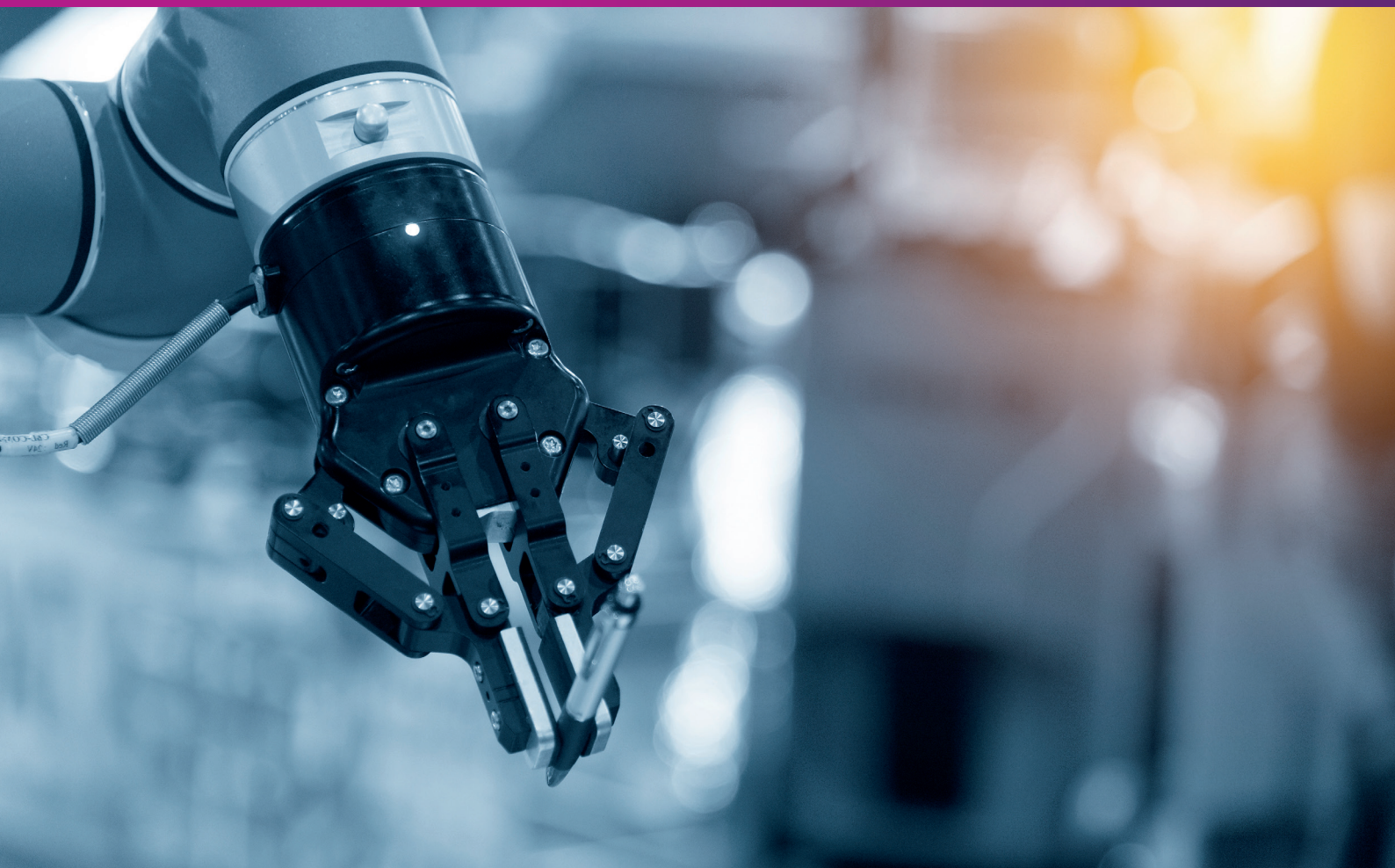


Inside Industrie 4.0: The factory of the future



How emerging technology can create more future-focused factories, with smart products, smart machines and more automated, insight-led operations.

A whitepaper by Insight





Introduction

The manufacturing sector is changing – and fast. All over the world, technology is improving the way in which manufacturers design and produce products, connect with customers, suppliers and stakeholders, and move products across the supply chain.

Manufacturing is no longer a linear and purely physical process in which the customer's needs and preferences remain static – or in which production issues are highlighted in end of month reports. Instead, we're now seeing the emergence of "Industrie 4.0" – a modern way of operating in which big data, the Internet of Things (IoT) and artificial intelligence enable manufacturers to manage their operations in much greater detail – and in real-time. In Industrie 4.0, the product itself influences the manufacturing process; production lines are predominantly machine-led, and data is used to help operators stay focused on the future - through process optimisation and predictive maintenance. By capturing the right data, and feeding it into cloud-based data processing technologies, manufacturers can improve manufacturing throughput, improve quality and improve uptime, end-to-end.

Globally, this transformation towards Industrie 4.0 is already well underway.

At the same time, however, Industrie 4.0 has raised some key challenges for modern manufacturers. As data is incredibly valuable, it also needs to be highly secure and protected from both internal and external threats. The rapid implementation and heterogeneous nature of much of the new technology means there is generally a lack of robust quality standards, as well as potential issues with reliability and stability. The industry lacks a sufficient number of people who are skilled in these new, emerging technologies, and many people and processes within the sector are also resistant to change – all of which can prove challenging.

At Insight, we specialise in helping our manufacturing clients overcome these challenges, embrace the principles of Industrie 4.0 and achieve practical and appropriately paced digital transformation.

It's estimated that over half of the world's manufacturers have already invested more than \$100 million towards smart factory initiatives.¹ And according to Capgemini, the results have been powerful. For the manufacturers who have successfully implemented smart, connected factories, there have been average realised productivity gains of 17-20% so far.²

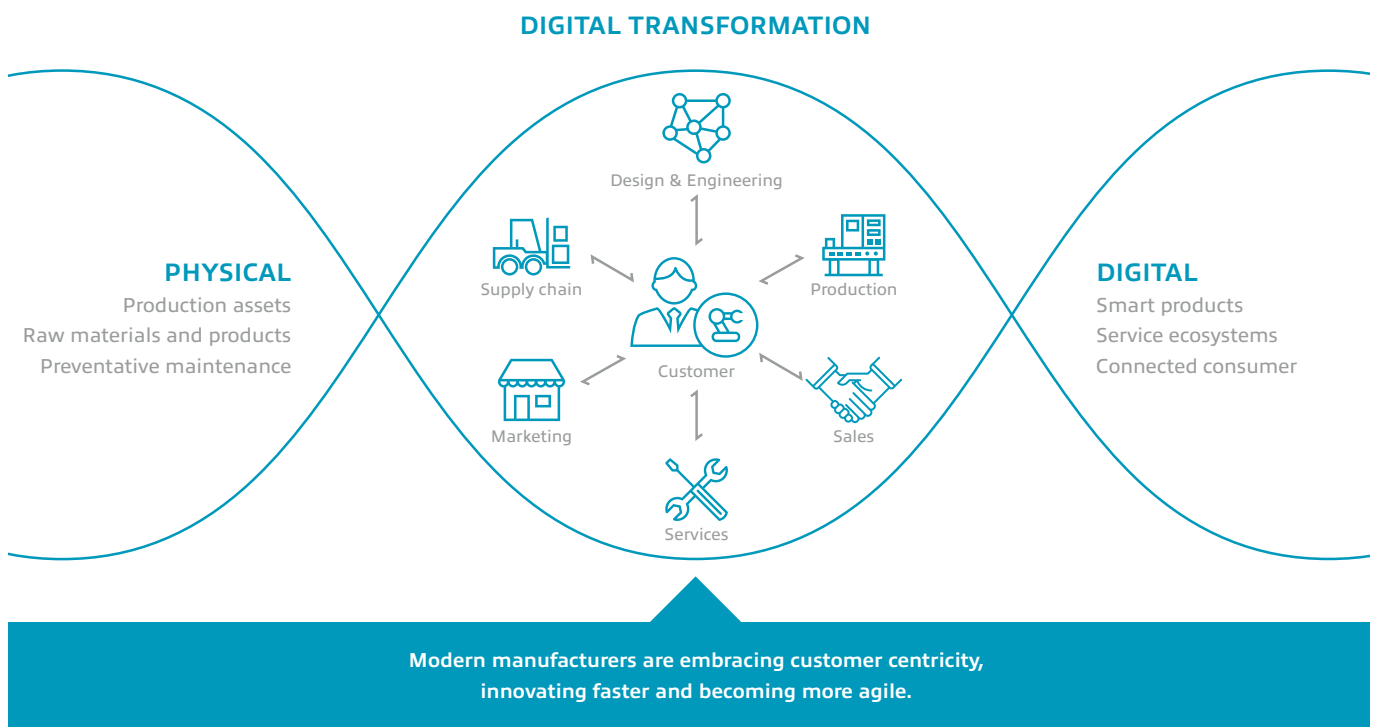
¹ [Capgemini, Smart factories: how can manufacturers realise the potential of digital industrial revolution, \[Online\] accessed 22 August 2018](#)

² [Capgemini, Smart factories: how can manufacturers realise the potential of digital industrial revolution, \[Online\] accessed 22 August 2018](#)





In this whitepaper, we explore the **factory of the future** in the context of Industrie 4.0. What does it look like? What role does technology play? And what do manufacturing firms need to do now, in order to keep pace with a rapidly-changing sector?





What does the factory of the future look like?



The factory of the future:

There are three core paradigms within Industrie 4.0⁴



The Smart Product



The Smart Machine



The Augmented Operator

"In the factory of the future, the value chain will be fully integrated, blurring traditional boundaries. Throughout the value chain, manufacturing will be facilitated by the comprehensive integration of IT systems and the availability of all required production data."

Boston Consulting Group³

³ BGC, The Factory of the Future, [Online], accessed 22 August 2018

⁴ Weyer, Schmitt, Ohmer, Gorecky, 2015: Towards Industry 4.0 - Standardization as the crucial challenge for highly modular, multi-vendor production systems, [Online], accessed 22 August 2018





The Smart Product

In the factory of the future, everything will be interconnected, and data will be used to drive decision making at all levels of the operation. Business owners and managers will be able to get a detailed view of how various lines and sites are performing – from anywhere, on any device, and at any time. As such, products themselves will start to influence the manufacturing process.

Data will flow easily and seamlessly in the cloud, so it can be securely accessed from any location. By having data in the cloud, the modern factory can also utilise machine learning and artificial intelligence to 'close the loop' on insights - ensuring any anomalies or patterns are realised and actioned in real-time for the benefit of the overall operation.

For instance, a site manager will be able to log on to a secure dashboard on his iPad to check on the Overall Equipment Effectiveness (OEE) of his plant – the details of which are presented to him in real-time, based on data gathered by internet-enabled sensors. He can then make informed decisions regarding required maintenance activity, which can potentially save the factory considerable time and money.

"In 2018 more companies will save time and money as their IoT-enabled equipment undertakes self-maintenance and alerts managers to developments. Along with substantial material cost savings, this will reduce equipment downtime, maintenance planning time, and overall maintenance costs."⁵

⁵ Industry Week, Four digital trends manufacturers should watch in 2018, [Online], accessed 22 August 2018





The Smart Machine

The amount of data that is being captured in the manufacturing sector is expanding in volume, veracity and variety – and is too much for traditional data analytics to manage. It's for this reason that artificial intelligence and machine learning will play an increasingly vital role – enabling automated analysis and insight that can provide very accurate and important insights.

In the factory of the future, machines themselves will therefore become cyber-physical production systems. Autonomic components with local intelligence will be able to communicate with other optimising operations. And as such, production lines will become so flexible and modular that even small lot sizes will be able to be produced cost effectively.

The Augmented Operator

One of the most distinguishing factors of a modern, future-focused factory is its use of predictive analytics and machine learning to identify problems before they escalate – as well as to ensure processes are continually optimised.

To reduce downtime and improve throughput, every operator needs to perform as well as the best operator.

With the right metrics in place, for instance, it should be possible to determine if a particular piece of equipment is in need of servicing – before it slows down production and costs the factory money. Data can also be used to avoid over production, which can also be very costly for manufacturers.

“For Microsoft, the factory of the future is a complex ecosystem of self-regulating machines and sites, able to customise output, optimally allocate resources, and offer a seamless interface between the physical and virtual worlds of construction, assembly and production.”

Connected Factory – Microsoft 2017



Key challenges for modern factories

1. Insufficient security
2. Dated quality standards
3. Lack of reliability and stability
4. Shortage of skills
5. Resistance to change

Insufficient security

Today, data security is more pressing than ever before. As well as the increasing risk of cyber-attack, new data regulations in Australia and in Europe place the onus on organisations to protect their security – and that of their customers.

While many factories do have security systems and processes in place, many are out of date – and simply not built for new, data-intensive, cloud-based ways of working.

As such, organisations are leveraging cloud platforms that can quickly protect their workloads with built-in platform controls across their identity, data networking and apps. Many are also choosing to work with an expert partner that can help them assess their security posture and ensure risk mitigations are proactively addressed.

Dated quality standards

As much of the principles and technology behind Industrie 4.0 and the Internet of Things is new and constantly evolving, the industry itself lacks overarching quality and compliance standards. As such, manufacturers need to ensure their individual approach and strategy is robust, thoroughly tested and continually updated.

This is where choosing an experienced consulting and implementation partner can help. With the right guidance, the manufacturer can then develop standards that are fit-for-purpose. These can then be applied seamlessly across design, deployment and adoption.

Lack of reliability and strategy

When it comes to having a machine-led operation, reliability and stability are essential. Technology hitches can be extremely costly, and in most factories, downtime simply isn't an option. As such, engineers and IT infrastructure teams need to secure the right external expertise to help them design multiple redundancies into new systems. Extensive testing and prototyping is also needed to ensure the integrity of production processes is maintained.

Shortage of skills

While there are some highly innovative and forward-thinking people within the manufacturing sector, most businesses currently lack the internal skills to effectively embrace an Industrie 4.0 approach.

At least in the short term, many manufacturers therefore need to rely on third party consultancies, such as Insight, to provide technical knowledge and expertise in areas such as data science, artificial intelligence, and neural networks.

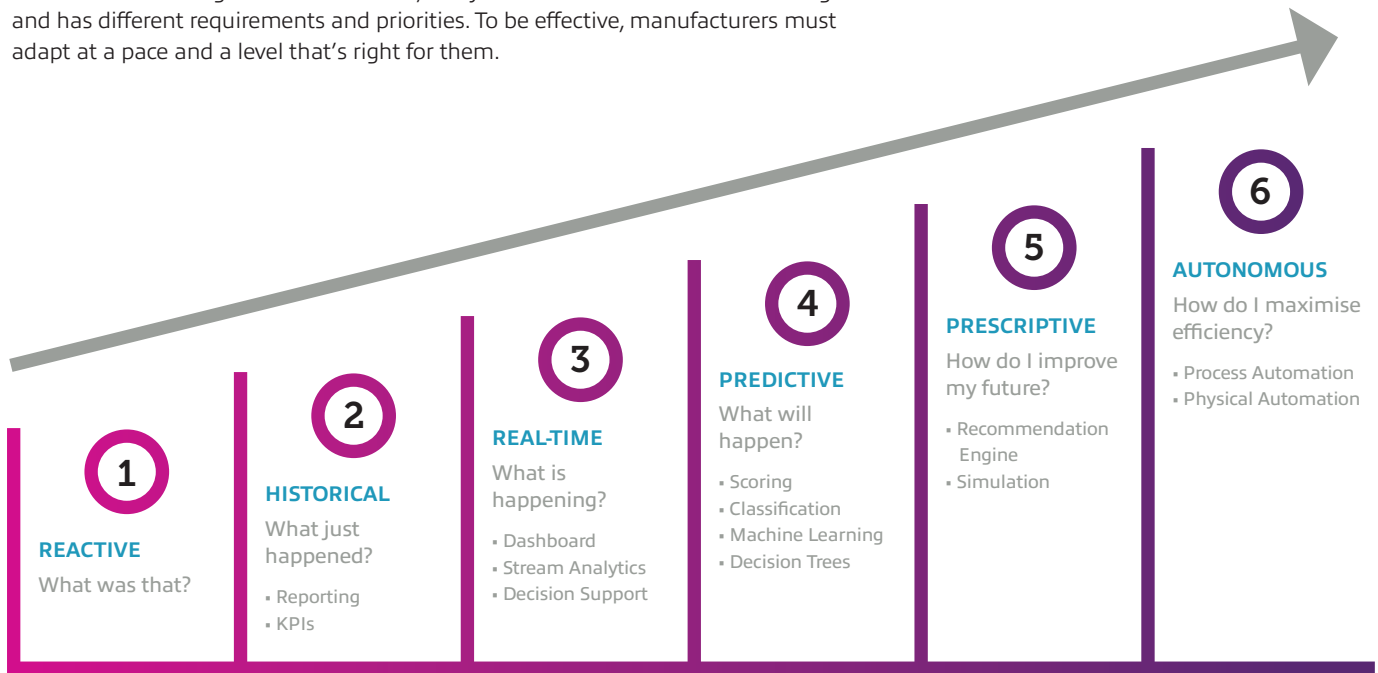
Resistance to change

Another common issue for Australian manufacturers is general resistance to change. Many plant operators are having to up-skill to use these technologies, and engineering teams which are offering support are having to cross-skill with necessary IT and analytics skills. Plant managers and operations teams are having to agree to make significant investments in technologies that sound futuristic and which they may not be familiar with or completely understand. All this change is therefore bringing about challenges - not the least of which is workforce concerns about obsolescence and redundancy. However, with a staged approach, and the right people in place, this can be managed. Importantly, investment in change management is also essential in ensuring the successful adoption of new technologies and processes.



Making the transition: key steps

When it comes to digital transformation, every manufacturer is at a different stage and has different requirements and priorities. To be effective, manufacturers must adapt at a pace and a level that's right for them.



Regardless of the level your organisation is at, there are typically three key phases to becoming a modern factory in keeping with Industrie 4.0:

Connect your machines

First you connect your existing machines to the cloud so you can collect data about their performance. This could include adding sensors to the machines you already have, or investing in a Software-as-a-Service (SaaS) application to connect your equipment to the cloud.

Monitor and adjust

Put this data to use by delivering it, in near-real time, to the employees who have the ability to act on it. With this data at their fingertips, your employees can make adjustments and order repairs earlier, minimising equipment downtime. In order to do so, you could leverage data visualisation software to achieve visibility into your operations. You could also equip your employees with devices so they can assess floor processes in real time. Or you could project the data on a large screen or wall on the factory floor.

Automate insights and optimise

Move from reacting to your data to acting on it proactively. Enable predictive maintenance scenarios and use your data to optimise production and make informed operational changes that maximise efficiency. To do so, you could determine which lines, systems and plants you need to upgrade, and consider replacing dated legacy equipment. You could also invest in strategic technologies like automation and robotics.





How the Insight Connected Factory solution can help

Insight's Connected Factory solution is built on the Microsoft Azure IoT suite, and includes a range of tools and innovative pieces of technology to help your organisation become more future-focused and digital.

While most manufacturing operations will have a manufacturing execution system in place, there are several vital benefits in choosing a new solution built on the Microsoft Azure platform. This includes:

Overarching insight

With Insight's Connected Factory solution, you can achieve end-to-end visibility into your production. The global summary dashboard aggregates data from across your factories to provide you with an overall picture of your manufacturing business. This means you can see at a glance your global overall equipment efficiency and key performance indicators. And critical alerts, outages, and operational and efficiency anomalies are all escalated for fast resolution. You can drill down into your data to compare the performance of individual factories, and can even compare the performance of equivalent machines at multiple sites.

Intuitive, visual dashboards ensure timely detection of anomalies, so your employees can order adjustments and repairs before operations are impacted. This drives improved utilisation, reduced waste, targeted cost savings, and improved quality.

Integration with IoT devices

If you have multiple sites, Insight can help you track and monitor your overall operation by installing IoT devices, and connecting them back into your Connected Factory solution for overarching insight. You can also connect individual pieces of equipment at your own pace, with no need to connect everything at once or disrupt production.

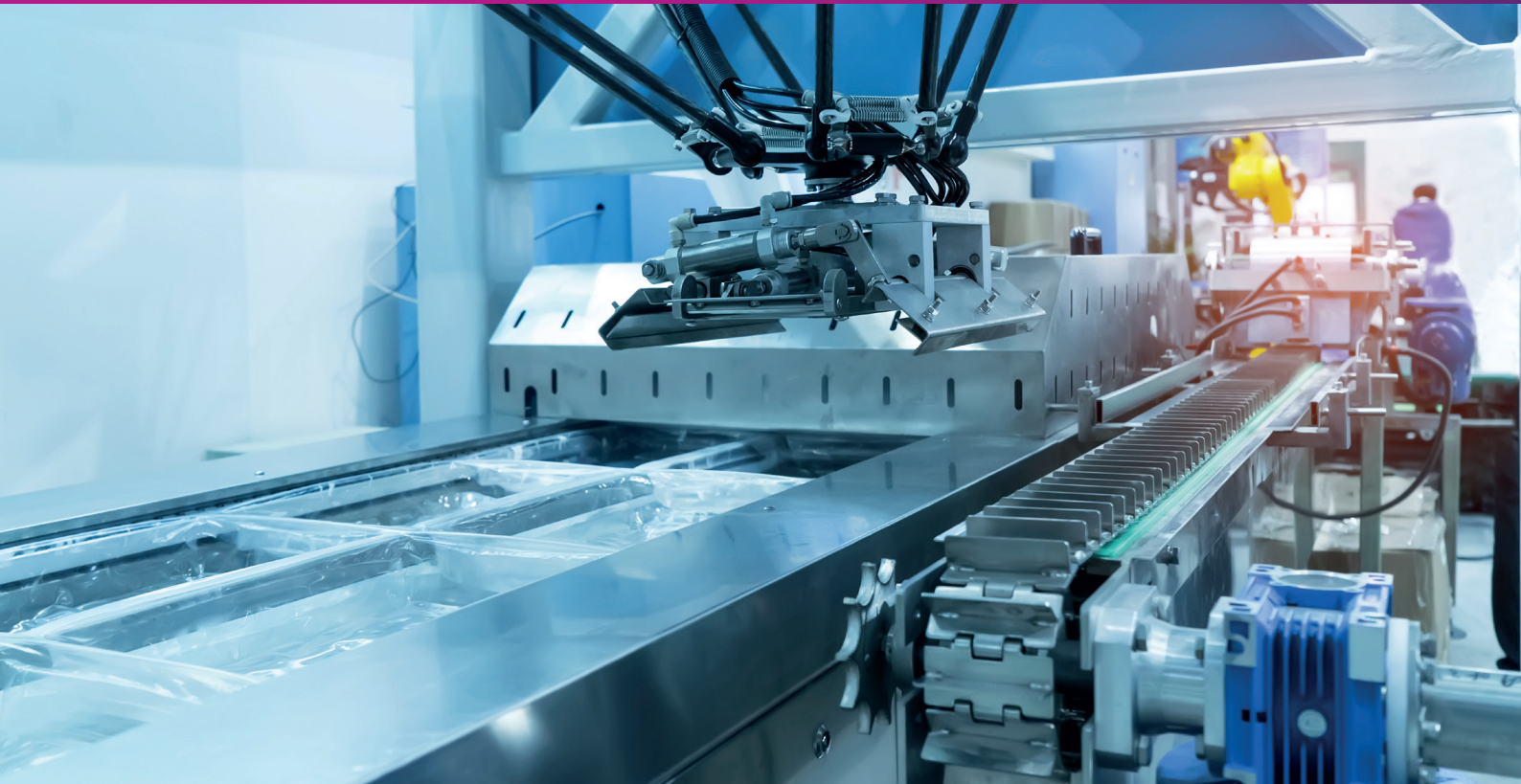
Insight's Connected Factory solution enables robust security by using the OPC UA standard and Microsoft Azure security end-to-end. (The German Federal Office for Information Security [BSI] verified that OPC UA architecture is highly secure by design. Microsoft also offers certificate management capability via a Global Discovery Server.)

With your machines connected to the cloud, you can empower your employees with near-real-time visibility into performance, whether they're on the factory floor or at headquarters.

Move from break/fix to predictive maintenance

By developing predictive models for your business, you can adjust processes and systems to trigger preventive actions when certain conditions occur. Imagine a scenario where one of your machines is reporting an increase in vibration. With machine learning, your system can automatically compare this event to past data points and determine the best route forward. In this circumstance, the model finds that similar increases in vibration in the past have resulted in downtime and a new work order will be automatically initiated to enable timely maintenance.





Enable new forms of quality assurance

Predictive models can also be used to identify variations in quality, as well as their causes, before quality thresholds are passed. In the above scenario, sensors identify that the output of a machine is approaching the tolerance threshold, and a worker receives a timely notification to replace the router bit to ensure that quality remains within an acceptable range.

Use data to make the business case for large investments

The distance between the factory you have now and the factory of the future is strategic investments and time. Your investments will get you there sooner if they're based on real operational data rather than guesswork. The data you collect with connected factory enables you to take intelligent action towards transforming your factory.

Employ advanced technology to transform business

Ultimately your investments may include advanced technologies like HoloLens, which can transform your business at every step. Here, a technician uses HoloLens to view a digital twin of the motor within a robotic arm. Insight into the condition of the motor without having to take the robotic arm offline or take it apart minimises downtime and enables you to model how equipment will behave over time as conditions like temperature and vibration change. Next-gen technologies like HoloLens can be used throughout the manufacturing process from design to production and beyond.





Why Insight?

The services division of Insight are specialists in digital transformation technology, Industrie 4.0, productivity and IoT applications. Our team has extensive experience working with a range of industrial machinery, and in applying cloud technology to drive greater effectiveness and insight. We have provided digital transformation services to a broad range of manufacturing organisations, and have the practical knowledge and experience to be able to effectively apply IoT in real, working scenarios.

Specifically, we have helped a number of manufacturing organisations standardise their data across their factories and facilities to enable real-time Overall Equipment Effectiveness (OEE) reporting and monitoring. We have helped factory managers reduce operational downtime and equipped site operators with the insights they need to perform as good as the best operator. Commonly, we have helped manufacturers start exploring their data science initiatives for predictive maintenance.

We are a Microsoft Gold Partner, and have an in-depth understanding of, and capabilities in, the Microsoft Azure IoT suite. We can help you get started with adopting the features of a smart factory by first piloting a solution at a specific site or production line. Through an opportunities backlog approach, we can help you prioritise your use-cases, so you can achieve quick wins and generate the return on investment you need to fund further use-cases – and make yours a smart factory.

Find out more

If you want to find out more about digital transformation in manufacturing and how Insight can help, please get in touch on +61 8 9365 8400 or at marketing.apac@insight.com

