Drive enterprise digital transformation and innovation with digital thread

ptc | Microsoft

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The business case for collaboration and cross-functional transformation

Faced with significant and ongoing disruption in the industry, manufacturing companies have known for years that digital transformation is essential to maintain a competitive edge. COVID-19 has only accelerated the need for digital transformation. The pandemic has disrupted supply chains, created an increasingly distributed and remote workforce, caused significant changes in demand, and increased the challenges of providing field service. To address these changes, manufacturing companies have accelerated their investments in digitization. According to McKinsey, advances in this area are now ahead of schedule by three to four years.[1]

With digital transformation, many companies are investing in optimizing individual functions—an approach that falls short of goals or is ultimately unsustainable in two-thirds of cases.[2] The conventional wisdom is that if you invest in each part of the value chain, you'll optimize the entire value chain. But in truth this just engenders competition: In an Accenture study, 75% of manufacturing executives surveyed said that business functions are competing against each other on digitization efforts.[3] And this creates redundant costs: "Cross-function competition is causing redundant investments in digital projects—with executives expecting a 6.3% increase in costs as a result."[4] In addition to increasing costs, siloed efforts create siloed data, which means employees are prevented from getting the information they need from other functions and collaboration is hampered.

In PTC's recent State of Digital Thread survey, 74% of leaders said that improving their ability to leverage data across the enterprise would be effective or highly effective at addressing

[1]McKinsey [2]McKinsey [3]Accenture [4]Accenture

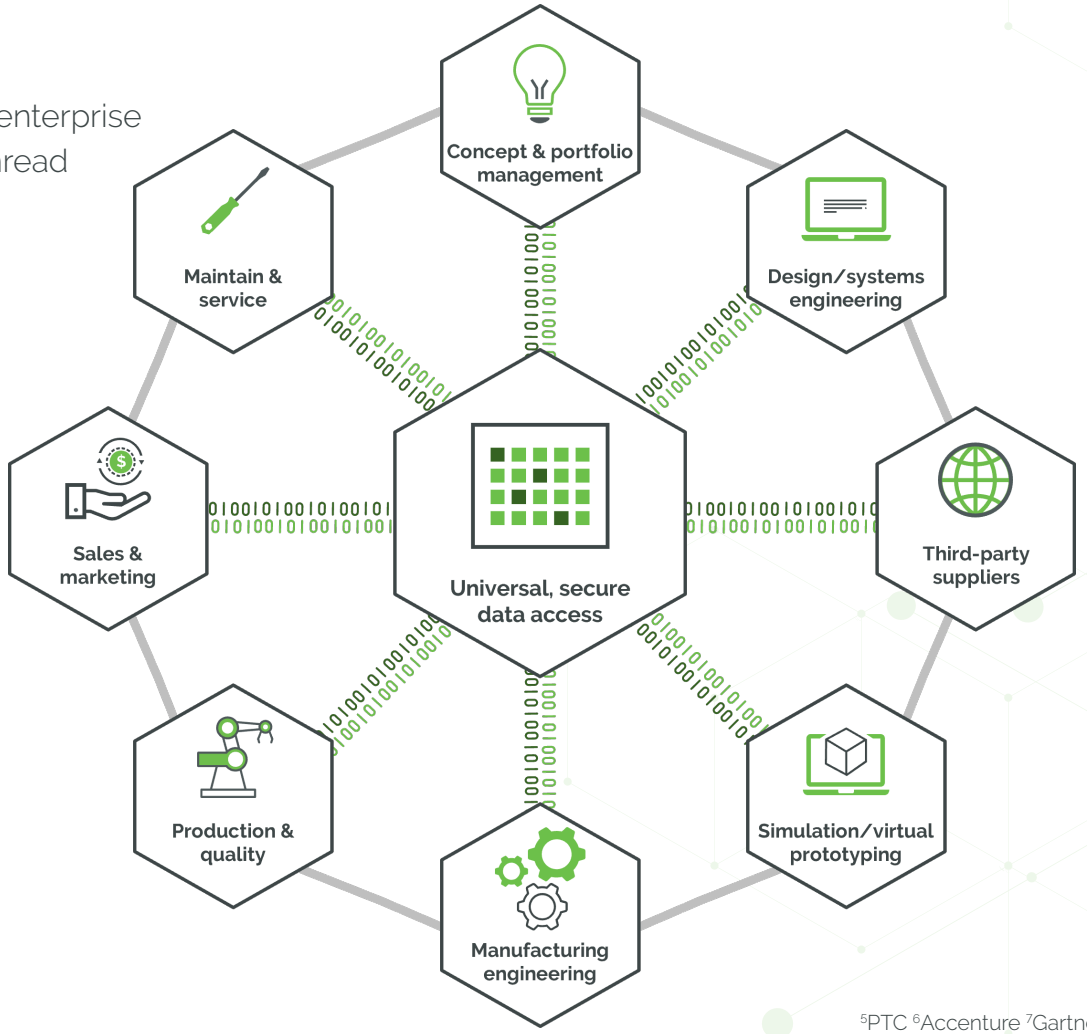
disruption.[5] And they're right. Cross-functional transformation efforts—those that work to improve collaboration across functions and the enterprise—show a significant improvement in results. An Accenture study showed that organizations that invested in cross-functional transformation yielded four times higher revenue gains—27% compared with 6.6%—with an investment of only 1.5 times more.[6] In addition, by 2023, organizations that promote data sharing will outperform their peers on most business value metrics.[7] Plus, there's even more benefit when data is shared outside the organization, such as with supply chain partners: Organizations that share data externally generate three times more measurable economic benefit than those that do not.[8]

Digital thread is the key to true cross-functional transformation

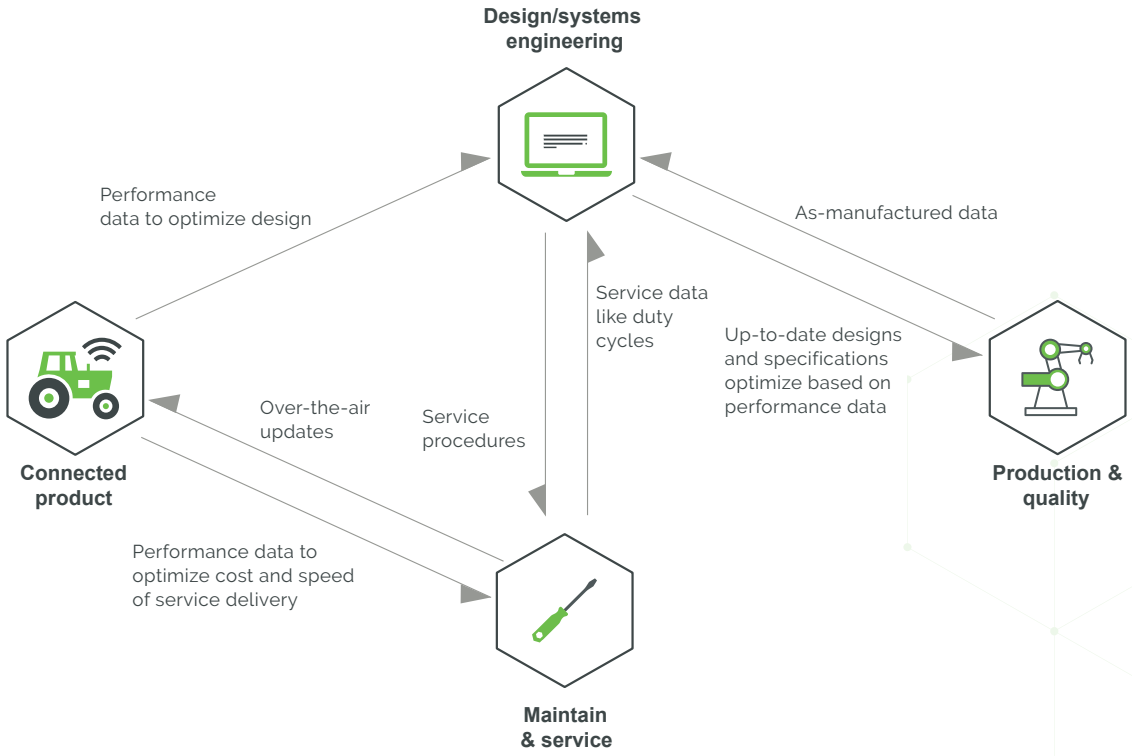
Expanding the vision of digital thread to be multi-enterprise

So how do you achieve this type of cross-functional transformation and collaboration? The key is a digital thread. A digital thread creates a closed loop between the physical and digital worlds to optimize products, people, processes, and places. In the digital world, the complexity of the physical world can be distilled down to the pertinent information needed to make decisions. By introducing digital processes to analyze, manage, and communicate this information, decisions can be made faster and

A multi-enterprise digital thread



[5]PTC [6]Accenture [7]Gartner [8]Gartner



The digital thread enables closed-loop optimization by delivering up-to-date, contextualized information across functional areas

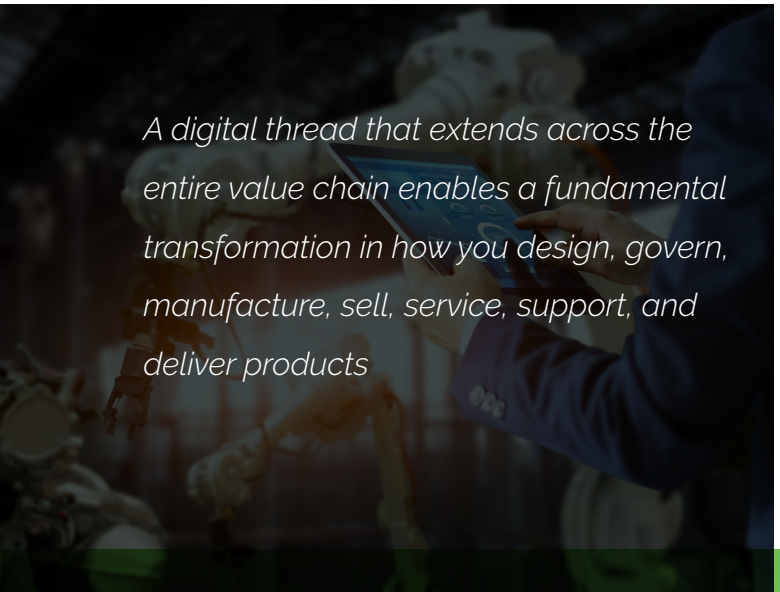
more accurately. Then, when the digital tools and processes that are utilized along the lifecycle of a product are connected using a digital thread, the knowledge gleaned from one activity can be shared upstream and downstream to inform others. This is "closing the loop" and it enables continuity of data across departments and collaboration across functions to improve the product and physical processes and empower the people who are involved at every step.

The key to maximizing the value of the digital thread is extending it beyond the four walls of the enterprise to encompass outside elements like customers, suppliers, and after-market partners—essentially making the digital thread both "multi-enterprise" and inclusive of the product end user. That's because information about products is generated across the entire value chain and needs to be distributed across the entire value chain, as well as governed and controlled. For example, engineering creates and distributes information to every function and data from connected assets flows back to engineering to enable closed-loop optimization of product designs and business models. Digital thread enables discrete flows of data like this, but also much more. The goal of the digital thread is universal, secure data access, as well as contextualization, traceability, and associativity of the data to gain insights at every point in the value chain.

5 key benefits of a multi-enterprise digital thread

1 A core component of a digital thread that extends across the value chain is complete digital product traceability (DPT), tracking the product across its entire lifecycle. Within design, DPT enables cross-system linking that can drive coordination among disparate engineers. Extending beyond design, it links requirements and tests with manufacturing and service activities that must be executed to spec. DPT also enables compliance with safety standards and in some cases is mandatory for regulatory compliance. At the enterprise level, this end-to-end traceability ultimately provides the proof that you are creating the right product and building it correctly, improving enterprise change decisions and coordination.

2 Digital thread also enables essential access to information. With a digital thread, up-to-date, accurate information gets to the right person at the right time, anywhere (whether they're a remote worker, a customer, or a supplier). Importantly, this information is delivered in a way that's easy to consume and that's based on the user's specific needs and context. For example, digital thread can deliver engineering changes directly to the manufacturing floor in real time.



A digital thread that extends across the entire value chain enables a fundamental transformation in how you design, govern, manufacture, sell, service, support, and deliver products

Through condition-based monitoring, it can also alert the customer and the supplier's service team to an impending issue before it escalates.

3 Another key benefit of digital thread is access to new insights that enable continuous improvement. For example, a digital thread can enable digital twins that provide accurate predictions of future performance. The more information and context a digital twin receives, the more sophisticated it can become. So by connecting data from across the value chain, you can create advanced digital twins that offer the insights necessary to drive continuous improvement.

4 A holistic digital thread can also drive more effective collaboration, especially across the supply chain. The digital thread enables you to work concurrently with suppliers while protecting intellectual property. Manufacturers can share design data and track deliverables to multiple projects around the globe, while automating new product introduction, change management, and quality processes.

5 Finally, a digital thread across the value chain can enable new business models. Bringing data back to the supplier on equipment performance and use is a foundational element to unlocking new models such as product as a service. Importantly, traceability enables better governance and manageability for product as a service. This new business model unlocks new revenue streams, greater lifetime value of the customer relationship, the ability to improve products more effectively, and differentiation in the market.

Ultimately, a digital thread that extends across the entire value chain enables a fundamental transformation in how you design, govern, manufacture, sell, service, support, and deliver products. You can accelerate time to market, increase revenue, boost quality and decrease its cost, improve flexibility and agility across the enterprise, and enhance productivity, driving an essential competitive advantage.

Applications of digital thread across functional areas

A digital thread can generate value in every function within the organization. Let's look at strategic use cases across engineering, manufacturing, and service.

Engineering

Within engineering, the digital thread enables increased efficiency at every phase of the design process and improves information sharing with other functions.

Celli Group transforms its operations with digital thread

Celli Group is an innovator in beverage dispensing, providing major global brands with equipment and services for serving soft drinks, water, and beer. Celli Group has taken a technology leadership position in the industry through Celli Digital Solutions, leveraging PTC and Azure internet of things (IoT) technologies. Their connected dispensing system provides insights to both minimize downtime and optimize the mix and inventory of beverages.

For a new, unique offering, Celli Group built on this experience, extending the digital thread to customers, to end users, and internally to their product development process. In partnership with PTC, Microsoft, and Accenture, Celli Group used the combination of product lifecycle management software (PLM) and IoT to speed time to market. They were able to manage engineering changes as they occurred and create augmented service instructions from evolving CAD models, all while the system was being developed.

5%
CAPEX REALLOCATION

+20%
REMOTE RESOLUTION

+8%
PLANNED INTERVENTION

-10%
SERVICE COSTS

+20%
CUSTOMER ACQUISITION

+14%
INCREASED SELLOUT

The digital thread enabled connection with alpha- and beta-models, in test beds and in the field, to help quickly identify component issues that the engineering team could fix. At the same time, simulation of the system, informed by real-time data, enabled the creation of a map of stress conditions that are the foundation for the Smart Warranty program, a new business model based on the extended digital thread. This unique offering bases warranty on performance against specification, rather than time in service, enabling customers to make informed choices about system use.

Learn more from the Celli Group **case study** and **webinar**.

Product data management: This unifies all your engineering tools to not only simplify engineering, but also enable access to data for the supply chain and the factory, improving effectiveness across the value chain.

Product verification and validation: Using digital thread-driven digital simulation capabilities at both the individual-component and complete-product levels throughout the design process helps to reduce the design cycle time, improve product quality, and reduce costs associated with physical testing.

Part and document classification: Part classification reduces the number of duplicate parts, which provides value to engineering and across the enterprise, since every introduction of a new part creates costs for nearly every function.

BOM and change management: With a digital thread, every time engineering makes changes, those changes are approved by the right people and visible across the board to manufacturing, service, and quality.

Manufacturing

Within manufacturing, a digital thread provides shop floor workers with seamless access to information while capturing execution data, enabling key use cases including digital and augmented work instructions and connected work cell.

Augmented and digital work instructions: With augmented and digital work instructions delivered via the digital thread, manufacturers can be sure that they are operating from up-to-date information, including accurate part specifications and processes, to help reduce scrap and rework.

Connected work cells: With connected work cells, manufacturers can equip assembly workers with a unified experience, bringing together accurate, up-to-date work instructions with work order information, machine data, and smart connected tools to help improve worker productivity, reduce scrap, and lower training time.

Service

A digital thread improves service delivery and enables outcome-based business models such as product as a service. The service function can also contribute benefits to other functions by feeding them information from customer interactions. For example, by leveraging service data, engineering can use actual performance to prioritize improvements; supply chain and operations can better understand consumable and spare part usage; and sales and marketing can more effectively prioritize their efforts.

Let's take a deeper look at how digital thread optimizes service delivery specifically:

Remote monitoring and predictive maintenance: With a digital thread, a manufacturing organization can use augmented reality to see a machine's performance remotely. And with the data collected from myriad devices in the field, they can predict when something will go wrong and intervene before it affects performance.

Remote service: The manufacturer then can service the machine remotely by delivering a software update or changing a set point, using software content management and remote access and control capabilities enabled by digital thread.

Customer self-service: If a manual fix on-site is required, the manufacturer can avoid an expensive truck roll by easily sharing instructions for customer self-service via augmented expert guidance or 3D work instructions. This reduces downtime and provides the customer more control over when service occurs.

Technician efficiency: Finally, if the machine does need to be serviced by a technician, the technician has access to the required information in the digital thread. This enhances technician effectiveness by improving both first-time fix rates and time to resolution—all leading to higher customer satisfaction.

Establishing a strong digital foundation based on the cloud

The first step to achieving the full value of digital thread is establishing a digital foundation, the precursor to strategic use cases like those discussed above. Once you've established a foundation, you can show value quickly by implementing a single use case and then build on the same foundation to enable additional use cases. Establishing a digital foundation requires more than just integrating applications. It requires creating a new information

architecture—organizing data, and linking, tracing, and associating it across systems, including CAD, PLM, manufacturing data, quality information, and connected machine and connected product information from the factory and the field.

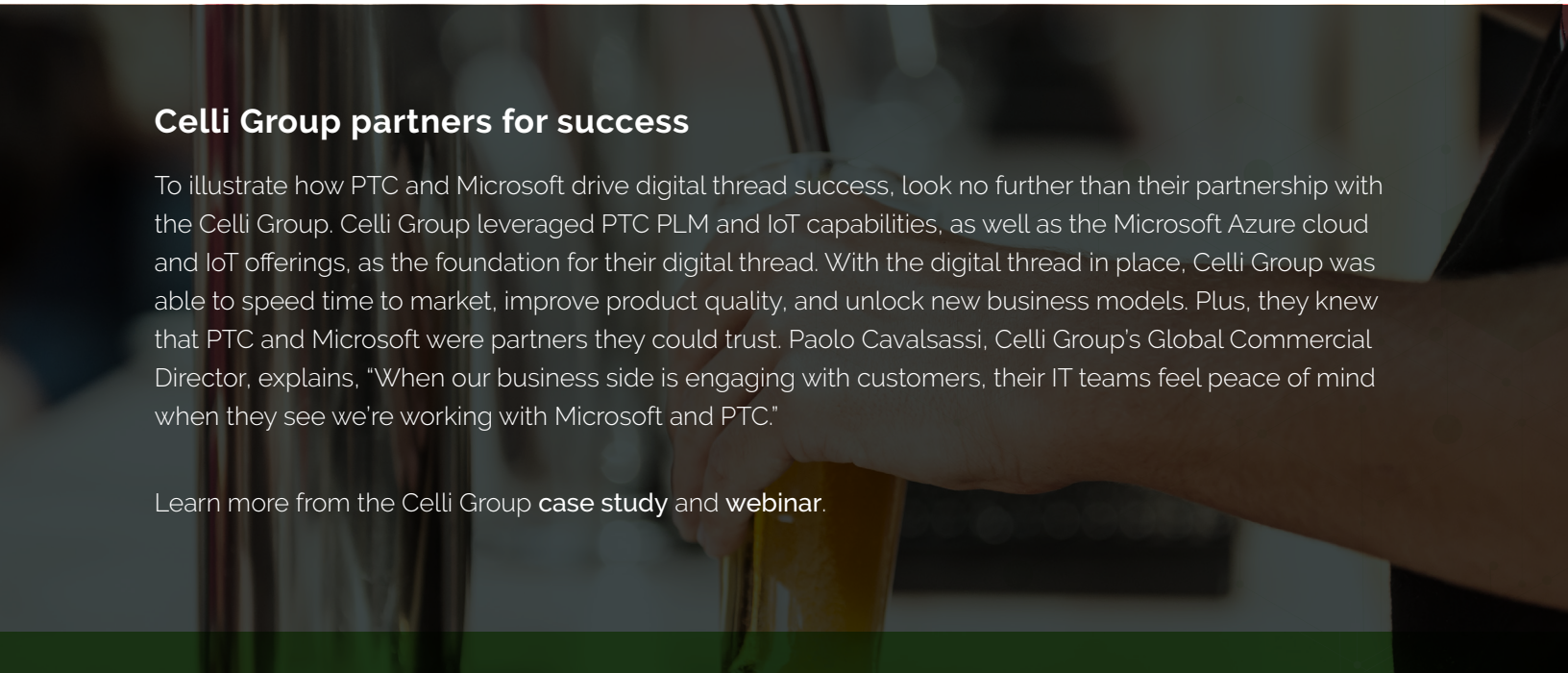
A key element of your digital foundation is the cloud. The cloud enables simplified flow of information across the entire value chain, connecting data from suppliers, products in the field, remote workers, different functional areas, and distributed facilities. It also offers more flexible collaboration and reduced total cost of ownership compared to other approaches. The key cloud capabilities that enable digital thread are scalability and high-performance compute, edge computing, security, and confidential computing.

How PTC and Microsoft enable digital thread

PTC and Microsoft are tightly integrated to bring you comprehensive technologies and services for a holistic digital thread, helping you along your entire journey, from building a digital foundation to enabling transformational use cases.

Jointly, PTC and Microsoft offer essential connectivity and integration capabilities that enable you to manage, associate, orchestrate, and flexibly deliver data across the entire value chain. Moreover, they offer exceptional performance with high availability at the application level and clustered deployment across multiple availability zones. They also provide extraordinary expertise with an integrated operations team and support for configuration, change management, and scalability. Finally, they offer world-class security with data encryption, an intrusion detection system, and personnel and access controls.

PTC is uniquely positioned to enable the extended digital thread across the entire value chain with best-in-class solutions to drive engineering excellence with CAD and PLM, manufacturing efficiency, service optimization, and product innovation with IoT and augmented reality. These solutions are supported by a range of offerings, including a model-based program for CAD (Creo), BOM-based programs (Windchill and Arena), an IoT and connected data program (ThingWorx), and an augmented reality solution (Vuforia). To support your digital foundation, you can also contextualize,



Celli Group partners for success

To illustrate how PTC and Microsoft drive digital thread success, look no further than their partnership with the Celli Group. Celli Group leveraged PTC PLM and IoT capabilities, as well as the Microsoft Azure cloud and IoT offerings, as the foundation for their digital thread. With the digital thread in place, Celli Group was able to speed time to market, improve product quality, and unlock new business models. Plus, they knew that PTC and Microsoft were partners they could trust. Paolo Cavalsassi, Celli Group's Global Commercial Director, explains, "When our business side is engaging with customers, their IT teams feel peace of mind when they see we're working with Microsoft and PTC."

Learn more from the Celli Group **case study** and **webinar**.

link, and trace all your data with PTC's PLM and ThingWorx offerings. Importantly, PTC's offerings provide out-of-the-box functionality, enabling quick time to value with configurable best practice processes.

Key to Microsoft's offerings is Azure cloud. The Azure cloud features world-class security, edge technology, and support for IoT. It also offers high-performance computing, confidential computing, AI and ML capabilities for unlocking insights, and HoloLens for delivery of product information. Moreover, Microsoft is committed to customers in building a trusted, responsible, inclusive cloud: Azure offers security, privacy and control, transparency, compliance, and reliability.

With these capabilities from PTC and Microsoft, a holistic digital thread is within reach and you can see value from it sooner.

Where to get started

Today, enabling data sharing and collaboration across the extended value chain is key to manufacturing success. And this is only possible with a digital thread that encompasses the entire enterprise and extends beyond it to include suppliers, customers, and after-market partners. In a world where siloed data is still the norm, this may seem out of reach. But by establishing the right digital foundation and leveraging the cloud, you have what you need to make digital thread a reality for your organization. PTC and Microsoft are your partners in realizing this vision. The sooner you get started, the faster you'll see benefits like accelerated time to market, increased revenue, lower costs of quality, improved flexibility, and enhanced productivity.

Contact us to start your journey today and check out our digital thread infographic for a simplified version of this narrative that you can share with colleagues.