

# CONNECTED FACTORIES

The Dawn of the Smart Factory



ptc

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A PTC – Tech Mahindra joint report on the emergence of smart factories as a foundation of data driven decision making by the manufacturer.





# CONNECTED FACTORIES

## THE DAWN OF THE SMART FACTORY

The Internet of Things (IoT) is a simple but powerful idea that will change processes, improve services and make lives better. IoT will enable many big leaps in several areas, from healthcare to lifestyle to transportation and more. Augmented Reality (AR) is another power technology that has the power to amplify the power of IoT and boost front-line worker productivity by as much as 50% and reduce human errors by up to a whopping 90%<sup>1</sup>.

Nowhere will the leap be more pronounced or significant than in manufacturing and production. The IoT and AR already plays a role in the industries and factories, eliminating silos, exploiting data and taking automation to a whole new level. This role will increase substantially with the maturing of IoT, AR and the Industry 4.0.

The time to change has never been more pressing with COVID-19 layering on formidable challenges including demand volatility, cost pressures, remote collaboration, workspace congestion and economic uncertainty. 75% of manufacturers cite supply chain disruptions from the crisis and 53 percent claim a change in their operations<sup>2</sup>. Manufacturers are accelerating digital transformation strategy and Industry 4.0 initiatives fueled by IoT are underpinning this massive change in mindsets. 90% of industrial companies are investing in digital factories<sup>3</sup> and 70% consider Digital Manufacturing at the top of their operations-strategy agenda<sup>4</sup>.

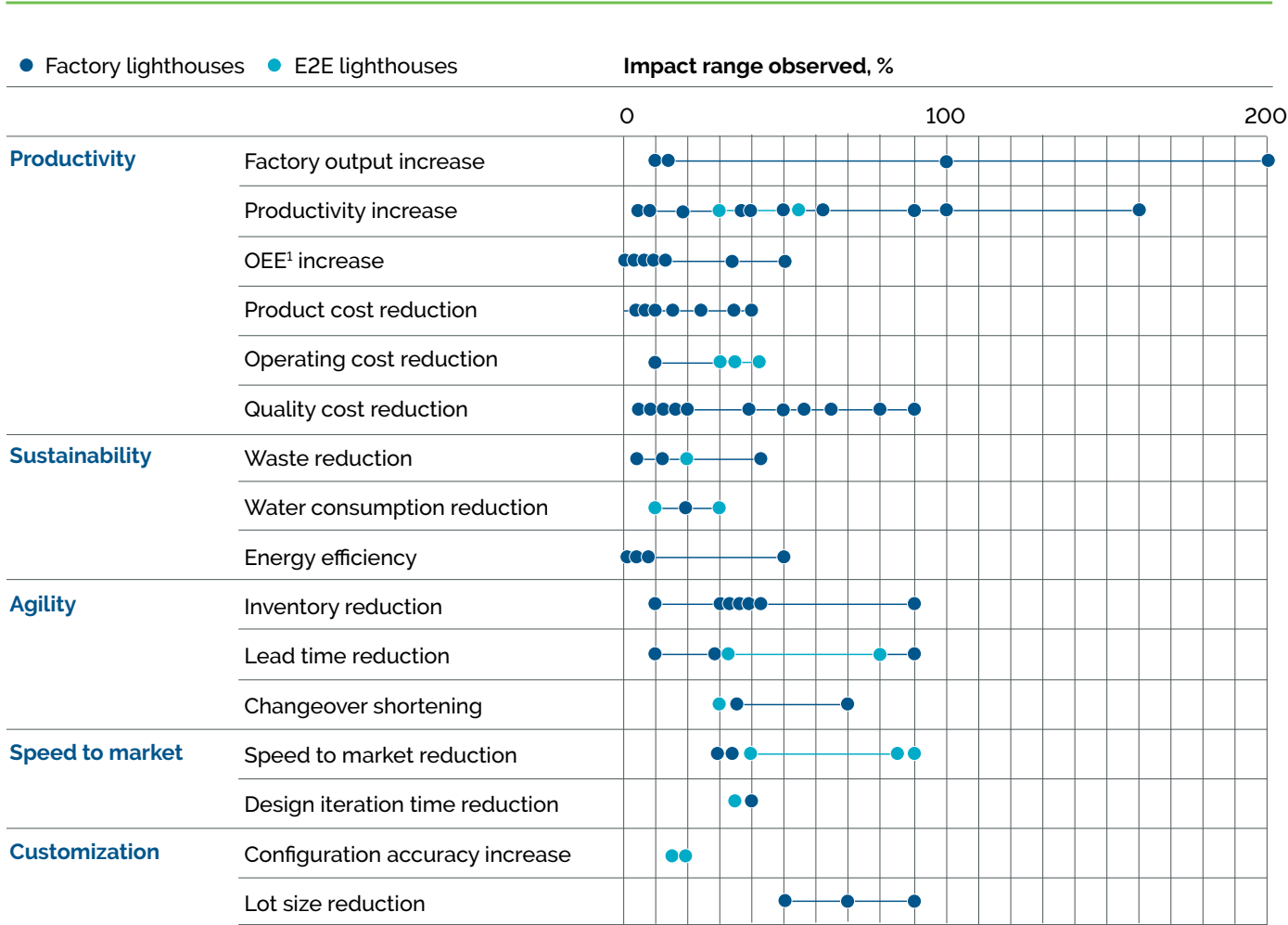
Welcome to a world of Connected Factories, where connected, intelligent and aware equipment built on IoT, front-line workers augmented by situational, actionable intelligence, automation and IT take productivity and predictability to never-seen-before levels.



# INDUSTRY BENCHMARKING

## DOUBLE DIGIT IMPACT

Early adopters and innovators with successful I4.0 initiatives have realized substantial business value across many critical areas of their factory operations<sup>5</sup>.



<sup>1</sup>Overall equipment effectiveness





# THE CONVERGENT PATH TO CONNECTED FACTORIES

The Internet of Things (IoT) is a simple but powerful idea that will change processes, improve services and make lives better. IoT will enable many big leaps in several areas, from healthcare to lifestyle to transportation. Tech Mahindra Connected Factories solutions, powered by PTC, combine the power of IoT and AR with intelligent analytics and IT, connecting a variety of sensors, PLCs, robots and Digital Control Systems through an IoT and AR enabled framework. The framework enables the acquisition of the data from all the connected sources. With built in analytics and enterprise system integration, the solution offers real time intelligence and data for improved productivity and efficiency.

- Sensors & Integration
- Gateways
- Remote Portals
- Control, Automation & MES Integration
- Mobility Solutions
- Augmented Work Instruction and Training
- Remote Collaboration
- Analytics

# THE CONNECTED SHOP FLOOR

Visibility and traceability are essential for automation in the shop floor. Connecting the different equipment, people and process in a shop floor on Tech Mahindra's Connected Factories platform makes available information that is critical for real time decision making. A 360 degree view of the production environment, together with intelligent visualization, means you can immediately identify unproductive practices, capacity erosions, inefficiencies and line performance bottlenecks.

- Cloud deployable
- Agile
- Scalable
- Flexible
- Wireless
- Multi-interface
- Configurable



# REAL-TIME PRODUCTION PERFORMANCE MONITORING

Understand real-time production performance through insights into the efficiency of your operations to increase throughput and quality while reducing unplanned downtime.

## PREDICTIVE MAINTENANCE

Factories and production environments utilize a lot of equipment and machinery that are complex and expensive to operate and maintain. Connecting the equipment with sensors through a common platform can provide invaluable data about the condition of equipment that can be analyzed to predict possible failures. Predictive analytics eliminates the inherent cost and production risks associated with equipment failure and shutdowns.

## REMOTE MONITORING

Visibility and traceability are essential for automation in the shop floor. Connecting the different equipment, people and process in a shop floor on Tech Mahindra's Connected Factories platform makes available information that is critical for real time decision making. A 360 degree view of the production environment, together with intelligent visualization, means you can immediately identify unproductive practices, capacity erosions, inefficiencies and line performance bottlenecks.

- SCADA based solutions
- Design of data collection systems
- Implementation of data collection systems
- Integration with enterprise systems
- Online real-time analytics
- Offline analysis
- Preventive maintenance
- Diagnostics and root cause analysis

## CONNECTED TOOLS: TRACK & TRACE

Track&Trace is an IoT driven solution that significantly improves shop floor efficiency and reduces costs. Track&Trace allows you to track every tool on the floor because they are Smart and Connected . Tools constantly send information about their location, which is recorded and stored. Since the location of each tool is known, the solution can automatically deploy the required program to the tool. The tools operational parameters are recorded and stored, ensuring quality and conformance to stringent regulations.





# WORKFORCE PRODUCTIVITY

**Empowers manufacturing workforce with actionable, augmented information to improve productivity and quality, avoid safety and compliance risk.**

## DIGITAL & AUGMENTED WORK INSTRUCTIONS

Improve the way knowledge, procedures and training are captured, authored, and delivered by combining asset and system data with in-context visuals, and 3D work instructions.

## CONNECTED WORK CELL

Provide workers with a single experience delivering seamless interaction with all the data they require to perform their work as well as execution validation across machine, IT systems and connected tools. Helps workers perform daily work more productively, and with fewer errors.

## AUGMENTED REMOTE ASSISTANCE

Connect remote experts to shop floor workers in real-time through augmented remote assistance to improve communication and rapidly troubleshoot unfamiliar or unexpected issues. Reduces cost and improves uptime and worker safety.

## DIGITAL SHIFT HANDOVER

Automated shift handover process for accurate capture and transfer of critical shift information to drastically reduce time spent logging and analyzing historical data.



# REAL WORLD DEPLOYMENTS

## 1. CONNECTED FACTORIES: TRACTOR MANUFACTURING PLANTS

We connected all the shop floor equipment with systems using our Connected Factories platform. The deployment encompassed multiple plants, providing the manufacturer complete manufacturing traceability and the ability to monitor performance real time, leading to an increase in overall production efficiency.



OEE



TCO  
INVENTORY LEVELS  
LABOR COSTS

## 2. CONNECTED ASSETS: SMART ASSET MONITORING AND CONTROL FOR AN MRO

We deployed the solution to enable the Smart Indoor Asset Tracking, Monitoring and Control System for Power Tools. The solution included executive dashboards for informed decision making and progressive quality improvement. The solution had a provision for Over-the Air Update, calibration and maintenance of all connected power tools.



15% TOOLS PRODUCTIVITY  
10% WORKERS PERFORMANCE

## 3. REMOTE MONITORING AND DIAGNOSTICS: STEAM TURBINE

Steam turbines are critical equipment. Their failure or shutdowns for maintenance can lead to significant delays and costs. Therefore, we developed and deployed a real-time, remote monitoring solution for steam turbines. The solution included a rule based Health Check automation tool to intelligently check the health of the turbine. The turbine could be remotely monitored using a System Health portal.



AVAILABILITY



90% PERSON-HOURS





# HOW TO CAPITALIZE CONNECTED FACTORY AT SCALE

Successful Connected Factory initiatives must start with financial impact and focus on addressing the most pressing problems in the factory with the high value use cases. The successful transformation journey have three components<sup>6</sup>.

## 1. IMPACT:

Get executive, middle-management, front-line workers and technology departments all aligned by identify financial impact, map with operational impact and a commitment to prioritize resources and eliminate potential barriers.

## 2. SPEED:

Prove value by addressing the most pressing problems in the factory with impact-proven use cases that capture value in as little as just a few weeks.

## 3. SCALE:

Expand value by executing an enterprise program for enterprise scalability, including people, ecosystem, capabilities, and a digital backbone to iterate quickly and achieve high-impact value to scale within 24-36 months.

### Footnotes and Additional Resources

- 1) AR and How We Work: The New Normal. Michael Porter & Jim Heppelmann. May 2020. Manufacturing Leadership Journal. <https://www.manufacturingleadershipcouncil.com/2020/05/21/https-www-manufacturingleadershipcouncil-com-2020-04-28-ar-and-how-we-work-the-new-normal/>
- 2) ISM <https://fortune.com/2020/03/11/75-of-companies-report-coronavirus-has-disrupted-their-supply-chains/>
- 3) PWC <https://www.manufacturingglobal.com/technology/pwc-digital-factories-shaping-future-manufacturing>
- 4) McKinsey <https://www.mckinsey.com/business-functions/operations/our-insights/how-digital-manufacturing-can-escape-pilot-purgatory>
- 5) Global Lighthouse Network Insights from the forefront of the 4th Industrial Revolution. Jan 2020. World Economic Forum. <https://www.weforum.org/whitepapers/global-lighthouse-network-insights-from-the-forefront-of-the-fourth-industrial-revolution>
- 6) Finally, Double Digit I4.0 Impact at Scale. Feb 2020. Manufacturing Leadership Journal. [https://www.ptc.com/-/media/Files/PDFs/solutions/Double-Digit-Industry-4-0-Impact.pdf?la=en&hash=50518AEE43CFC2B0BDC2B43D173A3A6B30840\\_Connected\\_Factories\\_With\\_Tech\\_Mahinda\\_0820](https://www.ptc.com/-/media/Files/PDFs/solutions/Double-Digit-Industry-4-0-Impact.pdf?la=en&hash=50518AEE43CFC2B0BDC2B43D173A3A6B30840_Connected_Factories_With_Tech_Mahinda_0820)

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