



MANUFACTURING IN MOTION: Transforming for a new industrial era

Interviewees

Tom McDermott

Executive director, Digital Manufacturing and Design Innovation Institute (DMDII)

Pooja Anand

Siemens' U.S. director of strategic projects and talent acquisition in the Americas

Harry Moser

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Insights from the makers: U.S. manufacturers seize the digital era

Manufacturing has fueled the U.S. economy for over a century, creating an era of mass affluence and catapulting the country to global leadership positions in innovation and industrial R&D. Through these developments, it has produced the foundation upon which the modern, tech-driven economy has been built.

Paradoxically, these achievements have helped portray manufacturing as a sector in decline rather than a vehicle of constant progress. Yet manufacturing is changing still as companies reinvigorate their operations and, on a larger scale, reinvent the sector for the digital age.

This transformation is often referred to as the Fourth Industrial Revolution (or Industry 4.0), and covers the convergence of digital technologies, data and a merging of physical and cyber systems across operations and supply chains. New opportunities are broadening horizons for U.S. manufacturers, and at the same time increasing pressures that may blunt the competitive edge of those who choose to maintain the status quo.

A survey of U.S. manufacturers

To explore how U.S. manufacturers are navigating this new industrial era, and where they see the greatest benefits accruing, The Economist Intelligence Unit (EIU), sponsored by Prudential, conducted a survey of 537 manufacturing executives across eight industry segments. More than half (52%) consisted of C-level executives, including 26% CEOs or their equivalent.

The survey findings are categorized in this report around three pillars:

- 1 the strategies companies are undertaking as they adapt to the new industrial age, and the benefits they are observing;
- 2 the implications of this broader shift on talent needs, and how manufacturers are responding; and
- 3 what it takes to innovate in this changing landscape.

Time to strategize

The new industrial era is creating new opportunities and value propositions for manufacturers. Entirely new approaches to production, unprecedented levels of efficiency, new business models and more agile supply chains all mean the time is ripe for manufacturers to seize the opportunity.

Such far-reaching technological changes do not come frequently, and those that move first can build a foundation for long-term competitive advantage. But competition is the operative word. A manufacturer's rivals have the same opportunities to leverage disruptive technologies too. A well thought-through strategy, swiftly executed, is essential to stay ahead of the pack.

The study shows 63% of manufacturers acknowledge the need for change and have already implemented an industrial transformation strategy to some extent. They cite increasing operational efficiency as their most common initiative, followed by the creation of new products and services.

Three in four manufacturers who have implemented transformation initiatives have already observed benefits. The biggest majority has seen increased revenue, followed closely by improvements in collaboration and communication, cost reductions and customer experience. These executives expect this broad pattern of benefits to continue, especially in customer experience, where respondents anticipate the most improvement to take place over the next three years.

Despite the imperative to evolve, not all companies have begun the transformation process. The survey shows 16% of companies have either not yet developed a transformation strategy or see no need to do so. These companies may find themselves at a disadvantage as competitors make advancements in efficiency and product quality, and increasingly capture a wider market share as a result.

Tom McDermott, executive director of the Digital Manufacturing and Design Innovation Institute (DMDII), believes larger manufacturers have greater awareness of the need for digital transformation, and the wherewithal to execute a cohesive strategy. "A very small manufacturer might be able to make one big move, maybe two, in a given year from an investment perspective. You need to have very tangible returns on investment to give them the confidence to embark on a digital transformation."



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Big picture transformation

Beyond adopting advanced technologies, executing an industrial transformation strategy means looking at the ramifications of technological change on other aspects of the business, such as operational structures and the roll-out of changes in a unified way.

Manufacturers can improve the experience of their customers by reducing product faults, for example, through “digital twin” systems that enable companies to design and test products in a virtual environment. This can allow for greater customization and, taken a step further, can be turned into a physical model through 3D-printing. Real-time data can then be fed into the model to cut down on maintenance costs and more accurately predict possible failures.

Apart from creating prototypes, 3D-printing is helping small-scale manufacturers create artisan products. Furthermore, additive manufacturing is being used to create components for much larger, complex goods like cars and aircraft. As these benefits compound and technology continues to advance, new opportunities may emerge for manufacturers to extend their market research or change their business models.



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Manufacturers have good reasons to look to the future optimistically. Over three-quarters of survey respondents expect flexible manufacturing techniques and smart supply chains to lead to better products and services over the next three years. They also believe that industrial transformation will make their organizations more competitive going forward. Close to half expect it will enhance employee productivity, while approximately two in five believe that their organization will benefit from more efficient logistics and expanded market reach.

“If we can digitize every aspect of the value chain, bring that data together and create interoperability, we can drive better end-to-end optimization and decision-making,” says Mr. McDermott. But “if you look across the value chain, which often spans multiple organizations and business units within a given organization, and then layer in IT system complexity, there’s a lot of friction in the flow of data required to unlock that potential.”

Workforce challenges

Although overarching industrial transformation strategies are important, so is a laser-like focus on how technological change is impacting specific elements of the business. Skills and talent stand out as a particularly fast-moving area. As data, digital technology and analytics penetrate more of the manufacturing value chain, the nature of jobs is changing and demand for technical skills is on the rise.

However, the survey shows many manufacturers are worried that there are not enough skilled workers for their needs. Over a third say recruiting and retaining talent is a key challenge, and seven out of ten say workers

will lack basic technical skills for retraining in three years. Positively, there are options available to bridge the skills gap. Survey data shows that nearly half of manufacturers believe reskilling is the most effective method for developing the right skills and competencies.

Siemens, which has 60 manufacturing plants in the U.S. and 10,000 employees, adopts such a view. “We do not simply swap out existing talent for new talent,” says Pooja Anand, Siemens’ U.S. director of strategic projects and talent acquisition in the Americas. “Our approach is focused on lifelong learning...because our skills needs are changing so rapidly, our training efforts need to move faster, too.”

Attracting new talent

Manufacturers seeking to attract new talent face a perception problem: manufacturing is not considered an exciting career by many young people. Indeed, among those grappling with securing needed talent, 38% predict a lack of interested candidates as a key hurdle over the next three years. Mr. McDermott believes a visit to a modern factory could dispel those illusions.

“As I walk around the manufacturing floors of our partners today, the reality is you’re not just sitting at a machine, pulling a lever and punching something out ... It is a much more dynamic and, frankly, much more challenging environment than I think people give it credit for. It’s also much more rewarding.”

Even when companies do hire, there is still more to do. “The thing I’m hearing most often from the industry is that new recruits require massive amounts of post-hiring support to be job ready,” says Mr. McDermott. Academic curricula have not kept pace with the rapid changes in the skills required to be successful in the industry. He notes, “A more purposeful dialogue between industry and academia is required to keep up with modern technological change.”

To develop work-ready talent, Siemens utilizes apprenticeships. Although the model has yet to take hold en masse in the U.S., it is a common route into manufacturing in Europe, and Siemens apprenticeships in the U.S. provide 6,400 hours of on-the-job training and 1,600 hours of college coursework.

“When we started our apprenticeship program in North Carolina, we established it to cultivate the talent required to support the expansion of our manufacturing facility,” explains Ms. Anand. “We saw significant value in this approach, and are now growing our program to eight more states.”

Harry Moser, president of the Reshoring Initiative, believes the apprenticeship route is under-utilized. “Compare the U.S. to Germany or Switzerland. Over there, about 60% of high school students go into an apprenticeship. Many will go on and get an engineering degree or an MBA, and will often come back and run the company where they started their apprenticeship.”



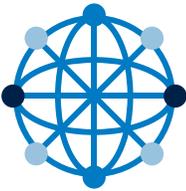
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What do innovation leaders do differently?

A capacity for innovation differentiates manufacturers who flourish from the rest amid this changing environment. An analysis of the EIU survey data categorized 20% of the sample as “leaders” based on respondents rating their organizations’ effectiveness in both innovation and adopting advanced technologies as “well above average.” When compared with the rest of the sample, this group is approximately twice as likely to report outperforming in revenue growth, and in attracting and retaining talent.

In examining what innovation leaders do differently, the survey finds that they take a more comprehensive approach in adopting industrial transformation strategies. For example, they expect to use a wider range of technologies than other firms over the next three years, mainly because they are more likely to derive value from technologies like cloud computing, the Internet of Things and big data.

Innovation leaders are also much more likely to have undergone substantial transformation (41% v 24% for the rest of the sample). “Historically, technology has always been introduced into the manufacturing environment but the pace at which that technology is changing today is significantly greater and accelerating,” says Mr. McDermott.



“There are so many technological disruptions happening that in and of themselves would be major events...And they’re all happening at the same time.”

Tom McDermott, executive director of the Digital Manufacturing and Design Innovation Institute (DMDII)

A holistic approach to innovation

Rather than adopting a single new process or technology, leading manufacturers are now taking hold of a wave of changes, and optimizing operations throughout their business. “There are so many technological disruptions happening that in and of themselves would be major events...And they’re all happening at the same time,” notes Mr. McDermott.

As distribution models favor closer proximity to customers and labor cost differentials with low-wage countries shrink, some companies are harnessing supply-chain agility. More flexible production runs, improved logistics infrastructure in the Amazon age and better product tracking data analytics all mean innovation is manifesting not just in product development, but also in the way manufacturers operate and deliver goods to customers. These trends are also causing a reshoring of jobs to the U.S., in a major strategic shift from previous decades. “Since the U.S. is the world’s biggest market for most manufactured goods, they want to produce inside the country,” says Mr. Moser.

Taking together the insights from the survey and the featured experts in this report, a holistic mindset and openness to change is critical in driving innovation forward. Maciej Kranz, vice president of Cisco’s Corporate Strategic Innovation Group, notes that industrial transformation is more than adopting technologies, but adopting them in line with a broader strategy.



TRANSFORMATION STRATEGY



TALENT



INNOVATION

Mr. Kranz emphasizes that manufacturers should start “a multi-year digital transformation journey, and approach these implementations from a change management perspective. It is about technology, but also about the workforce and a business vision.” He also warns against moving too deliberately, and advises taking the time to build on successes and gaining support from key stakeholders.

Looking to a brighter future

The U.S. has navigated several waves of technological change in the past and continued to reinvent itself in the process. It is well positioned to take advantage of the latest technological changes transforming the sector from a leadership position in robotics, artificial intelligence, sensor-enabled systems and other advancements.

Across the three central pillars explored in the survey, the mood among manufacturers is one of engagement. There is broad agreement that industrial transformation strategies can bring sizeable benefits, and companies that have already undertaken such reforms have seen results. But there are also challenges.

The skills of the U.S. labor force need to adapt to keep pace with advances in technology and manufacturers’ changing needs by developing STEM talent. And, finally, the new industrial era promises more long-term rewards in innovation, beyond gains in efficiency. New technologies may bring these innovations to life, but the innovations themselves may take the form of new business models and markets, and possibly give rise to new industries altogether.

Manufacturing is currently in motion, and its metamorphosis will take time to realize its full potential. Mr. McDermott likens the transformation to previous paradigm shifts. “I use the analogy of lean manufacturing. That is a methodology with decades of history, and there are still companies trying to figure out how to implement it.” Noting that digital transformation is still in its earliest days, he believes “the companies that successfully adapt to this new paradigm will thrive, while those that do not will find themselves increasingly challenged to survive.”

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