Unlocking double-digit performance improvements by recovering lost production hours with industrial IoT
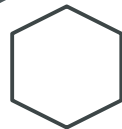
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PTC and Microsoft are combining IoT, cloud, and industry expertise to help manufacturers focus their continuous improvement efforts more effectively

Recently, two thought leaders in the manufacturing space—Howard Heppelmann, Divisional Vice President and General Manager ThingWorx IoT Solutions at PTC, and Indranil Sircar, CTO for Manufacturing Industry at Microsoft—discussed the state of the industry. In this conversation, Heppelmann and Sircar acknowledge that while there are global forces impacting manufacturers everywhere, it's important for those businesses to focus on what can be controlled. Here, we summarize Heppelmann and Sircar's discussion about how manufacturers can better identify and prioritize top improvement opportunities with a direct correlation to financial improvement.

In the face of disruption, manufacturers must focus on what they can control

Indranil Sircar: Thank you for joining me, Howard. I want to start our conversation by discussing the state of the industry. While disruption isn't new to manufacturing, the pandemic has placed exponential pressure on long-standing manufacturing challenges. Unprecedented volatility in demand, supply chain disruptions, material and resource scarcity, and labor shortages have amplified global production challenges to a degree not seen in decades. Moreover, innovative technologies like the Internet of Things (IoT) and mixed reality are changing the way organizations work—and as a result, shifting the competitive landscape. With so many forces impacting manufacturers around the world, what do you see as the key to thriving in today's environment?

Howard Heppelmann: Thank you, Indranil. You're certainly correct—manufacturers today are at the pinnacle of stress, caused by external market dynamics that are mostly out of their control. Whether it be a

sharp drop in demand, a spike in demand, changing product mix, a loss in efficiency due to labor shortages, supply chain disruption, or simply keeping pace with technology innovation, manufacturers need to prioritize their investments and resources to maximize financial impact on the bottom line. Doing so requires greater agility enabled by a systematic approach to real-time digital performance management.

Improving operational excellence is both a desire and challenge at the epicenter of every competitive manufacturer. Tracking operational key performance indicators (KPIs) and asset performance is nothing new for manufacturers, but despite heroic efforts, most manufacturers rely on reporting and performance KPIs that are out of date, incomplete, inconsistent, and devoid of actionable intelligence. Without a standardized, always-current system to monitor performance and identify and prioritize improvement opportunities, it's extremely challenging to get ahead in today's increasingly dynamic environment.

ThingWorx Digital Performance Management delivers the insights needed to make informed decisions

Howard Heppelmann: The good news for manufacturers—no matter what industry they're in or type of manufacturing process they operate—is that the industrial Internet of Things (IIoT) and data analytics have made it possible to address this challenge. Manufactures can now synchronize their production schedules, IT systems, manufacturing equipment, frontline operators, and management with the most important throughput metric of any production site: time. With time as the common denominator and time-based analytics as the catalyst for prioritized problem solving, manufacturers can stay laser focused on resolving the most critical issues constraining performance.

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ThingWorx IoT Solutions at PTC

Indranil Sircar: In addition to standardizing performance management, manufacturers must also think about how to make these efficiency improvements repeatable and scalable across their production lines and factories. Unlocking true, transformational value requires a systematic approach to continuous improvement processes.

Howard Heppelmann: Exactly. Transformational impact can only be achieved when it goes hand in glove with enterprise scale, and that's why we're so excited about the work PTC and Microsoft are doing: creating a SaaS solution that enables the standardization of a best-practice approach and helps to rapidly unlock efficiency improvements across a global production network. ThingWorx Digital Performance Management (DPM) enables a standard, systematic, always-current, priority-driven, closed-loop approach to identify, action, and validate the top improvement opportunities with a direct link to financial impact. Leveraging DPM on a flexible and secure platform like Azure, manufacturers can rapidly scale to capture double-digit performance improvement.

Accelerating time to value by leveraging existing systems and standardizing data in the context of time

Indranil Sircar: Let me ask the question on everyone's mind: how does DPM help manufacturers get started?

Howard Heppelmann: Our solution codifies digital performance management—the industry's number one, high-value, no-regret use case—into a standardized approach. DPM enables manufacturers to connect and unify real-time data across IT and OT systems, whether that's OT data directly from equipment and data historians, or IT data from ERP, MES, PLM, and other planning, scheduling, and execution systems. Manufacturers are often concerned that connecting the data required for comprehensive performance management necessitates a massive undertaking. But that's not the case anymore: the days of rip and replace are gone. Rather, DPM's IoT capabilities wrap and extend existing IT and OT systems already in place. This agile approach enables manufacturers to take advantage of all their existing systems and data and pursue the most impactful opportunities with minimal disruptions—supporting a "rising-tide-lifts-all-boats" outcome.

Indranil Sircar: And when manufacturers can leverage existing systems and data, they shorten time to value in weeks and months, not years. But there are many existing OEE and other performance monitoring tools available. What makes DPM unique?

Howard Heppelmann: Well, first of all, DPM is not another OEE tool. While DPM can output an OEE metric, it's really a system for prioritizing, managing, and executing measurable closed-loop efficiency gains. The DPM special sauce is actually quite easy to understand. As alluded to earlier in our discussion, there are a few critical differences that can be summarized as time, time loss analytics, and closed-loop outcome validation. Let's start with time—time is absolute: there are 168 hours of potential production capacity in a week. If a manufacturer doesn't operate on weekends, then they have 148 hours remaining. Whether they run one, two, or three shifts, optimizing capital investment, material, and labor costs determines the cost per unit. In the most optimized factories in the world—and there are few—production efficiency is 85-90% when measured against the absolute metric of time.

DPM reaches deep beyond the concept of OEE as a percentage and translates everything back to effective time against potential. It highlights the top reasons for lost production capacity, whether that's based on assets, labor, or quality. Then, DPM leverages analytics and advanced artificial intelligence (AI) to systematically guide operators and management to focus on the top improvement opportunities. This time-centric approach eliminates the "gaming" of OEE or performance management site by site and holds the entire operations network accountable to available time and effective time. And finally, DPM focuses on providing actionable insights and driving closed-loop validation of improvement outcomes, as measured by additional hours of production capacity.

The path to continuous improvement: identifying bottlenecks and prioritizing issues

Indranil Sircar: Access to data over an extended period opens a wide range of possibilities for manufacturers. Suddenly, they can better understand which bottlenecks have the largest negative impact on production and then take steps for remediation. When they perform remediation repeatedly—working their way from the worst bottleneck to the next, understanding how to balance the relative priority of constraints, and so on—continuous improvement becomes a much easier, targeted task.

Howard Heppelmann: That's right— in order to maximize throughput and

efficiency, manufacturers ask, "Where are we not operating at our best demonstrated performance? What are the root causes, and how do we fix them?" With DPM, manufacturers can monitor current performance, identify the most significant bottlenecks, understand the relative priorities and weighting of competing bottlenecks, and take actions against the greatest in the overall process. From there, they're able to leverage analytics to provide insights that are otherwise blind to the human eye, identify root causes, take action, and measure improvement outcomes—all within a systematic, closed-loop process.

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Indranil Sircar: I'd like to expand on that, Howard. Part of what you're saying is that organizations are using DPM to empower employees. Having a shared understanding of operations and issues is the foundation for collaboration and resolving issues faster.

It really changes how manufacturers manage

their time. Plant managers might need to meet increased demand while slashing the cost of overtime. By figuring out exactly why inefficiencies are occurring, plant managers can help teams focus efforts. Considering factors like scheduled time, required demand, and cycle times, they can easily see the greatest bottlenecks in the production process. With data normalized by time lost, manufacturers get a granular, consistent analysis that can be traced back to financial impact.

Howard Heppelmann: Once manufacturers have identified an issue, it's time to take targeted action. They can use DPM's action tracker to plan, monitor, and validate the corrective measures that teams have taken, using real-time data directly from operators and equipment on the front line. And finally, when progress is made, DPM captures the exact impact, measured in increased production time, directly within the solution. DPM is truly a no-regret solution in the sense that it records improvements in production throughput directly within the application. With this approach, gone are the days of not knowing how much value your technology investments deliver.

Transformational impact requires scale and flexibility

Indranil Sircar: For me, the key to unlocking true transformational value is doing so at scale. Our customers sometimes have hundreds of factories—so it's not about what you can accomplish at one or two factories, but what you do at scale. DPM adds tremendous value at the application layer, but how do manufacturers manage variability in the infrastructure and platform capabilities across many factories? Reducing variability in the platform is key to repeatability and therefore scalability of the solution. As a complement to DPM, Microsoft's Azure provides the infrastructure and platform capabilities at limitless scale so you can repeat use cases again and again.

Howard Heppelmann: Absolutely. At a basic level, it's just math. $2 million of impact at a single production site is interesting, but $2 million of impact across 50 production sites is transformational and more aligned to the expectations of C-suite leadership. We've seen that site-by-site, on-premises deployments require more investment and effort to scale, which is further exacerbated when each site's use case is unique. Frankly, the need for scalability and repeatability are how we think about developing solutions like DPM. We take the industry's number one IIoT/Industry 4.0 use case, capture it as a best practice, and then leverage Microsoft's Azure architecture so customers can deploy quickly and at scale to realize 5-30% improvements in throughput across their production network. Offering that combination as a standard, ready-to-use SaaS solution is what unlocks impact at scale.

Indranil Sircar: A crucial aspect of managing variability in different settings is the flexibility to provide the compute capability wherever it is required: from the edge to the cloud and everywhere in between. By bringing computational power closer to where the data is generated, organizations can collect, process, and act on data faster and more efficiently. For example, in one instance, manufacturers may run AI workloads on the edge that are tied to quality improvements and feed that data into DPM to identify anomalies. Another scenario may have a different data source and support different outcomes. The point is: manufacturers need anywhere-compute capabilities to support both.

Data security and governance inspires confidence across the organization

Howard Heppelmann: I agree. Embracing a hybrid cloud architecture and edge computing are not only critical for speed and flexibility, but essential to unlocking actionable insights at every layer of the hierarchy. In the pre-pandemic world, manufacturers were slowly warming up to cloud and cloud computing. However, with the onset of the pandemic and a

rising awareness of the need to accelerate digital transformation, it seems a switch has been flipped. Now, the majority of manufacturers recognize that a hybrid cloud infrastructure reflects the modern production architecture. That said, I know many of our clients are nervous about the security and data governance implications of an edge-to-cloud network. As a leader in industrial cloud computing, can you comment on their apprehension?

Indranil Sircar: It's important to think about managing data from an end-to-end perspective: where data is collected and how it flows throughout the enterprise, as well as how it extends to partners, suppliers, and customers. When manufacturers approach security and data sharing holistically, they lay in place a solid foundation for digital transformation. Manufacturers gain confidence across their entire ecosystem, enabling them to work uninterrupted and collaborate both within and outside their organization.

In terms of data governance and lineage, it's important to give specific people access to certain data. For example, consider a machine builder that makes production equipment with sensors for other manufacturers. That sensor data needs to be shared with other organizations, including the machine builder, in a way that doesn't expose sensitive intellectual property and operational data. Thus, it's important to not only think about who has access to your data but also what systems can access what data. Again, it comes back to confidence and knowing that everyone in that environment is within a secure framework.

Now, in terms of security, of course it's important to monitor IoT devices for threats. But what is really needed is a comprehensive security solution. Factories are an increasingly desirable target for cyber-attacks. That means manufacturers need full visibility into assets and risk across the entire digital estate—IT, OT, IoT, managed and unmanaged devices, smart personal devices, and any other system or data source. The ability to perform continuous asset discovery, vulnerability management, and threat detection of IoT and OT devices, in combination with flexible deployments across on-premises, cloud, and hybrid infrastructure, is vital to enabling this comprehensive approach.

Together, PTC and Microsoft fuel faster time to value

Indranil Sircar: At Microsoft, we're always proud to call PTC our partner. The partnership is strong for several key reasons. First, we can rely on one another's deep industry expertise. Second, the synergy between your IoT and mixed reality solutions and our cloud, edge, IoT, security, productivity, and mixed reality products unlocks value across organizations. And finally, we have a joint commitment to helping customers enable the digital transformation journey: both PTC and Microsoft are dedicated to helping manufacturers accelerate ROI by focusing on impact and reducing complexity.

Howard Heppelmann: Thank you, Indranil. Our alliance with Microsoft is critical to enabling real competitive differentiation for our clients. The strengths you just mentioned are the foundation of everything we've talked about here: our shared industry expertise, IoT, analytics, cloud technology, and above all, dedication to offering differentiated customer value through solutions like DPM. Our shared vision and joint technology synergy is what enables our customers to address the highest-value, no-regret use cases and capture double-digit improvement with speed and at scale.

To learn more about how PTC and Microsoft can transform production centers into factories of the future, visit the **ThingWorx Digital Performance Management** page on the PTC website.