

Digital Business

Crafting the Modern Manufacturing Enterprise in the Post-COVID-19 World

To get ahead in the industrial space amid the prolonged pandemic, manufacturers must embrace holistic agility and resilience, and democratize access to applications and data. This will eliminate operational silos at last and free data to more effectively inform everything: just-in-time build and logistics decisions, operational execution, customer experience product engineering decisions and everything in between, driving innovative product launches and much-needed cost reductions.

Prologue

As the world learns to coexist with COVID-19, manufacturers are experiencing jarring changes in demand, supply and production. How will this impact the manufacturing enterprise? What will these changes mean for manufacturers and their efforts amid severe capital constraints to thoroughly modernize in the post-COVID-19 age? We address these questions, and offer a structure and operational roadmap to carry manufacturers through the recovery and beyond.

Executive Summary

COVID-19, the most significant public health crisis in modern history, has forced manufacturers to create virtual war rooms to contend with supply challenges. Moreover, the prolonged pandemic has surfaced unprecedented physical asset management issues (i.e., involving plants, warehouses, equipment and inventory) that render planning and disaster recovery top of mind for business leaders.

For manufacturers, the pandemic starkly imposes a premium on agility and the ability to seamlessly pivot, both to avoid essential-supply shortages and to ensure innovative product and business-model opportunities. Workplace and employee safety – while always essential – is taking on new significance. For instance, contactless interfaces – newly enabled by the convergence of emerging technologies like augmented reality (AR), artificial intelligence (AI) and video collaboration tools – have become pervasive across business processes. These are critical for safety in manufacturing operations when applied to equipment maintenance, packaging operations and much else. (See [“Five Considerations for Creating a Contactless Workplace”](#) for more insights.)

Managing physical operations with traditional material testing, scanning, handling and logging transactional data poses challenges that require organizations to review every process through a contactless lens. Companies will need to decide how and where to safely and smartly re-integrate workers into factory operations.

Moreover, the pandemic provides an opportunity to reevaluate strategies, business models, processes and technology adoption as increased investments in new competencies and operational agility may be required to survive the ongoing crisis. Modern technologies such as cloud, virtual workspaces, thermal imaging and intelligent automation¹ will accelerate the pace of digital change. For most organizations, the opportunity will heighten their focus

on innovation, inspirational product designs and manufacturing processes to bolster their marketplace differentiation.

A case in point is General Motors. The automaker abruptly ceased making cars in March and in April turned its production to ventilators and personal protective gear for medical personnel. Under a \$490 million contract with the U.S. government,² GM recalled laid-off workers and reopened its long-shuttered Kokomo, IN, plant to produce 10,000 ventilators per week along with other gear – a flawless demonstration of the kind of agility it will take to thrive during and after the pandemic.

If nothing else, the pandemic has underscored the fact that manufacturers are capable of executing quick business pivots through muscular execution. In this white paper, we'll explore how manufacturers can use the learnings in collaboration, planning and execution to accelerate their transition to a modern enterprise.

The pace of change and resultant uncertainty have created a set of transformational imperatives:

- **Build resilience:** Ensure business continuity across all operations, and execute strategic plans with a highly engaged workforce.
- **Enable agility:** Have the capacity to pivot business models across customers, products, operations and the supply base.
- **Scale transformation at speed:** Enable rapid commercialization and monetization of innovative offerings tailored to fast-changing customer needs. This is a principal requirement, as enterprises can no longer remain in pilot mode with new initiatives built on the latest technologies. Instead, they must choose wisely to quickly achieve financial benefits that can then be scaled across the organization.

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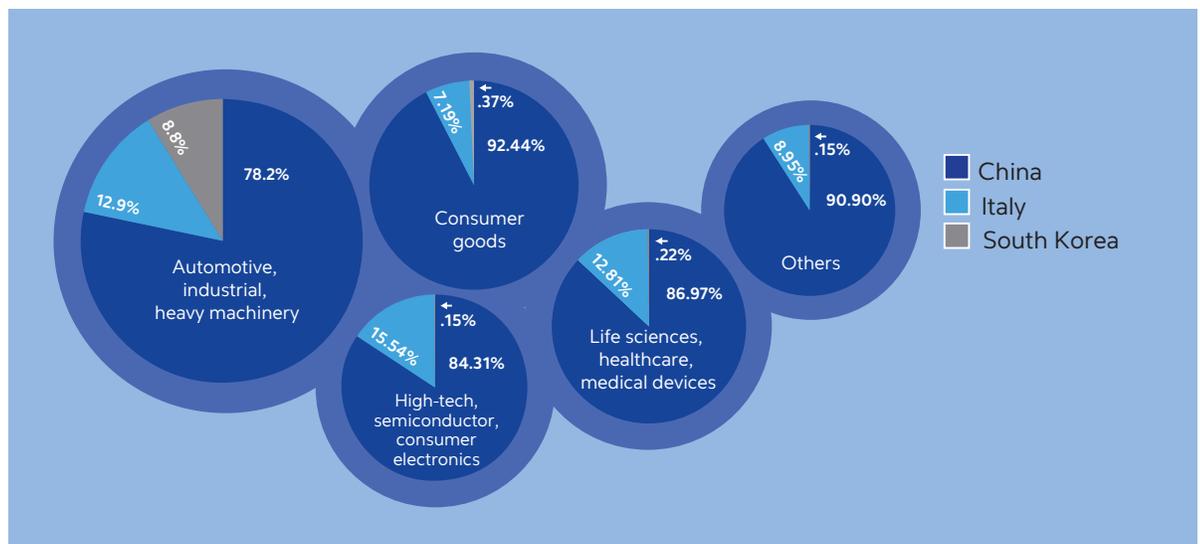
Massive uncertainties in the manufacturing landscape

As business leaders rethink operations and customer service, organizations of every type are finding a vastly changed competitive battleground. What does this mean for manufacturers and what does it take to be a modern enterprise in the COVID-19 era?

Accustomed to producing on a mass scale and interacting with customers through channel partners, manufacturers have long grappled with how to meet consumer-driven expectations for highly personalized experiences and omnichannel interactions. For many, this was a “nice to have” market dynamic that was not necessarily a show stopper if not achieved. The pandemic has shown how being able to pivot quickly – whether in adjusting from a wholesale to retail model or in sources of supply (see Figure 1) – can be the difference in keeping operations going or shutting them down. One example is a large intermediate commodity chemicals manufacturer with 100% dependence on imports for additives, i.e., the catalysts needed in local plants to process the feedstock. Though this input is required in small quantities, pandemic-driven supply disruptions have triggered a strategic redesign of the supply chain network to enhance reliability and security.

Major supply locations are concentrated

Excessive reliance by U.S. and European companies on commodities sourced from quarantined areas in China.



Note: As of March 2, 2020; percentages do not sum to 100% due to rounding errors.

Source: Resilinc

Figure 1

However, with limited resources to invest in new technology, manufacturers need to build a coherent digital strategy tied to concrete business outcomes with a clear path toward funding, execution and measurement.

Those that can accomplish all this can realize a positive impact on revenue and costs. According to a recent study we conducted with ESI ThoughtLab, business change focused on digital strategy, automation and workforce transformation can yield a roughly 10% bottom-line boost for manufacturers. Additionally, manufacturing market leaders are getting the biggest payoffs from data management, software deployment and AI, so lagging companies seeking to join their ranks should focus their efforts on these technology imperatives. The cumulative digital net impact, at 10.3%, is the third highest among all industries in the study.³

Many manufacturers now find themselves at a crossroads, as they need to get real about technology investment or risk falling behind for good. As our November 2019 survey of nearly 2,500 business and IT leaders bore out, companies further along the investment maturity curve are ahead on revenue and profitability, among other measures. While the highest returns originate from the basics – notably the cloud and mobility – front-runners lead the pack with investments in digital strategy.⁴

Savvy employers will use the pandemic to push long-overdue reevaluations of core competencies, associated IP and operations needed to support a new normal. The result will be reconfigured factory floor operations and reimagined supporting processes. (See how we helped a packaging solutions maker do this, on pages 12 and 13.)

Amid the current crisis, where there is intensified pressure on every investment dollar, manufacturers must grapple with both new and perennial issues:

- The reconciliation of multiple enterprise business systems, cloud instances and disparate technology approaches to streamline and simplify operations and reduce costs.
- Cloud strategy: Whether to deploy hybrid, private, public or multiple clouds to extract more value from sunk investments and accelerate the transition from CapEx to OpEx models.
- Data modernization and the use of advanced analytics to compete as a new-age digital business.
- Institutionalizing knowledge through e-learning and development strategies to train, retain and cultivate employees as the economy recovers.

Defining the modern manufacturing enterprise

The manufacturing industry has been a leader in converging information technology (IT) and operational technology (OT). However, the industry must now embrace connected product transformations to create truly unique offers for customers. Take Tesla: The carmaker's software-defined features such as battery life enhancement (via an over-the-air update) are an example of the convergence between IT, OT and product technology (PT).

By accelerating digital enhancement efforts and proliferating Industry 4.0 constructs, manufacturers can achieve such a merger of technological capabilities, and also enable the business to run with greater resiliency and flexibility to meet competitive demands (see Figure 2, next page). Making this happen will require a level of employee enablement representing a workplace that combines and connects employees through a combination of physical process execution and virtual collaboration.

For example, during the pandemic we enabled a mid-sized manufacturing firm by deploying a quick convergence solution to reduce downtime. Production associates using AR-enabled tablets and real-time video connections could diagnose and troubleshoot problems with help via remote visual inspection from maintenance specialists at home. This not only provided speedier resolutions but also helped maintain safety by limiting the number of personnel in the plant. The combination of high capacity and speed and low latency of new 5G wireless networks will enable manufacturers to stream video data to a local cloud endpoint for quick analysis.

But it is not enough to implement up-to-date versions of each of these types of systems. Functioning as a truly modern enterprise requires the ability to view the organization in its entirety.

With agility and resilience the key attributes of the modern manufacturing enterprise, unlocking these fundamentals depends on the following strategies:

- I Leverage data and partnerships to cultivate new sources of revenue.** The infrastructure that supports enterprise operations tends to grow along organizational lines, with associated technology footprints that stunt interoperability and collaboration. The modern enterprise demands a holistic approach to business operations that is designed to eliminate operational silos and unlock data. That done, data can be integrated with business and engineering systems and converted to information that can be utilized to drive down operating expenses or launch new service lines.

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The manufacturing value chain: Future capability map

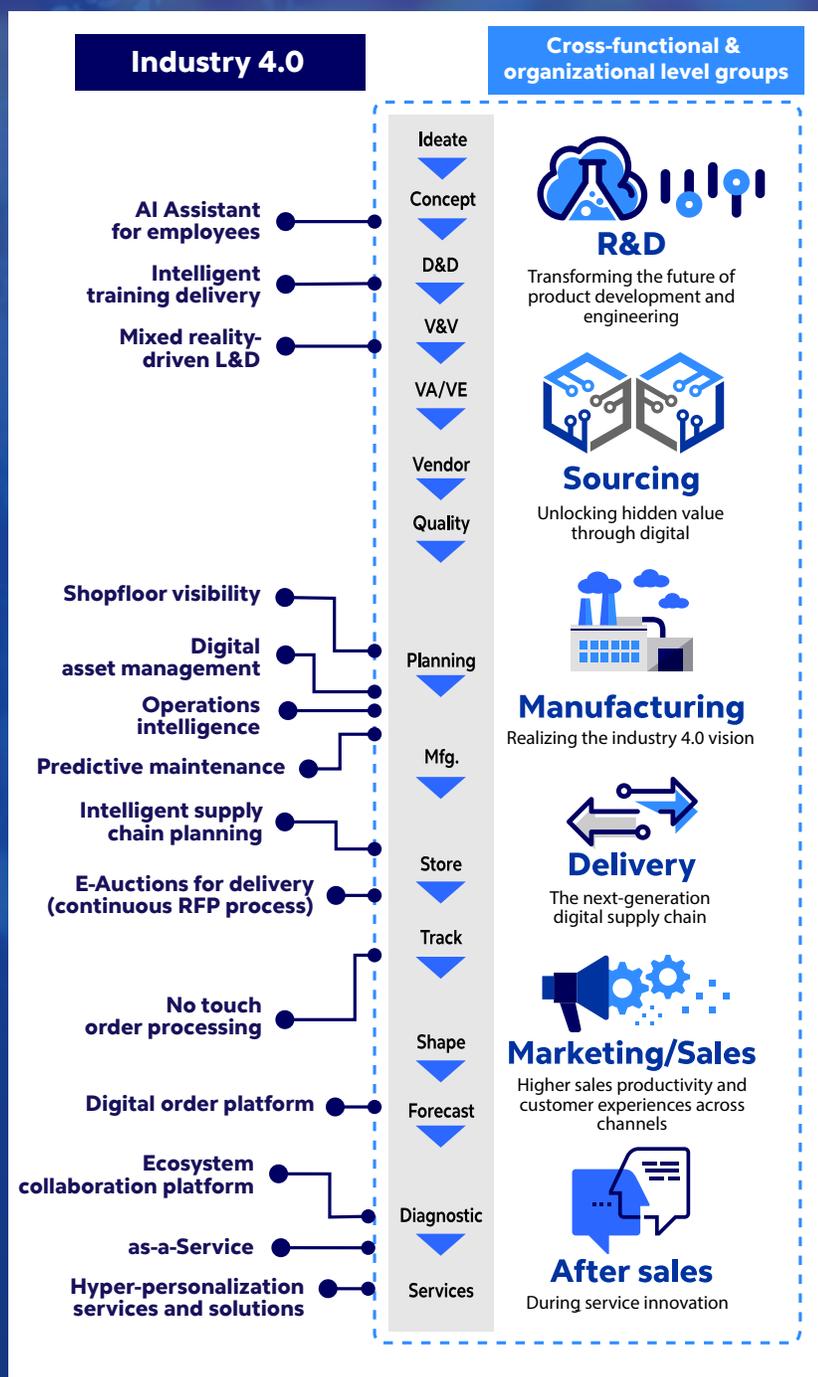


Figure 2

I Merge physical and digital worlds. The true value of IT and OT integration can be achieved only if data generated by physical assets is integrated with the IT systems designed to support them. For factory operations, this means integrating systems affiliated with different manufacturing processes on the factory floor with enterprise resource planning (ERP) and product lifecycle management (PLM) systems. This provides a 360-degree perspective on operations that can be analyzed in order to anticipate and adjust for equipment failure, production bottlenecks and supply chain issues.

I Democratize data. The need for manufacturers to deliver highly personalized experiences requires access to customer records, which were previously unavailable due to system incompatibilities. The underlying approaches that facilitate the modern enterprise, such as cloud computing and API management, help unlock critical data that was previously inaccessible. However, without a modern data architecture, strong data management and a resilient data governance foundation, businesses will struggle to fully realize this potential. Data modernization efforts that aggregate and normalize data make it much easier to store, use and share. From here, a manufacturer can do more with its data as it shifts from a hard-to-manage and expensive-to-store liability into an asset that helps leaders drive revenue growth, contain costs and increase business value. Accessible data also holds insights that can be mined via AI.

For example, APIs for pandemic tracing can be directly integrated into the operational data store (ODS) feeding supply chain planning engines. This will help forward planning and execution by monitoring likely shutdowns, limited manpower availability and material supply disruptions.

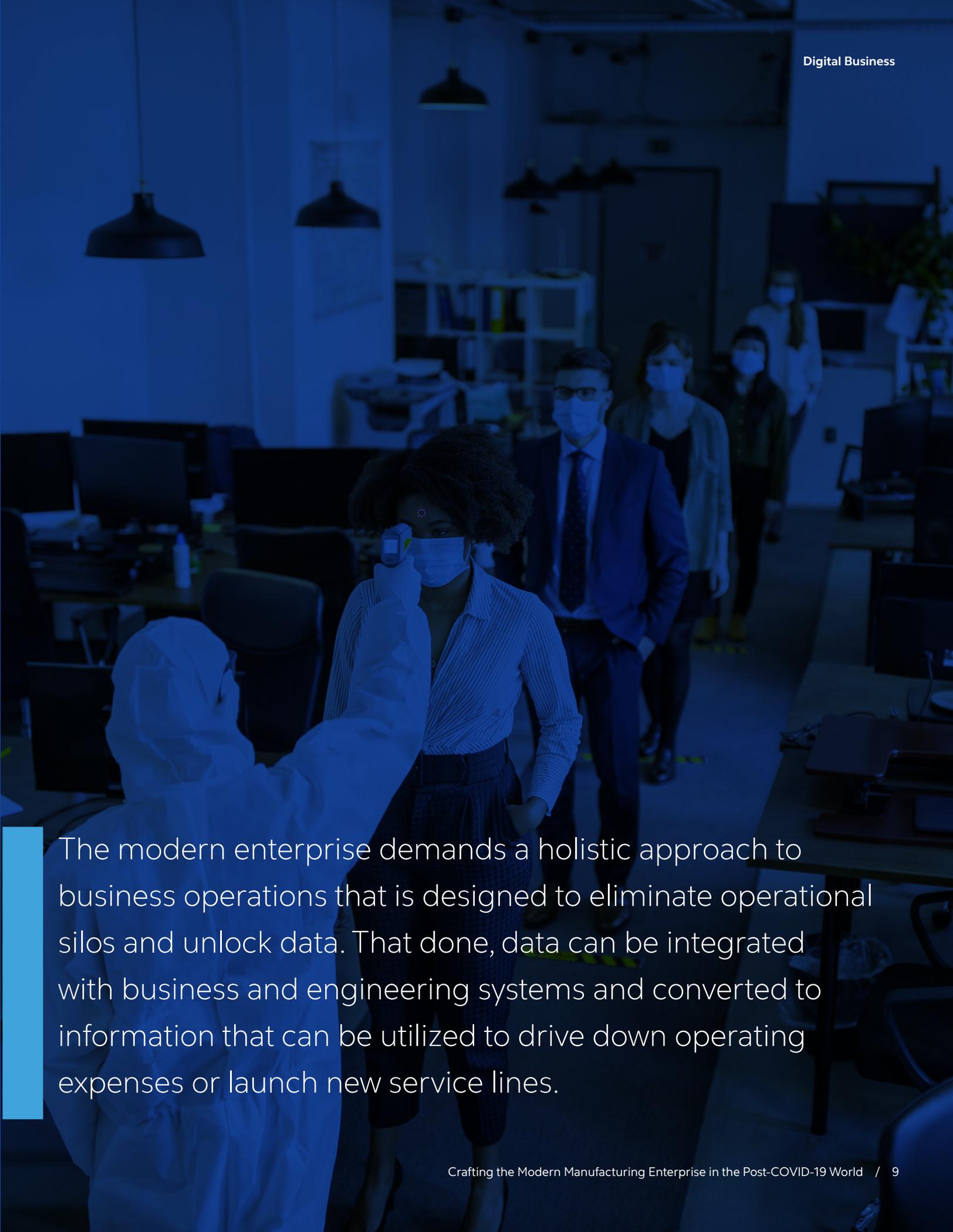
The opportunity presented through data democratization, modernization, integration and conversion to insight takes on more urgency in a post-pandemic world.

I Augment human skills with AI. The integration of the modern enterprise construct is expected to raise the bar for insight and decision-making. Employees will use AI to assist in the conceptual design phase of the R&D process, which will swiftly unravel complex production bottlenecks on the factory floor. Smart businesses will extend this to areas of their operations that historically were digitally “disenfranchised,” merging traditional blue-collar work with white collar and creating a “digital craftsman” in the process.

I Achieve continuous development, deployment and operation. The use of advanced technologies will enable more agile product development that can be executed using an “anyshore” model. This means not only the ability to leverage Agile software development methods and tools, but the creation of a common product foundation. Such an approach helps to institutionalize organizational agility, ensuring prompt development and delivery of products and services that anticipate and meet regional market requirements.

I Ensure superior experience at every touchpoint. In sum, a modern enterprise approach must enable manufacturers to become hyper-responsive to customer needs across the value chain by building the products they want, when they want them, at a price they are willing to pay, and with matching service and support.

For example, an automaker’s survey revealed that most customers highly value safety. OEMs and suppliers have responded to this fact by creating solutions such as interior surfaces coated with permanent anti-microbial materials that kill viruses and in-car UV light-based solutions. With speedy data capture, analysis



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and prediction, as well as simulation of the impact of these physical solutions, carmakers can deliver a safe experience that customers prize.

Similarly, car dealerships need to embrace new thinking to stimulate and fulfill demand. An auto OEM's ability to track the pandemic situation by wielding APIs in real time at the county or city level to understand the trajectory of local business conditions can help it to coordinate micro-promotions such as disinfecting cars prior to test rides or home deliveries. This capability for integrated transactions and collaboration between the OEM and the sales channel can make the difference between business survival or doom.

Anatomy of the modern manufacturing enterprise

Manufacturing operations have traditionally been defined by the key pillars of technology that underpin the value chain:

- I Transactional systems need to be rewired.** This applies chiefly to ERP and supply chain management and decision-support tools such as analytics. Platform vendors (including SAP and Oracle) have continuously modernized their applications. SAP's journey, for example, has progressed all the way to S/4HANA in-memory computing and other tool sets for modern experience with [Leonardo IoT](#) and [Fiori](#). Despite enormous advancements in these systems, maximizing the value of these technologies post COVID-19 calls for virtual collaboration. This can be enabled through integrated solutions such as Microsoft Teams and remote execution with full-scale IoT or assisted real-time video-based expertise as part of the process design.
- I Customer-facing systems should no longer be stand-alone.** This applies primarily to customer relationship management (CRM) and customer-experience management (CEM). These systems connect to existing ERP and HR systems, frequently as layered applications, thus providing a suite of capabilities that are focused on customer experience – not just the employee – enabling engagement using social channels. Salesforce is the top example in this category. Customer-facing systems receive a huge boost from AI, enabling manufacturers to interact with its clients. Close-looping these systems with connected product infrastructure/platforms is imperative for most manufacturers.

For an industrial equipment manufacturer, we built the IoT platform for remote monitoring and the diagnostic system that leverages equipment performance data along with external data sources. Two closed-loop execution processes are triggered. One automates processing through service event management and parts shipment systems. The second triggers interaction with the contact center and facilitates activities between service advisors and equipment operator/fleet maintenance supervisors in the field. The proactive service engagement and fulfilment result in improved economics owing to more effective downtime management. And this in turn fosters loyalty in very competitive high-capital-investment projects. For the manufacturer, it also guarantees service and parts revenue, thus improving the lifecycle revenue outlook.

- I Product engineering and PLM are critical digital foundational elements.** This class of applications supports the design and development of products. [Digital twin](#) development and the ability to create a digital thread are now critical parts of business transformation. (For additional insight, see [“Is Your Organization Ready to Embrace a Digital Twin?”](#))

The technology stack critical to post-pandemic success

The architectural pillars depicted in Figure 3 build on a foundation of data, IoT and cloud, all of which are needed to support a range of contactless technologies that will become more pervasive in a post-pandemic world. In order to operate at full production capacity while adhering to new social-distancing norms (which will likely drive a reduction in shop-floor headcount), manufacturers must speed their adoption of virtual reality and augmented reality (VR/AR).

For example, consider a scenario in which only one-third of the workforce is managing the factory floor, with the remaining two-thirds working remotely. In such a scenario, if there is an electric motor heating issue requiring servicing or maintenance in the factory, the specialist on duty may use an AR headset or hologram to perform the work with virtual support from remote specialists.

The modern manufacturing enterprise: A systems view

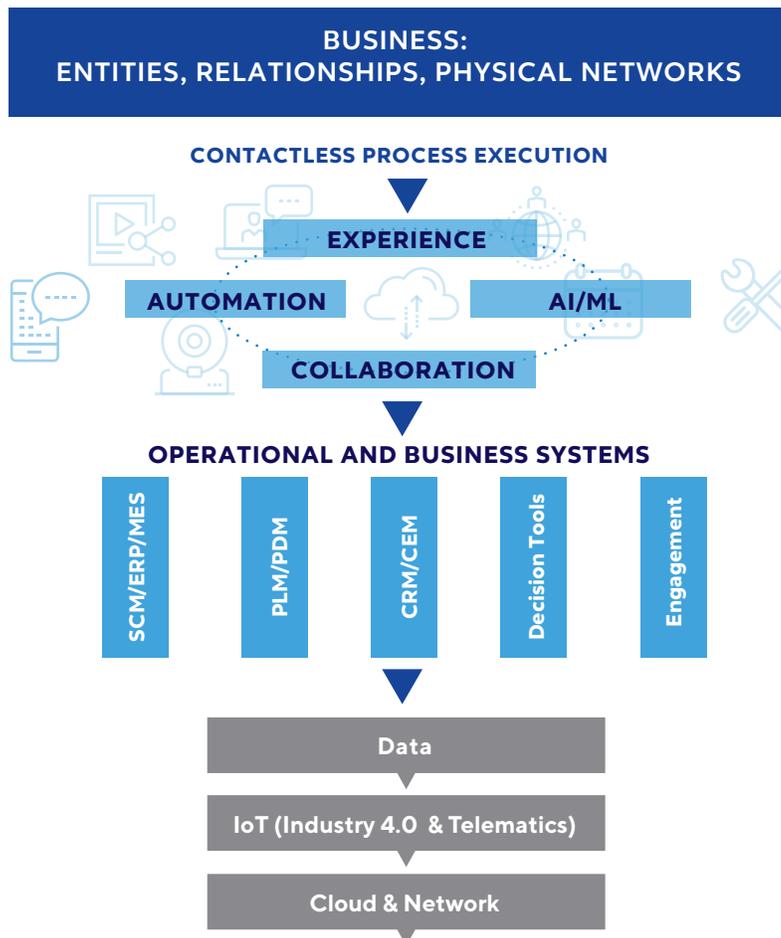


Figure 3
Source: Cognizant

Quick Take

Charting the Way for a Packaging Solutions Maker

We recently helped a global provider of packaging solutions to chart its course for becoming a modern enterprise.

Clients often undertake strategic endeavors when they have lost their competitive advantage or need to cut costs. With this client, however, the converse held true: Success was the impetus for the work. The company was executing extremely well, with a level of operational excellence that combined high utilization of its physical plant with a collaborative, flexible workforce. It was a winning equation, providing the agility necessary to meet the needs of clients looking for highly customized finished products. In this way, it was already demonstrating many of the characteristics of the modern enterprise and a digital operating model.

But this also presented a host of associated problems, ranging from complex account relationships to increasingly complicated product lines, demand volatility, the need for better talent and knowledge management challenges. As a result, the client wasn't sure its investment strategy was consistent with market dynamics and its growth aspirations.

We used our modern enterprise framework and proprietary NorthSTAR consulting methodology (see Figure 4) to identify and assess a range of disruptive business factors ranging from market dynamics driving future product line requirements to innovation initiatives. All of these factors together provided a context for digital innovation. We evaluated the company's maturity via 36 core and 60 cross-functional digital capabilities. This exercise identified the interventions and process reengineering needed to drive the client's business functions moving forward across key areas: creating integrated visibility across the supply chain; new collaborative business models enabled by a digital platform; improving worker productivity through automation and knowledge harvesting; and employee engagement. In the end, the client's executive leadership was able to adjust its transformation strategy to better serve its business and, most importantly, gain execution buy-in at the board level. The strategic plan is now being phased in via a full-time transformation program office.

NorthSTAR consulting methodology: A full-spectrum view

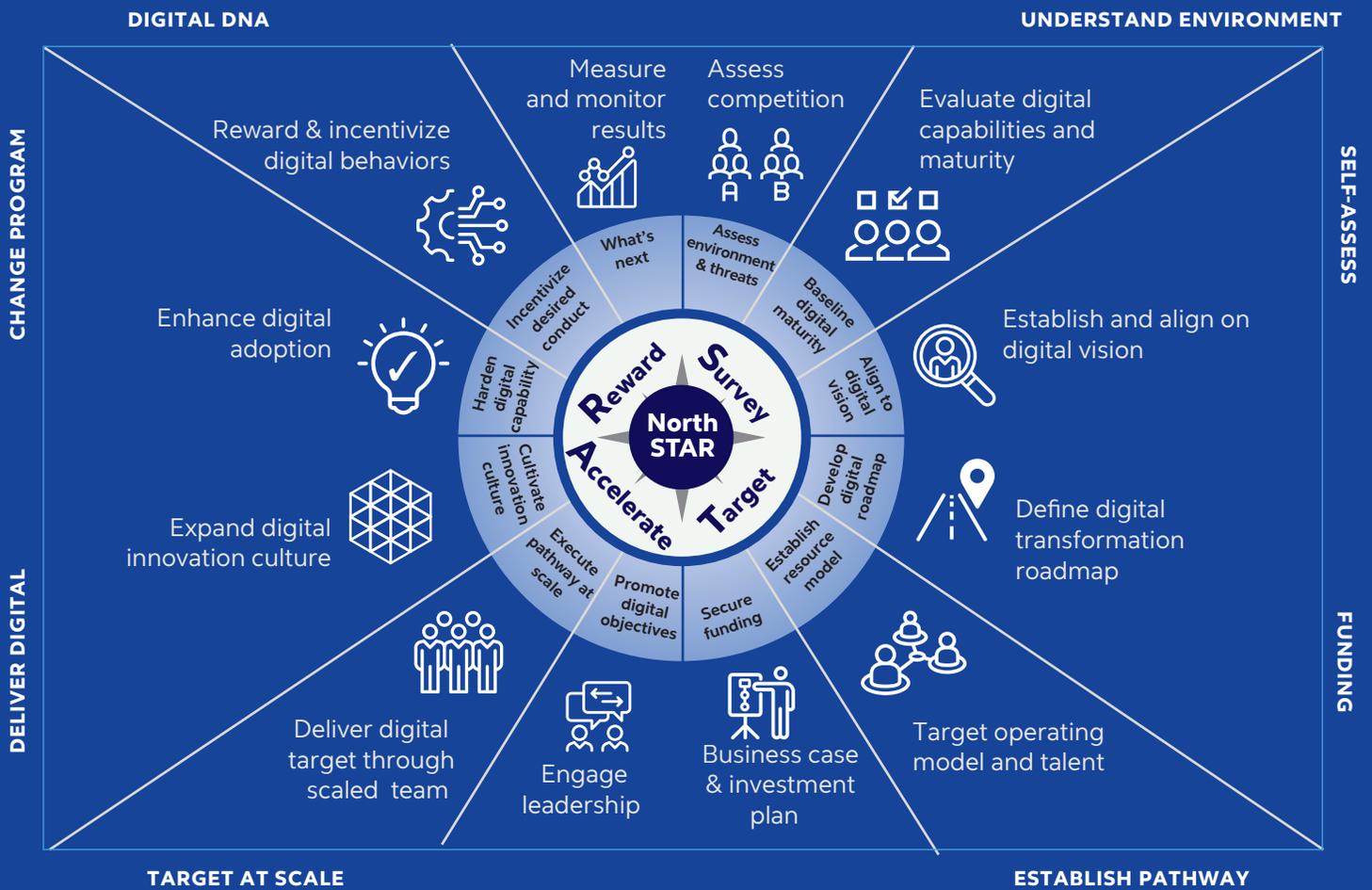


Figure 4

Moving forward

Manufacturing organizations will require a total strategic reset in these pandemic times to scale business technology change to the needs of a modern enterprise. Scenario-based brute force response mechanisms – created in the early phases of the pandemic – now need to yield to a systemic and structured transformation program to fulfill the imperatives of a modern enterprise. We recommend the following “pivots,” many of which have emerged in our work helping manufacturers during these unprecedented times:

I Innovation:

- > Reimagine the value chain flows based on end-use consumption patterns.
- > Rethink business models, products and operations.

I Demand generation:

- > Simulate demand-side changes and scenario modeling.
- > Reposition products/offers to changing needs.

I Supply planning:

- > Build inventory and alternate materials.
- > Reevaluate network configuration as a medium to long-term strategy.

I Workforce:

- > Enable “health security” measures, similar to the security measures invoked by the U.S. Transportation Security Administration following 9-11 (see more on this in our [“After the Virus”](#) special report.)
- > Facilitate virtual and collaborative workspaces (see [“Remote Work: We Did It – Now What?”](#)).

All the factors described above – agility, resiliency, speed, scale, IT-OT-PT convergence – should manifest in new processes and capabilities that deliver on the promise of a modern manufacturing enterprise. Without moving through these gates, manufacturers will remain tethered to tired old legacy approaches to working that are unfit for today’s digitally empowered times and may risk losing an opportunity to transform the business.

Endnotes

- ¹ Euan Davis & Manoj Mathew, “The Renaissance of Blue Collar Work,” Cognizant Center for the Future of Work, Dec. 11, 2019, <https://www.cognizant.com/futureofwork/whitepaper/the-renaissance-of-blue-collar-work>.
- ² Kirsten Korosec, “GM delivers first ventilators under 30,000-unit government contract,” TechCrunch, <https://techcrunch.com/2020/04/17/gm-delivers-first-ventilators-under-30000-unit-government-contract>.
- ³ “Path to Digital Leadership - Industrial Manufacturing, Cognizant/ESI ThoughtLap, April 2020, based on the original survey, “Path to Digital Leadership” of 2,491 firms, conducted from April-July, 2019.
- ⁴ Ibid.

About the author



Prasad Satyavolu

Chief Digital Officer & Consulting Leader; Manufacturing, Logistics, Energy & Utilities Business Unit, Cognizant

Prasad Satyavolu is the Chief Digital Officer and Consulting Leader of Cognizant’s Manufacturing, Logistics, Energy and Utilities business unit. He is responsible for incubating new solutions, offerings and commercialization for digital business and advisory services in these industries. Prasad has written extensively on the future of mobility and energy, connected infrastructure and manufacturing, monetization and consumer experience. In his nearly three decades of work in the industry,

he has held leadership roles and managed complex business environments. Prasad has successfully incubated and scaled several business lines, and continues to advise clients on large-scale transformation programs. He can be reached at Prasad.Satyavolu@cognizant.com | [linkedin.com/in/prasadsatyavolu](https://www.linkedin.com/in/prasadsatyavolu).

About Cognizant Digital Business

We help clients build digital businesses and innovate products that create new value – by using sensing, insights, software and experience to deliver on what customers demand in the digital age. Through IoT we connect the digital and physical worlds to make smart, efficient and safe products, operations and enterprises. Leveraging data, analytics and AI we drive intelligent decisions and anticipate where markets and customers are going next. Then we use those insights, combining design and software to deliver the experiences that consumers expect of their brands. Learn more about how we're engineering the modern enterprise at [cognizant.com/digitalbusiness](https://www.cognizant.com/digitalbusiness).

About Cognizant Manufacturing

Cognizant's Manufacturing and Logistics Practice operates as a trusted global partner to automotive, industrial and process manufacturers as well as transportation and logistics companies helping them accelerate business performance and drive growth through the power of digital. By leveraging our domain expertise and knowledge of manufacturing, transportation and logistics business processes, we're able to deliver next-gen digital solutions "in context" across the R&D, sourcing, production and aftermarket support value chain. In doing so, we enable organizations to take a holistic approach to their business, delivering systematic and structured transformation that defines the modern enterprise and delivers the promise of Industry 4.0. Our business unit has been recognized as one of the top 10 providers of manufacturing services by HfS Research for innovation, execution and voice of the client. Learn more at www.cognizant.com/manufacturing-technology-solutions.

About Cognizant

Cognizant (Nasdaq-100: CTSH) is one of the world's leading professional services companies, transforming clients' business, operating and technology models for the digital era. Our unique industry-based, consultative approach helps clients envision, build and run more innovative and efficient businesses. Headquartered in the U.S., Cognizant is ranked 194 on the Fortune 500 and is consistently listed among the most admired companies in the world. Learn how Cognizant helps clients lead with digital at www.cognizant.com or follow us [@Cognizant](https://twitter.com/Cognizant).

Cognizant

World Headquarters

500 Frank W. Burr Blvd.
Teaneck, NJ 07666 USA
Phone: +1 201 801 0233
Fax: +1 201 801 0243
Toll Free: +1 888 937 3277

European Headquarters

1 Kingdom Street
Paddington Central
London W2 6BD England
Phone: +44 (0) 20 7297 7600
Fax: +44 (0) 20 7121 0102

India Operations Headquarters

#5/535 Old Mahabalipuram Road
Okkiyam Pettai, Thoraipakkam
Chennai, 600 096 India
Phone: +91 (0) 44 4209 6000
Fax: +91 (0) 44 4209 6060

APAC Headquarters

1 Changi Business Park Crescent,
Plaza 8@CBP # 07-04/05/06,
Tower A, Singapore 486025
Phone: + 65 6812 4051
Fax: + 65 6324 4051