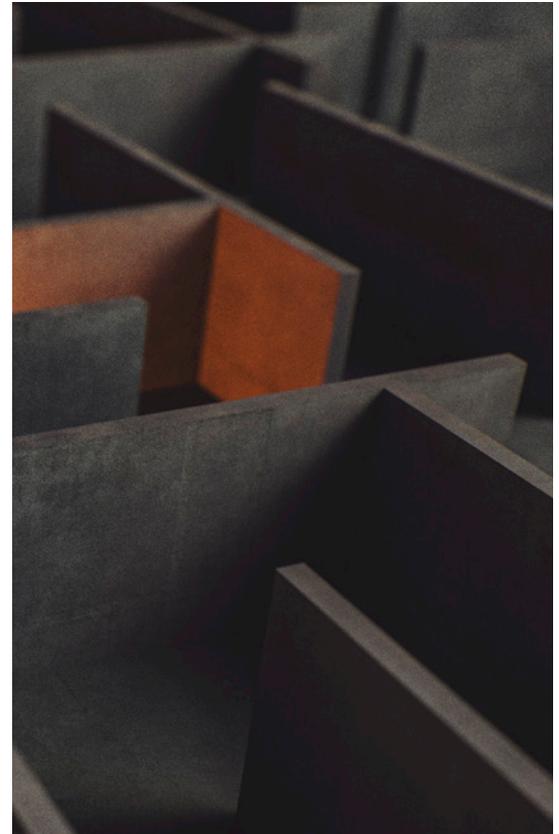
Of course, such controlled access can be applied to everyone involved in the development and product launch process, granting access and permissions to stakeholders as needed. What's more, systems with controlled access rights or policies can track decisions and design changes while providing a full audit trail in case quality or compliance issues arise later. In other words, a single product development system solves multiple problems at once.

When it comes to product development and commercialization processes, product lifecycle management (PLM) and quality management systems (QMS) provide the single source of truth that teams, both internal and external, need in order to work together. Thanks to these solutions, teams can review, approve, and collaborate on the connected product record, speeding up the review and approval processes for new designs, engineering change orders, quality issues, and project tasks. In addition, this single system provides enhanced visibility and traceability throughout the entire product lifecycle, eliminating development and manufacturing blind spots.

Ultimately, it is this single system that provides the necessary foundation on which optimal supply chain collaboration rests.

A single, cloud-based solution keeps everyone on the same page and facilitates collaboration.





BARRIERS TO EFFECTIVE COLLABORATION

While the goal of seamless, interactive collaboration between internal teams, manufacturing partners, and suppliers is achievable, there are a few barriers that can get in the way.

Siloed Engineering Design Tools

There are many great design tools that mechanical, electrical, and software engineering teams use to create their individual designs. However, these tools are rarely connected, which means that companies often need to invest in resources that can ensure both the interoperability and the manufacturability of the final design. More importantly, companies need a simple way to share the entire design record internally with quality, purchasing, and manufacturing, as well as externally with suppliers. These downstream product teams do not generally have access to engineering design tools or expertise in their use. Thus, the earlier you can aggregate and share the complete design with the rest of the new product introduction team, the sooner you can address any design or quality issues.

Integrated Process Optimization

Many companies have started to implement an integrated planning process, with the aim of supporting strategic decision-making through a comprehensive, data-driven overview of company resources and needs.

Achieving this can be challenging enough within a company, in part because plans can quickly become inaccurate due to manual overwrites.

The situation only gets worse when companies need to include the plans and forecasts of external partners. Without the proper alignment of planning processes, the integration of planning data from multiple sources, and reciprocal transparency, it is difficult to sustain meaningful collaboration across a complex supply chain.

Market Uncertainties

As we have noted previously, the global economy is currently rife with uncertainty, making planning difficult. Even before the pandemic, however, companies faced a competitive environment that required them to work fast, be first to market, and increase market share. Specialization has played a critical role in their efforts. OEMs focused on their core competencies and IP, relying on highly distributed, multitiered supply chains to source, build, and test their products. Given these new and ongoing pressures, it can be easy to question the value of creating a more distributed supply chain, particularly in the absence of secure systems that make it easier to collaborate.

As we have tried to emphasize throughout, it is in times like these that orchestrated real-time collaboration is critical to ensure the delivery of high-quality products to market.

FOSTERING GREATER COLLABORATION

What can manufacturers do to overcome these barriers to effective collaboration?

First of all, manufacturers need to adopt technology that will enable them to create a single source of truth and maintain the visibility and communication necessary for collaboration. After that, of course, manufacturers need to integrate their supplier chain partners into their product development system. Here are four things to consider when doing so.



Security

As critical as the sharing of information is, OEMs are understandably wary when providing product design record access to suppliers because it can compromise their IP. For this reason, manufacturers need to determine what product information should be restricted, and to what degree, when it comes to outside partner access. OEMs must ask and answer the following questions before giving any external partner access to product information stored in their PLM or QMS application:

- How will you enable supplier access to the product data they need while preventing access to sensitive or restricted data?
- Do you need to enforce regulatory constraints (e.g., FDA, ISO, environmental) or export controls (e.g., ITAR, EAR)?
- How can you ensure valid security filtering on your most sensitive product design records?
- How will product record attributes allow you to define and determine which suppliers can access, modify, or approve designs during your change review processes?

Proactive Communication

External partners need to be able to access and retrieve specific product information quickly and easily. To ensure fast and proactive communication, it is a good idea to set up automated notifications for your supply chain partners. Automation of processes, such as engineering change orders and reviews, removes bottlenecks, speeds approvals, and eliminates costly mistakes ranging from sourcing the wrong parts to sourcing parts that are not compliant with regulatory standards.

Pragmatism (Not Perfectionism)

Change is inevitable in today's manufacturing environment. Teams need to be ready to turn on a dime as technology improves, design and manufacturing processes evolve, and market conditions shift. Many companies make the mistake of striving for perfection before using their systems internally or with suppliers. While it's important to have a good baseline and solid security, it's best to take a "walk before you run" approach. Once you have addressed security and notification processes, outline a review process that provides the simplest path for getting product designs from engineering to manufacturing. Frankly, you can't foresee all the issues that may arise with supply chain partners until everyone is using the system. In other words, don't wait until everything is perfect. It won't be.

Training

Training is key for any system, especially when you have a range of players and teams with varying levels of technical aptitude. Cloud-based software-as-a-service (SaaS) solutions lower the "complexity bar" and require less training, thanks to their simpler interfaces delivered via web browsers. The days of having IT teams install client software on dozens or hundreds of desktops while dealing with myriad operating systems and manual client updates are gone. Nevertheless, providing partners with clear onboarding instructions and basic training protocols will smooth the adoption process for everyone.

Roll out a process that works and then perfect it over time based on real performance data.



STRATEGIC COLLABORATION DRIVES INNOVATION SUCCESS

As complex as the world may seem today, it is also full of possibility. Opportunities exist to dream up a new product or service (or, as is increasingly common, a combination of the two) and bring it to market. Even now, cutting-edge companies and savvy entrepreneurs can access resources from all across the globe to manufacture, deliver, and service products without having to invest in large teams or systems.

Constant, continual, and proactive collaboration was key before the pandemic, and there is no reason to believe that will change. Sharing information fast and efficiently with every stakeholder involved in designing and building products ensures that problems can be identified and addressed in real time. Improving access, visibility, and traceability throughout the new product development and introduction process allows teams to optimize designs and streamline manufacturing approaches.

All of this drives faster innovation, adaptation, and, ultimately, viability in an ever-more-complex business environment.

**SEE ARENA PLM
and QMS IN ACTION**

[> SCHEDULE A DEMO TODAY](#)

ABOUT ARENA

Arena helps innovative electronic high-tech and medical device companies create products that change the world. Arena unifies product lifecycle (PLM) and quality management (QMS) processes, allowing every participant throughout the product realization process from design to manufacturing to work together. With Arena, teams accelerate product development and delivery to increase profits.

For more information, visit [ArenaSolutions.com](https://www.arenasolutions.com).



121 Seaport Blvd, Boston, MA 02210 : ptc.com