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Coronavirus: Industrial IoT in challenging times

The Industrial Internet of Things can help companies navigate the current crisis and emerge stronger once operations ramp up again.

by Stefan Fahrni, Christian Jansen, Michael John, Tarek Kasah, Bodo Körber, and Niko Mohr

Industrial companies expected 2020 to bring economic pressure from ongoing trade disputes, the aftermath of Brexit, automotive-industry challenges, and slowing demand in China. But none anticipated that the COVID-19 pandemic would throw the global economy, and their own operations, into an unprecedented crisis. As the coronavirus continues to spread, governments, healthcare authorities, and business leaders are focused on preserving lives and containing the pandemic. In parallel, they want to lessen the humanitarian toll by protecting the livelihoods of millions of workers who are now furloughed, unemployed, or in danger of losing their jobs.

Within industrials, shocks to both supply and demand have significantly decreased production volumes or stopped operations. For instance, all major automotive OEMs in Europe have shut down their production networks, resulting in the breakdown of entire value chains. Where business has continued, physical-distancing measures are dramatically altering operations, employee responsibilities, and staffing.

To navigate the current crisis and reach the next normal that will emerge after the pandemic abates, companies must embark on a journey with three horizons, each of which involves different questions:

— *Resolve.* How can we ensure business continuity now?

— *Return and resilience.* How can we return to business and increase our flexibility to thrive in the "new normal"?

— *Reimagination and reform.* How can we improve our business over the long term, in a world changed by the pandemic, and emerge even stronger?

Industrial IoT (IIoT), a major element of Industry 4.0, can help companies as they proceed on this journey. It has demonstrated its value on many occasions over the past few years, but some skeptics still

doubt its worth and elected not to make bold investments in this area. What's more, few business leaders view IIoT as a critical improvement lever in times of crisis, especially if their organizations have not previously explored it.

This article dispels misconceptions about IIoT and describes how industrials can apply it as they move through the three horizons outlined (exhibit). Companies can begin this journey without a full IoT stack in place because the necessary technology foundations, including connectivity solutions and platforms, are readily available on the market. Any business can therefore apply IIoT solutions with limited effort.

Resolve: Applying IIoT to secure business continuity

Faced with the COVID-19 crisis, industrial leaders have one business imperative: maintaining their operations. IIoT, implemented in a plug-and-play mode, can be instrumental in ensuring business continuity and minimizing economic damage by ensuring employee safety and security, improving liquidity, and lowering short-term costs.

Ensuring employee safety and security
Companies are suddenly dealing with remote work on a large scale, as well as new concerns about protecting their remaining on-site employees, and have adapted their workforce organization in consequence. On the shop floor, such measures include the following:

— keeping teams at a maximum of five to ten people

— decoupling the start and end times of shifts

— reorganizing the workplace layout to allow for a distance of more than 1.5 meters (five feet) between employees

— conducting shift handovers remotely

Exhibit

The Industrial IoT is an important improvement lever during challenging times.

Theme	Lever	IIoT use-case example	Full potential
Resolve	Ensuring employee safety and security	Remote employee collaboration Workforce tracking Vision-based control systems Remote asset control	Safeguarding operations
	Improving liquidity	IIoT-enabled inventory management Waste reduction Maintenance-cycle increase	−10 to −35% inventory −20% waste −10 to −15% maintenance costs
	Lowering costs in short term	Digital performance management Remote assistance	20 to 40% labor productivity −10 to −40% service costs
Return and resilience	Connectivity and cybersecurity	Large-scale connectivity rollout Cybersecurity	Strategic enabler
	Mid-term cost improvement and flexibility	IIoT-enabled asset optimization Real-time procurement transparency	Up to five-percentage-point overall equipment effectiveness −2 to −5% spend
	Revenue stability	Next best action for sales and service Dynamic pricing optimization	Case dependent 5 to 8% revenue
Reimagination and reform	Increasing operational flexibility	Supply-chain integration across value chain In-line process optimization	Strategic enabler

IIoT tools can play an important role in ensuring a seamless transition through these changes, enabling location based services.

Remote employee collaboration. In general, the more digitized a company's processes are, the simpler it is to collaborate remotely. Off-the-shelf IIoT tools support the continuation of operations with fewer employees on site, since they facilitate remote work in direct and indirect functions. For example, a US tier-one supplier is using a manufacturing-execution system (MES) to optimize production and increase transparency. Even though many managers are no longer on site, the MES outputs provide the information they need to have valuable discussions during videoconferences. Similar solutions are available for the shop floor. Consider how one European commercial-vehicle OEM uses digital team boards to coordinate jobs, measure production levels, and improve performance gaps across shifts. Other IIoT tools, such as digital heat maps, can support root-cause analyses for various problems. With machine breakdowns, for instance, IIoT tools can receive input from sensors that help pinpoint problems, such as broken components or oil leakage that could interfere with production. Teams can then review the tool outputs and discuss the potential sources of error over videoconference.

Workforce tracking. When facilities remain open, workforce-tracking solutions can help enforce essential physical-distancing measures. If workers consent and local regulations permit, employees can wear positioning devices for fencing purposes that show where they are moving within a facility. This information gets fed into intelligent algorithms that help managers optimize workflows and minimize contact at shift changeovers and other critical points. Recently, for example, one company quickly staggered breaks and rearranged shifts based on IIoT insights, allowing it to continue operations while drastically reducing employee contact. Some IIoT tracking solutions automatically restrict access to certain areas if there are too many people.

If employees test positive for the coronavirus, companies could use positioning data from their wearable devices to notify colleagues with whom they had been in close proximity. Of course, all worker-specific information must be anonymized to protect employee privacy. And if COVID-19 forces many people to be absent because of illness, the devices will inform management about short-staffed areas, allowing management to identify operational areas where slowdowns or other risks may materialize.

In addition to protecting workers, tracking solutions can improve operations. Overall, case examples have demonstrated that they increase productivity by 10 to 30 percent, depending on factory set up (for instance, the number of machines and types of processes).

These improvements come from both higher employee productivity and decreased cycle times.

Industrial companies can achieve significant impact through workforce tracking in as little as a few weeks through off-the-shelf IIoT solutions. Some can be deployed within five days after they begin preparing for implementation. These prepackaged solutions typically contain an IIoT kit (sensors, edge transmitters) and a prepackaged IIoT platform (data platform, dashboards, interfaces). They require relatively little investment, even those that provide real-time and in-depth operational analyses.

Vision-based control systems. As with remote-collaboration tools, vision-based control systems can play an increasingly important role during the current crisis. For instance, systems that analyze video feeds can be combined with infrared imaging to detect fevers. Together, these tools can assist with the identification of infected or infectious employees, monitor physical distancing, and ensure that sick employees remain home. (Again, local regulations may determine whether such applications are permissible). Some companies combine low-tech measures with vision-based control systems for the same purposes. Amazon, for example, takes body temperatures of workers at the entrances to warehouses. It also uses machine-learning software to analyze footage from on-site video cameras to ensure that employees are maintaining safe, recommended distances from one another during shifts.[1]

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[1] Darrell Etherington, "Amazon begins temperature checks and will provide surgical masks at warehouses," TechCrunch, April 2, 2020, techcrunch.com.

Remote asset control. IIoT can allow companies to maintain operations when public-health interventions forbid or limit on-site work by monitoring and controlling equipment remotely. To implement such services, companies must connect critical assets to cloud-based control software. Machinery OEMs and vendors of industrial control software offer connectivity kits and software extensions for most equipment. Employees can then establish access to these tools from home while adhering to the highest security standards to protect their companies and customers.

Improving liquidity

With COVID-19 disrupting both supply chains and customer demand, managing liquidity is crucial for industrial companies. IIoT can help in three areas.

IIoT-enabled inventory management. This use case can help industrial companies reduce inventory and thus directly free up liquidity. For instance, sensors can monitor container-fill levels at a single site using ultrasound. Other applications can track the flow of materials over long distances by using geo tags in combination with integrated mobile communication. This real-time transparency allows the logistics team to manage the material flow more accurately and order raw materials and other inputs closer to the date they are needed, reducing inventory. Although results vary by industry and company, IIoT can help reduce overall inventory levels by up to 36 percent.[2]

Waste reduction. Similar to inventory management, IIoT can provide transparency about the waste created during the production and its root cause. These insights help save cash because less raw material is needed to produce the same quantity. For mass production, companies can achieve significant savings by installing basic measurement devices, such as scales and in-line sensors that send information via IIoT. For example, a packaging company started to measure the length and weight of the plastic film thrown away and began to incentivize machine operators to reduce waste. These efforts helped reduce waste by 20 percent in under six months.

Longer maintenance cycles. Instead of replacing a machine part after a certain time period, companies can extend its lifetime by measuring its condition with IIoT sensors. If a repair is not warranted, companies can delay it beyond the standard period. Improved condition monitoring typically reduces maintenance costs by 10 to 15 percent.

Lowering costs in the short term

As the crisis unfolds, industrials can benefit from short-term cost reductions, and several IIoT-enabled tools can help in this respect.

Digital performance management. IIoT-based software solutions can provide a real-time dashboard of key performance indicators to support shop-floor performance dialogs, increasing transparency. These tools also allow the tracking of improvement actions and send alerts to operators via mobile devices. The software evaluates machine data, such as information on overall equipment effectiveness, part production, and quality through IIoT connectivity. Improved performance management can help companies boost labor productivity by 20 to 40 percent.[3]

Remote assistance. In addition to improving employee safety, experience suggests that remote assistance and maintenance tools can yield a 10 to 40 percent reduction in field-service costs, especially travel, by reducing the need for in-person visits. The gains may be particularly high at machinery OEMs with a large installed base.

Return and resilience: Applying IIoT to increase flexibility amidst uncertainty

The coming months will be defined by new and unknown challenges. After the pandemic ends, unexpected shocks will undoubtedly occur, ranging from new health issues to supply and demand changes to geopolitical tensions that interfere with trade. Companies can expedite their return to normal operations, increase IIoT usage, and build resilience by focusing on improvements in three areas.

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[2] *Global lighthouse network: Insights from the forefront of the fourth industrial revolution*, a joint report from McKinsey and World Economic Forum, December 2019, weforum.org..
[3] Ibid.

Connectivity and cybersecurity

Strong connectivity and cybersecurity enable better visibility across the supply chain, allowing industrials to respond more rapidly to disruptions. The time required to improve connectivity and cybersecurity will vary, depending largely on a company's operational setup, including the number of machines and software solutions in place.

Large-scale connectivity rollouts. Many companies have a pressing need to provide employees with remote access and control of various machines. Since many machines are now experiencing higher-than-usual downtime, companies may be able to install connectivity kits on them more easily. To accelerate the rollout, workers could install a connectivity box each time they perform routine maintenance services. Every machine that is connected to the internet will help industrials, since it becomes available for remote monitoring, data collection, and other services.

Cybersecurity. As companies increasingly digitize their manufacturing operations, cybersecurity becomes more important. As with large-scale connectivity, companies can more easily improve cybersecurity at all levels when asset downtime is high or operations are shut down, since applying fixes will not create major disruptions. Companies can undertake some simple cybersecurity measures, such as critical software updates and firmware updates of hardware, fairly quickly. These small steps help to minimize overall cybersecurity risks.

Mid-term cost improvement and flexibility

There are several IIoT use cases that can help industrial companies adjust to the next normal after the crisis by reducing their break-even point and creating a more flexible cost basis.

IIoT-enabled asset optimization. This use case involves using advanced analytics to identify the root causes and countermeasures related to the three drivers of overall equipment effectiveness (OEE): availability, performance, and quality. For instance, an aerospace supplier had a low OEE when producing an important airplane component. It then used IIoT solutions to monitor and detect

certain problems, such as tool wear and missing materials. Based on this sensor information, the company was able to optimize job sequences in a central control room. With these improvements, the company achieved 80 percent OEE. IIoT tools may also help companies discover previously unknown problems within the supply chain. While impact may vary drastically across settings, companies may improve OEE by as much as 5 percentage points—for example in low-volume, high complexity discrete manufacturing settings.

Real-time procurement transparency. IIoT tools can help companies optimize procurement by using real-time information on inventory levels and production capacity to determine what quantities must be ordered and assist with rapid contract renegotiations. This feature is especially relevant during the current crisis because commodity prices have decreased significantly. Take oil and copper, both of which have decreased in price by about 20 to 25 percent. Optimizing vendor allocations and improving negotiation strategies typically deliver a 2 to 5 percent reduction in raw-material costs. Given current events, these savings will likely be higher now.

Revenue stability

By ensuring revenue stability during business cycles, industrial companies become more resilient when they encounter unexpected downturns. Consider some IIoT use cases that can help achieve this goal:

Next best action for sales and service. This customer-centric use case can increase both revenue and customer satisfaction. Applying advanced analytics to installed base management, companies determine the best actions for sales and service representatives to take next with a particular customer after assessing data about its current machines. Depending on local regulations, such data could include information on real-time and historic machine conditions, as well as customer records. The relevant IIoT tools can also estimate how customers might respond when they encounter certain service issues or are offered various options, such as service upgrades or the supply of spare parts or consumables. The revenue impact

of this use case varies significantly by industry, depending largely on the importance of after-sales services. Companies can also apply this use case internally to define the next best action for their own maintenance team, provided that the necessary data is available.

Dynamic pricing optimization. IIoT-enabled pricing tools can analyze data on supply and demand from connected assets in near-real or real time, including information on stock levels, available capacity, production schedules, and anticipated delivery dates. Based on this analysis, the tools recommend the best price for a particular date, allowing companies to make updates more frequently. This use case typically increases revenues by up to 5 to 8 percent. It also allows companies to simplify pricing frameworks for new products.

Reimagine and reform: Leveraging IIoT to emerge stronger post-crisis

The pandemic will have a lasting effect on businesses, even after it abates. On the customer side, industrials might see a permanent shift toward contactless delivery or greater end-user configuration. They may also decide to implement new strategies along the entire supply chain to avoid disruptions similar to those they encountered in early 2020.

In addition to negotiating the current crisis, companies must prepare for such changes and aim to emerge stronger than they were before. Lighthouse factories prove that deploying IIoT use cases at scale can create significant improvements for all operational key performance indicators.[4] For example, some have increased output by 10 to 200 percent, reduced product costs by 5 to 40 percent, and decreased time to market by 30 to 90 percent. Overall, industrials will need to continue to strive for more operational flexibility, particularly the ability to change production volumes when needed. The following IIoT use cases show how companies can increase operational flexibility and start achieving impact at scale.

Supply-chain integration across the value chain

IIoT facilitates real-time data exchange between all supply-chain participants, creating an integrated view of production programs, scheduling, inventories, quality, and anticipated delivery times. In addition to building transparency and trust, such tools can also reduce supply-chain costs and risks—for instance, by receiving signals from connected machines when they are running out of raw materials, or by tracking the flow of materials along the supply chain using geolocation tags. With these insights, companies can optimize inventory levels, production planning, and transport utilization through a more holistic approach. (The information on inventory is used to improve planning across the supply chain, including decisions about producing materials). Companies will also learn about supply-chain problems more rapidly, allowing them to act before they escalate.

In-line process optimization

IIoT can increase production efficiency of single machines or entire production lines by using advanced analytics to optimize process parameters. The algorithm analyzes information on all available variables, including production, scheduling, asset condition, and input goods. Data from individual machines gets combined with information about the overall production program, allowing companies to optimize machine settings based on previous and subsequent production steps. This allows companies to adjust production schedules quickly to account for changes in demand or unexpected supply-chain disruptions.[5]

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Industrial companies will take different approaches to leveraging the power of IIoT in challenging times, but three actions are always helpful when getting started:

— Moving quickly and leveraging off-the-shelf IIoT solutions, including those from technology providers and machinery OEMs, to maintain critical operations; these solutions can enable

[4] Enno de Boer, Helena Leurent, and Adrian Widmer, "'Lighthouse' manufacturers lead the way—can the rest of the world keep up?," January 2019, McKinsey.com.
[5] *Global lighthouse network.*

a rapid shift to remote operations and help safeguard employee safety and health.

— Undertaking strategic improvements, including large-scale connectivity rollouts and cybersecurity investments, especially if operations are slow in order to build resilience and become more competitive.

— Reforming the operating model with IIoT solutions; non-operations employees who may have idle time during a crisis can help assess, prioritize, and prepare long-term solutions that will allow companies to thrive and emerge stronger than ever when the pandemic abates.