TRENDING TOPICS

INDUSTRY 4.0 AND THE FACTORY OF THE FUTURE

Trending Topics represents an executive summary compilation of news, information and perspective on matters affecting businesses and business leaders today. This insight is being provided to keep you up to date on the latest developments and trends influencing these topics. These views do not necessarily represent the views and opinions of PNC. For additional research on these topics, please consult the sources cited in this article.

It's not your father's factory anymore. Manufacturing is in the early stages of a dynamic transformation, one that integrates equipment with cyber systems to monitor physical processes and communicate in real time with other systems, equipment and humans — both within the factory and across the supply chain. The goal is to create sustainable "smart factories" that improve productivity and economic performance.

This new era has been christened "Industry 4.0" to reflect the next iteration of the industrial revolution.[1] The envisioned transformation will be brought about by the integration of "cyber-physical" systems that enable companies to converge their equipment, procurement, production and warehousing into cohesive networks across their entire supply chain and product life cycle. As a result, here's what the production line of the future may look like:

- Processes will govern themselves, and individual parts will be automatically replenished.
- "Smart" products with embedded data sensors will take corrective action to overcome production malfunctions and avoid damage.
- Production workers will wear smart eyeglasses that supply logistics and manufacturing data in their field of vision.
- Virtual production models, sometimes called "digital twins,"[2] will be updated continuously with real-time performance experience and replacement parts data to improve after-market sales, service and the design of future models.

TECHNOLOGICAL ADVANCEMENTS DRIVE PROGRESS

Manufacturers of all sizes, all over the world, are being affected by this paradigm shift. Myriad stakeholders — manufacturers, suppliers, technology companies, universities, government agencies and laboratories — are working to seamlessly link intelligent machines, advanced analytics and workers in the next generation of manufacturing processes.

The Boston Consulting Group cites several technological advancements that form the pillars of Industry 4.0. With focus on the manufacturing process and supply chain, these drivers will intricately link products to information. They include[3]:

- Big data and analytics driven by information collected by sensors and actuators
- Advancements in autonomous robotics
- Horizontal and vertical information technology (IT) system integration beyond enterprise borders
- The "Industrial Internet of Things," in which devices and unfinished products will be embedded with smart sensors and connected to standard technologies.[4] This will enable autonomous robotic processes that interlink and adjust production
- Heightened cybersecurity to protect critical, networked industrial systems and manufacturing lines
- The cloud to support increased data sharing across locations and beyond boundaries
- Additive manufacturing processes such as 3-D printing to produce small batches of customized products and reduce transportation costs

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- Augmented reality (AR), which blends information with the user's environment or live video in real time through technology interfaces such as mobile devices and smart eyeglasses,[5] will provide workers with real-time instructions for improved decision-making

READY, SET, GO?

Many challenges lie ahead in the march toward Industry 4.0. Although productivity improvements are practically guaranteed, the transformation will require commitment and sizable investment from companies, suppliers, governments and other stakeholders in several areas:

- ***Readiness*** — In a survey of 300 manufacturing leaders conducted by McKinsey & Company in January 2015, only 48% of manufacturers felt ready to meet the challenges of Industry 4.0. However, 78% of the suppliers surveyed were comfortable with their companies' readiness.[6] This may indicate that supply chain partners may lead the way for Industry 4.0 transformation.

- ***Displaced workers*** — Different skills will be needed to operate the systems of the smart factory, and in the short term increased automation will displace many low-skilled workers.[7] Revenue from increased production and more efficient processes will be offset somewhat by increased training and displacement costs.

- ***Skills shortage*** — The transformation to fully integrated manufacturing is putting pressure on colleges, universities and government agencies to create more training programs to equip workers with the knowledge and skills needed in engineering, software development and IT technologies. Mechatronics, which integrates several engineering disciplines, is emerging as the career field of the future for manufacturing.[8]

- ***Equipment upgrades*** — The executives surveyed by McKinsey & Company estimated that between 40% and 50% of today's equipment will need to be upgraded or replaced to operate in this new world of integrated manufacturing.[9] It will take considerable investment over many years to adapt today's factories to future requirements.

To discuss these topics in more detail, please contact your PNC Relationship Manager.

1 "Design Principles for Industrie 4.0 Scenarios: A Literature Review" by Mario Herman, Tobias Pentek and Boris Otto, Technische Universität Dortmund, pages 4–5. Available at: http://www.snom.mb.tu-dortmund.de/cms/de/forschung/Arbeitsberichte/Design-Principles-for-Industrie-4_0-Scenarios.pdf

2 "Digital Twin: Manufacturing Excellence through Virtual Factory Replication," a white paper by Dr. Michael Grieves, University of Michigan, 2014, available at: http://innovate.fit.edu/plm/documents/doc_mgr/912/1411.0_Digital_Twin_White_Paper_Dr_Grieves.pdf

3 The list of nine technological advances and related background content is included in the article, "Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries," Boston Consulting Group's *BCG Perspectives*, April 9, 2015. Available at: https://www.bcgperspectives.com/content/articles/engineered_products_project_business_industry_40_future_productivity_growth_manufacturing_industries/

4 "Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries," Boston Consulting Group, *BCG Perspectives*, April 9, 2015.

5 Definition of Augmented Reality (AR), found at: http://whatis.techtarget.com/definition/augmented-reality-AR

6 "Manufacturing's next act," McKinsey & Company, June 2015. Available at: http://www.mckinsey.com/insights/manufacturing/manufacturings_next_act

7 See citation for "Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries," Boston Consulting Group's *BCG Perspectives*, April 9, 2015.

8 See citation for "Industry 4.0: The Future of Productivity and Growth in Manufacturing Industries," Boston Consulting Group's *BCG Perspectives*, April 9, 2015.

9 See citation for "Manufacturing's next act," McKinsey & Company, June 2015.

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