

An Initiative of BSA | The Software Alliance

# Manufacturing

## Digital Tools Transform How Things Get Made

From the early days of mass production to Henry Ford's invention of the assembly line, a manufacturer's success has hinged on creativity. Today, software-enabled innovations are enabling creative thinking about what to make and how to make it, and they are overhauling the manufacturing industry from top to bottom. In turn, digital transformation introduces a range of new issues for the manufacturing industry—issues that will require a new level of policy innovation as well.

Today's software advances expand opportunities throughout the manufacturing process—creating once-impossible design ideas, implementing cutting-edge software-enabled production tools, and taking today's everyday products and modernizing them by adding in the possibility of software from the very beginning. Along the way, all these advances are creating new jobs and revolutionizing the workforce.

Data lies at the heart of these innovations. The ability to effectively move, analyze, and build on enterprise data will be essential to the new generation of manufacturers. This also means that manufacturers will be increasingly impacted by public policy decisions in Washington, Brussels, and across the globe on technology issues such as artificial intelligence (AI), data privacy, cybersecurity, and digital trade. In addition, cultivating a skilled workforce for the digital transformation age will be critical for stakeholders throughout the manufacturing industry.

#### A NEW AGE OF MANUFACTURING

Today's digital tools transform the manufacturing process from beginning to end.

In the initial stages of product design, manufacturers can now develop prototypes more quickly and test them more thoroughly using Al-enabled 3D design software.

At the production stage, a new era of employees input these digital designs directly into software-enabled 3D printers, CNC machines, and computercontrolled welders that make things with digital precision.

These smarter factories, in turn, turn out smarter refrigerators, TVs, and other devices that can send data back to manufacturers, who can update the device software and design new features.

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## → 2025 global digital transformation (DX) spending among companies in discrete or process manufacturing industries will total more than \$816 billion.

New IDC Spending Guide Shows Continued Growth for DigitalTransformation as Organizations Focus on Strategic Priorities (November 2021).

## Technology Fuels Modern Manufacturing

The factories of the future are here, and they are implementing new software-enabled technologies that allow for increased revenue, improved productivity, enhanced safety, and greater sustainability.

### **Digital Twins**

Before even starting a production line, today's manufacturers can "build" a computerized model of what they plan to make. These so-called digital twins allow manufacturers to test their products in a multitude of different scenarios. By using Internet of Things (IoT) data and AI, digital twins can help improve goods, predict the need for maintenance, increase energy efficiency and safety, and determine the best production processes.

#### DX AT WORK

At the start of the COVID-19 pandemic, **Medtronic** design specifications for ventilators with permissive licenses to speed production of these high-demand devices across the globe. Using digital twins and other technologies, **Siemens** leveraged its digital enterprise portfolio to help manufacturers conceptualize and simulate operations to help meet these needs, ensuring greater efficiency and safety across supply chain, production, and quality control processes.

Siemens now also has a strong collaboration with **Unity Technologies** to couple its simulation software with Unity's 3D capabilities and Robotics Hub. This interface makes the software more open, shortens timeframes for new application development, and improves products overall.

→ More than 90% of manufacturing leaders believe that DX is important for their success.

PTC, Drive Transformational Outcomes and Achieve Impact at Scale.

## 91% of senior manufacturing leaders have increased digital transformation investments in the last year.

Fictiv, 2021 State of Manufacturing Report.

## Additive Manufacturing & 3D Printing

Additive manufacturing is the process of creating an object by building it one layer at a time. Most commonly associated with 3D printing, these technologies combine sophisticated software and hardware to take products directly from digital to physical using materials as wide-ranging as metals, polymers, gels, and even biomaterials. Supplementing traditional methods, manufacturers use 3D printing to enable highly customizable components, on-demand manufacturing, and an iterative design process which improves product quality and creates production efficiencies over more complicated supply chains.

#### DX AT WORK

To execute on bold electrification goals, **General Motors (GM)** needed to produce lighter vehicles with a shorter supply chain. Building on the capabilities of generative design and additive manufacturing, **Autodesk** software allowed GM engineers to design a proof-of-concept part—a seat bracket—that is 40 percent lighter and 20 percent stronger than the original part. It also consolidates eight different components into one 3D-printed part.

## 5G and IoT

The new network technology that most people associate with smartphones also enables factories to create low-latency wireless sensor networks that span the manufacturing floor or even several far-flung factories. With Industrial Internet of Things (IIoT) sensors, devices, and machines increasingly coming online, such networks allow for the collection and analysis of the data that the IIoT creates. This will cut costs and can be used to improve maintenance of equipment to reduce downtime.

#### DX AT WORK

In Hickory, North Carolina, **Corning** operates one of the largest fiber optic cable manufacturing facilities in the world. To remain competitive and meet the growing demands for their product, Corning teamed with **Verizon** to install 5G Edge service in the facility to dramatically speed data collection, allow machines to communicate with each other in real time, and wirelessly track and inspect inventory using 5G-connected cameras. They are also using 5G to improve the function of autonomous guided vehicles by helping them move more efficiently around the factory floor.

#### AI and Edge Computing

The incredible amounts of data available to today's businesses allow them to turn insight into action in mere moments. Al systems will analyze real-time data to manage quality control, detect and correct errors, and maximize productivity. Near-immediate corrections will require edge computing so that analytics occur as close as possible to the sources of the data.

DX AT WORK

When cosmetics maker **L'Oreal** sought a makeover for its manufacturing operations, the company turned to **IBM** for AI and edge solutions to make its factories smarter and more agile. The new applications allow for the collection of data from various sensors within the production system, ability to process the information, solve for pain points, and more quickly make informed decisions. The added agility allows for faster product innovation while maintaining the high quality expected by L'Oreal's customers.

## Augmented Reality (AR) and Virtual Reality (VR)

Two emerging visual tools present a range of opportunities for manufacturers with their ability to layer virtual information on top of the physical world (AR) or immerse workers into an entirely digital environment (VR). Superimposing a computer-generated image on a worker's view of the physical world through AR can help train new workers on product assembly or provide maintenance workers with real-time access to far-flung manuals. VR can even help in the sales of final products by allowing customers to experiment with a digital replica before making a purchase.

DX AT WORK

**Intel** manufactures advanced semiconductors using complex machinery. When these machines need repair, onsite technicians use **Microsoft**'s HoloLens 2 AR devices to guide them through some of the most complicated technical tasks. The agility provided by these AR capabilities saves valuable production down-time and repair expenses.

→ Successful digital transformations show clear impact in the form of significantly greater earnings before interest and taxes (revenue) increases.

Patrick Forth, Romain de Laubier, Saibal Chakraborty, Tauseef Charanya, and Matteo Magagnoli, <u>Performance and Innovation Are the Rewards of</u> <u>Digital Transformation</u> (December 2021).

4



IBM, 2021 Digital Transformation Assessment.

## Moving Forward Together

Today's technology is dramatically transforming manufacturing—eliminating waste, increasing energy efficiency and enabling cutting-edge design. Industry and policymakers need to work together to create the right policy environment to support the future of manufacturing.

## **Cross-Sector Series Overview**

Digital transformation is having profound impacts across all industries. This series of reports is intended to demonstrate how software-enabled technologies and innovative companies are enabling the creation and improvement of business processes, culture, and customer experiences across sectors.



#### Financial Services: Digital Tools Transform How We Save, Spend, and Invest

This report explores how digital transformation enables banks, insurers, and payment providers to personalize services, save employees and customers time and money, and comply with global regulations upstream.



#### Construction: Digital Tools Help Build a Better Future

This report explores the digital tools and processes that enable architects, engineers, and contractors to design, construct, and maintain the built environment worldwide.



#### Automotive: Digital Tools Help Drive the Next Era of Transportation

This report outlines digital transformation in the automotive sector, including innovation toward important objectives, including lowered emissions, improved safety features, and enhanced connectivity.



# Sustainability: Digital Tools for a Sustainable Future

This report demonstrates how software can help reach sustainability goals, such as reducing overall net electricity demand by more than 25 percent, cutting greenhouse gas emissions by 19 percent, and saving billions on our energy bills.

Learn more at www.dxnetwork.org/sectors/.



Digital transformation is redefining business and society, initiating an unprecedented new era of opportunities and challenges. Digital transformation enables the creation and improvement of business processes, culture, and customer experiences and has the potential to yield profound benefits in the areas of sustainability, inclusive growth, and workforce development.

Governments around the world are seeking to regulate the digital environment in key areas such as privacy, artificial intelligence, cybersecurity, cross-border data, and other areas more boldly surfaced by digital transformation. Learn more at www.dxnetwork.org.

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The Digital Transformation Network (DTN), an initiative of BSA | The Software Alliance, brings together cross-sector business and technology leaders for constructive dialogue and information exchange in the areas of government regulation, public policy, and impacts to society associated with software-enabled digital transformation. Charter subscribers represent market leaders experiencing digital transformation across advanced manufacturing, automotive, consumer goods, energy, financial services, healthcare, retail, media, and telecommunications industries.

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