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Microsoft



The better the question.
The better the answer.
The better the world works.





Performance



Staying power



Competitiveness

Manufacturers have long pursued manufacturing excellence programs to continually improve the performance of their facilities and equipment. Many of those initiatives were successful for a time, but they've lacked staying power. Today, most manufacturers still struggle to achieve – and sustain – higher levels of performance. And now manufacturers also have to deal with escalating digital disruption that increasingly challenges their competitiveness and ability to grow.

**The good news is, there's a powerful alternative.
It's called the smart factory.**

The smart factory can help manufacturers improve performance in a dynamic, digital world.

The smart factory is an environment in which cyber-physical systems monitor the physical processes of the factory, provide analysis, and automate or support controls and decision-making to improve manufacturing efficiency and effectiveness.¹ Interest in smart factory applications continues to grow because of the significant operational benefits and competitive advantage the smart factory can generate for manufacturers that embrace it. These include real-time, on-demand visibility into performance across the production chain; information and technologies to improve physical process control; flexible, adaptive, and proactive production; and end-to-end integration

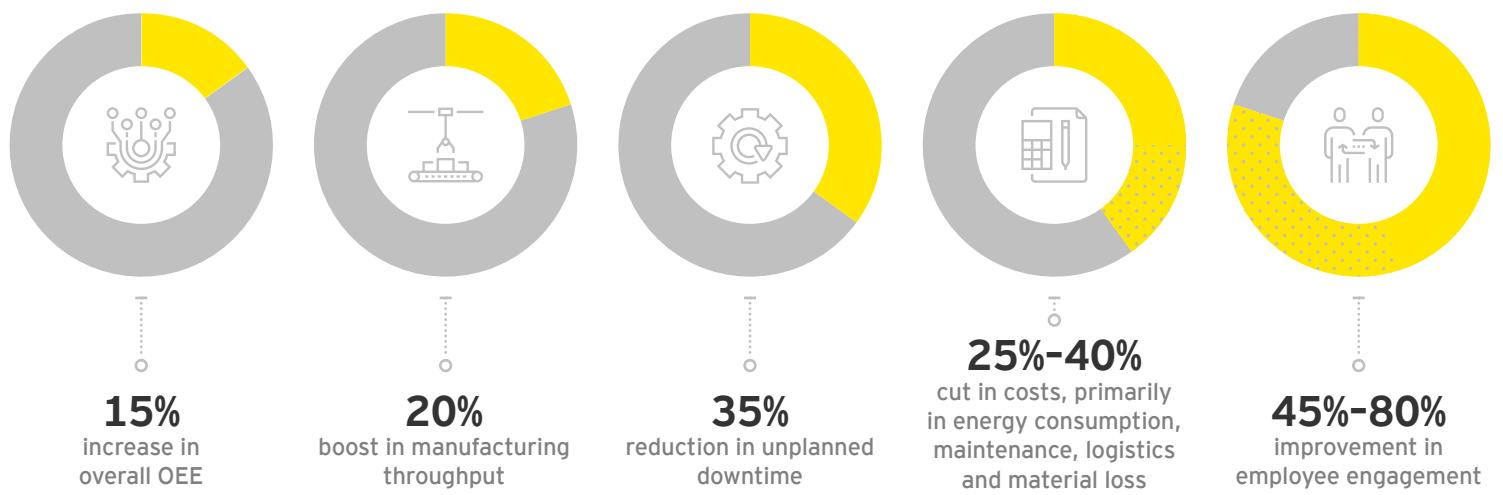
with suppliers and customers. Such benefits translate into a major impact on key performance metrics (Figure 1). For instance, by boosting overall equipment effectiveness (OEE), the smart factory can help manufacturers increase revenue and defer capital investment. It also can improve workforce productivity and morale, and substantially reduce operational costs.

Indeed, the potential cost savings alone are a major incentive to make the shop floor "smarter." A survey by the US Department of Commerce estimates the smart factory could save US manufacturers as much as \$57 billion dollars annually.²





Figure 1: Some real-world results that manufacturers have experienced working with the EY Smart Factory team.



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Despite widespread interest in the smart factory, overall adoption continues to be slow.



It's a compelling vision, which is why, as digital technologies continue to mature, there's a pervasive aspiration across manufacturers to embrace the smart factory concept. Unfortunately, however, interest and enthusiasm haven't necessarily translated into widespread progress toward a genuine smart factory. Pockets of success have emerged, but a broad, full-fledged transformation has yet to occur.

The most progress has been in automation, particularly the kind geared toward simple cost reduction. One could argue such initiatives do make the factory incrementally smarter. But they don't include truly game-changing technologies such as artificial intelligence (AI), the Internet of Things (IoT), augmented reality and blockchain. Overall, the vast majority of smart factory initiatives have yet to move past the pilot stage.



It's time for manufacturers to kick their smart factory initiatives into higher gear.

How can manufacturers accelerate their progress and begin capturing the value the smart factory can generate? EY teams have identified four key actions that can help take the smart factory more quickly from concept to large-scale reality:

1. Get strategic
2. Get a framework
3. Get tactical
4. Get the right solution

Get strategic.

For starters, manufacturers need to ensure they have an overarching strategic plan that concurrently considers their operations technology,

information technology and operations excellence maturity. Because the digital technologies that underpin the smart factory will have an impact across the company, the entire organization must be aligned on both its vision for where it's going and how it will get there.

A strategy that combines operations technology, information technology and leading practices in operations excellence creates the opportunity to significantly increase performance by working to ensure smart factory initiatives are based on business value, and are connected, scalable and sustainable.

Importantly, this strategy should provide the context for prioritizing investments in the right technologies – i.e., those that solve specific business problems.

The entire organization must be aligned on its smart factory vision and how it will get there.

For instance, if a company's top goal is to reduce headcount and streamline specific processes, implementing robotic process automation (RPA) could be the first order of business. The strategy also should make it possible to identify key smaller-scale, targeted programs that can be executed quickly and can generate returns the company can use to fund other, bigger-bet initiatives that can deliver more significant results.

But the strategy also needs to go beyond technology to address the people and process dimensions. The smart factory will never achieve its full promise unless a manufacturer understands how work will change in a smart factory setting, as well as the skills and talent needed to execute those processes.

Get a framework.

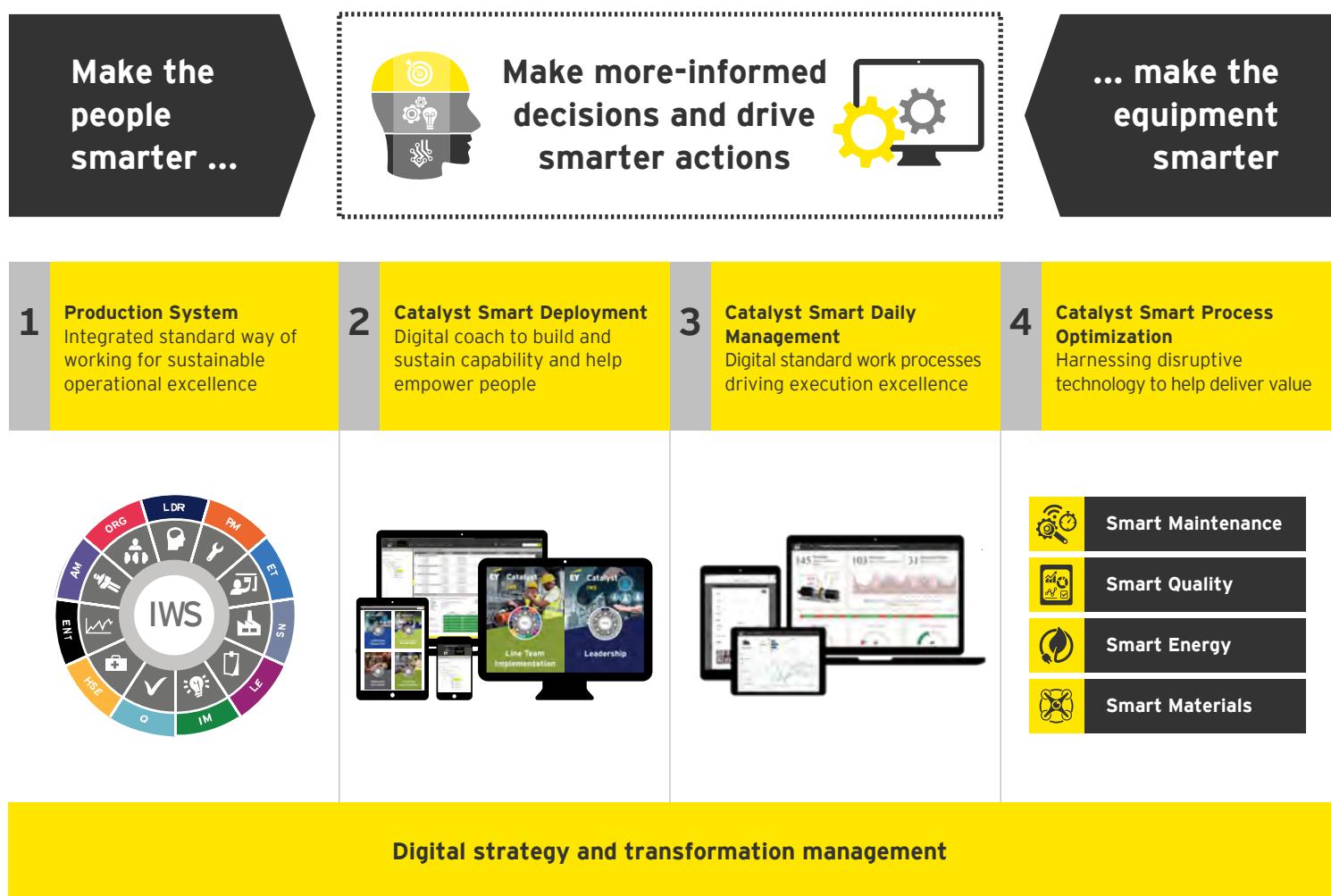
With a solid strategy in place, manufacturers need a framework that can guide subsequent smart factory initiatives. Such a framework enables manufacturers to integrate human capabilities and smart technologies to help accelerate and sustain performance improvement.

One example is the EY Smart Factory framework, which is illustrated in Figure 2. Running on Microsoft Azure, it includes integrated and standard ways of working for sustainable operational excellence, and provides online services that help build and sustain capability and empower people. The framework also incorporates a number of important solutions, including off-the-shelf use cases that have been tried and tested; point solutions to address critical shop floor challenges; and practical applications of digital technologies focused on creating immediate value.

The EY Smart Factory framework is built on the Catalyst Smart Deployment system, a cloud-based operational excellence solution that helps companies enhance their supply chain and manufacturing performance-improvement programs. The EY Catalyst system helps clients deliver a production system that gives the entire workforce access to an extensive intellectual property database containing tens of thousands of supply chain operational capabilities in multiple languages.

With the EY Smart Factory framework, manufacturers can make more-informed decisions, which ultimately help them lower costs, reduce waste and boost sales through more-effective demand fulfillment.

Figure 2: The EY Smart Factory framework: Advanced technology, supported by standard ways of working and powered by Microsoft Azure, helps empower a capable workforce to deliver value.





Get tactical.

The EY Smart Factory framework can help manufacturers address the tactical and people side of the business – most fundamentally, closing the gaps in its operational excellence capabilities that are the source of most performance issues.

Historically, the biggest obstacle manufacturers face in applying smart factory technologies is inconsistency in capabilities across various processes – for instance, how people operate and maintain equipment, how they solve problems and what they do in their downtime. Time and time again we see, even in the best-run companies, instances in which people aren't all "rowing in the same direction." That's the root cause of breakdowns, waste and other problems that undermine performance.

A digital coach can help employees continually assess and build the skills needed to keep the factory humming.

Take, for example, loss analysis. Despite their best efforts, most manufacturers still struggle to minimize losses in production – whether that's in productivity, energy or material waste. Such losses are the single-biggest drag on competitiveness and profitability. For new smart technologies to have a big impact, a manufacturer first needs to re-examine every production process and address shortcomings that lead to losses. Ultimately, the goal should be to develop a zero-loss culture – no waste, no unplanned downtime, no maintenance breakdowns and no productivity leakage.

This is where the production system in the EY Smart Factory framework comes in. It supports manufacturers deployment of integrated processes and standards to help ensure everyone from line operator to supervisor can execute their work consistently and at a high level of quality.

The key is the EY Catalyst Smart Deployment system, which acts as a digital coach that helps employees continually assess and build the skills that are critical to keeping the factory humming. The digital coach provides 24/7 global access to what shop floor employees need to do their jobs, develop new capabilities and continually improve their performance. This includes:

- A leading-practice self-assessment capability the shop floor teams use to evaluate themselves against a phased maturity map.

- A 90-day improvement road map based on the leading-practice self-assessment gap report that acknowledges the good work done to date, and maps the "gap to good" by making specific improvement suggestions and giving detailed directions on how to improve.
- Online learning and in-house training materials that trainers and leaders can access to develop the skills needed to improve and sustain the improvement over time.
- Performance improvement tracking that makes the ratio of improvement in practice and its impact on KPI results visible and accessible to everyone across a global network.
- Consistency in performance standards and improvement methods, which helps leaders compare "apples to apples" and identify challenges and opportunities.

At the end of the day, it's about helping to ensure all of the improvement methods, tools, processes and support are available to and focused on the people who are running the factory's machines. People will be a lot more empowered, able to see the impact they have on the process and its outputs and make suggestions based on their own observations and experience that help drive continuous improvement. It puts the ownership of and emphasis on performance where it should be: on the shop floor where products are made.



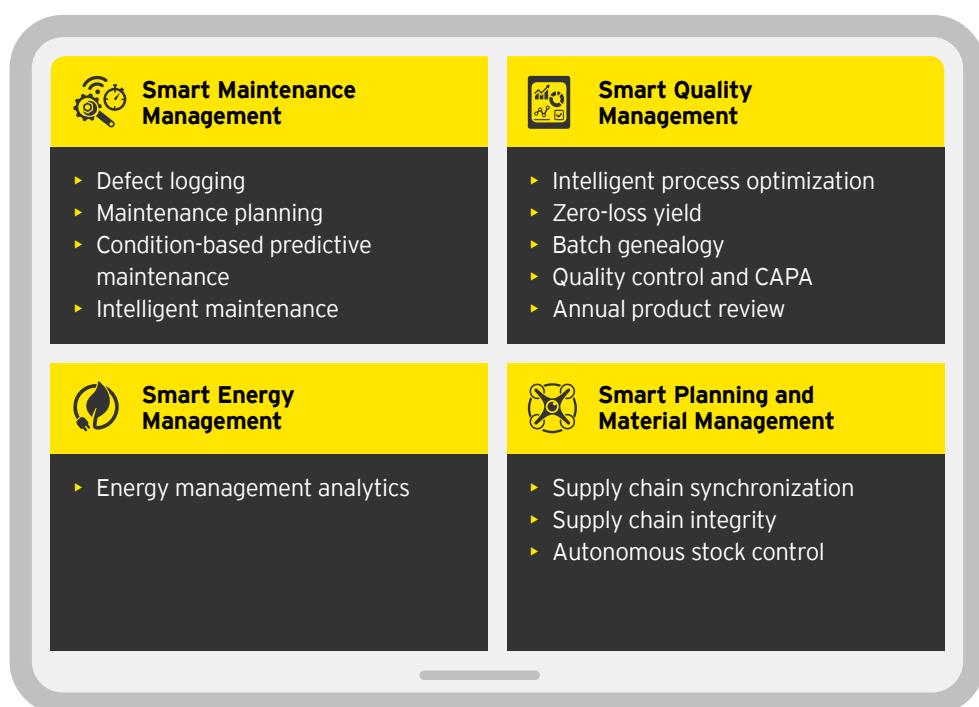
Get the right solution.

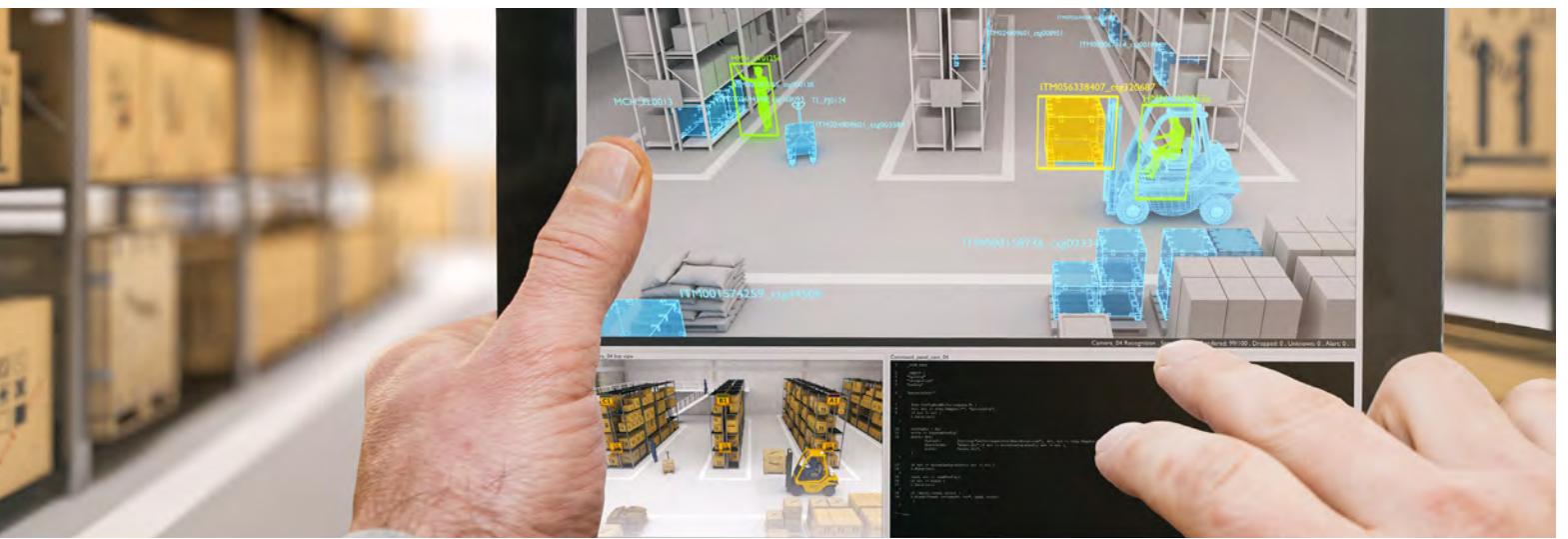
Manufacturers should also leverage the right solutions to help accelerate and sustain their progress, keeping in mind the specific business value and performance impact of each.

Pre-built smart factory applications are one example. These applications – which include modules that leverage a common data structure, code and user experience – integrate different digital technologies to automate work processes and make equipment smarter in key areas of a manufacturer’s operations. The EY Smart Factory framework includes four such applications that can make a positive impact on a factory’s performance (Figure 3):

- ▶ A smart quality management application can continually optimize processes to maintain quality control and minimize (and ultimately eliminate) loss.
- ▶ A smart energy application can give a manufacturer deep visibility into how energy is used across a facility to, in turn, be able to reduce energy usage, pay less per unit of energy and reduce its greenhouse gas emissions.
- ▶ A smart maintenance management application can log defects and help manufacturers predict and plan maintenance by continually monitoring equipment conditions.
- ▶ A smart planning and materials management application can autonomously control stock and synchronize the shop floor’s needs with the larger supply chain.

Figure 3: Key applications within the EY Smart Factory framework can help accelerate the transformation of specific aspects of manufacturing.





Additionally, a variety of solutions from Microsoft, an EY alliance partner, are available or emerging that can help manufacturers develop more intelligent, connected technologies and processes.

One is Microsoft Azure IoT Edge, which is a boon for operations managers. In the typical manufacturer, important data resides in multiple systems – e.g., ERP, manufacturing, execution, lab monitoring, quality and safety – around the company. This makes it difficult for operations managers to get a consolidated view of performance across their operations. Historically, companies have had to create custom code to extract data from each individual system, put that data into the appropriate context and create a single dashboard to display the information managers need to manage their day.

IoT Edge simplifies that process right from the beginning. The IoT Edge software still needs to be configured, but it includes robust capabilities for creating a standard data model, contextualizing data and connecting the Edge device to the relevant systems. In fact, Microsoft has connectors for all the major systems that have been deployed in a manufacturing environment. So now, instead of investing a lot of time on custom code to extract data from these disparate systems, a manufacturer

can spend more time with managers on configuring the dashboard so it's most helpful to them in driving more-informed business decisions.

Another solution is Microsoft Dynamics 365, which can help manufacturers transform various aspects of their shop floor operations. Mixed reality is one example. The Microsoft Dynamics Remote Assist application combines Microsoft HoloLens (a self-contained, head-mounted, holographic computer) with mixed reality video calling, annotations and file sharing to enable professionals to remotely troubleshoot complex problems and help technicians. This powerful application helps save time, reduce travel costs and improve operational efficiency on the shop floor.

With Microsoft Dynamics 365 Layout, shop floor designers can visualize and walk through proposed layouts with holograms in the physical world or in virtual reality, and make changes in real time. Microsoft Dynamics 365 Layout easily imports floorplans from Microsoft Visio and 3D models from other apps, which allows designers to experience layouts at scale and to share their vision in context to make better decisions and move from concept to completion faster, with fewer costs.

This future may not be all that far off. According to a recent Harvard Business Review Analytic Services study,³ nearly 70% of respondents believe mixed reality is important to achieving their companies' strategic goals in the next 18 months. And they're moving quickly: Just under 90% of respondents are currently exploring, piloting or deploying mixed reality; about one-third said mixed reality systems will be in production at their companies within the year.

Microsoft IoT edge simplifies the process of pulling together data residing in multiple systems.

Perhaps even more important, Microsoft Dynamics 365 can become the "glue" that unifies relationships, processes and data across not only the shop floor but the entire organization. Leveraging Microsoft Dynamics Common Data Service, manufacturers can integrate information across disparate systems and applications, allowing a company to push and pull data across all of them. If a company brings all of this data together into a unified repository in the cloud via Microsoft Azure, it can then apply AI and analytics to that data to become much more "intelligent."

When it comes to the smart factory, the future is already here.

As digital disruption cuts deeper and becomes more pervasive, the pressure on manufacturers to achieve and sustain higher levels of performance continues to intensify. Manufacturers know that they need to transform their operations to compete and grow in the coming years, and that the smart factory is the path to that future.

But the smart factory itself isn't a futuristic vision – it's here today. In fact, the digital technologies that hold tremendous potential for manufacturers are now increasingly within reach of many more companies because their costs have declined significantly, largely thanks to the cloud. That's a big reason EY expects to see smart factory momentum and progress accelerate.

Another is the emergence of Microsoft Dynamics 365. As Microsoft Dynamics' integration with smart factory processes and technologies grows, it will become an indispensable tool that can help manufacturers more easily and confidently deploy next-generation applications that infuse AI, predictive analytics, mixed reality, social and mobile capabilities.

A third is the combined power of the EY and Microsoft alliance. Working together, we create innovative solutions that help clients digitally transform more quickly with less risk. We provide the technologies and insights manufacturers need to remove barriers to digital adoption. And we can help manufacturers increase their return on their investments in the digital technologies that are key to a more intelligent and connected manufacturer.

The smart factory itself isn't a futuristic vision – it's here today.

With equal attention to the strategic and tactical dimensions of transformation – complemented by key solutions that can reduce digital technology deployment time, effort and risk – manufacturers can reshape the shop floor into the high-performance machine they want and need it to be.

For more information

EY teams have developed an approach, framework and related solutions that can help manufacturers accelerate the progress of their smart factory initiatives. Visit ey.com/en_gl/advisory/smart-factory to learn more.

To discover how EY and Microsoft can help accelerate your digital strategy and amplify your business performance to thrive in a digital world, visit ey.com/Microsoft.

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¹ Mark Heidenreich, "Smart Factory = Smart People + Smart Processes + Smart Technology," LinkedIn, December 29, 2017, <https://www.linkedin.com/pulse/smart-factory-people-processes-machines-mark-heidenreich>.

² Keith Belton, "What's Stopping the Smart Factory Revolution?", IndustryWeek, June 4, 2018, <https://www.industryweek.com/leadership/whats-stopping-smart-factory-revolution>.

³ "Mixed Reality: A New Dimension of Work," Harvard Business Review Analytic Services, 2018, <https://hbr.org/resources/pdfs/comm/microsoft/MixedRealityNewDimensionOfWork.pdf>.