



A NEW INDUSTRIAL REVOLUTION: BUILDING THE FUTURE OF U.S. MANUFACTURING

As digitization has seeped into people’s everyday lives and disrupted whole industries, it has heralded a new era in manufacturing often referred to as the Fourth Industrial Revolution or “Industry 4.0.”

This new wave is characterized by the integration of digital connectivity and advanced technologies, giving rise to automated industrial systems and smart production processes that boost efficiency across supply chains.

Much like the industrial transitions of previous centuries, these technological advancements are transforming people’s way of life and the overall economy. At the consumer level, they have manifested as smart home devices and voice-enabled technologies.

At a societal level, they are fueling the growth of smart cities, revamping public services with an eye toward sustainability and better serving residents. The integration of these technologies in manufacturing magnify their potential even further, scaling their impact through supply chains, interdependent sectors, the people manufacturers employ and consumers they serve.

This article explores the wide-ranging ways this shift is reshaping the U.S. manufacturing industry and offering unprecedented opportunities to businesses. It discusses how advanced technologies are enabling optimized and customized production, enhancing jobs, supporting growth in emerging manufacturing sectors, and facilitating the rise of start-up producers.

Smarter food production

For evidence of the opportunities advanced manufacturing can unlock, look to the food industry: 3D smart cameras check product quality and portion quantities, while real-time data and remote sensors can identify production bottlenecks and track supply chains. Wireless sensors are reducing the waste of perishable foods, for example, by keeping cold storage and transportation systems at optimal temperature levels.

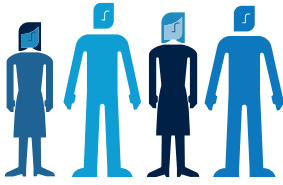
Nestlé is among the major food manufacturers harnessing digital technologies. “We are beginning to embrace the Fourth Industrial Revolution to competitively capture new business opportunities,” notes Paul Bakus, president of Nestlé Corporate Affairs. As an example, he cites how Nestlé is leveraging predictive analytics by continuously monitoring real-time data of manufacturing equipment performance.

These new capabilities would not have been possible without upgrading Nestlé’s workforce. “All of these technologies require an enhanced skill set across the board—engineers, IT, business managers, operators, maintenance and so on,” says Mr. Bakus. To get future-fit, the company is partnering with local community colleges and vocational schools on high-tech food manufacturing training. It also offers apprenticeship programs to develop its talent pipeline.



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Smarter work

While automation has resulted in job losses, it can enhance the work and capabilities of human workers. Advanced technologies can leverage digital tools to do tasks that people are less suited for, leaving workers free to focus on higher value work like design and engineering. Weight sensors can remotely monitor inventory at distant warehouses and retail stores, allowing for more efficient management of supply chains. Meanwhile, robots and drones can inspect metal structures, such as offshore oil rigs, that might be dangerous or inaccessible to human workers.

That said, advanced technologies do not only operate in separate silos from human workers. They are also enhancing human capabilities, especially through smart glasses, or augmented reality-enabled headsets that can visually guide workers through a task by displaying information or step-by-step instructions. Smart glasses can be used to support skilled technicians or to train new workers.

Green manufacturing

While advanced technologies are a defining trend of today's age, manufacturing is being shaped by other factors too, such as growing concerns over climate change. “The recent growth of the U.S. clean energy market has worked to increase renewable energy manufacturing,” says Todd Foley, senior vice president of policy and government affairs at the American Council on Renewable Energy (ACORE). “We have seen significant growth in U.S. solar manufacturing as the market has increased,” he notes.

Through technological innovation and a growing market size, solar technology has become increasingly cost competitive. At the same time, rising consumer interest in eco-friendly products has led to strategic investments in electric vehicle production. Tesla manufactures both.

In October 2016 the company unveiled its Solar Roof technology that looks like roof shingles. It also recently launched its Model 3 electric car priced for the mass market. The company strongly relies on automation and robotics in its production systems, which it says enables a faster speed to market. If mass adoption of electric vehicles and solar technologies becomes an eventual reality, companies like Tesla will have made major contributions toward climate sustainability.

The rise of the small manufacturer

While big companies are leveraging digital technologies throughout their extensive operations, these tools are also democratizing manufacturing by allowing the entry of smaller players in the sector.

Several connected trends—such as online sales platforms like Amazon and Etsy, social media-based marketing apps like Pinterest and Instagram,



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crowdfunding to get start-up or growth capital, and low-cost prototyping and production through 3D printing—are contributing to the rise of the small manufacturer.

In particular, online sales platforms are enabling “small-scale making and manufacturing to reach a new level of exposure,” says Lee Wellington, founding executive director of the Urban Manufacturing Alliance.

She observes that small-scale production is growing especially fast in cities, which are uniquely placed to bring together communities with different specialties. “We see something catalytic happening in urban environments as technologists collaborate with those involved in fabrication processes, and those in the arts and creative professions.”

The routes available for those wishing to enter the manufacturing industry are also changing, as production deepens its connection with the broader innovation economy, and as alternative certifications and apprenticeships become more commonly available.

“A four-year degree is not a prerequisite,” Ms. Wellington says. “There are many alternative qualifications that are emerging as valuable for the sector, and we see an effort across community colleges across the country to build industry partnerships and think creatively about making the adaptable skills needed in manufacturing today.”

Industry in progress

From global manufacturers to local start-ups, manufacturing offers a dynamic future for those able to capitalize on advanced technologies, digital capabilities and the connected systems they create.

By supporting manufacturers across all parts of a business—from production to machine maintenance and quality assurance—these tools are creating new possibilities in ways that were inconceivable a generation ago. They can also help manufacturers and new players find new sources of revenue and growth.

On a broader level, these technologies can bring wide societal benefits through innovative products and processes that reduce waste, improve people’s work lives and encourage sustainability at a mass scale. This rapid pace of innovation is still shaping the manufacturing industry of the future, promising wide benefits to those that adapt and evolve with its progress.

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