



MANUFACTURING 2021: THE YEAR OF THE CONNECTED WORKER

eBook



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The challenges brought by the coronavirus pandemic have created a newfound appreciation for the automation that manufacturers have been putting into place to optimize their operations. Whether assisting workers on the shop floor or helping back-office employees to continue their jobs remotely, these smart manufacturing technologies have been central to enabling business continuity in the wake of evolving safety guidelines, rapid market changes, and unpredictable supply chains.

Now smart manufacturing is entering a new phase—one where companies compete for business based on the productivity of their people. As a result, 2021 will be the year of the connected worker with manufacturers expanding their technology investments in areas that empower employees to improve decision-making and achieve greater productivity safely and working remotely when possible.

Realizing that any technology spending only matters when it removes roadblocks or accelerates a person's productivity in 2021 and beyond, let's look at the top nine priorities for this coming year.



1. BRIDGING THE SKILLS GAP IS A TOP PRIORITY

The competition for jobs in the service sector over those in manufacturing is only increasing. Black Friday in 2020 was the largest shopping day in U.S. history, reaching \$10.8 billion according to Adobe's Digital Insights Report, which also predicts a 33% increase in e-commerce sales this holiday season.

The upswell in e-commerce and big-box sales online is creating thousands of new jobs each month. Manufacturers' only real choice for attracting and retaining the workforce they need is to pay more and offer more compelling work environments. Digital transformation has two immediate impacts. It automates previously manual tasks, and it eliminates some of the more mundane work on the shop floor. The result is lower labor costs and a more interesting or challenging working environment.

This is a primary driver behind enabling the connected worker. The idea is to create digital work center consoles that guide, record and inform workers so they can quickly step into a work center, know what to do and how to do it, and take whatever manual actions might be necessary to complete a particular production run.

Examples might be:

- Cycle times should be 20 seconds +/- five seconds
- Flash bigger than 1mm is rejected
- Critical dimension measurements that must be made every 10 parts

With the rapid turnover in job mix and in the hourly labor performing these jobs, the ability to quickly and digitally direct a worker to take the exact steps related to a particular job creates faster change overs, requires less training, prevents the most common types of human errors, and significantly increases labor flexibility.



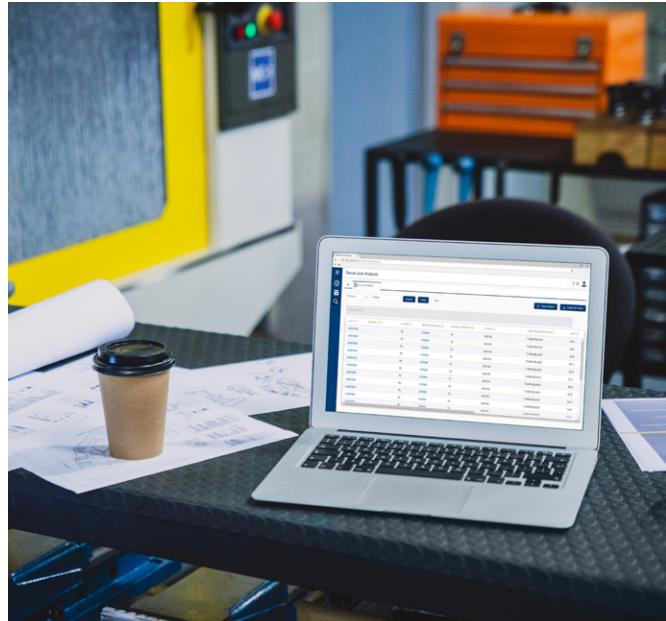
Other important technology trends in addressing the continued shortages in skilled manufacturing labor include:

- Robotics for automating manually intensive, repetitive tasks—such as end-of-arm assembly, labeling, pick and place, packaging, stacking, and palletizing—will become more commonplace in 2021 to reduce the need for labor.
- More intuitive, touchscreen-based shop floor interfaces to enterprise resource planning (ERP) and manufacturing execution system (MES) software will improve production efficiency. Key benefits of this new class of interface include streamlining access to data and real-time insights, improving quality, and reducing costs.
- Real-time analytics will provide associates the information they need for creative problem solving to improve production throughput and quality.
- Digital training tools will reduce training time by as much as 75%, further increasing the expertise and knowledge of production team members across locations, according to the World Economic Forum.

2. ERP IS CENTRAL TO BUSINESS CONTINUITY

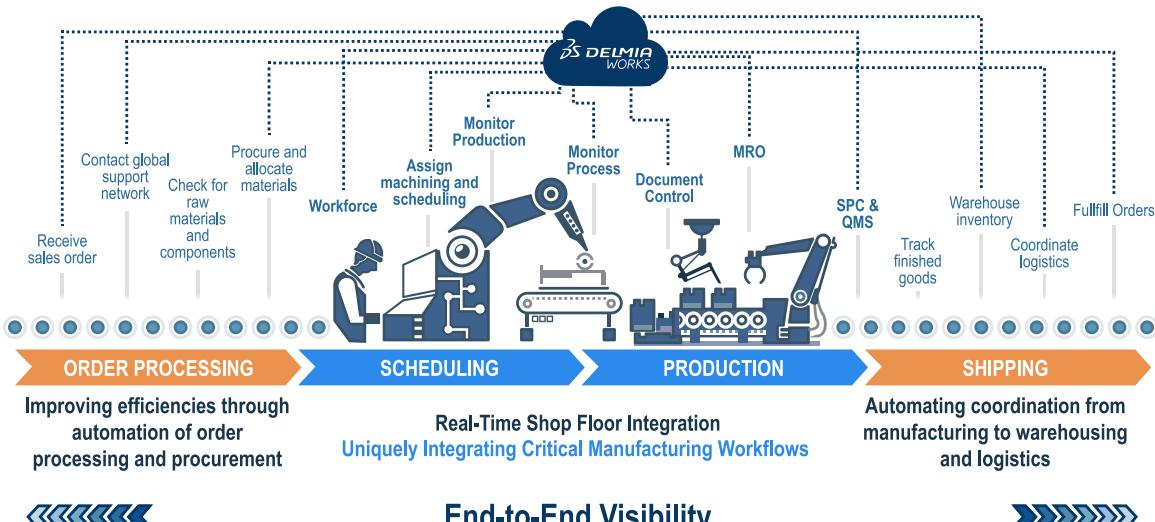
Enterprise resource planning is no longer optional. In 2020, ERP went from being a way for manufacturing firms to improve their operations to becoming the foundation of ensuring business continuity. Top-performing manufacturers are using real-time insights from their ERP systems to manage shifts in market demand, keep production on track, and empower employees to do their jobs whether working onsite or remotely. They will continue to thrive despite the market uncertainty that could remain for another year.

Manufacturers are now using a combination of ERP and MES to minimize their onsite shop floor staff by precisely scheduling work; dispositioning materials, and monitoring equipment for output, quality and maintenance issues in real time. In other words, manufacturers are managing the shop floor by exception rather than rote supervision.



Manufacturers are also increasing adopting the more finely tuned financial reporting provided by ERP systems to better understand how stable sales, revenue and production forecasts are for the coming year. Knowing with greater certainty how variations in manufacturing operations impact financial statements will be a cornerstone in measuring the company's progress in meeting revenue and cost management goals.

The last year has also underscored the importance of having a 360-degree view of a business. The most informed manufacturers are those taking advantage of real-time process and production monitoring data from the shop floor in their ERP, manufacturing execution system (MES), quality management system (QMS), and warehouse management system (WMS) software—all running on a single database.



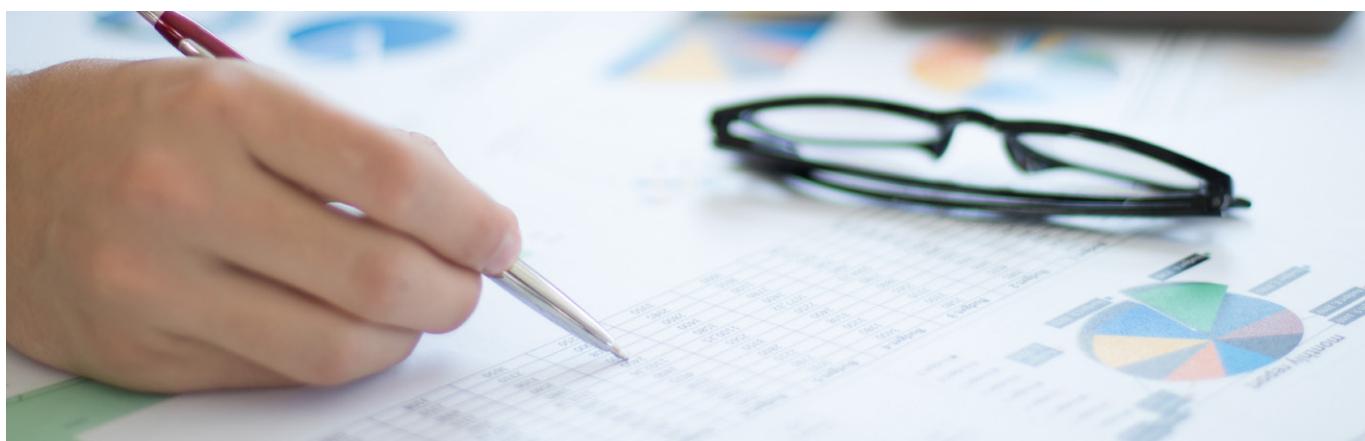
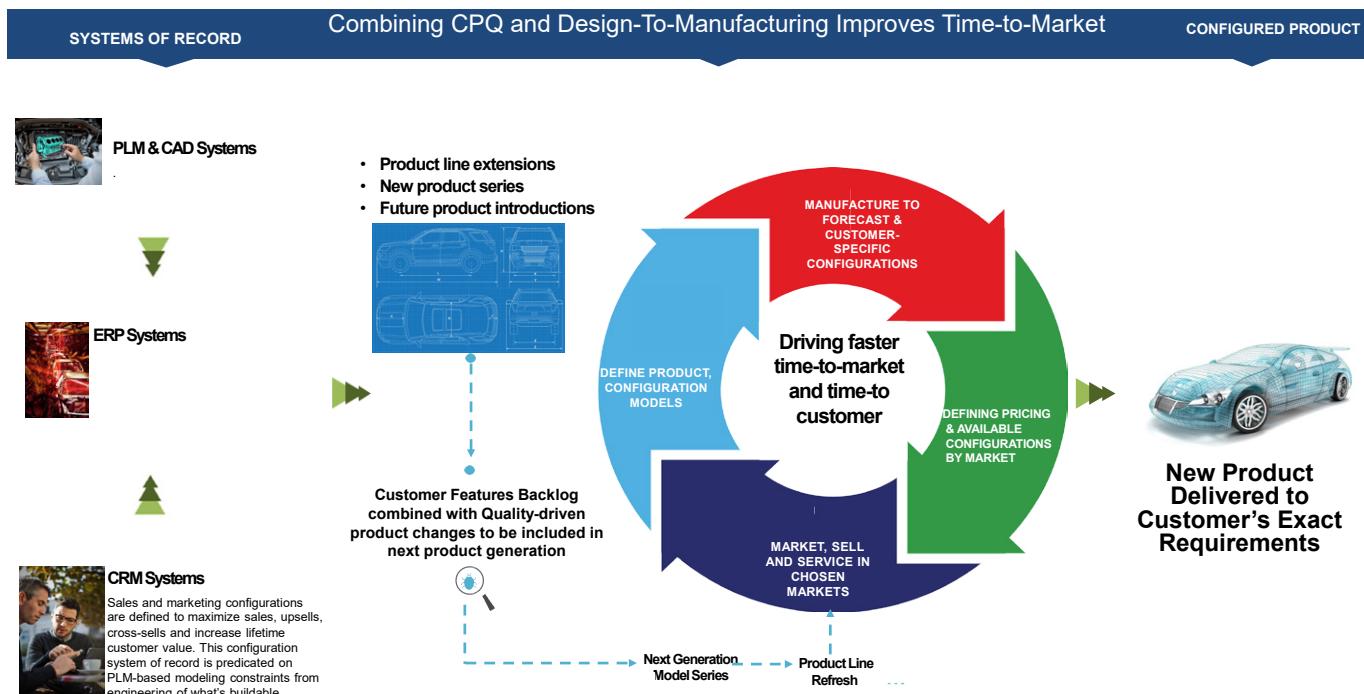
Setting people up to excel across every factory floor starts with end-to-end visibility based on verifiable, trustworthy data. By having all manufacturing systems rely on a single database, employees gain a level of visibility that is difficult and costly to attain with disparate.

3. QUOTING AND PRICING WILL GET A MAKEOVER

In the past year, manufacturing has seen demands for faster time-to-market, greater channel visibility, and more visually compelling quotes of custom-configured products using 3D images. Turning these challenges into more revenue starts with a configure, price, quote (CPQ) tool, which guides users through a workflow to review available options and select the configuration and pricing that best meet their needs.

The most effective CPQ tools are those made available as part of a modern ERP system due to the accuracy and timeliness enabled by working from the same data. This translates into the ability to improve price management and control across channels, increase margins, and reduce order errors in the process, which in turn, helps speed time-to-market and preserve margins during a turbulent, uncertain time. As manufacturers move into more digital channels in 2021, having a streamlined CPQ process within the ERP system will become an even greater competitive advantage.

Also foundational to success with CPQ will be adopting design-to-manufacturing, which further accelerates time-to-market by speeding up new product development cycles, improving product quality, and increasing yield rates. A unified design-to-manufacturing will integrate the ERP system with diverse production systems encompassing simulation/finite element analysis (FEA), electrical, computer-aided manufacturing (CAM), inspection, and work instructions. Then, by adding CPQ to this platform, manufacturers can stop the revenue leaks and earn more margins and profits, as the graphic below shows:



4. REAL-TIME INSIGHTS DRIVE THE SHOP FLOOR AND BACK OFFICE

"Rapid" has taken on new meaning in the wake of COVID-19, as many manufacturers tightened their reporting from weeks to days and from days to hours. Whether responding to rapid changes in market demand or shifts in the supply chain, manufacturers have relied on real-time data to quickly make informed decisions.

Over the last few years, we have seen real-time visibility gain importance on the shop floor. Real-time process and production monitoring have been instrumental in giving manufacturers insights into capacity that have allowed them to take on additional business, as well as identify potential issues before they affect product quality or delivery times. Manufacturers are also using real-time production monitoring in combination with MES and quality management software to run lights-out manufacturing shifts.

Now real-time visibility is headed into the back office. The shift is particularly marked in financials as manufacturers have less in cash in the bank and want to trust that the revenues they are generating are real. This is where ERP has really earned its stripes. CFOs are riding hard on the cash that is in the bank, and they are using ERP systems to monitor accounts payable and cashflow.

In 2021, manufacturers will increase their use of real-time process and production monitoring to assess and reduce risk, relying on insights from these systems to provide an early-warning system of factors that could impact revenue and margins. Knowing that every machine, process, and system is operating and stable brings greater stability to production and revenue forecasts and, ultimately, financial results. A move to augment this knowledge with predictive analytics is gaining momentum as manufacturers strive for the most accurate sales and margin forecasts they can get.

In 2021, production and process monitoring will gain added momentum across a broader base of manufacturers driven by goals to:

- Enable higher levels of inventory control accuracy and performance across all production locations.
- Improve cycle times and reducing scrapped parts by using real-time data to better manage and optimize against constraints.
- Continually improve product quality by using real-time data for statistical process control (SPC).
- Attain higher compliance and traceability levels by receiving data directly from any machine on the shop floor in real time.
- Improve production plan performance by attaining greater schedule accuracy.
- Convert more sales quotes and proposals into orders by providing real-time available-to-promise (ATP) and capable-to-promise (CTP) dates on all standard or custom product configurations.
- Prolong the life of the equipment, machinery, and tools using real-time data to predict when maintenance, repair and overhaul need to take place.
- Reach a new level of accuracy, quality, precision, and speed with internal and regulatory audits. Notably, for highly regulated industries, such as medical devices, food and beverage, and aerospace, having real-time data can reduce the time taken to get audits done from weeks to days.
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5. SHORTER, PREDICTABLE PRODUCTION TAKES CENTER STAGE

The past year has led to unprecedented uncertainty, and customers are turning to companies that can deliver quality products, quickly and predictably on time. We've seen that manufacturers who can meet this demand are growing their business by 115% or more, and they are able to preserve or raise their prices to retain their margins.

Notably, standard timeframes for product development and initial production runs in 2021 will be significantly shorter than they were at the start of 2020. We were already seeing compressed timeframes to meet demands for more customized, short-run orders. However, skyrocketing demand for a range of medical, pharmaceutical and consumer products in the wake of COVID-19 has accelerated this shift.

In the past, companies might take six months to get a new production line up and running; now they are doing it one month. ERP systems that support pre-built manufacturing processes will become necessary as manufacturers look to gain more short-notice production runs across a broader customer base while launching new products of their own.

Moreover, manufacturers that have integrated their ERP and computer-aided design (CAD) software will be among the most agile in tightening the time it takes to develop a new product and get it into production.



6. IOT BECOMES MAINSTREAM

Smart sensors and low-cost, low power edge devices capable of capturing a greater variety and volume of data are becoming part of mainstream workflows of production monitoring. Already, for the last few years, we've seen an uptick in manufacturers investing in either upgrading their existing machinery with IoT sensors or buying new smart, connected machines. More recently, there's been a bigger push to buy new, smart equipment.

The driver can be as simple as monitoring the number of cycles on a machine and predicated maintenance needs rather than having maintenance staff walk the floor looking for machine issues. Or, it can be a more complex digital transformation, like measuring critical dimensions with digital scanning devices and alerting for issues through SPC-type process monitoring intelligence.

We will see a growing use of smart, connected machines that produce statistical process control data, build SPC graphs, and keep themselves in compliance by automatically self-regulating themselves-- all based on their own real-time monitoring algorithms. Early adopters of these smart manufacturing machines are already starting to see dividends from their investments in more machinery uptime, higher yield rates from production runs, and new insights into how to improve manufacturing efficiencies.

IoT's adoption in manufacturing will closely resemble how analytics was first adopted in manufacturing decades ago. IoT initiatives will live or die based on how well they do the following things in 2021:

- Define a compelling business case that goes beyond monitoring machines or people to reduce costs and seek new productivity and growth opportunities based on the data analyzed over time—for example, finding new ways to free up production time and sell short-notice production runs for higher margins.
- Remain committed to an effective change management strategy and provide everyone whose job is affected by IoT monitoring an opportunity to gain greater mastery of the technology as they relate to their jobs.
- Set and stay committed to measurable goals to keep IoT from flooding the business with terabytes of interesting yet useless data.
- Realize that existing security approaches won't scale for the proliferation of threat surfaces that a successful IoT implementation has and that a "zero trust" approach is essential to protect networks as they grow.

7. COMPLIANCE EXPERTISE IS A COMPETITIVE ASSET

In the wake of the pandemic, manufacturers have started looking at regulatory auditors, as teammates to ensure that higher levels of compliance and new levels of quality are consistently achieved. There is a general sense that we are all in this together, which will continue into 2021 and beyond.

Customers in regulated industries— notably food and beverage, medical products, and pharmaceuticals—value manufacturers who are experienced in gaining certifications, collaborating with regulatory auditors, and staying in good standing with compliance organizations, all of which turns into a formidable competitive advantage.

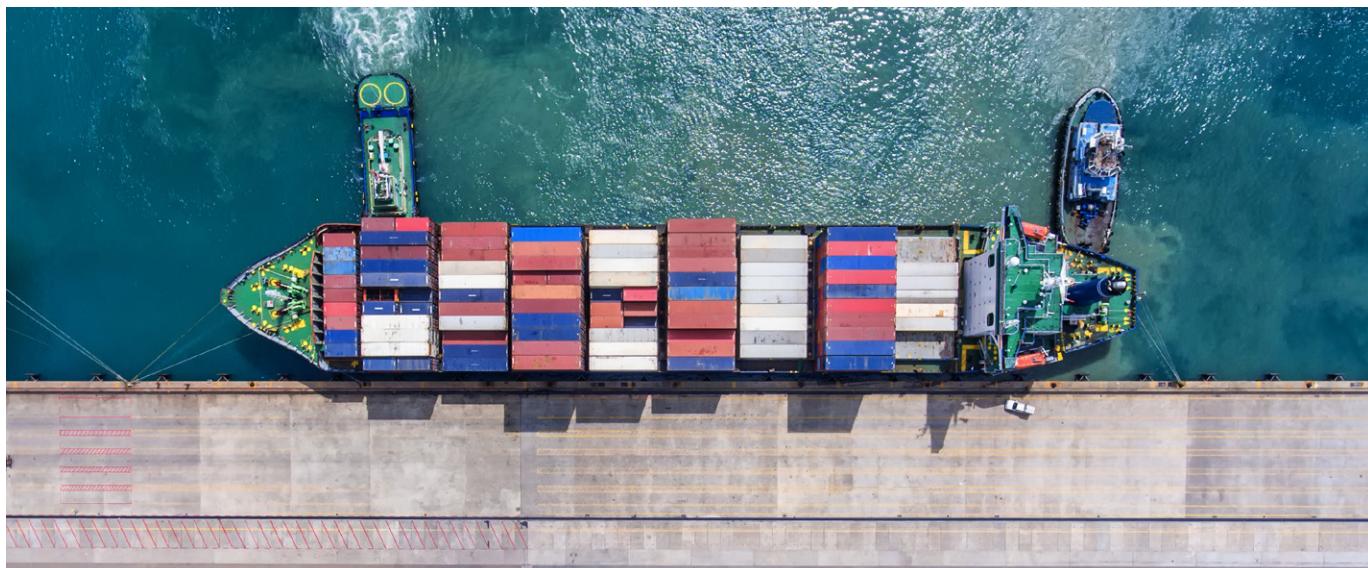
These dynamics are occurring across all of manufacturing with contract manufacturers seeing the greatest gains by offering their compliance expertise to brand manufacturers. What's especially attractive to brand manufacturers in pharmaceutical plastics and medical devices is that contract manufacturers have the compliance certifications today that otherwise might take a brand manufacturer year or more to complete on their own.

Providing proof that inbound supplier shipments to a manufacturing facility are clean and in compliance with health and safety regulations will become an even greater competitive strength in 2021. Tier 1 suppliers, including major automotive companies, are reshoring their supply chains and working with manufacturers on anticipated audit, health, and safety requirements for 2021.

One example of how manufacturers are getting ready for these requirements is the rapid adoption of trace-and-trace today in anticipation of more generous data sharing and collaboration with their customers in 2021 and beyond. Acumen Research & Consulting predicts that global demand for manufacturing traceability, including track-and-trace software, will reach \$7.2 billion by 2026, achieving an 18% compound annual growth rate (CAGR).

Factors making track-and-trace and supply chain visibility high priorities for manufacturers in 2021 include:

- The need for health and safety is leading to a track-and-trace renaissance across all manufacturing sectors today as every business strives to keep its employees, customers and suppliers safe.
- Troubleshooting how a defective part was first introduced into production can save revenue and margins on product life cycles that otherwise may have been lost.
- A well-managed track-and-trace system helps reduce inventory shrinkage by providing greater visibility and control across supply chains.
- Track-and-trace also strengthens production scheduling accuracy and efficiency by providing more visibility into assembly, part and component inventory.
- Supply chain track-and-trace will prove foundational to manufacturers' quality management and compliance strategies.
- Track-and-trace is part of manufacturers' race to digitally transform their supply chains and gain the insights to reduce risks to employees, customers, partners, and the business itself.



8. SUSTAINABILITY IN MANUFACTURING OPERATIONS GAINS MOMENTUM

Multiple factors are leading manufacturers to increasingly embrace sustainability best practices. Key motivators include a desire to become a good steward of the environment, the financial benefits of sustainable practices, demands for regulatory compliance, or some combination of these drivers.

Typically, sustainability initiatives will start their suppliers and progress through process redesign to reduce waste. This is followed by packaging and product lifecycle improvements to further accelerate sustainability across manufacturing operations. Additionally, design-for-sustainability will motivate manufacturers to create new biodegradable products, lighter-weight products, and recyclable packaging materials.

More manufacturers will also acquire smart, energy-efficient production equipment while retooling production lines to achieve even greater sustainability in 2021. Today's smart machines consume an order of magnitude less energy than older equipment. They produce fewer scrap parts, improving profits and lowering the manufacturing footprint on the environment. Additionally, they require less direct labor.

9. DIGITAL TWINS AND MODELING GAIN GREATER PROMINENCE

Like digital transformation on a more strategic level, digital twins are having a breakout year as the pandemic created a greater urgency to improve than the most compelling business case ever could. Manufacturers are piloting digital twin-based projects to ensure employee safety, create more self-contained work centers, and improve machine uptime. Digital twins are also being used to reduce new product risk and provide greater financial visibility by validating that new product designs are buildable and will be profitable once produced and sold.

At the same time, modeling is the cornerstone of how manufacturers are adopting the design-to-manufacturing strategies that have proven so effective this year in accelerating time-to-market, improving yields, and most important, serving customers. Modeling's inherent design attributes are continually being augmented with new data and intelligence that becomes part of the design-to-manufacturing process. Look for design data structures, files and processes to become even more integrated with manufacturing, engineering, sales and service in 2021.

CONCLUSION

The smart manufacturing technologies that enabled business continuity in 2020 will continue to play a central role in enabling manufacturers to compete for business based on the productivity of their people. By expanding their technology investments to address the nine priorities outlined here, manufacturers can empower employees to improve decision-making and achieve greater productivity in 2021 and beyond.

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