TALKING ABOUT (INDUSTRIAL) REVOLUTION

enterprise iot insights

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The STATE of 'THINGS' in SMART MANUFACTURING

– how enterprises are grasping for and grappling with industrial IoT

by James Blackman
Editor, Enterprise IoT Insights

Image: KPMG / Cover image: 123rf

Spending on factory-based IoT data applications will grow from $18 billion in 2019 to just over $27 billion in 2024, a rise of 50 per cent in the period. About $32 billion will go on industrial IoT platforms for smart manufacturing by 2025. The market for artificial intelligence and machine learning services will spiral upwards 10-fold (!), to about $10.6 billion by 2026. Spending on private and shared 5G networks will surpass spending on public cellular networks in about 15 years.

These are all statistics from ABI Research – which, for our money, has just about the keenest eye on the broad industrial IoT space. They are useful, of course, but they are best considered to show the general direction of travel for industries and technologies, and not to chart a particular course for enterprises themselves, on a personal quest for their own private industrial revolution. (There is a sage line in here, somewhere, about 'statistics, drunk men, and lampposts'.)

What these numbers say is that the pace is gathering, quickly. What they do not say is how the market is actually doing, today, in 2021 – in the long shadow of the future promise and the big business of smart-everything? Rather, we are left to ask: what do we think we know, and what do we want to know, about the state of 'things' in manufacturing? We can make a number of assumptions; mainly that the demand-side is hungrier, emerging from a global pandemic that has locked-down global supply chains, and the supply-side is more laden, with better technologies and deeper experience.

The gap between the grand vision of change and the hard graft of engineering appears to be difficult to close – and is cleaved-wider by technical challenges with integration and interoperability, translating into functional problems with simplicity and scalability.

This much is plain. But problems persist, clearly. As for every 'smart' industry, the minutiae of cross-connecting systems and processes to cross-fertilise data and magic-up 'insights' is mind-numbingly complicated. The gap between the grand vision of change and the hard graft of engineering appears to be difficult to close – and is cleaved-wider by technical challenges with integration and interoperability, translating into functional problems with simplicity and scalability.

Despite the bluster and hype from the tech industry, and the slow march by early adopters in manufacturing (as the leading sector), Industry 4.0 remains like a ball of snakes for many enterprises. So how is that being resolved, particularly as enterprises grasp for organisational solutions to the waking nightmare of Covid-19? What should they do, to drive digital change and guard against future lockdowns and shutdowns? The best way to find answers to these questions is to poll the industry itself. On the next pages, we present anecdotal evidence that, indeed, problems persist, but that progress is quickening.

James Blackman, Editor, Enterprise IoT Insights

‘Jump-in smart’ – the only way to bridge the new Industry 4.0 digital divide

The truth of Industry 4.0 can be found in the clank and boom of digital change in regions like the US ‘rust belt’; KPMG set the scene

To start with, we stop with KPMG, which has an industrial manufacturing practice to pull together all of the disparate component parts to make sense of this fragmented, complex world. In particular, we stop with Eric Logan, principal of the firm’s industrial strategy practice, focused on industrial markets, and well-placed to observe the state of ‘things’ in the smart manufacturing, and to tee-up conversation with the rest of industry in the next pages.

Logan also leads the firm’s ‘operations centre of excellence’, working across a number of verticals, and its Industry 4.0 service offerings in the US, part of its industrial manufacturing practice. He has worked for two decades in the steel industry in Ohio, joining KPMG five years ago from a Fortune 500 manufacturer of components for the aerospace and oil and gas sectors. Raised in Cleveland, he is also a board member at Team NEO, a non-profit business development organisation, geared to increasing jobs in the industrial heartlands of Northeast Ohio.

Here, in the seat of the US ‘rust belt’, the digital divide between smaller enterprises and the tier-one manufacturing corps is writ large. This divide has deepened by the manufacturing sector’s struggle to stay open and profitable through the Covid-19 pandemic. Logan has seen it at close quarters in Ohio. “There are a lot of small- and mid-sized firms here, and the landscape for industrial IoT is very different for them, just based on access to capital,” he reflects.

Cleveland, Ohio – where the ‘rust belt’ meets Industry 4.0

KPMG splits the technical discipline of Industry 4.0 into three areas: data-generating devices, covering all manner of new-fangled IoT sensors and equipments, as well as new interface mechanisms to harvest data from legacy machines; data analytics, about how to convert raw information into actionable insights, with left and right turns into popular applications like predictive maintenance, digital twins, and associated AR/VR tech; plus data platforms, as the mash-up plane to connect and orchestrate these other sensing (IoT) and sense-making (AI) tools.

“That is the realm I look at; that is the way I view the world,” he says. At the same time, he implies, these are just new tools of the trade; decisions about which to select and combine, and how to apply the right torque and pressure, are the same as always: they depend on the job at hand. The message is the new Industry 4.0 tech is brilliant, often, but requires a ‘jump-in smart’ approach, where planning is bold, even expansive, but also deliberate and appropriate.

Like staring at the sun, the bright light of digital change should only ever be considered through the prism of the enterprise; it is too easy to be blinded by the glare of the tech, suggests Logan. As we have heard, in reports about every fragmented new horizontal tech in every siloed old vertical sector, success will only come with care and collaboration. Which positions consultancy firms like KPMG as potential kingmakers for tech buyers and tech sellers.

Logan comments: “If a company ever claims to have a whole smart manufacturing solution, then I would recommend to steer clear. Because it requires partners – all the way from high-level strategy, about the value you can get, to the low-level collaboration, with staff on the shop floor, to get into the bones of it.”The rest of the interview is laid out below, in full; the rest of the discussion, with the enterprise customers and technology

providers putting industrial IoT to work, can be found on the following pages.

Talk about this idea that digital transformation of the manufacturing sector is a two-speed affair, with large manufacturing companies – often with international operations, sometimes with an interest in the supply of IoT as well – with the will and the way to make change, and smaller enterprises, which comprise the lion's share of manufacturing, just trying to get by in the current climate. Do you see it that way – that this is a market that can be glanced at two ways, as both a fierce reality and a pipe-dream?

"Yes, it is bifurcated. Many SMEs, especially post-Covid, are struggling with cash flow and recruiting. It is difficult to separate them because most are part of the supply chains of larger manufacturers. But, yes, they have different levels of access to capital, and a lot of smaller manufacturers are struggling to understand where to go with Industry 4.0. In the end, the focus has to be the same for both. What that means may be different, but each of them has to decide on the value opportunity.

"It has to be a value-first approach, which identifies organisational value – which is not a tech problem. Too many are enamoured by the technology – they say, 'Look, this technology is available, and we should take advantage of it'. That is not the way; the technology should be considered as an enabling business solution, to be leveraged. Just like 'lean manufacturing' is a business solution. The question is how does the technology fit into what the business is doing, and how to get business value from it.

"A lot of organisations, and even a lot of trade groups, see Industry 4.0 as the way the world is going, as something to jump into right away. And, yes, you do have to jump in, but you have to jump-in smart, right? And that is the same for large and small organisations. The difference is where to jump into it. Because large organisations have more of an opportunity to look beyond their own four walls, to integrate with customers, and go backwards into their supply chains.

Smart manufacturing – business agency Team NEO is working with traditional steel and modern pharma to stimulate innovation and jobs (Images: Team NEO)

"Just because of capital constraints, a lot of smaller players are more focused on Manufacturing 4.0, as opposed to Industry 4.0 – on how to use IoT for shorter-term manufacturing gains. Which is really important. Because if they can't see a benefit within the first few months of rollout, then they are going to walk away from it. So that is really the bifurcation in the marketplace."

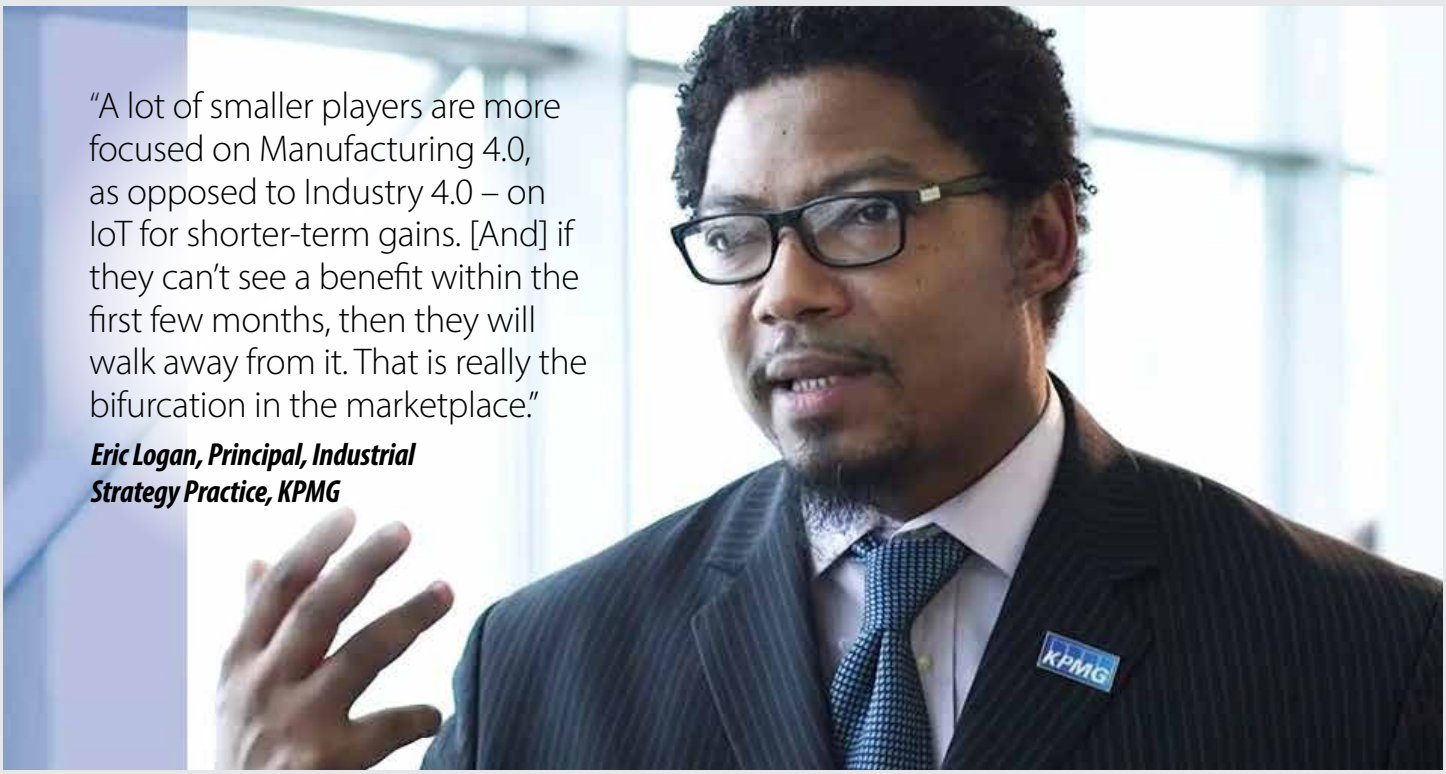
You mention that it is important enterprises are not 'enamoured by the tech'. The sense I have is they are not, as a rule – that they are more pragmatic than that. Do you think there is a culture clash between the buying and selling sides in this transaction?

"I don't fully agree with that. Yes, if you are talking about greater automation, then no one is really enamoured by that. Talk articulated robots, and I agree – look, we have been doing that for years. No one is going to get excited about palletizing systems, say. But there is a bunch of new tech that people really are enamoured by. I mean, think about AR goggles for [collaborative] work and maintenance, for example.

"The problem is there is this premise, right now, that these technologies will generate a whole bunch of value, but the [individual business] value is never really specified. The challenge is how to use this plethora of new data to make better decisions. People are marching down the path [but the path doesn't always go anywhere]. They think, cool goggles; but that doesn't mean the process will be any more efficient. The question, every time, has to be whether these technologies will generate the value you think they will."

So as all-sized enterprises go into this, what is the approach KPMG recommends to discern and calculate value? Should enterprises start by picking off the 'low-hanging fruit', and build systematically from there? Describe that process.

"The question for enterprises is about decision making, whether to resolve gaps



in forecasting, or gaps in manufacturing, or in something else. Manufacturing tends to gravitate towards two things when it comes to emerging tech: overall equipment effectiveness (OEE) and asset management. But, there are organisations out there with strong maintenance practices already, so maybe predictive maintenance isn't the place to start. Because the key is to go somewhere that will pay the way to go somewhere else. You have to show value, and do so fairly quickly. And the idea is it expands, and continues to expand.

"So it comes down to decision making – not just the metrics that show you're bad here or there, but the decisional gaps that are causing headaches. And certain criteria lead down certain paths in certain sectors. Visibility into the supply chain, for example – what we call 'statusing', to know where things are, and where business is – is a big challenge for some, especially beyond tier-one. It is often a manual process, which takes days. So the ability to transfer information through a supply chain [is valuable].

"Other industries, especially the older ones, have become somewhat stagnant – so for them, the challenge is around productivity... [and decision-making gaps can be closed by] connecting and scheduling machines, and by predictive analytics. Meanwhile some are trying to expand into new revenue generation, and how to monetise all the new data they are producing – and to know, even, whether customers will pay for it. In the end, if you segment by supply, process, and demand, different industries have different agendas and schedules, but emerging tech can be used to address issues in each."

On the supply chain, and manufacturing as a point along it; how has Covid-19 spurred interest in technologies that bring visibility and flexibility, and reduce blockages?

"Covid has spurred interest for a couple of reasons. Firstly, it has put focus on better managing supply chains. When Covid first hit, everyone was just trying to manage working capital and cash flow – and to get sight of any suppliers that were at risk. Because the whole visibility piece was like a black box, especially when you get beyond tier-ones. As they restructure many organisations are trying to establish 'smart supply chains' to remove instabilities in the future.

"Secondly, Covid has spurred interest [in technologies to help] get labour to return to the workplace. A large chunk of the market was effectively given a pass for much of 2020, because everyone understood what had happened. Now, recovering from that, many are increasing automation and analytics, to reduce their dependence on third parties and human labour, to better manage situations like this in the future. But everything is based on business fundamentals, at the end of the day, and I think the urgency [to invest, post-Covid] is probably short term – even if that urgency remains for now, as we return to the 'new norm'."

What about challenges with organisational structures and data sharing? This is the classic barrier for smart-anything, it seems. If you compare with the smart-city space, for example, new tech projects often unravel

between city departments in the funding process, and data sharing blurs the lines between the public and private sectors. In manufacturing, the funding question is negated to an extent because the money is private, but data sharing crosses organisational and regional boundaries. Just put this in context.

"Yes, when you talk about tools to enable the free-flow of information across functions, organisations, or regions, there are fundamental challenges to determine the value. The traditional way was certain functions owned both the cost and the benefit. And, traditionally, information is not shared. In fact, we are afraid to share – because we want credit for what we've done, and we want to be able to charge for it, and so on. Even if it is a transactional relationship between a supplier and a customer.

"So you have to determine the value proposition on both sides. If an enterprise tells one of its suppliers it wants to install some technology to have greater access to their facilities and their plans, the supplier is going to ask what's in it for them. It has always been hand-shake transactional, but now Industry 4.0 is breaking down the walls – the functional walls inside an organisation, and the organisational and regional walls outside of it."

Is there an issue with sharing knowledge – and not just data? Manufacturing wants to keep its innovations secret. Which, again, compares with the city space, where the availability of public-sector funding often hinges (in theory) on sharing knowledge. Is a lack of information sharing a barrier for industrial IoT?

"Yes, so manufacturing has become incredibly efficient and made its way along the learning curve. Which means it is a more competitive, supply-driven market, where cost is everything. If you get an opportunity, you often don't want to share with competitors. That creates a problem. It relates to some of the things (Ohio-based regional business development agency) Team NEO is doing in Northeast Ohio, where all these small manufacturers are looking to invest in new tech to differentiate themselves.

Steel industry – looking for ways to reform and reinvent itself with new data analytics technologies (Image: KPMG)

"We are looking to raise the entire region by creating something that is much more open source, and to figure out a way to do it without creating a market challenge or disadvantage for any of the participating companies. There are some open source IoT platforms out there, and opportunities especially for those that can't afford to go on this entire journey by themselves. We have to have some way to bring the masses, for lack of a better term, up to the standard when it comes to emerging technologies."

You mentioned earlier about the ambition, beyond driving efficiencies in production and raising equipment effectiveness, to create new revenue streams, and possibly even new products. How is that going?

"Yes, the monetisation piece is a challenge. The big question is what people will pay for [and what to charge for]? Even if you want to install some IoT maintenance software you have to work out how to charge for it. Do you have some contingent workforce in place, as in the past? Do you charge for their time? Do you take a [revenue share] for equipment uptimes? Do you charge a licence fee for the software, and a service fee for sending staff out? Revenue models are not yet defined, just because everything is still so new."

How, then, should we conclude? Presumably, the only approach, whether for a small manufacturer in Ohio or a tier-one multinational, is to be open and deliberate, and laser-focused on business value? And if enterprises keep going through the same problem solving process, they come out at the other end, at some point, as a 'smart manufacturer'? Is that right?

"I think it is. Because obviously as you address problems you generate value, and as you generate value and see the value in data, then you expand the usage of it. So you take this iterative approach. It is important to jump in, and figure out where you are going to get the value. I hate this term 'use cases', because it is so transactional – as opposed to 'value cases', which ties to the value. So you start out with the value cases, and expand on them. Most organisations are identifying use cases to go to market with. The discipline is to tie them to value. Because if they are tied to value, and you know what they are worth, then the whole organisation will get behind."

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Primed, potent and problematic – a picture of Industry 4.0

Image: Bosch

So what is the state of 'things'? Ask the industry, and you will find a new sense of urgency urgency and the same old concerns

The state of 'things' in smart manufacturing – how can one possibly know that, when the sector is so varied in terms of the companies that prop it up and the disciplines that make it up, and so fragmented in terms of the technologies prescribed to change it up? Well, you could do worse than to ask the market itself, and poll both the supply- and demand-sides of the new Industry 4.0 equation. It is hardly scientific; but the cast has been carefully selected from the coal face of Industry 4.0 to paint the scene – and the truth only ever comes by talking.

So then, here we have the strokes and daubs of two 'smart' manufacturing companies (putting industrial IoT to work), two industrial giants (playing both sides of the Industry 4.0 line), one campaigning industry membership organisation (making a private and competitive sector collaborate), one industrial IoT data specialist (solving the definitive headache of data integration), one enterprise IoT connectivity provider (joining the dots), and one well-placed market analyst (bringing order to proceedings).

And while their picture is impressionistic, it is not at all abstract; it leaps off the canvas, telling of a crossover IT/OT market that is primed to make change – which is grappling slowly with deep familial hang-ups about openness, interoperability, and collaboration, and which is in command finally of a stack of technologies that might yet deliver on their promise. We have said it before in these pages, and everyone here concurs; industrial IoT is a team sport. The thing is to get stuck in; the warning is to take it slow. But here are the experts, to paint the scene. (A key to the speakers can be found in the box, right).

How do you assess adoption of IoT technologies in manufacturing – including deployment of sensors, analytics, edge computing, and connectivity? How does takeup compare with other industrial sectors?

Sven Hamann / Bosch: "That is a difficult question, and depends of course on many different parameters – such as the type of manufacturing, and whether or not dedicated budgets and strategies are in place. It depends as well on how you assess the urgency [for industry to transform]. But from our experience, the automotive industry, for one, has advanced significantly [on

the path] to digitalize factories and supply chains. Other sectors have been quick to implement IoT technologies, too.

"We are seeing a shift, as manufacturing companies from different industries have realized the potential of industrial IoT. This has been triggered by the Covid-19 pandemic, among other things. But the volume and complexity of available technologies often make it difficult to make the first move – which is where Bosch is looking to offer support, to help companies of all sizes to get started and make the transition as smoothly as possible."

Farid Bichareh / IIC: "Before Covid-19, industrial IoT was part of longer-term planning for most industries. But the pandemic has made adoption of these technologies a higher priority, especially in factories – which are the number one adopter of industrial IoT. Covid-19 has moved industrial IoT from a theoretical [practice], part of a longer-term agenda, to a practical exercise, with the reality of deployment.

"This is the case for all aspects of it – for sensors, edge computing, and analytics. But most significantly, it is the case for connectivity, which has been a major challenge for industrial IoT adoption – because of interoperability issues. The advancement of 5G, as well as of innovative wireless technologies like Li-Fi, has provided a response to these connectivity challenges."

Roelof Koopmans / Semtech: "We see adoption [mostly] for tracking assets and people, to improve [operational] efficiency and safety. [For us], there are also cases in industrial manufacturing of sensors with edge intelligence for predictive maintenance. [But] other industrial sectors like smart cities, smart utilities, and smart buildings are a little way ahead."

What material impact is industrial IoT having in the manufacturing sector? What use cases, and what ROI? Can you give examples?

Hamann / Bosch: "Transparency and efficiency in manufacturing and logistics. Our own

Look who's talking (*you have been watching, in order of appearance*)

Sven Hamann, Chief Executive, Bosch Connected Industry, Bosch

– Sven Hamann leads Bosch's Connected Industry division, the company's IoT software 'house'. Its NEXEED portfolio is used by customers across the globe, as well as its own factories – at the centre of the company's digital transformation.

Farid Bichareh, Chair of the Smart Factory Work Group, IIC; Chief Technology Officer, AASA

– Farid Bichareh is chief tech officer at AASA/01LightComm, a specialist in light-based Li-Fi. He serves as co-chair of the smart factory working group at the Industrial Internet Consortium (IIC), focused on industrial IoT and Industry 4.0.

Roelof Koopmans, Senior Director for System Integrators, Wireless and Sensing Products, Semtech

– Roelof Koopmans is senior director in Semtech's wireless and sensing group, looking at deployment of LoRa/LoRaWAN in vertical markets, including the manufacturing end of the industry 4.0 sector.

Dave McGorman, Managing Director, Unipart Technologies Group

– Dave McGorman is in charge of Unipart Group, which has a significant manufacturing footprint in Unipart Manufacturing Group (UMG), a producer of internal combustion engine (ICE) and electric vehicle (EV) components. Its EV business is "leading the world" in IoT, it says. It expects a "sharp transition" between the ICE and the EV businesses through 2025. Battery manufacturer Hyperbat, also owned by UMG, has just claimed a "world-first" industrial VR solution using a 5G network from BT and Ericsson.

Juha Pankakoski, Executive Vice President for Technologies and Chief Digital Officer, Konecranes

– Juha Pankakoski is in charge of digitalization at Finnish firm Konecranes, which claims a a 'smart factory' at Hyvinkää and a new private 5G (by Edzcom and Nokia) for "advanced R&D" for factories and ports.

Sean Riley, Vice President of Global Industry Solutions, Software AG

– Sean Riley leads 'manufacturing strategy at Germany-based data analytics and integration firm Software AG, which positions itself as as the 'glue' in the Industry 4.0 system, and a go-between for the shop floor and top floor.

Johan Rauer, Senior Partner, Siemens Advanta

– Siemens Advanta is consultancy and system integrator for Industry 4.0. Dr. Johan Rauer consults about the challenges and opportunities stemming from automation and digitalization.

Ryan Martin, Research Director for Industrial and Manufacturing, ABI Research

– Ryan Martin covers new and emerging tech, including industrial IoT and Industry 4.0. He leads ABI's manufacturing, industrial, and enterprise IoT research.

Sander Rotmensen, Director of Industrial Wireless Communication, Siemens

– Sander Ritmensen handles Siemens' product portfolio for industrial wireless LAN components and routers, as well as its management platform for remote access. His remit covers industrial 5G and Wi-Fi 6.

factories are a good example. Our NEXEED software is already implemented in more than half of all Bosch plants, and can reduce maintenance costs by up to 25 percent and increase machine availability by up to 15 percent – as different use cases in Bosch's own plants have shown.

"[But] numerous international companies [also] use our software. As an example, the BMW plant in Landshut [has] more transparency into the production of interior components. Staff can keep an eye on relevant process parameters, such as when 'back-foaming' cockpit parts. The software derives wear-predictions from [machine] data, and enables direct comparison of different foaming processes.

"Other use cases; the ticket management and transport management applications in the Nexeed system [enable] employees in maintenance and repair to receive service orders on their mobile devices, according to their qualifications and availability – which saves walking [between jobs] and down-time. Staff can save half the time on collecting status information and coordinating material flows. The ticket management app shows forklift drivers, for example, where they need to go next, along with the best route. Utilization of logistics assets such as forklifts can be increased by 10-15 percent."

Dave McGorman / Unipart: "Productivity, reliability, agility, and validity are the most significant impacts of IoT adoption. Unipart has deployed novel digital platforms in its EV facility and is working on a 5G deployment with leading tech organisations as part of its efforts to halve the time required to introduce a new product to market.

"The ROI for such a capability is winning new business – and saving cost during the design and development. There is also a cost saving from reconfiguration of the production line to accommodate new products, as a result of 5G flexibility, and also from reducing carbon as a result of efficient workflows and processes."

Bichareh / IIC: "There has been a big impact on manufacturing, especially in light of the Covid-19 pandemic – as industrial IoT has afforded a way to digitalise the shop floor and the top floor, and to protect workers in the field, and introduce remote operations. As far as ROI, the impact is high as well – just because the alternative in the pandemic has been putting business into lockdown, and turning production off."

Smart factory – Konecranes is using industrial IoT and private 5G at its plant in Hyvinkää in Finland (Image: Konecranes)

"We have been preparing for Industry 4.0 for years. We have built new features based on shared data. We are developing our IT systems, [and] interfaces. When all these major components are ready, we expect to see real benefits"

Juha Pankakoski, Chief Digital Officer, Konecranes

Is IoT data and analytics being threaded across wider enterprise operations yet, or does it remain largely in silos? Are there examples of enterprises running data through design, production, and usage of their products?

Koopmans / Semtech: "It is largely in silos still."

Juha Pankakoski / Konecranes: "We have been preparing for Industry 4.0 for years, and we participate in a number of public research projects targeting Industry 4.0-ready production. We have built new features that are based on data that is shared in a factory ecosystem in Germany. We are developing our IT systems, building interfaces to them and also to our devices being used in our factories; when all these major components are ready, we expect to see real benefits."

McGorman / Unipart: "Weaving a digital thread beyond site boundaries and operations is something we have taken very seriously. Unipart has introduced platforms and integrations across its own businesses, as well as across supplier businesses – including a product data management solution with its own design house, and a digital portal with suppliers. [The idea] is to run the product data to suppliers during early design and development, capture their feedback, and pass it on to production. The next step is to securely collect product data during usage in the field to improve the lifecycle of our products."

What about sharing and integration of IoT data and insights across supply chains?
McGorman / Unipart: "There are many challenges with [this], including skills, data ownership and intellectual property, business models and regulation, security and interoperability – [as well as just] the ability to connect multiple technologies, systems, and formats. We are seeing examples of our technology applied to our customers' assets, enabling a live 'digital twin' via IoT devices.

"This IoT data is transferred into usable, actionable information through AI techniques. We see this in the rail, consumer tech, and healthcare markets. But while this capability is widespread in some markets (think about smartphones as IoT devices using AI as part of the 'internet of behaviors' trend), we still have a way to go in the enterprise space. In the future, it will be commonplace and part of standard practice."

Sean Riley / Software AG: "Currently, IoT data sharing across supply chains is mostly focused on logistics movements as well as product condition in-transit. In the future, this data could be expanded to include the manufacturing data for each unit to improve end-product quality."

Bichareh / IIC: "Disruption to supply chains was one of the major impacts of the Covid-19 pandemic, and supply-chain transparency has become a key to predicting and managing disruption – and so we have seen a real focus on utilizing AI and industrial IoT for supply chain analytics. And as we go forward, IoT and AI will only be more important to have the freshest and most accurate insights about the supply chain."

What is your approach to industrial IoT? Should there be a 'master plan' to start with, or is this an iterative process, where use-case value is identified and then architected – and where the big Industry 4.0 dream is captured piece-by-piece? Or both?

Riley / Software AG: "There should be a vision about what the end result looks like, coupled with an iterative process. Use cases should be considered initially with the understanding that not every use case will be identified from the start, and that there will be changes and unexpected occurrences, both positive and negative, along the journey. The Industry 4.0 dream should absolutely be captured on a piece-by-piece basis to minimize risk and obtain returns as fast as possible."

Hamann / Bosch: "The most important thing is to get started in the first place. Readily developed solutions for user-oriented use cases make it possible to scale-up step-by-step according to budget and need. For existing machines, a few industrial IoT devices are often enough to collect and analyze data, increase productivity, and reduce costs. The basic prerequisite is that corresponding solutions access the same data and work together optimally."

Bichareh / IIC: "It's both, and it depends on the industry and defined objectives. While a blueprint based on best practices is very helpful to start with, and provides [a model] for a successful implementation, it is important to identify the use-case value and focus design and planning to achieve that. Unfortunately, we have seen how many industrial IoT projects have failed because they have not paid proper attention to both industry best-practices and the needs of business-specific use-case."

Johan Rauer / Siemens: "Unsuccessful industrial IoT projects fail because the companies try to achieve too much too soon. Successful projects start with a solid 'north star' definition – which articulates what companies want to achieve. The question is should [the industrial IoT deployment] be a lever to increase productivity, or should it be an lever to introduce a brand new

business model? Or both? A solid definition of that 'north star' [objective] requires a solid understanding of the company's operational pain-points, function by function, and an in-depth analysis of the customer-centric value drivers and implications – in other words, of industrial IoT as a lever to grow the business. Once that is defined, companies should adopt a kind of 'accelerator mindset', and kick-off a manageable number of smaller 'sprints', which either succeed or 'fail fast'.

"Smaller industrial IoT initiatives that prove successful can be very powerful because they can act as change catalysts. They provide evidence that digitalization works, ultimately, and brings tangible benefits. At the same time, establishing a failure culture is crucial, and makes change-management a top priority. There needs to be acceptance in the organization that some initiatives will fail early on. But this makes room to continue with the initiatives that have the biggest impact."

McGorman / Unipart: "No one can predict the pace of change in technology and create a perfect master plan for the years to come. What enterprises can do is think about the right system architecture for their business. Once the right system is in place – to support the backbone of transactions internally and externally – the adoption of industrial IoT follows as an iterative and value-driven approach. That has been our approach, and we have created an Industry 4.0 board to drive and guide activities across domains."

How do you assess IT/OT crossover (co-creation / collaboration) in manufacturing companies? How important is this? Is enough being done?

Riley / Software AG: "This topic is interesting because a correctly completed industrial IoT platform should not require continual assistance from IT. It should be completed, and IT should fade into the background or into a support-only role. Users should be able to create their own complex algorithms and rules without IT assistance and should be able to integrate to most common systems as well, without IT."

"The telco industry needs to sell differently to cater to the way industrial firms buy. Industrial firms want complete solutions that solve specific problems. Systems integrators are a key channel for industrial IoT implementations"

Ryan Martin, Research Director, Industrial and Manufacturing, ABI Research

Hamann / Bosch: "This kind of co-creation is part of our daily routine. Software developers team up with shop-floor experts in user-experience workshops; specialists from the different ['vertical'] areas combine to develop solutions that solve very specific pain points in manufacturing. And we work with a large network of partners, as well. Bosch has a significant advantage here, as both a leading user and a leading supplier of Industry 4.0 solutions. We know the challenges on the shopfloor, from our daily work – which puts us in a position to develop solutions for specific needs with input from relevant employees."

Bichareh / IIC: "IT/OT co-creation is still very poor, generally, and another reason so many industrial IoT projects fail. More and more manufacturing companies are trying to create these kinds of collaborative ecosystems and environments, running through the development and deployment of these projects. But, still, much more needs to be done to connect the shop floor and the top floor as stakeholders on the journey. IT and OT have always been separated by their strategies and governance. But with proper alignment around new industrial IoT projects, both sides can grow their capabilities – reducing the risk of failure, sharing together in greater successes, and making the impossible possible."

McGorman / Unipart: "It is a very sensitive but important subject. OT wants to deploy a solution and IT wants to be able to manage it. There is usually a much better chance of a collaborative approach if IT is involved from a very early stage of technology feasibility and supplier selection. The key is to be understanding, inclusive, and task-oriented.

"We have an example, where, during the introduction of one of our manufacturing execution systems, IT and OT worked closely from the early stages to ensure the components and integration were well-understood, and the skills were there to maintain the system. It meant OT was fully aware of the cost of the deployment and the rollout of functionalities, and IT had a chance to source relevant skills to fill the gap opened up by the new technologies."

Does the tech / telecoms industry collaborate and consult well on industrial IoT – or is it still generally approached like a transaction?

Ryan Martin / ABI Research: "It is getting better. The telecoms industry needs to sell differently to cater to the way that industrial firms buy. Industrial firms want complete solutions that solve specific problems with high reliability and accuracy. Systems integrators are a key channel for successful industrial IoT implementations."

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Bichareh / IIC: "There is some collaboration [between the sides] and the new 5G release for industrial IoT networking is a result of that. But much more needs to be done on both sides. Resolving the connectivity challenges of industrial IoT is only possible if the development and planning strategies are aligned."

Pankakoski / Konecranes: "We have regular meetings with operators and telecom companies, and information sharing is open. That helps us prepare to use upcoming technologies before they are more widely available in the open market. Through this dialogue, telecom equipment makers and operators get feedback which they can then apply in their own work."

McGorman / Unipart: "We are seeing a much more collaborative approach from the tech and telecoms industries. For the technology to be viable for industry, it has to first serve a purpose. The tech and telecoms sectors are very much aware of that and working closely with the industrial partners to develop applications with the most efficient business models to enable adoption. A good example is our 5G collaboration with BT, Ericsson, Dell, NVIDIA, and Masters of Pie at Hyperbat."

How do you assess the challenge of tech fragmentation / complexity? What about challenges with data sharing / silos between departments, facilities, regions etc?

Martin / ABI Research: "Point solutions are typically most successful at demonstrating fast time-to-value and ROI. The challenge is that point solutions can result in disparate systems supported by multiple vendors. Organizing around a common industrial IoT software backbone with sufficient solution depth in terms of capability and scale enables a land and expand strategy. Use of cloud is increasing; cloud improves collaboration and synchronization across teams."

Pankakoski / Konecranes: "I think the challenges we are seeing, for example around things like interfaces and data sharing, are the same challenges as everyone else has. Therefore, Konecranes is constantly working with other parties to find common solutions for common challenges.To lower the barriers between the different machines, Konecranes is taking part in standardization work where the universal interface to connect the cranes is developed with the (Frankfurt-based Mechanical Engineering Industry Association) VDMA. That work will enable the easy integration of cranes to the smart factory ecosystem."

McGorman / Unipart: "In our experience the main challenges are commercial and cultural, and typically centered around data ownership. The technologies are mature enough to allow fluid sharing and intersystem operability."

Does the tech / telecoms industry put too much hype on technologies like 5G and 'AI'?

Koopmans / Semtech: "Yes, absolutely. 5G will only solve a subset of connectivity cases, but not those cases where low battery consumption is key to the total cost of ownership (TCO). Companies make small steps first, and sometimes, lack a bigger picture on how to integrate AI across their various business processes. 5G is only key to high bandwidth and low latency IoT applications, like autonomous driving and other video image recognition applications."

Bichareh / IIC: "Good question, because we have heard about 5G and AI for years already and, for so long, they have been used as marketing tools – and have been the reason a lot of these industrial IoT projects have failed. But since mid-2019, and especially since 2020, these technologies have come a long way. They are now a reality, and are helping with digitalization in manufacturing in a more practical way."

Rauer / Siemens: "Undoubtedly. 5G and AI are key enablers [for] the interplay between IT and OT. But success will not be achieved through technology alone, and these technologies will only be impactful if they are in the hands of people acting on data-related insights. Processes, interfaces, and decision making [all] need to be adapted within any organization to trigger the right actions, based on data. The successful application of 5G and AI requires the triangulation of [IT] technical experts, [OT] domain experts, and [continuing business] practices and processes."

Pankakoski / Konecranes: "5G has been designed with a strong focus on future industrial needs, [and so] a lot of expectations were attached to it early on – including these concepts of Industry 4.0, Work 4.0 and Society 4.0. The standards process indicates

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5G will be the enabling technology for the 'fourth industrial revolution', and every real-life implementation of it, at any level, is likely to forward our understanding of the possibilities beyond theoretical assessments."

How important is 5G? Is it a panacea for digital change, or just another networking technology?

Martin / ABI Research: "5G has the potential to fundamentally change the upper limit of manufacturing process optimization. However, it will be several years before this starts to happen. 5G is both 'just another networking technology' and a 'panacea for digital change', depending on how it is deployed. [But] the earliest we will see 5G start to scale for production line applications is 2024."

Industrial 5G – Siemens is prototyping an 'end-to-end' private 5G system for blue collar Industry 4.0 (Image: Siemens)

Bichareh / IIC: "Industrial connectivity is a challenge, especially when we get into environmentally difficult or restricted areas – where electromagnetic interference is an issue, as in healthcare and manufacturing; or security is an issue, as in financial services and manufacturing; or radio communications are unsuitable, as in underground mining or underwater environments.

"The new version of 5G, released last year, responds to some, but not all, of these issues – and expands the adoption and implementation of industrial IoT. But there are other innovative wireless technologies as well advances, such as Li-Fi, which responds to the shortcomings of any radio-frequency based industrial wireless technology, and helps with industrial IoT across different industries."

Sander Rotmensen / Siemens: "New technologies are required before we can give a green light to this whole idea of 'smart factories' – in production, intralogistics, transportation. Wireless technologies like industrial wireless LAN already enable different industrial applications today, such as automatic guided vehicles and overhead monorail systems.

"Wi-Fi 6 and 5G will enable us to do more, and combine together. A great example is [collaborative] mobile robots. These kinds of applications place demands that would quickly push today's networks to their limits"

Sander Rotmensen, Director of Industrial Wireless Communication, Siemens

"The next generation, including Wi-Fi 6 and 5G, will enable us to do much more, and combine applications together. A great example is mobile robots working together as so-called 'cobots'. These kinds of applications place demands that would quickly push today's networks to their limits. The unprecedented reliability, extremely low latencies, and comprehensive industrial-grade connectivity of 5G, for example, can clear the way for pioneering applications in the industrial environment in the future."

Pankakoski / Konecranes: "Factories and ports are increasingly becoming digitalized and automated, creating an ecosystem of inter-connected devices and machines. The private 5G network at our Hyvinkää smart factory – with low latency, high bandwidth, and greater reliability – gives the chance to accelerate automation even further, improving efficiency and opening up new use cases that can benefit Konecranes and its customers.

"Tests done on our LTE network in Hyvinkää show that scaling up the system with, for example, higher bandwidth-consuming components impacts network reliability and latency. We believe that

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standalone 5G and enhancements with ultra reliable low-latency (URLLC) 5G connectivity will improve these aspects greatly."

McGorman / Unipart: "5G is an enabler for mobility, flexibility, and reliability – which are the catalysts for digital change. Unipart is at the forefront of deploying 5G in its operations to support the digital journey with its value chain. However, like all other technologies it is our experience that there is no such thing as a panacea: many new technologies will surpass it."

What needs to happen for industrial IoT to scale – not just in advanced companies, but across manufacturing, and among the small and mid-sized firms throughout the supply chain?

Riley / Software AG: "Industrial IoT adoption will scale successfully when industrial IoT platforms are not seen as an IT project but as platforms that users – production engineers, field technicians, and so on – can use without requiring IT every step of the way."

Martin / ABI Research: "SMEs need access to service-based business models that allow them to test and benefit from digital transformation without the upfront investment and risk of large capital programs. Cloud is critical to democratizing access to industrial IoT innovation. The adoption of cloud technologies will ultimately drive scale."

McGorman / Unipart: "The cost of use across hardware and software has to be substantially reduced through technology advancement and new business models. Major development is needed to ease and broker the data sharing between systems, and between systems and people."

Hamann / Bosch: "The key for a digital production environment is in the interoperability, openness, and scalability of the software. All data must be 'translated' into the same language and made accessible. But it doesn't have to be an all-encompassing solution. SMEs can approach it quite simply, step-by-step. If you start with the most important challenges, such as maintenance intervals or material flows, then new gains can be made quickly. With the right software, as well as IoT sensors and gateways, existing machines and vehicle fleets can be brought into the digital age cost-effectively.

"Once digitalization has started, it's all about making the huge amounts of data usable for everyone who works with it. Data is the raw material for Industry 4.0. It forms the basis for transparency, knowledge, and concrete benefits. The problem is data still comes in proprietary formats, often, and has to be made available via vendor-specific interfaces. Which means a continuous data flow in production can only be realized with considerable effort, and lots of individual solutions. Therefore, we need to open interfaces and systems to enable scalability, and make the data universally understandable and usable.

"We can do this by giving data meaning through semantics, to create virtual images of products and machines – the famous 'digital twins'. These enable simple communication between software, hardware, and people, and make innovative applications, end-to-end process digitalisation, and new business models possible in the first place."

"Industrial IoT will scale when industrial IoT platforms are not seen as an IT project but as platforms that users – production engineers, field technicians, and so on – can use without requiring IT every step of the way"

Sean Riley, Vice President of Global Industry Solutions, Software AG

Koopmans / Semtech: "Companies need to develop clear strategies, about which business processes should be optimized for cost, performance, or other metrics like safety. Based on this, they need to define multi-step processes for adopting selective technologies, and validate the ROI of such industrial IoT process-enablement before taking the next step."

Rauer / Siemens: "Many industrial IoT applications require the interplay between multiple companies in the supply chain. We often see use cases solved in cooperation with multiple suppliers and manufacturers, as well as end-customers. This kind of cross-company 'ideation' and implementation makes professional [consultancy and project management] increasingly important – [to cover] partner selection, co-creation, lifecycle management, contract management, and intellectual property rights sharing models."

Pankakoski / Konecranes: "Greater publicity is one thing. Currently many tests are internal and the monetary value of them, plus the savings companies get, is not published. In addition, even greater collaboration between different providers in manufacturing is needed. If, say, a number of different parties in a 'smart factory' need data from the same sensors, a solution should be available to all of them to utilize the same data resources. [Because enterprises want] to avoid any unnecessary complexity."

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INDUSTRIAL 5G SLAs

– industrial 5G network performance, and the new turf war over the supply and management of 5G in Industry 4.0

by James Blackman

Editor, Enterprise IoT Insights

EXFO VOLTDB

Heat, dust, contaminates – and the need to dress IT as OT at the industrial edge

Industrial IoT is pushing general-purpose IT into hazardous OT environments; CPI talks about how to keep critical systems safe

Chatsworth Products International (CPI), which closes this report, comes with a different angle. The firm, headquartered in Agoura Hills in California, is not directly involved in the digital pyrotechnics to light-up the smart manufacturing sector. Instead, it makes enclosures, cabinets, and other containments to house this technical wizardry, and to keep it safe on hazardous factory floors. Which sounds incidental, almost, to the rarefied task to design and manage complex new Industry 4.0 systems; but its role to dress standard-duty IT products in industrial-grade OT garb should not be overlooked.

Because it is the skin on the banana, the key in the lock, the icing on the cake – offering last-line protection against industrial-grade slip-ups. However reliable an enterprise's connectivity network, however robust its compute architecture, a poorly-conceived defence against environmental contamination and physical tampering will blow the system. As the interview below makes clear, any such slip-ups, and the whole thing goes 'pop'. More than this, CPI occupies a unique position, at the far edge, where Industry 4.0 is officially 'live' and kicking.

As well as industrial casements for server infrastructure, smart devices, and networking gear (in higher demand, as the market for private LTE and 5G networks gathers pace), CPI is also a manufacturer in its own right, with a stated ambition to be 'smart' about production in its factories and supply chain. Sam Rodriguez, the company's senior product manager for industrial solutions, tells below of its keen usage of new sensing (IoT) and sense-making ('AI') technologies to raise performance at its factories in the US.

Roof line – a lack of space for Industry 4.0 gear has forced infrastructure vendors to be creative (Image: CPI)

Rodriguez has a good perspective on the Industry 4.0 market. He has been with CPI for 23 years, as the company has pivoted from 'clean' data-centre solutions to also cover shop-floor installations. He notes, below, the rush of factory constructions and upgrades, stimulated by interest in new Industry 4.0 tech. "We are helping industrial enterprises to enable that supporting infrastructure to drive forward with digital change," he says. "Which has peaked especially with the availability of industrial-grade 5G, and the advancement of IoT and AI technologies in industrial edge environments."

All the answers below are from Rodriguez.

How does CPI sees the industrial IoT market, in general? How does IT infrastructure need a boost – with the expansion and disaggregation of compute infrastructure?

"New technology is being deployed everywhere, of course, and demand has picked up significantly in the last five years. The Covid-19 pandemic has accelerated this. Technology has changed everything

– from everyday smartphones and online shopping, through to remote schooling and home-working, and traffic control and security cameras, and onwards to drone deliveries and smart cars. The whole landscape is being connected, and digital infrastructure has been drastically impacted to keep pace.

"We are seeing major factory upgrades, and a major shift to sensor-based operations. New machinery is being deployed – brand new equipment, and also a tremendous amount of retro-fits to bring legacy machines into the digital era. A lot of work is being done around predictive analytics – to forecast the performance of a machine or a work cell, and schedule downtime for repairs, and balance workloads and machine utilisation. In the end, the focus is to improve productivity and reduce lead times. And with the introduction of industrial 5G into factories, there are ever-higher demands being placed on edge IT infrastructure."

How is this impacting non-traditional IT environments, like the factory floor? What are you seeing in terms of installations of industrial enclosures for new edge-based server racks and IoT equipment?

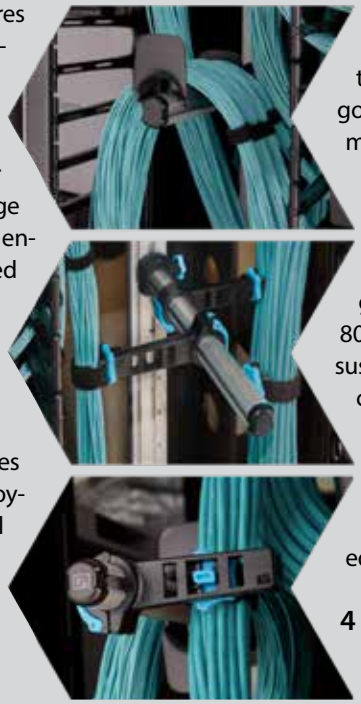
"More IT is being deployed on the factory floor, whether for inventory control, IoT sensor tracking, or more advanced edge processing, where data from sensors needs to be collected close to workspace. A lot of industrial enclosures are going up in OT environments – free-standing on the factory floor, or wall mounted, or even affixed to the ceiling. All those devices that were previously mounted neatly in secure telecom rooms, or in a data centre, are now being deployed in industrial enclosures inside factories."

What are the considerations when deploying IT equipment in OT environments?

"You need to think how to take care of it, which means making sure it's a clean space, first of all; you don't want a conductive substance in the air, for example, going into your electronics, causing burnouts and failures. So it needs to be a sealed environment,

Five pillars for industrial-grade edge deployments

Industry 4.0 requires compute and connectivity to be brought closer to the action, often into harsh and unfamiliar environments. These edge locations can either be in environmentally controlled colocation facilities, or in non-controlled environments that might contend with heat, humidity, rain, and snow, as well as corrosives and dust. Such deployments require careful storage, support and maintenance. CPI outlines five principles ('pillars'), below.



1 | ENVIRONMENTAL CONDITIONS

"The first thing to consider is the environmental conditions – what you need to do to protect all the devices in an enclosure from the outside environment, including the temperature, the contaminants in the air, and so on."

2 | SECURITY REQUIREMENTS

"The unit has to be lockable, with electronic access controls. We can add sensors, so customers know who is accessing the enclosure, and can send someone out in the event of unauthorised access. The system can be tied in with local security cameras, as well. With the doughnut example (see page 22), they would have known if they'd had a sensor on the cabinet."

3 | KIT AND CABLING

"The third pillar is about the type of equipment going inside – how it is mounted, and the cabling required. With all the servers and storage devices and power supply systems, enclosures are getting larger. We see more 800mm-wide cabinets, versus the standard 600mm [enclosure] – going to a depth of 1200mm. You are still mounting 19-inch (482.6mm) racks in there, but it gives more room for equipment."

4 | THERMAL MANAGEMENT

"Heat can be dissipated with a filter fan, as the most basic cooling mechanism, with the heat going out with the exhaust, or a physical ADX air-con units. In some cases, we use air-to-water heat exchangers, with a cooling coil built into the enclosure, and a system that dissipates somewhere outside the building."

5 | POWER, REMOTE MONITORING

"Intelligent PDUs and environmental sensors can measure temperature, humidity, airflow, power, intrusion and detect entry of water – useful for edge locations, where remote monitoring can mean the difference between uptime and downtime. PDUs automate monitoring and let you set thresholds and receive alarms when conditions approach limits."

with no gaps, including in the cabling in and out of the structure – which presents challenges, as well. But then you have this sealed box, concealing this equipment that is generating a lot of heat – inside production environments that often get very hot, as well.

"So then you also have to think about thermal management. Shop-floor enclosures tend to incorporate cooling systems – to keep equipment in a specific temperature range. Can you do this with a standard fan, or with a filter fan, or an air conditioning unit? And if it is an active air-conditioner, you have to decide what to do with the heat going onto the production floor, and whether to use a heat exchanger, for example.

"Apart from clean air and temperature, you have to be able to protect against liquids and oils in the air, which could be detrimental to the equipment, as well. And there is demand for various security protection, access controls, and monitoring tools. These are the primary things we are seeing – as all this generic IT equipment moves onto the shopfloor. That is where we are seeing the demand – especially because it tends to be standard-duty non-industrial rated equipment that is augmenting these traditional OT environments."

How is CPI engaged in infrastructure upgrades in factories – via existing relationships with traditional IT companies, expanding into the industrial IoT domain, or via new partnerships with industrial OT players? And how well are the requirements for this kind of industrial-grade IoT infrastructure cladding understood?

"Yes, so a lot of customers are already working with us in clean data centre environments, and are moving into the manufacturing space. These customers are often less familiar with more industrialised requirements for racks or cabinets in those environments – both in terms of the physical space and from an environmental protection standpoint. For some, it is the first time, and they don't have a lot of experience, and want guidance and recommendations. But you see both; some come to us and know exactly what they are doing, as well – how it is going to be used, what the challenges are, what they need; all of it written down in a very nice set of specifications."

"Some projects need funding from city governments to attract private money; others run on their own because the private sector and utilities see the value."

Sam Rodriguez, Senior Product Manager for Industrial Solutions, CPI (above)

I imagine you have some real horror stories of enterprises failing to protect their shiny new IoT equipment on the shop floor. Are there any you can share, just as cautionary tales?

"Yes, there are a few. We had an issue, one time, where the customer had been very careful, and installed a different manufacturer's enclosure with a really good seal, but had found that every time they went to change [a connection], they squeezed the RJ45-type [connector] jack and the plastic just disintegrated. Even though the equipment was in a sealed box, something was going on. After we looked at everything the customer did, it turned out the conduits coming out of the enclosure had no seals at the tip-ends, and just stopped in the middle of this automotive facility, and were drawing contaminated air into the enclosure, causing the cabling systems and electronics to fail.

"There is another one with a doughnut, which is kind of illustrative; where we were doing a factory tour at an automotive plant, and we spotted this enclosure across the shopfloor, and there was something not right about it. And so we asked, and it turns out the door had been left open after maintenance, and someone had wedged a doughnut into the enclosure – just to show, you know, that the maintenance crew had dropped the ball on it, and potentially compromised a key piece of operational technology."

You mentioned ceiling fixings earlier; how difficult is it to find space on the factory floor for all the new edge infrastructure, networking equipment, and compute resources?

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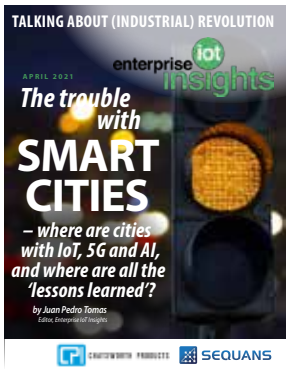

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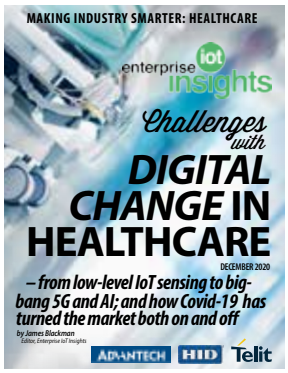

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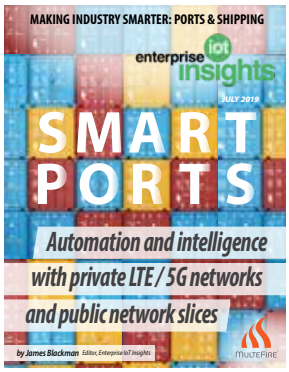

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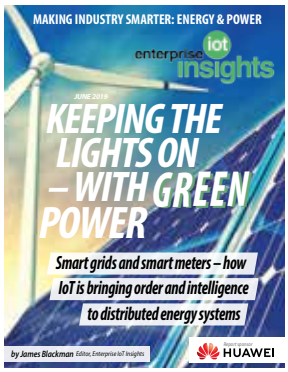

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"The main purpose of these environments is for manufacturing; the goal is to make products. And all of a sudden digital transformation demands that enterprises bring in this IT infrastructure. If it's a new build, then they have likely planned for it, and there's dedicated space available. But in most cases, it's a retrofit, and the site was not intended to house all of this extra equipment. Even 10 years ago, end users were likely not thinking about industrial IoT infrastructure. So that's a big challenge – where to place this essential networking gear so you have the right distances to the sensors on the equipment, when it was never planned for originally.

"CPI did an installation several years ago for a food processing plant, and there really wasn't dedicated space for the IT infrastructure, and the only space that was available was overhead – to go just underneath the roofline of the building. So instead of having new enclosures on the factory floor, the customer installed these full-sized cabinets onto the columns supporting the building, just beneath the roof. It all had to be engineered to the site, and distributed to support the various equipment.

"It was a unique challenge. But overhead, up above the factory floor and the people, is where everyone seems to have a little bit of availability. But even on a busy factory floor, where some space is available, there is a challenge around positioning and protection, with equipment and forklifts going through. It takes careful planning."

What about in your own manufacturing operations; how are you looking to use technology in your factories and supply chains to improve productivity and efficiency?

"CPI has multiple factories. We use some contract manufacturing to deal with additional capacity in certain regions, and, like everyone, we use a global supply chain for specific parts. We continue to upgrade our factories, and look for ways to utilise IoT sensors on machines that yield data about production and performance, including on older equipment that still has very useful life.

Security access – industrial-grade server cabinets should be secured, with sensors and alarms (Image: CPI)

"In particular, we are using IoT data for machine reliability – to know how long machines have been running, how long they've been idle, and how we can balance production. It means if machine utilisation is over-indexing in a certain area, we can put it right before it becomes a bottleneck, or look at capacity, and re-layout the factory to bring new machines online to manage spikes in demand or increasing production.

"We are also using IoT sensors to collect data from the machines in real time – optical sensors to monitor parts as they are being fabricated, to make sure what's coming off the line is built to the right specification; and cycle counting to record how many times machines are going through an operation cycle, and how many times they are producing certain parts.

"Data is being published on monitors throughout our factories, so staff know right away if there's a problem, or if the workloads need to be recalibrated, or more materials can be put through, or even just if an operator has been too long at their station. We are adding more and more capabilities all the time to improve our entire manufacturing operation."

Does CPI have an ambition to be a 'smart manufacturer'. Does the company talk about it in those terms, or is that tech-in-dustry jargon, and is CPI rather focused on continual improvement to eke out performance?

"We definitely have a long-term digital transformation plan that focuses on continuous improvement and innovation. We have a project team that meets to see which technologies can be added. Of course, the sheer cost to create a fully automated factory makes it a long-term project. It's important to evaluate the steps to get there, and the equipment and technology to enable it – along with all the ROI calculations, and priority focus areas, all written into a budget, and implemented when ready. It is a continuous process; you can't just start from scratch with a facility that is completely smart and automated."

How would sum up the challenges the industrial IoT market faces, and would-be 'smart manufacturers' in particular?

"The biggest thing is to make sure all the stakeholders communicate, right from the beginning of the project, and all the individual needs are taken into consideration. When you look at what's going onto the factory floor, yes, you need to speak to the IT folks, of course; but everyone else must be included as well – whether the facilities engineers, the mechanical engineers, or the rest of the OT team. That task to review and collate all of the individual needs is probably the biggest challenge. If you can do that at the start, to capture all the key points, and spec the job accordingly, then you are on the right track – and you won't find a whole bunch of different requirements being tacked on as you go through.

"The other thing, particularly with larger companies, is to consider regional implications. California, for example, is in a seismic zone, with very different challenges; a company that wants a solution for North America and Europe, say, has to deal with different certifications, and voltages, and imperial-versus-metric systems.

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The trouble with SMART CITIES – where are cities with IoT, 5G and AI, and where are all the 'lessons learned'?

by Juan Pedro Tomas
Editor, Enterprise IoT Insights

So, what does this exercise tell us? What is the message from these cautionary tales of digital change, articulated by this cross-set of Industry 4.0 protagonists? Well, firstly, as logic dictates, the manufacturing sector has been shocked into action by Covid-19. Practically every link in the supply chain has been forced to reevaluate its change-strategy, and look again at new digital tech. Pre-pandemic, industrial IoT was a part of a longer-term gameplan, says the Industrial Internet Consortium; now it is considered more like an urgent priority, for all-sized manufacturing businesses.

What else stands out? Mainly, that industrial IoT is working, as prominent testimonies from Bosch, Chatsworth Products International (CPI), Konecranes, and Unipart Manufacturing Group (UMG) tell. The argument by KPMG about the primacy of new industrial tech is important, too; this stuff really matters, and even wows. However excitable the tech sector, and however circumspect the enterprise sector, new technologies – whether they are flagged as IoT, AI, and 5G, or bagged as AR/VR, AGVs, co-bots, digital twins – are transformative for manufacturing disciplines. The catch, as KPMG states, and as others repeat, is only that the solution must match the problem.

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It seems strange the inputs and outputs of Industry 4.0 negotiations should ever get misaligned; but the implication is the tech can appear dazzlingly potent and blurringly abstract at the same time, and projects have frequently gone off the rails. More tellingly, perhaps, the message is to to keep close watch and tight control. A 'north star' [objective] and a "vision of the end-result" should be kept in mind, agree Siemens and UMG. But 'too much too soon', and industrial IoT will unravel and overwhelm, says Bosch, chorused by these others.

In the end, the message is that the time is right. Be bold, regardless, say both sides of the Industry 4.0 divide. Be quick, and be careful; the technology is potent and primed, and the problems can be negated by being discerning and deliberate – and by choosing the right partners.

CONCLUSION

Image: KPMG

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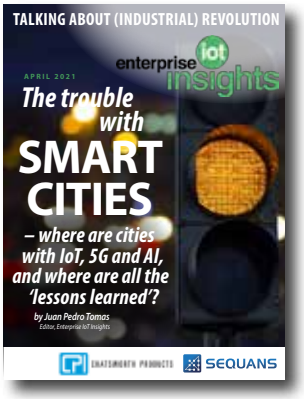

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