

Smart manufacturing requires always-on connectivity that allows people, processes, and business applications to accelerate business output and drive operational agility. The legacy nature of most manufacturers means that succeeding in the digital-first economy requires a new and holistic focus on adaptability.

Building a Resilient and Adaptable Foundation for Manufacturing

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Introduction

Expectations for more personalized products, deliveries, and services, combined with the current period of systemic change, are driving opportunities for manufacturing companies to transform how their operations stay aligned with their markets. Lean and other types of continuous improvement philosophies used by operations teams in factories and plants will always be important. These methods have benefited manufacturers as they pushed for operational excellence. However, the key to success moving forward will be to become more innovative, market driven, and responsive. The rapid pace of change has led the industry to start defining its future success by how well it can react and adapt to market disruptions.

Manufacturers have encountered many challenges in their efforts to become more resilient, but one of the most cited issues is outdated/legacy infrastructure. Most manufacturers tend to rely upon a mix of plants, assets, and technology systems that are decades old and limited in functionality. Manual or paper-based processes are frequently relied upon, and even if data is collected, it is often trapped in silos across manufacturing operations. This situation results in information being difficult to access and analyze, hindering the ability to make the most effective decisions in the necessary time frame.

Even as operations have started to ramp back up to pre-pandemic levels, the impact of disruption on the manufacturing industry has driven organizations to address these issues by prioritizing connectivity to keep further business disruption at a minimum (see Figure 1).

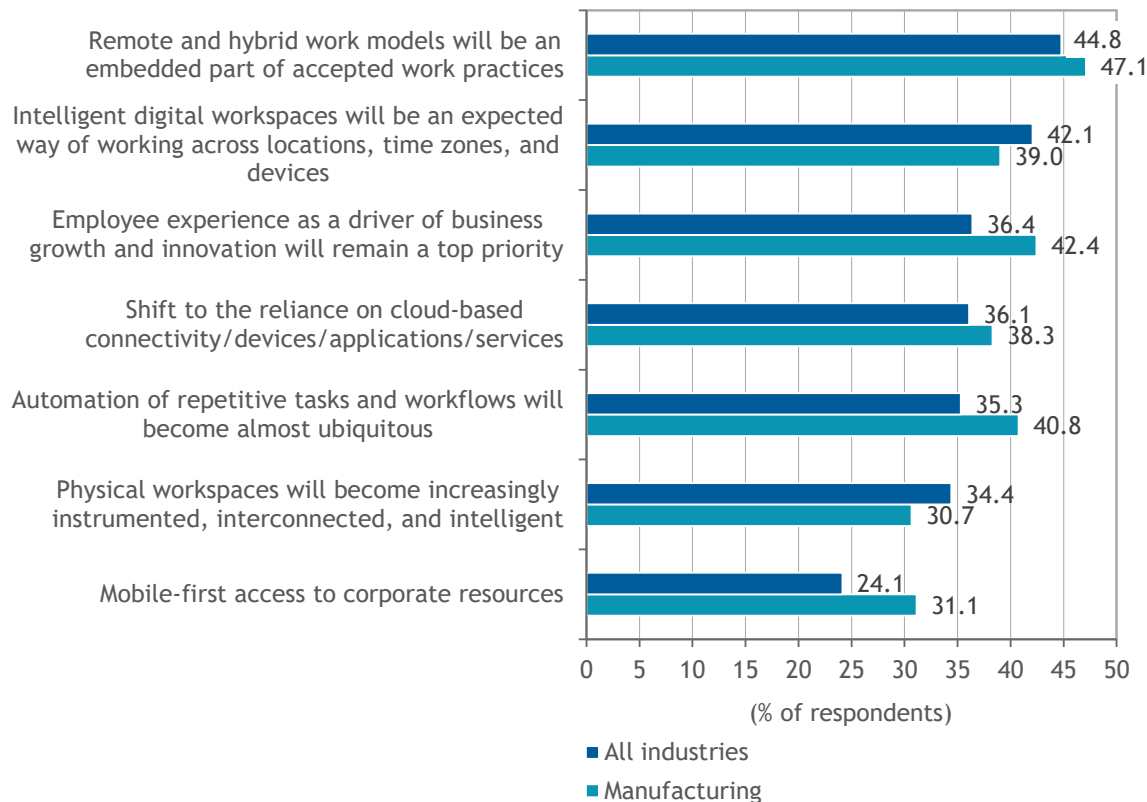
AT A GLANCE

KEY STAT

According to IDC, operational data generation is expected to increase 3–5x over the next 5 years.

KEY TAKEAWAY

Connecting business processes to eliminate silos and apply analytics to newly expanded and contextualized data removes bottlenecks and empowers workers to make rapid and confident decisions.

FIGURE 1: **Connectivity and Adaptability Underlie Permanent Changes from the Pandemic**

n = 858

Source: IDC's Future Enterprise Resiliency and Spending Survey, Wave 11, December 2021

Transforming Outdated Manufacturing Organizations into Smart and Adaptable Enterprises

Leading manufacturers are prioritizing data movement and maximizing value as key requirements of digital transformation. IDC predicts that operational data generation will increase 3–5x over the next 5 years, as an increasing number of devices are connected and smart processes drive increased data volumes.

Resilient and adaptable operations require a scalable, flexible, and intelligent network strategy that ensures that people, processes, content, devices, and systems are all connected and providing accessible, trusted, real-time insights. Strategic investments should address:

- » Robust network security that ensures the business is protected against rogue agents, viruses, and DDoS issues to reduce the risk of disruption or stoppages
- » Adoption of complementary network technologies (e.g., Wi-Fi 6 and 5G) across factory locations, distribution centers, and other campuses to ensure pervasive and consistent coverage to keep systems connected and operations resilient

- » Data-driven processes that enable real-time insights to understand performance and predict future activities
- » Scalable performance that reduces latency, enables faster time to production, and improves business agility regardless of business demands
- » Visibility into network traffic needs, aligned to business demands
- » Collaboration capabilities that allow employees to stay connected to tools and data that keep them productive and effective

Benefits

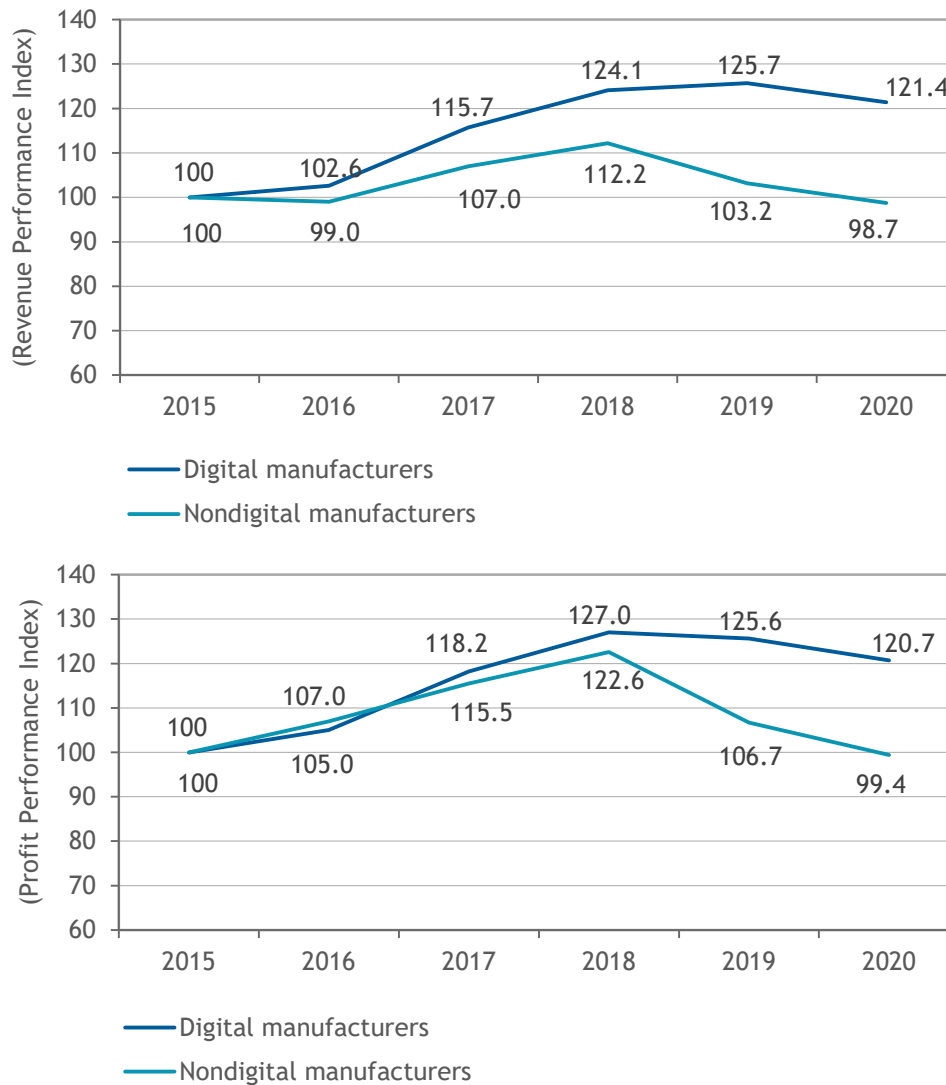
When trusted connectivity becomes a central foundation for enabling resilient decision making, manufacturing organizations can predict or respond to larger and potentially longer-term disruptions more quickly. It also helps the organization deftly navigate the multitude of smaller "divergences" that occur almost continuously within global operations like fluctuating demand or variations in supplier quality. Benefits include:

- » **Improving asset management.** While a core aspect of smart manufacturing, transforming the asset management process through remote monitoring, diagnostics, control, and predictive analytics can serve as the foundation for adaptability. Many manufacturers still rely on aging infrastructure that makes managing assets more proactively a challenge; connecting these assets is a critical first step. Traditional preventative maintenance processes are slow and generally ineffective, but strategic asset management will put an emphasis on condition-based monitoring and predictive analytics to raise the availability of critical factory assets. With unplanned outages costing the industry billions per year, and a limited supply chain for replacement parts, predictive maintenance is key to preventing delays and maintaining customer satisfaction.
- » **Increasing automation.** While manufacturers are much more automated today than they were five years ago, significant opportunities to leverage faster networks and more connected devices remain. Resilient decision making through automation not only speeds decisions with prescriptive support but also potentially limits dependency on human involvement in more repetitive tasks. For an industry facing a widening skills gap, the role that automation and digital technology will play in curbing its impact is an important one to consider. In addition, greater connectedness across systems and applications and the use of real-time data-driven insights accelerate decision making, allow organizations to adapt and effect change during times of crisis, and address an overall need to draw insights from the rapidly growing amounts of data being generated and ingested by the organization.
- » **Enabling remote/hybrid work.** While remote and hybrid work models have been shown as essential to business continuity and are expected to be long-term enablers of manufacturing success, these models are not well-known within the manufacturing industry. In fact, over 40% of manufacturers say that their work models will need to be redesigned to support a hybrid workforce, the top permanent change cited by the industry (source: IDC's *COVID-19 Impact Survey*, September 2020). Manufacturers need to increase investments to improve network bandwidth and security for remote and onsite workers. Flexible work options will also play an important role in attracting young talent that the industry has struggled to appeal to currently.

Digital Manufacturing

Trusted connectivity is one of the cornerstones of digitization and has long been a priority of the adaptable enterprise to drive operational agility. In IDC's *Digital Manufacturing Study* of 680 publicly traded manufacturers, there is a clear advantage that occurs over time for organizations that embrace digital technology. Over the study's six-year period, digital manufacturers benefited from a 26% increase in their revenue performance index (RPI) and a 27% increase in their profit performance index (PPI); during this same time, nondigital manufacturers experienced decreases of 9% (RPI) and 2% (PPI) (see Figure 2).

FIGURE 2: *Importance of Digital Technology Toward Sustainable Operations*



n = 680 publicly traded manufacturers

Source: IDC's *Digital Manufacturing Study*, February 2021

However, the biggest takeaway from the study is how the gap between the two groups increases over time. There are many companies that have already acted, using digital technology to become more adaptable, and they are reaping the benefits. This gap has only increased from COVID-19, as manufacturers with digital investments and a connected strategy already in place were able to adapt much faster than those without. The question nondigital manufacturers need to ask themselves is how much longer they can wait. The more time that passes without taking any action, the more of an advantage their peers experience. In today's highly competitive manufacturing environment where disruption can occur at any moment, companies cannot risk inaction.

The increased adoption of cloud technology by manufacturers has played a large role in the improvements experienced. However, the business resiliency benefits from cloud systems are now one of the largest drivers behind investment in faster, more resilient networks. In addition, the benefits of adaptability can be even more impactful, especially for the line of business. The amount of data that can be analyzed in the cloud is where true value is generated, as manufacturing organizations can now analyze larger data sets and drive improvements across multiple plants and locations.

As manufacturers aim to become more market driven and better prepared to pivot, the cloud's ability to optimize operations can only be realized when paired with 5G, edge, and other connectivity assets that can provide resilient transport of data between critical business resources. The future of manufacturing will require an edge to cloud strategy, something that many organizations are still in the early planning stages of development. Manufacturers need to ensure that resilient networking enables business processes that determine which workloads will move to the edge and which workloads will move to the cloud.

Having the proper foundation in place also allows a company to be better suited to take advantage of innovative technology. AR/VR tools can be used to improve worker productivity and allow remote experts to collaborate no matter their location. Digital twins, or virtual representations of products and assets, is a growing concept and can be used to manage multiple aspects of a manufacturing business, including highly complex, customized products and connected assets, such as manufacturing plants or facilities and the assets within them. Data and processes from multitier supply chains, service plans and execution, and the operating environment perpetually feed digital twins to ensure the most up-to-date view of the past, current, and future performance and condition of products, assets, facilities, and plants. Manufacturers will need a way to access and manage the influx of data from new technologies like AR/VR or digital twins, making connectivity a critical enabler.

Considering Lumen

Lumen is a global technology company headquartered in the United States that offers network and collaboration services, security, cloud connections, edge infrastructure, and managed services. Lumen works across all manufacturing segments and geographies, with solutions focused on enabling Industry 4.0 by creating an advanced application delivery architecture that is designed specifically to handle the complex and data-intensive workloads of next-gen technology and businesses.

Lumen offers a mix of cloud, edge computing, and security solutions to enable connected factories and adaptable operations. The Lumen Edge platform is focused on latency-sensitive, data-intensive applications where performance and speed are priorities. As well as distributed, cloud-agnostic connections deployed on Lumen's global fiber network and

60+ planned edge market nodes are designed for 5ms of latency or better. Lumen's platform connects the global cloud core to the distributed network edge, enabling software apps to run where they have the greatest impact for the digital business.

This platform is run over Lumen's global infrastructure in an agile model that addresses three core IT architectural imperatives:

- » High-performance dynamic connections able to reach hundreds of thousands of locations and clouds globally
- » Hybrid cloud infrastructure that gives customers a range of cloud and edge computing options designed to meet the performance requirements of their business logic
- » Service orchestration, which enables the deployment, management, and security of software workloads everywhere Lumen's network reaches

Lumen has combined the talent, experience, infrastructure, and capabilities of CenturyLink, Level 3, and 25+ other technology companies to create a new company designed specifically to address the dynamic data and application needs of digital operations and Industry 4.0.

Challenges

Lumen faces the challenge of overcoming the perception that it is only a network-focused company. While Lumen's network can be a strategic advantage, the company still needs to raise market awareness among manufacturers by showcasing its managed services and private cloud infrastructure. Also, Lumen offers solutions across a wide range of industries beyond just manufacturing and will have to compete with providers singularly focused on the industry. This includes SaaS providers and hardware and control systems manufacturers that have their own managed services, SaaS, and cloud offerings. Lumen's ability to stand out among a growing crowd will require it to bring the right combination of its platform solutions and services together to achieve the outcomes that manufacturers prioritize.

Conclusion

The manufacturing environment is changing faster than ever before. As the industry comes to terms with this shift, those organizations that embrace adaptability will become the most successful. Operations play a critical role in enabling this resiliency; manufacturers need to ensure that they have the digital foundation in place. The improvements that can be realized through data-driven decision making are too important to ignore. Modernizing the manufacturing environment through connectivity and digital technology such as cloud, edge computing, and analytics can no longer be overlooked and will play a key role in turning all this operational data into actionable insight.

About the Analyst



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Reid Paquin is Research Director for IDC Manufacturing Insights responsible for the IT Priorities & Strategies (ITP&S) practice. Mr. Paquin's core research coverage includes IT investments made across the manufacturing industry and manufacturers' progress with digital transformation. Based on his background covering the manufacturing space, Mr. Paquin's research also includes an emphasis on the technology enablers that help manufacturing executives make better-informed operational decisions.

MESSAGE FROM THE SPONSOR

Lumen is a technology company that enables organizations to benefit from emerging applications that power the 4th Industrial Revolution. We deliver the fastest, most secure platform for next-gen applications and data to help manufacturing companies deliver amazing experiences.

Lumen solutions integrate network infrastructure, cloud connectivity, edge computing, connected security, voice, collaboration, and enterprise-class services into an advanced application architecture across industries. As technology advances the way we live and work, and as data is dramatically shaping the future, Lumen is working relentlessly to unleash the potential of data, leading to more capable and efficient edge computing and pervasive technologies across devices, systems, and workloads.

Learn more about how Lumen supports the manufacturing industry customers, visit:

www.Lumen.com/manufacturing.

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