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AI & Digital Transformation of the Enterprise

TheEE.ai

Talking Heads:

Intel's Joe Jensen explains why retail is embracing AI at the Edge

Can AI prove its worth with high value use cases?

Juniper Research assesses the progress

Artificial Intelligence on the shopfloor

Why reports of the death of traditional shops may have been over-exaggerated

PLUS: Company, Product & Market News • 'The Insider' Column: Why big egos seldom prosper • The ethics of AI • AIoT and what it means for DHL and Walmart • Retail moves closer to the edge • IoT Security • COVID-19 beyond the lockdowns • Could 5G be the difference between life and death • **See more: @TheEE_io www.TheEE.ai**

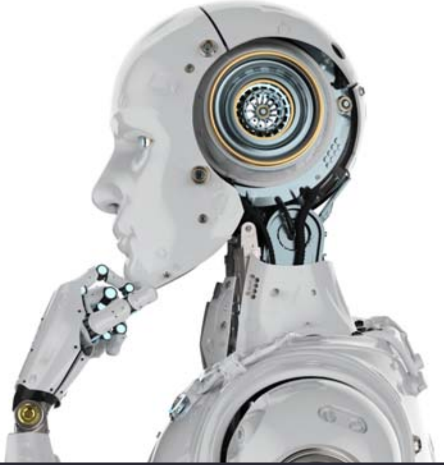
Contents

In this Issue

Cover Sponsor

Intel (Nasdaq: INTC) is an industry leader, creating world-changing technology that enables global progress and enriches lives. Inspired by Moore's Law, we continuously work to advance the design and manufacturing of semiconductors to help address our customers' greatest challenges. By embedding intelligence in the cloud, network, edge and every kind of computing device, we unleash the potential of data to transform business and society for the better. To learn more about Intel's innovations, go to **newsroom.intel.com** and **intel.com**.

Suddenly we're older, bolder and wiser



They say, "A week is a long time in politics." Well, it's been an eventful aeon since our first issue of **The Evolving Enterprise** (**www.TheEE.ai**) was published in Q1. We have learned a new vocabulary; of coronavirus, social distancing, and PPE, and phrases like the "new normal" have become clichés. Yet, despite all the sadness and challenges the virus has brought, some things haven't changed. We still need many of the same products and services, and for businesses to deliver these has required technological innovation, creativity, and hard work. In short, enterprises have been forced to evolve at breath-taking speed.

We could never have anticipated that the launch of the **www.TheEE.ai** and this magazine, would coincide with a period of such extraordinary change, but if businesses are to adapt quickly to new demands we need forums like this to share information. We already share insights daily in our online News. Now it's the turn of our market-leading Analysis. In an exclusive interview (pages 8-11) with Joe Jensen, vice president of **Intel**'s IoT Group and general manager of its Retail Solutions Division, you can see how the power of artificial intelligence (AI) is being harnessed at the Network Edge, not just to improve shopfloor performance but throughout the supply chain. Jensen believes we're on the brink of an AI and analytics breakthrough, and COVID-19 is just accelerating investments in retail from the humble High Street to giants like Walmart.

This magazine has also commissioned a bespoke report by **Juniper Research** on AI's vital role in Financial Services and Retail – we bring you its conclusions on pages 15-18. It makes encouraging reading for retail but in financial services there are deep-seated regulatory problems the industry has to overcome. This issue also brings you assessments of AI and Machine Learning's use in industry (pages 22-23), and how to rein in AI's bias towards unethical, costly choices (24-27). Plus, you'll find out how to tell a great leader from an egoist (28-29), and how AI is working well with the Internet of Things.

There's much more; on Edge intelligence, IoT security, 5G, and augmented reality. One thing there isn't though, there's no going back. Enjoy the magazine.

Jeremy

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Conversational AI capabilities added to hyperautomation platform

Enterprise robotic process automation (RPA) software company, **UiPath** has added conversational artificial intelligence (AI) capabilities to its end-to-end hyperautomation platform.

With out-of-the-box conversational capabilities for UiPath robots, industry-tailored chatbots, and new automation capabilities that engage employees more productively, UiPath aims to make it easier for enterprises to offer always-on, scalable, best-in-class global support. This gives customers access to support whenever they need it on the most popular global messaging channels.

As the COVID-19 pandemic continues to impact business operations, organisations around the world are facing extreme challenges, including the increased need in customer support. **OTP Bank Romania** is using an automation solution that integrates the capabilities of both **Druid** chatbots and UiPath's software robots to process requests to postpone bank loan instalments, for example.

The integration allowed the bank to cut down the processing time of a single request from 10 minutes to 20 seconds, and cope with a 125% increase in the number of calls received by call centre agents, enabling it to process three times more deferral requests with the same number of people in the back office.

"UiPath's conversational AI capabilities expand the reach of traditional chatbot platforms into enterprise applications for gathering real-time knowledge and fulfilling tasks," said Param Kahlon, chief product officer at UiPath. "As next-generation apps continue to be more conversationally focused, we are focused on helping to bridge the connection between chatbots and legacy enterprise apps."

NXP, Mastercard and Xiaomi expand global reach for mobile payments into Europe

NXP Semiconductors, **Mastercard** and **Xiaomi** are jointly bringing more convenient and secure contactless experiences to Russia as the first phase of a European-wide roll-out with NXP's mobile wallet solution.

Powering mobile payments for Xiaomi's Mi Smart Band 4 NFC wearable devices, NXP's mWallet 2GO supports an accelerated roll-out across Europe by addressing OEMs' needs for easy, yet secure and scalable, wallet implementations. It also addresses user demands to quickly enable payment devices by digitising their bank cards and experience smooth NFC transactions at the Point-of-Sale.

The collaboration builds on the companies' successful history in driving tap-to-ride mobile transit experiences in Beijing, Guangxi, Shenzhen and several other major Chinese cities with some of the world's busiest metro stations and public bus lines. The Xiaomi Mi Band 4 offers the industry's best price-to-performance ratio for fully-active, NFC- and SE-based and EMVCo-certified payment devices.

"NXP is the first in the industry to offer the full scope of mobile wallet development with mWallet 2GO," said Rafael Sotomayor, executive vice president and general manager of Connectivity & Security at NXP. "As the worldwide impact of COVID-19 leads to an increase of contact-free transactions at a rapid pace, NXP's leading hardware technology, software, and ecosystem integration bring convenient and secure contactless payments to Xiaomi and other mobile devices."

Rafael Sotomayor, **NXP Semiconductors**

ThinkIoT solutions aim to simplify preparation for workers' return

Lenovo has launched a new package of Internet of Things (IoT) solutions called ThinkIoT Back to Work, for businesses returning to work after the coronavirus pandemic.

Lenovo has assembled an ecosystem of IoT solutions to help make it easier for customers to get back to work in offices without dealing with the hassle traditionally encountered in IoT projects. To that extent, Lenovo validates, deploys and manages these end-to-end solutions globally in a set of turnkey offerings, especially important for large businesses with distributed locations. These are the first solutions from Lenovo's Commercial Internet of Things Business Group, established in 2019 to help drive the company's service-led transformation.

In a recent Lenovo survey in the US, 58% of respondents said their job shifted to remote work in response to COVID-19, and 88% say it's important for their companies to deploy technology-based safety measures within their workplaces before they go back to work.

Lenovo has outlined a three-step framework with technology at its core to help make spaces safer and to accelerate business transformation for the long term.

1) Control who gets into the location
2) Manage behaviour within the space; and
3) Prepare to respond to incidents

ThinkIoT Back to Work solutions support this three-step framework with a set of end-to-end, pre-tested and validated IoT solutions incorporating carefully selected and proven hardware and software partners, including **CXApp**, **Inpixon**, **L Squared**, **Openpath**, **Relogix**, and **Viper Imaging**.

Customers can choose what's most important to them and mix and match solutions based on their desired outcomes. Lenovo serves as the one-stop shop for deploying and managing these Back to Work Solutions.

"For the past decade IoT solutions have promised great results but haven't delivered," said John Gordon, Lenovo's president, Commercial Internet of Things. "Our purpose is simple – to overcome the logistical challenges of IoT systems to make them practical at scale."

Report calls for urgent action to meet cyber threat to critical infrastructure

Global safety charity, **Lloyd's Register Foundation** today launched a report called Operational Cyber Security for the Industrial Internet of Things: Challenges and Opportunities. It highlights an impending threat to critical infrastructure from cyberattacks, given the growing reliance on the Internet of Things (IoT), say Robert Hannigan, executive chairman international at **BlueVoyant** and Sadie Creese, professor of Cyber security, Department of Computer Science, **University of Oxford**.

The core finding of the report is that the current pace of change will not match the fast emergence of new security threats to Industrial IoT (IIoT) environments. Current capabilities, the report points out, either do not scale, have not been tested or simply do not yet exist. The report additionally points to the approaching tipping point for recovering from cyberattacks, and the challenges for mindset, regulation and insurance that can build preventative security practices.

Whilst regulation, the requirements of cyber-insurance providers, and the adoption of a cyber security mindset within organisations could drive progress towards bridging operational capability gaps and developing risk controls that translate effectively into the IIoT, there are new, pressing challenges to confront.

The management of cyber security risk for traditional systems already faces many challenges. These include the sheer difficulty of trying to map the complicated relationships between technical and human systems, and the challenges of communication between different communities where the frameworks for understanding risk are fundamentally different.

Michela Menting, **ABI Research**

IoT cyber security demand to boost embedded hardware sales

In the ongoing push for more secure IoT devices and applications, the hardware choices for embedded security are growing dynamically.

A new report by **ABI Research**, a global tech market advisory firm, forecasts shipments for secure hardware serving digital authentication and embedded security will reach 5.3 billion by 2024. This is double the number of shipments in 2019.

"Hardware-based security offers better protection from manipulation and interference than its software-based counterpart because it's more difficult to alter or attack the physical device or data entry points," explains Michela Menting, digital security research director at ABI Research. "Yet, less than 10% of IoT devices are currently being protected with hardware security."

Fortunately, hardware security technology development is accelerating rapidly, and the technologies being adopted today in IoT markets come in a range of form factors. Some are adapted from existing security solutions, such as trusted platform modules (TPMs) and trusted execution environments (TEEs), NFC embedded secure elements and authentication ICs, while others are emerging from IoT market demand, such as embedded SIM and secure microcontrollers.

"Certainly, this dynamism means there is plenty of opportunity in the market for new secure hardware technologies targeted at the IoT. The emergence of iSIM, secure microcontrollers with TEE functionality, and even hybrid dual-core micro and application processors are a testament to the growing demand for embedded security," added Menting.

Boomers, Gen-X doubled BTC investments every month since lockdown

Data compiled by in-house **Mode Banking** analysts has revealed that Bitcoin (BTC) investments have been doubling every month since February 2020 among older age groups (Baby Boomers and Gen-X), signalling wider crypto adoption.

Mode saw an initial uptick in BTC investments in March this year, at the same time as global markets crashed and many countries went into lockdown. As the global pandemic evolved, Boomers and Gen-X began accelerating their exposure to BTC on Mode's platform.

Taking February as a benchmark, Boomers and Gen-X invested 2.24x more in BTC in March than they did in February, 4.49x more in April, and a staggering 8.88x more in May.

Mode's research also compared the average month-on-month growth of BTC investments among different generations before and during COVID-19. Millennials and Gen-Z dominated the leaderboard with investments growing 118% month-on-month prior to COVID-19 and 125% during COVID-19.

In the pre-COVID-19 months of January and February, older generations' BTC investments grew almost twice as slow as those of younger generations (61% vs. 118%). However, during the pandemic, Boomers & Gen X accelerated their BTC investments much more than Millennials and Gen-Z, thus narrowly closing the month-on-month growth gap (107% vs. 125%).

"We believe these to be very interesting findings, and although the reasons for this could be manifold, they could potentially reveal an unprecedented change in the way investors think today, as a result of the global pandemic," said Janis Legler, chief product officer at Mode. "Bitcoin is becoming popular among all age groups and is being endorsed by more mainstream investors every week."

Kinaxis buys demand planning provider Rubikloud for $60m

Kinaxis, a specialist in decision-making technology, has agreed to acquire Toronto-based **Rubikloud** for US$60 million (€53 million) in an all cash transaction. Rubikloud is an emerging provider of artificial intelligence (AI) solutions that automate supply chain prescriptive analytics and decision-making in the retail and consumer packaged goods (CPG) industries.

Globally-recognised retailers and CPG manufacturers in the health and beauty, household and grocery segments use Rubikloud's AI-based products today. The company's offerings include demand forecasting and automation to manage and optimise trade promotions, pricing and assortment to drive product demand and dramatically improve financial results.

"Rubikloud has capabilities and value that we can offer our CPG customers today, leads us into the retail industry with some bellwether accounts, and adds a group of approximately 80 people to an already-impressive AI and machine learning (ML) team here at Kinaxis," said John Sicard, the president and CEO of Kinaxis. "Over time, this enhanced group will contribute to new and existing AI-powered capabilities across the full Kinaxis RapidResponse platform and applications. This acquisition reflects the growing importance of AI and ML to power intelligent automation and augment human decision-making to better deliver on customer promises, remove waste and increase resiliency for effective risk management."

Rubikloud's SaaS-based ML offerings empower retail and CPG manufacturers to transform their core operations by improving and automating complex, profit-generating decisions. Rubikloud's proven AI capabilities and intuitive tools enable users to utilise disparate data sources to improve forecast accuracy, site-level allocations, inventory availability and promotion plans by allowing users to run boundless simulations in real-time.

(L-R): Pactum co-founders Kristjan Korjus, Martin Rand and Kaspar Korjus

AI negotiation platform Pactum closes $3m seed funding

Pactum, an artificial intelligence (AI)-based platform that enables global companies to automate personalised commercial negotiations on a massive scale, today announced the closing of a US$3 million (€2.65 million) seed financing round. This was led by Berlin-based **Project A**, a venture capital firm focused on innovative start-ups, with investments by **DocuSign** and other previous Pactum investors.

Pactum was founded in 2019 to help companies uncover hidden value in supplier contracts. Many Fortune Global 2000 companies have thousands of vendors with contracts that have been neglected for long periods of time because the value of the contracts are too small and too numerous to warrant proper procurement specialists' time. Pactum autonomously negotiates these supplier contracts, which releases significant capital to the bottom line while also improving terms for vendors. **Walmart** is one of the first customers Pactum is able to disclose.

"We're happy to announce this round of funding which will bring our technology to more enterprises that need it," said Martin Rand, Pactum's CEO. "Project A is at the forefront of the most innovative breakthroughs in tech and AI and DocuSign is an iconic brand in the world of agreements, so we feel they provide the perfect balance for us."

Uwe Horstmann, a general partner of Project A, added: "We are convinced that AI-based systems will shape the future of commercial negotiations. Pactum is well on its way to play an essential role in this future. Therefore we are happy to support this great company."

Matt Carter, **Aryaka**

Alibaba Cloud partners with Aryaka to deliver global, fully managed SD-WAN

Aryaka has partnered with **Alibaba Cloud** to provide a global, software-defined wide area network (SD-WAN). Aryaka aims to extend the global cloud service provider's services to enterprises, both within China and internationally, in support of their digital transformation initiatives. The partnership benefits Alibaba Cloud customers in China who wish to extend their reach abroad, using a global service that integrates SLA-driven connectivity with application acceleration, security, WAN optimisation, SaaS access, last-mile services, and global orchestration.

The same advantages also apply to enterprises outside of the Alibaba Cloud footprint, who can now leverage Aryaka's end-to-end global WAN for access into China. In effect, Aryaka is now providing a global on-ramp to the Alibaba Cloud. As part of the partnership, Alibaba Cloud will offer the Aryaka SmartServices portfolio via the Alibaba Cloud International Marketplace. Alibaba Cloud's and Aryaka's joint reseller partner, **Netbank**, will offer

"Alibaba Cloud is the number one public cloud provider in Asia Pacific and China," says Matt Carter, the CEO of Aryaka. "We are thrilled that Alibaba Cloud has partnered with Aryaka as one of its global networking partners. The combination of the world's best managed SD-WAN provider and Alibaba Cloud will help deliver a truly cloud-first WAN to enterprises, modernising their WANs."

Alibaba Cloud is recognised by **Gartner** and **IDC** as the largest public cloud provider in China and Asia Pacific as of 2019, with 41.7% market share in China and 28.2% across APAC.

More compute power makes everything better for retailers

Joe Jensen is a vice president in the IoT Group and the general manager of the Retail Solutions Division at Intel which has been pioneering the usage of artificial intelligence in the retail industry for more than a decade. Jensen joined the company in 1984 as a product engineer and holds a bachelor's degree in electrical engineering from South Dakota State University and an MBA degree from Arizona State University.

As retailers get to grips with the challenges presented by the COVID-19 pandemic, he tells Jim Moar, the lead analyst at Juniper Research, how Intel is helping retailers harness the power of artificial intelligence (AI) at the Edge. Importantly, it's not just about helping traditional retailers maximise shopfloor performance, AI goes deep into the supply chain and is also vital for online businesses entering the bricks and mortar world.

SPONSORED INTERVIEW

Jim Moar: What does AI mean to you?

Joe Jensen: I've always had a deep belief that more compute makes everything better. The more intelligence and data we can bring in, the more we can improve consumer experiences, business results and overall satisfaction. AI technology is evolving rapidly and enabling us to get real-time insights that were unattainable previously.

It's key to get all the technologies to come together at the right price point and deliver the right value proposition. For example, let's go back to the tablet era - I was the product manager for tablets at Intel around 1991. We had a tablet that weighed 12kg, was three inches thick and lacked Wi-Fi. It had a black and white display with relatively low resolution and a stylus input. We sold zero units because it didn't provide much value to customers, but as soon as we had thin, light tablets with good connectivity, an attractive screen and content, tablet sales just exploded.

It's key to get all the technologies to come together at the right price point and deliver the right value proposition

I think we're there today with AI. We've been using AI technologies in our own manufacturing sites for each of the very expensive pieces of equipment in the wafer fab for 15 years. When machines are US$10-$30 million each, having AI could make sense, but you wouldn't install it in the kitchen of every restaurant. However, the compute keeps getting cheaper, connectivity is improving in terms of bandwidth

Joe Jensen, Intel

and reliability and cost, and the technologies around AI and deep learning have brought a massive change in AI's capabilities. All these things have their own maturity curve, and we're getting to the point where we're hitting a sweet spot in terms of price performance and the ability to get insights really cost-effectively.

JM: Given that landscape, where do you see AI functioning in the retail space?

JJ: I think the uses of AI are almost endless. If you look at some of the more traditional ones that are scaling and were scaling pre COVID-19, we're very big proponents of anonymous use of computer vision - using vision to study observable traits of a shopper in the moment is really the key to obtaining valuable insights. When you add the shopper's pattern of behaviour they're exhibiting together with the estimated generic characteristics and the colour palette of the shopper's clothing, then this is much more meaningful in terms of being able to serve that shopper, than merely trying to identify a person by name.

JM: What about other AI technologies in retail, such as digital signage for example? How are these being used?

JJ: Most digital signs today run on Intel and can provide insights when adding a basic webcam and vision algorithms that fit within the existing processing capability. In addition to the media player running Intel silicon, all you'd need is the camera and the analytics software. And the data cost is tiny compared to the overall cost savings. AlphaDigital recently did a study which showed that in retail, sales of four out of five products experienced almost a 33% increase when promoted via in-store digital signage, and the signage reduced consumers' perceived wait time by up to 40%.

Now, with the COVID-19 pandemic, we have a totally different business dynamic at play that is accelerating these kinds of investments. We're seeing rapid innovation using analytics and AI. There's a huge push in hospitality and retail to ensure that employees and customers are safe. There's a viewpoint that consumers are going to pick and choose where they go, where they shop, where they dine, all based on how safe they feel.

These solutions are all relatively simple modifications to some of the algorithms they've already been running and deploying pre-pandemic, like measuring the path of shoppers, which has been around for up to ten years. We've hit that tipping point where the cost per insight is now affordable.

At Intel, we have an AI development toolkit we call OpenVINO that enables you to optimise your algorithm to run on Intel hardware and helps customers get the best cost-performance benefit and fit the right power envelope for your situation. We've always had customers that are at the leading edge, and we've got a tremendous pipeline of new business coming in, who are taking advantage of our tools like the Intel OpenVINO Toolkit and the Intel DevCloud for the Edge.

When machines are US$10-$30 million each, having AI could make sense, but you wouldn't install it in the kitchen of every restaurant

When a shopper comes in the store, if a product isn't on the shelf, then from the shopper's perspective, you're out of stock

We've also been deploying and scaling AI in more premium retail brands and locations - beyond the headquarters stores. There are companies that have been in business for a hundred years or more doing retail the traditional way, and their leadership tends to be a traditional retail style. Now we've got a new wave of brands and retail coming in called digital natives - companies that started online. They create a brand and a product, do online sales exclusively, and then they hit a ceiling at somewhere between US$600-700 million to US$1 billion dollars per year in sales.

In order to cross over that billion-dollar threshold, they realise they have to actually go into physical retail. What we're finding is these digital native companies are continuing to think like online sellers even after they've opened their bricks and mortar store, asking questions like: What's my traffic? How long are people dwelling on my site? What do they put in the cart? and What do they abandon in the cart?

JM: Is it a question then, of getting retailers used to the idea of rearranging store layouts and prioritising certain products on a much faster feedback cycle?

JJ: Yes, right down to what sort of inventory you sell. In Arizona, there's a mid-range department store chain with a store in South Tucson that served a shopper demographic that was mostly short ladies, which meant they typically sold out of short pants for ladies really quickly and had piles of long pants in stock. The reason for that problem is that they couldn't afford to put buyers in every single store to optimise the inventory. But with a data-centric model, you can optimise. With data, you can have the value of an onsite product management team and an onsite optimisation for that local store. And you can have that in every single store.

JM: Does that prevalence of small players create an opportunity for small and medium sized businesses to start using these technologies?

JJ: I think it's very bimodal. Our view is that retail has been under a tremendous amount of pressure in transformation for more than five years. Retailers like to blame Amazon for their problems. We actually think it's not Amazon, it's the consumers whose expectations are always rising. You get an amazing experience in one aspect of your life as a consumer, and then you wonder why every other experience isn't that good.

Consumers have ever-growing expectations and Amazon has been very nimble and they've been able to deliver quickly on those expectations. What we're seeing is a class of retailer who are in front of this issue, the big players who've made big multi-year investments in the foundational IT technologies. Somebody like a **Walmart** has maybe two or three times the annual spend on IT as a percentage of revenue compared to what other players are spending.

These big players now have a base infrastructure capability, a single data lake, much better tools and capabilities that will allow them to deliver on what these new AI-based analytics solutions can enable them to do. Like being able to solve real time inventory problems. When a shopper comes in the store, if a product isn't on the shelf, then from the shopper's perspective, you're out of stock. You might have a whole case in the back, but if it's not on the shelf, it's dead inventory. And Walmart's really attacking that inventory problem.

We see this happening over a ten year horizon where we're going to see winners and losers.

And we're seeing the pandemic accelerating the timeline – in addition to consumers expecting more in regard to their safety. As a consumer, if I'm going to put on a mask and gloves and fully prepare to go shopping, and then find out you're out of stock, I'll be doubly angry.

JM: Is there a natural progression of moving towards automating everything, from stock management to check-out payments?

JJ: If I were architecting a chain of stores to succeed over time in the future, it would have the capability to understand very accurately what our real-time inventory situation is, and we'd be using that data to drive a much nimbler supply chain.

One great example of using analytics is the Fung Group, the biggest importer, or shipper, globally of apparel, representing 5,000 different factories in China. A lot of stores, especially house brands, will work through Fung Group, and they'll farm that business out to different factories. Currently, the supply chain is six months. If you come up with a bunch of products and the cobalt blue sweater is selling really well, even if you wanted more cobalt blue sweaters, it's a long lead time. Fung Group is working really hard, using analytics and AI to be able to shorten that pipeline to four weeks.

JM: We've spoken a lot about utilizing AI technology to address existing concerns. Are there any examples of what AI can do that's new, or almost impossible to do without it?

JJ: I'm on a retail trade board called the Retail Industry Leaders Association (RILA) and what we're hearing is that one of the top concerns of CEOs of billion-dollar retailers is that shoppers are not wearing masks and enforcing masks has been difficult. They all have stories of their staff being physically assaulted when they try to tell customers they have to have a mask on. They all love the idea of installing an automated system, like a kiosk, at the front of the store that just flashes green or flashes red.

JM: Are you seeing other forms of technology change to reflect the needs of AI itself in retail?

JJ: Let's look at how the leading-edge innovative retailers evolved the past ten years, as they were putting more technology in the store. Every time they installed something new, it was yet another box or server. Pretty soon that means you have a whole bunch of endpoints in the store that are difficult to manage and maintain. In recent years, because of that, we've been working on building a next generation system architecture, that enables all these workloads to be managed and controlled and run like you do in the cloud.

So, the first thought is, well, why don't we put all these things up in the cloud? We've got a grocery retailer in China that has 400 HD cameras in every store, looking at all the shelves to make sure they're always perfectly stocked. They're not going to stream 400 high def cameras worth of video to the cloud to process because of latency and cost issues. If a retailer wants to influence you on this digital signage you're walking by, it's got to be able to detect your general traits quickly, and then adapt the content quickly. They've got a couple hundred milliseconds to be able to do that before somebody has already walked past.

This is the velocity that AI in retail needs to enable. And at Intel, we've deployed the OpenVINO toolkit and edge AI platforms such as Movidius VPUs to help make that velocity happen. ■

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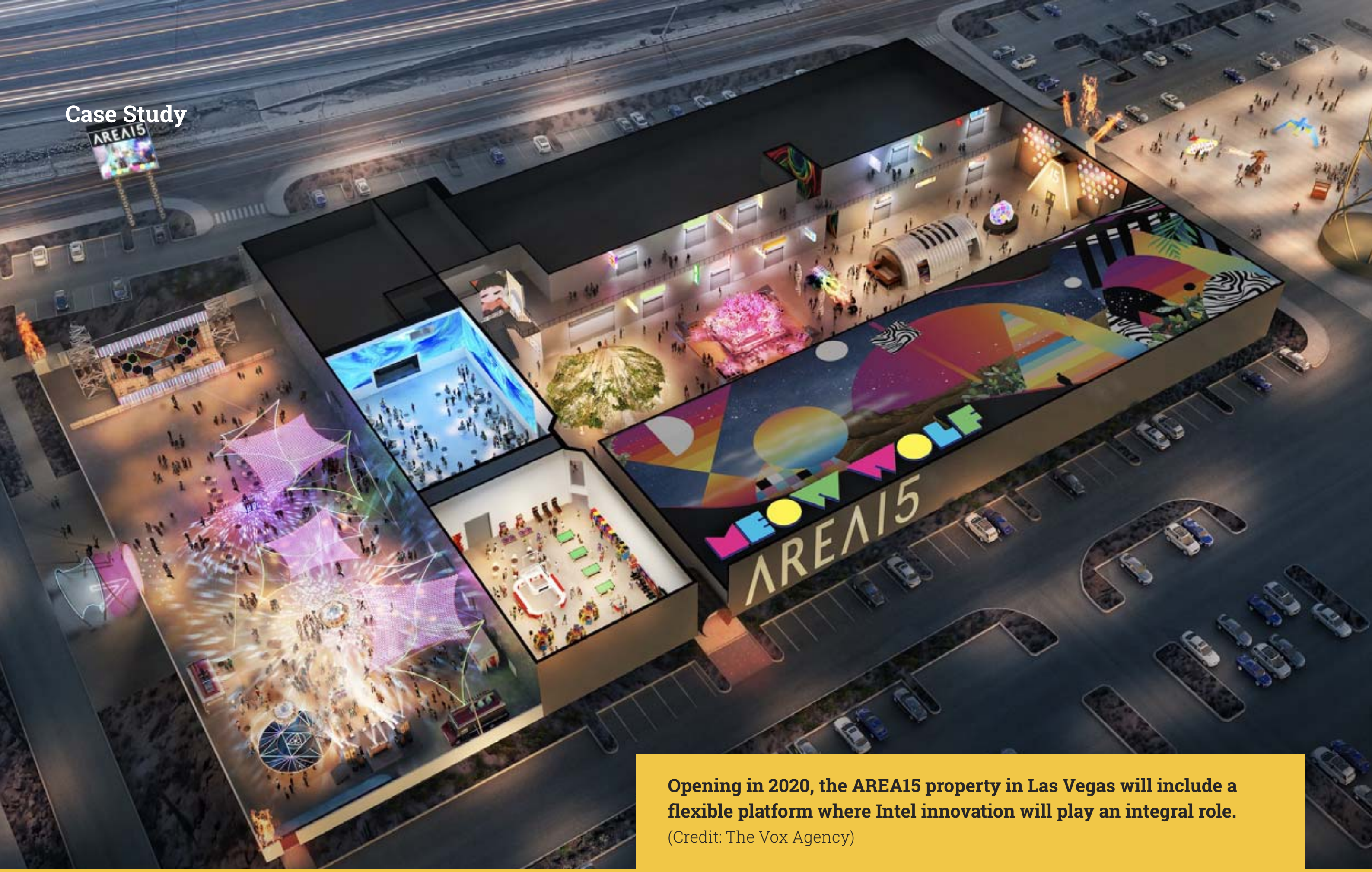
> **If I'm going to put on a mask and gloves and fully prepare to go shopping, and then find out you're out of stock, I'll be doubly angry**

Case Study



Opening in 2020, the AREA15 property in Las Vegas will include a flexible platform where Intel innovation will play an integral role. (Credit: The Vox Agency)

Intel and AREA15 bring experiential retail to life in Las Vegas

Intel has announced a collaboration with AREA15, one of the first purpose-built experiential retail and entertainment complexes. To thrive in the digital age, traditional retailers and malls face a reinvent-or-die reality.

AREA15 is tackling this issue by offering live events, immersive experiences and activations, and monumental art installations, employing ground-breaking technology and much more for the retail environment.

"Today, only top retailers can afford to explore and implement experiential design in their stores," said Joe Jensen, Intel vice president and general manager of the Retail, Banking, Hospitality and Education Division. "We believe immersive, authentically engaging and inspiring experiences in retail are not only possible, but should be accessible for all. Ecosystem collaboration is in Intel's DNA. AREA15 will help provide scalable, world-class experiential retail solutions for retailers and brands of all sizes."

Why the project's important

Research from CNBC[1] shows that 81% of Generation Z prefer to shop in stores, and 73% like to discover new products in stores. This offers the opportunity to transform how a new generation of consumers chooses to interact with brands. Retailers and brands can't afford to miss out on engaging this demographic, which is on track to become the largest generation of consumers by 2020 – responsible for US$29 billion to $143 billion in direct spending, according to Millennial Marketing[2].

The rise of the 'experience economy,' fueled by rapid shifts in technology-enabled design and culture, has resulted in the business-critical need to understand customers – not only Gen Z – and use that data to design a real-time personal experience.

SPONSORED CASE STUDY

The Intel Experience Incubation Hub will be a multiuse venue for innovation and collaboration. It will allow retail ecosystem partners to test new design concepts and technologies.
(Credit: Design Distill)

Intel's role

The alliance will initially focus on immersive experiential retail design with the launch of the Intel Experience Incubation Hub, a multiuse venue for innovation and collaboration. It will allow retail ecosystem partners – from creatives to technologists – to test new design concepts and leading-edge technologies.

The AREA15 property in Las Vegas aims to be the gravitational centre for the new experience economy, building a flexible platform where Intel innovation will play an integral role. AREA15's technical and physical infrastructure will be modular, allowing for innovations coming out of the Experience Incubation Hub to be easily tested for proof of concept and scalability – within AREA15 and beyond – in a variety of forms, from pop-ups to short-term engagements to more permanent installations.

Early collaborators and experiences featured in the Experience Incubation Hub include **Artist TRAV**, **Papinee**, **Pressure Point Creative**, **ThenWhat** and **Variant**.

"AREA15 is a radical reimagining of retail, where visitors can expect to be authentically engaged and inspired in an otherworldly setting," said Winston Fisher, the CEO of AREA15 and partner in Fisher Brothers. "Experience design cannot be separated from technology – it is essential that the two are intertwined and co-developed. That's where our collaboration with Intel comes in. Together, we're raising the standard of experience design, and developing best practices for combining technology, art and commerce in exciting, unexpected ways."

This article is reproduced from the Intel Newsroom **https://newsroom.intel.com/news/intel-area15-bring-experiential-retail-life-las-vegas/**

1 https://www.cnbc.com/2019/09/17/gen-z-shopping-habits-can-fuel-a-brick-and-mortar-resurgence-report-says.html
2 http://www.millennialmarketing.com/research-paper/the-power-of-gen-z-influence/

Artificial intelligence in retail and financial services

Artificial Intelligence (AI) and Machine Learning (ML) are already playing a significant role in the efficient delivery of some services in key industry sectors. Among the front runners are the consumer retail sector and financial services. Evolving Enterprise commissioned leading industry analysts, Juniper Research, to assess the innovations in these two sectors and to see what lessons other industries can learn from their ground breaking experience.

The introduction of AI in retail and financial services

While financial services and retail are highly different markets with different challenges and drivers, one consistent similarity is the need to digitally transform and innovate.

For financial services, the rise of digital channels has meant that financial players have had to transform the way they interact with users, which has required fundamental change throughout organisations. In the retail market, the rise of eCommerce has meant that retailers now face an increasingly omnichannel world, where they must engage in digital strategies or they will succumb to competition from eCommerce vendors.

These challenges have meant that stakeholders in both markets have sought out technologies which can accelerate their digital strategies and deliver fundamental improvements in their ways of working. As one similarity between the markets is the widespread availability of data, AI has emerged as essential to efforts in both sectors.

The rise of AI

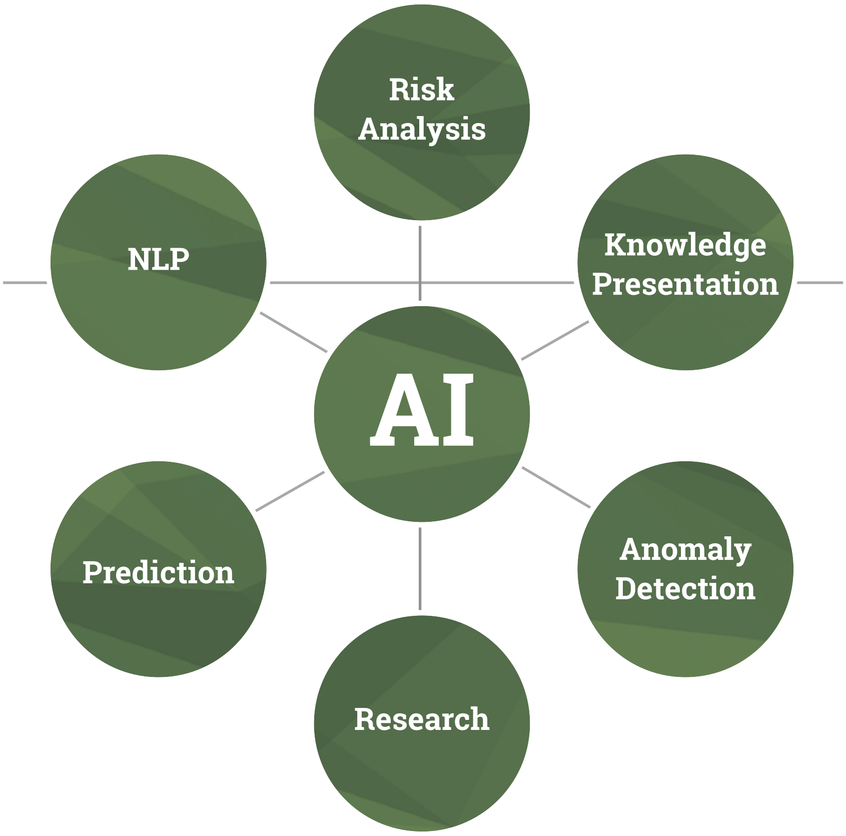
Before analysing its deployment in fintech and retail, it is important to establish a definition for AI, as the area suffers from confused definitions.

Juniper Research defines Artificial Intelligence as a computer program that uses a combination of digital building blocks, such as mathematics, algorithms and data, to solve complex problems normally performed by humans.

AI is not generally used for complicated tasks, it is merely scaling tasks at a rate that cannot be matched by humans. By utilising AI to undertake previously manual tasks, human intervention can be reduced to near zero, while increasing the total volume of tasks undertaken.

AI use across fintech and retail generally requires certain common capabilities, which are important to recognise when analysing use cases in these sectors.

In this context, the definition of AI does not distinguish between different types of AI, such as deep learning and supervised learning. Over time, more advanced AI techniques will be used, but this is limited at present in these segments.



The use of AI in fintech

Ever since the advent of computer use by financial institutions (FIs) in the early 1950s, financial services has been a sector that generates an enormous amount of data. This has meant that FIs have consistently adopted analytics tools to understand the wealth of data they generate. In this context, it is unsurprising that financial services is one of the first sectors to be significantly disrupted by AI deployment.

However, for AI to reach scale in financial services the 'black box' challenge must be resolved, which means that whenever AI is used, there is a fundamental problem with implementing it in important use cases. Current rules-based systems follow a traceable approach, where decision processes can be recreated. For AI systems, this is not as straightforward. Algorithms are so complex that it is difficult to establish their reasons for reaching a certain decision. In processes where transparency is a must, such as regulatory compliance or lending, this is a challenge. Vendors must focus on boosting the explainability of AI systems in order to combat this challenge.

The most progress in terms of AI deployment in financial services has been made in the following segments:

- Roboadvisors
- Chatbots
- Lending
- Insurtech
- Regulatory technology (Regtech)

For the purposes of our comparison with retail, we will focus on the two highest value areas, Insurtech and Regtech.

Regtech: AI for transaction monitoring

Transaction monitoring is a key task in the prevention of money laundering, which is a significant cost to the economy. Transaction monitoring systems (TMS) are an integral part of fraud prevention and compliance with anti-money laundering (AML), yet transaction monitoring is among the most difficult of compliance actions for large FIs to complete.

The estimated amount of money laundered globally in one year is 2-5% of global GDP, or at least $800 billion (possibly as much as $2 trillion).

It is in this context that the magnitude of the AML task facing FIs becomes apparent. Market globalisation has meant a significant increase in the number of customers to check, and TMS are incapable of handling this enormous task in an effective manner. The volume of alerts generated by current systems is such that 90% of them are ignored, with 8 out of 10 of the remaining 10% turning out to be system-generated false positives. It is clear that current rules-based approaches are not sufficient to address the complexity of the task. False positives in the know your customer (KYC) and AML processes are a drain on time and resources. The aim for companies must be to achieve maximum process efficiencies while keeping down the costs associated with regulatory compliance.

Consequently, AI is being progressively introduced as a solution to improve TMS. AI is uniquely suited to enhancing TMS. TMS as machine learning techniques mean that an AI system will learn how to interpret data more effectively over time, increasing the process' efficiency. An AI system in this area can be trained effectively by feeding it data about previously confirmed instances of money laundering. This will mean that AI will produce fewer false positives than a traditional TMS, reducing compliance team's workloads dramatically. There can also be an improvement in the data which can be used in transaction monitoring. By leveraging natural language processing (NLP), AI can understand notes and other more diverse forms of data, which can enhance transaction monitoring processes. Automation of the repetitive processes associated with AML tasks (onboarding, transaction monitoring and fraud) will enable companies to identify the relevant information more quickly, achieve consistency and increase the responsiveness to issues identified.

AI in insuretech: conversational platforms
AI-enabled conversational platforms allow insurers to use NLP to communicate with their customers in a similarly personalised way as human-to-human interaction, while capturing the relevant information. Machine learning allows conversational platforms to train algorithms and adapt, thereby continuously improving underwriting processes. Some of the use cases for this technology are:

- **Chatbot sales agents** - for less complex insurance types, such as travel, home or motor, chatbots can potentially act as the sales mechanism. A chatbot can retrieve only the relevant information to provide an automated quote, saving time across the process.
  Retrieving information in a conversational way can result in less consumer frustration and fewer errors, higher quality data, as well as a more personalised process.

- **Policy queries** - chatbots are well suited to deal with queries relating to policy changes or terms and conditions, which can function without large customer service teams.

- **Claims reporting** - particularly in motor insurance claims, details can be collected via a standard set of questions. This process naturally lends itself to chatbot solutions, facilitating accident reporting, initiating the claims process and providing a smoother service to policy holders. It may also help with fraud detection, through analysing question responses.

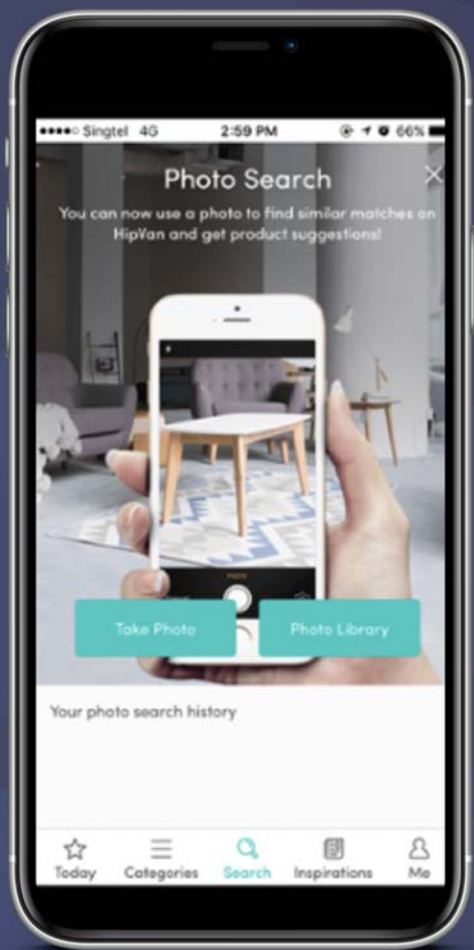
The use of AI in retail

The emergence of eCommerce giants such as Amazon and eBay from the mid 1990s has created a long-term challenge for traditional retailers. Many have met this challenge by attempting to offer a compelling omnichannel experience, where the physical retail and online channels merge through the use of solutions such as click and collect. While this has dramatically improved the customer experience, it has not prevented a reckoning for many traditional retailers, with multiple large-scale insolvencies, including Toys R Us, Sears and HMV.

Therefore, retailers must further adapt their business models to protect their futures in the face of advanced competition. In order to do so, there is increasing momentum behind leveraging the tools that eCommerce players have used to such great effect, particularly AI.

High value use cases
To understand the potential of AI in retail, it is important to examine the highest value use cases.

i. Visual search
One of the biggest ways in which AI is being used in retail to deliver personalised services in visual search. AI systems are



uniquely qualified to help narrow down choices, personalise product catalogues or to find similar products using visual search. Retailers can leverage computer vision (CV) technologies to enable systems to understand product pictures, identifying key characteristics, such as colour, material and style. This data is then combined with metadata from product catalogues, enabling the systems to automatically find a product that has similar characteristics.

One such example of visual search is in the clothing retailer UNIQLO, which uses ViSenze's Search by Image function to merge the offline and online retail channels. Shoppers take a picture of an item, which is then analysed to find matching products online.

Visual search systems are also useful in optimising a retailer's own operations. By using a visual tagging system, retailers can automatically tag their items with the most appropriate metadata, allowing more effective organisation of items on a website. It also enables features such as search for similar, which will find comparable items based on metadata.

ii. Customer analytics and marketing

AI is also uniquely useful in allowing retailers to analyse their customers. As shopping habits have changed, the value of knowing the customer has not diminished, in fact, if anything the value of customer information is far higher. However, shopping is now largely impersonal, which has implications for customer retention.

This is also important in the context of changing shopping habits. In North America and Europe, discount retailers have enduring popularity, offering branded goods at low price points. Stagnation in wages and slow economic growth has fuelled this. Retailers that offer goods at high prices need to understand their customers better and target them more effectively, maximising their Average Revenue per User (ARPU).

Knowing their customer allows connected retailers to more effectively handle their relationships with their most important customers. By using analytics systems, retailers can look at a customer's transaction history and immediately establish patterns which may be related to selling to them. Once these patterns are identified, the business can act on them in the hope of increasing their purchases. This will primarily take the form of specifically targeted marketing, which will attempt to personalise marketing and provide offers that are relevant to the customer, based on their previous purchases or interests. This can increasingly be determined from other sources, such as integration with social media, which has become popular.

In terms of marketing, AI offers great opportunities for designing optimal website layouts and automating A/B testing. Instead of running individual manual tests, testing can be fully automated, with many permutations checked at once. This allows retailers to optimise their marketing strategies on the fly, swiftly making changes that make users more engaged with a retailer's online content and store.

Conclusion

AI clearly has potential in both financial services and retail, across numerous use cases. To date, this potential is more realised in retail than in financial services, as retailers are faster to adapt to new methods of working. Banks and other financial institutions can be slow to adopt new technologies.

There are also fewer regulatory concerns in the retail market. While data protection rules generally mean data must be handled for a specific, justifiable purpose, retailers are used to collecting and handling data for loyalty schemes. This loyalty scheme data can then be analysed by AI, adding an extra layer of value to existing data sets. This is now even more valuable, given the fact that many retailers are omnichannel, so many schemes cover online and offline channels.

In contrast in financial services, there are massively complicated regulatory frameworks which are delaying innovation, meaning that AI will be restricted to a largely advisory role. The creation of more explainable and transparent AI systems will accelerate AI innovation in financial services.

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https://www.unodc.org/unodc/en/money-laundering/globalization.html

AI steps out of the store-room and onto the shopfloor

The saying goes that retail is detail and it has never been more true as retailers gather more information about their customers' online and physical preferences than ever before. To an extent, there's even too much information being collected. However, customer data is only one aspect. Retailers have also amassed huge volumes of operational data which enables them to run their businesses efficiently. The challenge now is to automate and apply intelligence to retail data and processes, writes George Malim.

Artificial intelligence (AI) in retail hasn't really been about customer-facing innovations so far because immediately accessible large value can be achieved in the capabilities AI is bringing to the backroom to help optimise operations and gain greater insights into shoppers' behaviour. This is phase one of AI in retail and many retailers have completed or are well on the way to adopting AI for various backroom systems – and they're reaping the benefits. The next step is to become more shopper-facing and several different approaches are being taken to achieve this. These are broadly split into the transformation of traditional retail via new approaches such as the autonomous store or the experiential applications of AI for things like augmented reality mirrors, interactive walls or tactile experiences that need to be measured.

As always, and especially in these times of pandemic, retailers need to consider their strategies carefully and understand the pitfalls to watch out for, what constitutes best practice and how to manage expectations.

"AI technology has become widely used in the retail industry," confirms Selina Yuan, the president of International Business at **Alibaba Cloud Intelligence**. "As a result, new applications and solutions are emerging to meet the needs of retailers on the high street, as well as those online. While AI can positively impact retail sales, especially those online, many applications are currently more focused on operational areas like customer services, logistics and warehousing."

Back on the supply chain gang

Coming out of the store-room depends on the AI maturity of a retailer and also on what its customer base is demanding. "While it's still early days for most retailers, AI will play an increasingly central role in helping retailers optimise their operations and deliver efficiencies in the future," says Wayne Snyder, the vice president of Retail Industry Strategy EMEA at **Blue Yonder**, which delivers AI and machine learning (ML)-embedded systems for retailers. "Recent research we ran with WMG at Warwick University highlighted that while only 15% of retailers are currently using AI in supply chains, more than half of them want to be doing so by 2025. However, if we look globally, we do see more examples of shopfloor adoption. Across Asia, technology is strongly integrated into the retail experience, with many staffless stores in operation. **Amazon Go** and similar frictionless payment technologies rely on AI to ensure the right charge and reduce fraud."

Yuan adds that the continuous development of analytics technologies and algorithms will further promote the transformation of the retail industry and allow intelligent applications to permeate throughout the sector. The merging of the online and offline shopping experience is continuing, and these increasingly complement each other. She explains that some solutions, such as Alibaba Cloud's Image Search and Machine Learning Platform for AI, have transformed the way that customers interact with sites and how they search for products online, before perhaps deciding to view or try them in a physical store.

"Image Search is a technology that utilises machine learning and deep learning to analyse images, find desired products, and fulfil search requests quickly and conveniently," says Yuan. "This type of technology means retailers can offer it as an added functionality to improve the effectiveness of search results, thus enhancing the customer experience, too. Speaking more broadly about what's happening behind the scenes, orders, payments, product assortments, marketing information and supply chain processes are increasingly being digitalised to provide a seamless online and offline shopping experience for customers. Given how competitive and challenging the retail sector is, the decision to make the cloud and related technology like AI part of a retailer's digital transformation journey could well have a bearing on their success."

For Paul Clough, the head of Data Science at **Peak Indicators**, a UK-based consultancy that provides data science and machine learning support to **HSBC**, **AstraZeneca**, **L&G**, **Nomura**, **Schneider** and **GO Outdoors**, who is also professor of Search and Analytics at the University of Sheffield, advances are being made by AI in retail. "I think there's a difference between key features and nice-to-have enhancements," he says. "Mature AI technologies work well for many core retail tasks in many situations, and the predominant use case is likely to be predictive analytics based on machine learning. Many companies are experimenting with AI techniques for more advanced user experience features, including recommendations, and companies such as **Amazon** and **Asos** are also using tools such as robotics to automate their warehouses."

Exiled from Main Street

As these technologies have been adopted and the retail industry has been transformed, first by the increased digitisation of retail and more recently in the COVID-19 pandemic, the definition of the shopfloor has altered. There's no longer the division between the online retail storefront and the physical shop in the mall or on Main Street.

"As we emerge from the first wave of a major pandemic, it's likely that the shopfloor is now virtual and online compared to physical," adds Clough. "There are many features provided on retail websites that are powered by AI, especially machine learning, such as recommendations or digital assistants, that are now commonplace."

Yuan agrees. "The ongoing transformation of the retail industry has seen it shift from the traditional structure, centred on products and stores, to one focused on the consumer and driven by analytics and technology," she says. "AI is at the heart of this and is reshaping the consumer experience – both online and on the high street. However, most of what goes on to power this change happens off the shopfloor."

"AI systems process huge amounts of business intelligence to help predict customer behaviour and forecast demand, based on buying patterns, which allows retailers to optimise stock and inventory, in order to ensure they have exactly what customers want, when they want it," Yuan adds. "We're already seeing some AI technology appearing on the shopfloor, predominantly to check things like stock levels and pricing, but we see this trend continuing to develop as new technologies emerge."

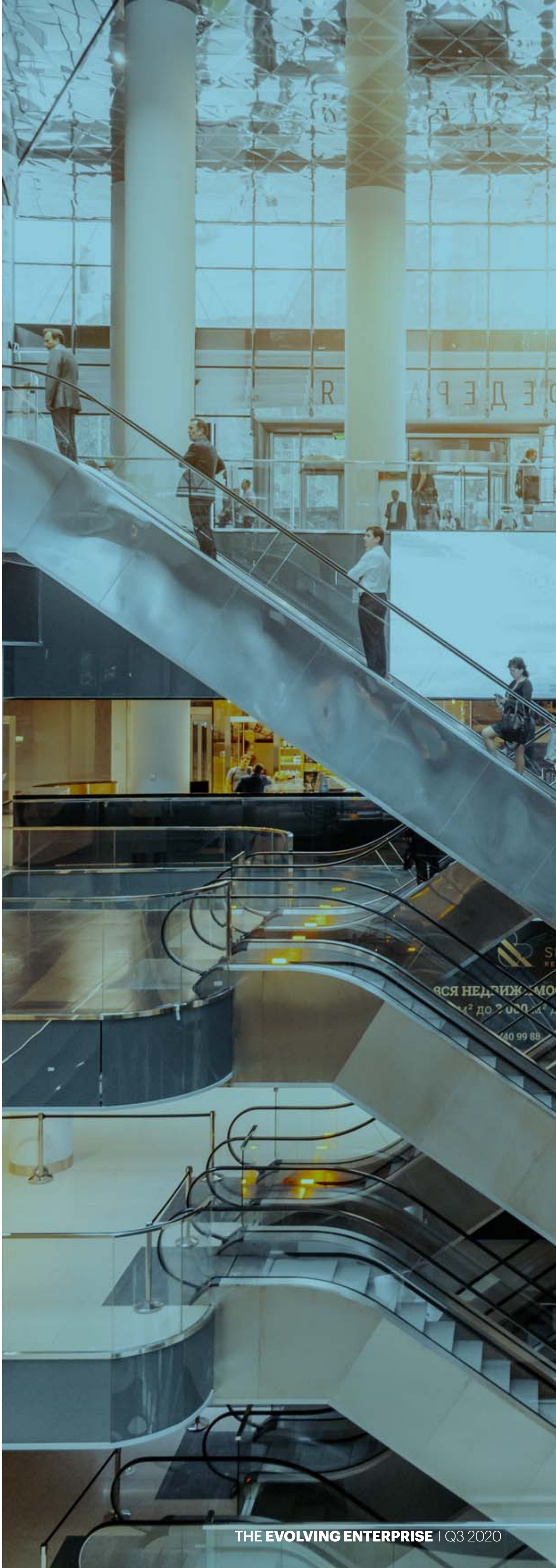


Image recognition is certainly proving attractive to specific types of retailer. "In the fashion industry, companies like Asos and **Zalando** are starting to use advanced image recognition and mobile apps," says Clough. "You can take a picture of an object or someone you see on the street, and the app will use visual analysis and machine learning to show matching items from a product catalogue or make recommendations of what products shoppers may also like."

Dedicated followers of fashion

Snyder also sees fashion taking a lead but warns all forms of AI aren't necessarily a good fit. "It's important to remember that not all applications of AI on the shopfloor will be an instant success," he says. "There was the example about a robot being 'sacked' by a supermarket in Scotland after it either failed to understand customers, or provided them with unhelpful answers. In time, AI will prove more helpful, but the right use case must be found first."

"In recent times, magic mirrors were starting to gain traction with additional functionality such as ordering additional sizes from the changing room," he adds. "After the pandemic, enabling people to visualise what they would look like wearing a range of different clothes without having to physically try them on may become an important ingredient. The potential for this technology to reduce the amount of time people spend in stores, and the number of them that visit changing rooms, means it could prove particularly useful in the months ahead."

Yet, like all technologies, AI must prove its worth to retailers and given the immense shifts in retail over the last 12 months, its hard to prove value in what is in effect a new arena. "There are many challenges in measuring the success of customer facing AI being used on the shopfloor," says Clough. "Understanding what success means is a starting point, as well as developing suitable criteria and metrics for success to monitor and track success. There will be questions around ethics and privacy if user data is being used to drive metrics. There is also the challenge of integrating experimental methods into the entire process, such as tracking success over time reliably and using techniques such as A/B testing to see the effects of using particular AI techniques or introducing new features."

Snyder agrees. "As they are breaking new ground, it is difficult for retailers to measure the success of shop floor AI.," he says. "They need to draw up their own metrics or yardsticks, but the direct link between the two can often be difficult to trace. However through engagement with customers, retailers will be able to assess those technologies that drove satisfaction and those that incumbered it. As well as tracking what the return on investment has been, it's also important retailers to take time to step back and think about which tasks are best managed through technology, and those which a human would perform better."

"Retailers need to understand their own priorities," he adds. "It is not possible to adopt all AI capabilities in one go, but there is an urgent need to increase AI spend as this will prove to be a major differentiator for retailers in providing personalised experiences and delivering an efficient operation."

AI in action – from industrial automation to new antibiotics

Annie Turner provides a brief overview of artificial intelligence and machine learning, and looks at some examples of how and where they are being used, and possible future applications.

There is much confusion about artificial intelligence (AI) for a variety of reasons. For one thing, it results in and is perpetuated by people using analytics, artificial intelligence, machine learning (ML) and automation interchangeably. This is easily remedied.

Analytics analyse data, for example, looking for anything unusual in data patterns that could indicate fraud. These anomalies are flagged to a human who can then make an informed decision to ignore, intervene or investigate further. Although analytics process data in volumes and at speeds way beyond the capabilities of humans, in many applications they simply repeat the same task or process.

While not all analytics involve AI, all AI relies on analytics. AI can be defined as the development of computer systems that can perform tasks that normally need human intelligence. AI is often talked about as though it is a single thing, but in fact it is a growing group of technologies that are evolving rapidly. The technologies can be used individually, or in combination, depending on the application.

What can AI do?

AI enables systems to perform four broad categories of tasks:

- To 'sense' the environment they operate in by processing and analysing images (autonomous vehicles and surveillance), sounds (to help monitor an unlit warehouse, container or data centre), speech (Alexa, Siri, Cortana), text (Google Translate) and/or other data.
- To analyse the sensed data so devices can 'understand' what is happening through the recognition of patterns and any disruption to them, which is also known as cognitive computing.
- To trigger actions in the digital or physical world based on the 'meaning' deduced from the analysis of its environment.
- Constantly to 'learn' and optimise performance based on feedback and other mechanisms.

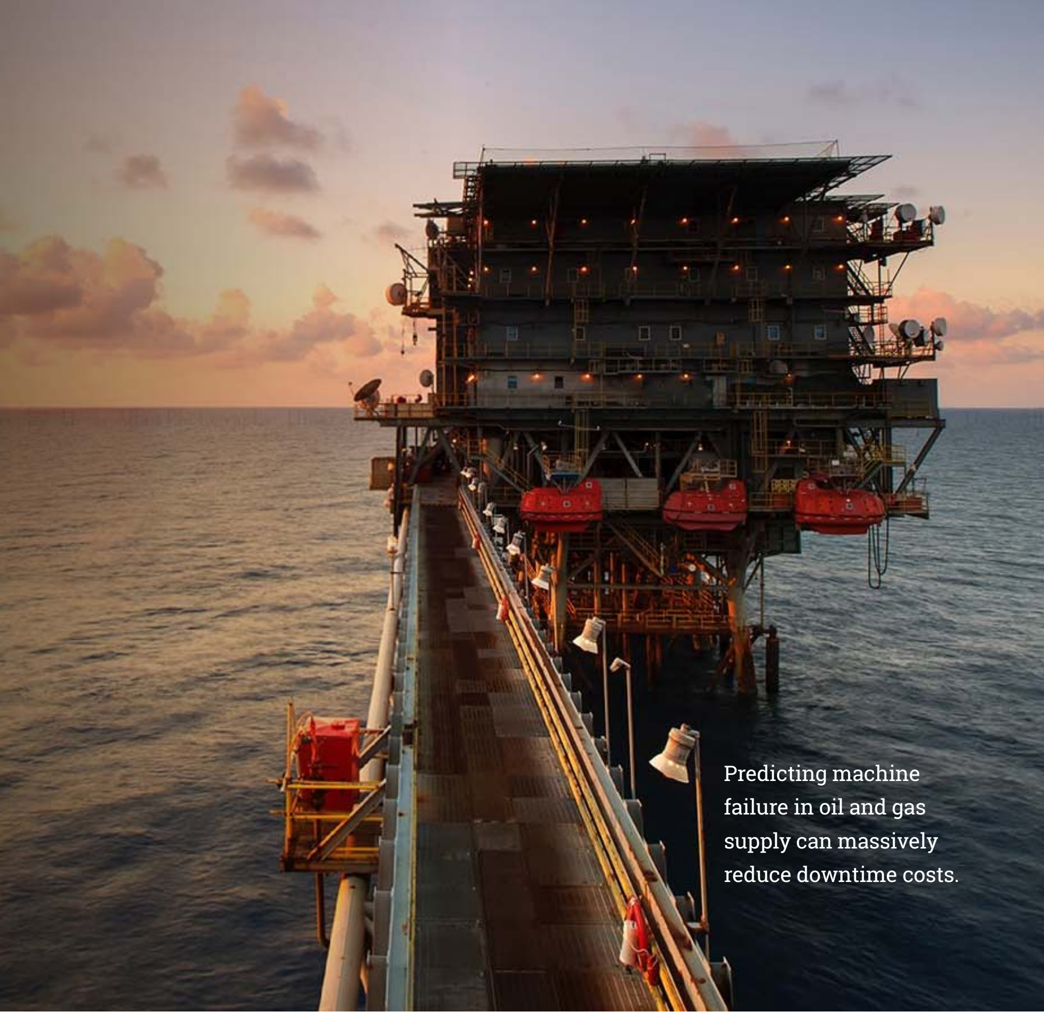
It is important to note that each application of AI is designed to address one task – each problem needs a specific algorithm (a set of rules or a process encapsulated in code) to address it. Within narrowly defined objectives, AI can outstrip human abilities – such as beat the best of us at chess or Go – because of the speed at which it can analyse immense amounts and figure out the most effective action, but unlike us, AI engines cannot switch that 'intelligence' to another function, such as facial recognition, for instance.

Supervised learning is used to 'teach' an AI-powered system for autonomous vehicles to recognise a pedestrian.

Machine learning

ML is the most widely deployed AI technology, allowing devices to learn automatically and constantly to improve their accuracy and performance. Crucially, the devices 'learn' from experience and adapt their behaviour to what they learn, without being explicitly programmed to take those steps. This is the fundamental difference between AI and other kinds of automation – it evolves.

One variety of ML uses supervised learning, which teaches a device to match an input to an output having been fed many examples of input-output pairs. A good example is 'teaching' an AI-powered system for autonomous vehicles to recognise a pedestrian. This is easy for a sighted human but terrifically difficult for a device because pedestrians come in all shapes and sizes, singly and in groups, and look different in light, shade and darkness, and the array of possible weather conditions and different backdrops.



Predicting machine failure in oil and gas supply can massively reduce downtime costs.

People walk dogs, pull shopping trolleys, push prams, wheel bicycles and sit in wheelchairs, and might be partly obscured by street furniture or parked vehicles. They might wear shorts and T-shirts or brimmed hats with rain coats billowing in the wind. Each image the AI-powered system correctly identifies as a pedestrian is added to its store of knowledge and expands its 'experience'.

Glamour to the bottom line

Algorithms trained by supervised learning are also the most widely used in predictive operations and maintenance, and can deliver impressive results for many industries if applied intelligently. Predictive maintenance might ostensibly be less glamorous than self-driving vehicles – but only until you look at the bottom line.

At the ARC Industry Forum in Florida, in February this year, Chris Williams, global director of Professional Services at AspenTech, gave some examples of how successful predictive maintenance solutions can be across many sectors. He cited one instance in the oil and gas sector whereby providing up to 45 days' notice of machine failure massively improved maintenance scheduling, helped reduce downtime and increase process availability.

In petrochemicals, a firm was better able to deal with the perennial problem of fouling in a furnace and reduced downtime by two days annually thereby avoiding losses of about of €1.7 million. This was because it replaced calendar-based scheduling with information from the AI engine about the best times to shut down the furnace with minimal losses. Likewise, the challenge of cyclone blockage is a problem for cement kilns and one firm was able to save US$1 million by using AI to eliminate just 25% of blockages.

Getting deep

The fastest growing subset of ML is deep learning, which uses layered neural networks. They are a series of algorithms built to recognise underlying relationships in data sets in a way that emulates how human brains function, with the output of one layer providing input to the next. They are suited to situations that cannot be reverse engineered; that is where a device cannot be programmed to achieve a specified result as that is unknown.

A powerful and pertinent example is medicine. The increase of antibiotic-resistant bacteria means there is a growing need to discover new ones, but pharmaceutical companies are not investing heavily in antibiotics for various reasons. Unlike other drugs that may have to be taken long-term or even for life, patients typically only need antibiotics for days. Drug companies can't charge as much for antibiotics as other drugs and over recent years, the discovery and regulatory approval of new antibiotics has slowed dramatically.

"People keep finding the same molecules over and over," explained a professor of synthetic biology, James Collins at the **Massachusetts Institute**, who added, "We need novel chemistries with novel mechanisms of action".

To address this, Collins led a team of **MIT** and **Harvard** researchers who built and trained a neural network to identify new types of antibiotic from looking at cell structures in more than 100 million molecules to predict their potential antibacterial activity. The neural network grouped and ranked them, and found eight that were structurally distant from any other known antibiotic. The one of greatest interest is Halicin. Initial tests on mice have found it to be effective against a wide range of bacteria, including tuberculosis and bacterial strains considered untreatable.

Excitingly, this approach could be applied to searches for other types of drug such as to treat cancer or neurodegenerative diseases. Or maybe to help find vaccines against viruses. Work in the lab continues, but the scientists are hoping to attract pharmaceutical firms and others to turn their deep learning into widely available medicines.

AI and its many flavours clearly have fabulous potential, but it is important never to forget that it's the humans who provide the intelligence – the rules – in the first place and that it is a very long way from rivalling human abilities except for specific tasks. ■

The author is freelance technology writer, **Annie Turner**.

Using AI for good:
The importance of ethical AI

Artificial intelligence (AI) has arguably been one of the most disruptive technologies in the past few years. AI has played a vital role in progressing technology advancements across a variety of industries and is set to make big changes in the future.

Although AI has contributed to a lot of good in our society it can, says Asheesh Mehra, Group CEO & co-founder at AntWorks, unfortunately, also lead to misuse of technology that has been relayed into attention-grabbing headlines, pitting AI against humanity. We need to remember why humans created AI in the first place. It is because when used correctly and ethically, AI can be an incredible tool for good.

AI will continue to make drastic improvements and advancements across many sectors which will have a

profound impact on society. The use of AI within healthcare will see medical research and trials conclude quicker. Transportation is set to change with self-driving vehicles and smart roads which will contribute to creating smart cities. AI can also help to predict natural disasters which will help to reduce those affected, which currently stands at 160 million people worldwide each year (Source: who.int/).

Real-time data can aid farming and address agricultural productivity to help provide for the growing population. AI allows for more efficient use of resources, increased productivity, and better customer experiences. It can contribute to improved healthcare and it's even promising longer life expectancy. These are just a few examples of how AI can enhance our lives, businesses, and the world.

On the opposite end of the spectrum, there is AI bias, accelerated hacking, and AI terrorism. This is where big challenges await both government institutions and legal organisations as they will have to tackle the larger issues that can arise from the misuse of the technology.

Regulating AI: Who is responsible?

AI is a powerful technology but with great power comes great responsibility. This is where the discussion around ethical AI comes into play. There needs to be a widespread realisation of ethical AI and what is required to get there. Both businesses and governments need to address and ensure AI accountability. Accountability means ensuring people use AI engines as intended and not for fraudulent or other malicious pursuits.

In addition to this, ethical AI relies on the ability of AI solutions to enable auditability and traceability. Accountability means ensuring people use AI engines as intended and not for fraudulent or other malicious pursuits. I believe that technology vendors should be held to the highest standard of responsibility and accountability for ensuring an ethical approach to the design and application of AI products and services. Governments need to play an important role in AI accountability for ethical AI, too.

Technology providers must also educate their teams and partners on appropriate uses of AI. Some people are unaware of the power of AI engines and their potential for misuse. With the right education, such individuals can learn about the risks and how to avoid them. Education is a big horizontal component that is expected to cut across every aspect of an AI journey. That will go a long way towards contributing to ethical AI. Legislators and regulators have a key role to play in the area of AI accountability. That involves specifying the applications for which AI can and cannot be used and holding vendors responsible if the technology is misused.

While AI needs regulation, technology as a whole shouldn't be stifled. There needs to be governmental legislation, developed in collaboration with businesses, put into place to help standardise how AI technology can be used sector by sector. For example, regulations should indicate the specific purposes and contexts that are appropriate for the application of AI and equally, which ones should be prohibited. One way AI solution providers address accountability is by having very strong deal qualification criteria before starting work with an organisation. For example, declining the business of an organisation that planned to use AI bots to amass Broadway show tickets within seconds of their availability and then sell them to the public at elevated prices.

Whilst there is a great deal of unwarranted fear around AI and the potential consequences it may have for businesses' workforces. We should be optimistic about a future where AI is ethical and useful.

The author is Asheesh Mehra, Group CEO & co-founder at AntWorks. AntWorks™ is a global specialist in AI and Robotics. He believes humane, responsible AI is the future, and is excited by its limitless applications to solve issues that impact business, our lives and the planet we inhabit. Prior to boarding the entrepreneurial ship, Asheesh headed Infosys BPO – Asia Pacific, Japan and the Middle East. His experience over 20 years has also spanned leadership roles in large ITeS organisations, such as Mphasis, TCS and WNS, having worked extensively across the UK and the United States.

Asheesh was named Singapore Business Review's 2019 Innovator of the Year, distinguishing the most innovative industry leaders in Singapore who pioneered solutions leading to significant company growth. His achievements were also recognised by the Shared Services & Outsourcing Network (SSON), which presented him with the 'People's Choice for Personal Contribution to Industry – APAC' award in 2011 and the 'Thought Leader of the Year – Asia' award in 2010. With a penchant for the unconventional, Asheesh's vision for AntWorks remains human wellbeing, authentic customer benefit, and responsible innovation that respects the environment and all it sustains. ■

Mathematical idea reins in AI bias towards unethical, costly commercial choices

Researchers from the UK's University of Warwick, and Imperial College London, as well as EPFL (Lausanne) and Sciteb Ltd have found a mathematical means of helping regulators and businesses manage and police artificial intelligence (AI) systems' biases towards making unethical, and potentially very costly and damaging commercial choices. This, they say, is keeping an ethical eye on AI.

Artificial intelligence is increasingly deployed in commercial situations. Consider for example using AI to set prices of insurance products to be sold to a particular customer. There are legitimate reasons for setting different prices for different people, but it may also be profitable to 'game' their psychology or willingness to shop around.

The AI has a vast number of potential strategies to choose from, but some are unethical and will incur not just moral cost but a significant potential economic penalty as stakeholders will apply some penalty if they find that such a strategy has been used – regulators may levy significant fines of billions of dollars, pounds or euros and customers may boycott you – or both.

So in an environment in which decisions are increasingly made without human intervention, there is therefore a very strong incentive to know under what circumstances AI systems might adopt an unethical strategy and reduce that risk or eliminate it entirely if possible.

Mathematicians and statisticians from University of Warwick, Imperial, EPFL and Sciteb Ltd have come together to help business and regulators by creating a new "Unethical Optimisation Principle" and providing a simple formula to estimate its impact. They have laid out the full details in a paper bearing the name "An unethical optimisation principle", published in Royal Society Open Science on 1st July 2020.

Professor Robert MacKay of the Mathematics Institute of the University of Warwick says: "Our suggested 'Unethical Optimisation Principle' can be used to help regulators, compliance staff and others to find problematic strategies that might be hidden in a large strategy space. Optimisation can be expected to choose disproportionately many unethical strategies, inspection of which should show where problems are likely to arise and thus suggest how the AI search algorithm should be modified to avoid them in future.

"The principle also suggests that it may be necessary to re-think the way AI operates in very large strategy spaces, so that unethical outcomes are explicitly rejected in the optimisation/learning process," he concludes.

The four authors of the paper are Nicholas Beale of Sciteb Ltd; Dr. Heather Battey of the Department of Mathematics, Imperial College London; Prof. Anthony C. Davison of the Institute of Mathematics, Ecole Polytechnique Federale de Lausanne; and Prof. Robert MacKay of the Mathematics Institute of the University of Warwick. ■

Prof. Robert MacKay, University of Warwick

Dr. Heather Battey, Imperial College London

How leaders beat the status quo and egoists fail to

Dealing with change: Dictatorial approach is self-defeating

As enterprises pivot to customer-centricity and adopt digital era tech, often their greatest foe is their own status quo. Too often, a stubborn commitment to the status quo starts at the top and is ego-driven, says Ed Finegold, author, analyst, and digital start-up veteran, Silverwolf Productions LLC . It's frustrating to work for a leader for whom no amount of data, logic or rational argument will change their closely held convictions.

Their single-minded approach, sometimes accompanied by a foul temperament, is self-defeating. It promotes an unwillingness to challenge assumptions in environments where positive, data-driven improvements are needed. Leaders who have succeeded as positive change agents are showing there is a better way.

Refusal to change

I have worked for more than one mercurial, stubborn executive in my career. But it was a meeting with a client that best exemplified the ego-driven, status quo-bound mindset.

My chief executive and I were meeting with the CEO of a US$31 billion (€28 billion) client company. Our goal was to gain some funding for an advertising campaign which would benefit our customer. There were four people in the conference room with us: the client's CEO, his chief marketing officer, his head of digital, and his chief advisor from a major, global consultancy.

As soon as the meeting began, our client's CEO told us he wasn't going to give us any money that day. I was suddenly unsure why we were having the meeting but figured facetime with the boss was still valuable. The discussion then focused on the relationship between customer experience and loyalty.

Our client's CEO insisted on ignoring loyalty and focusing on new customer acquisition. He proposed a variety of gimmicky new ideas, even suggesting we offer a $1 million (€0.9 million) sweepstakes prize which no one could win. Everyone in the room nodded affirmatively to please the CEO, except for me.

The flying pencil incident

I argued that customers were leaving, and it was time to offer them something of perceived value to plug the leaks. The CEO insisted proactive customer outreach would only chase them away. Everyone in the room again gave their assent.

Clearly, this was a culture where no one would dare challenge the CEO's assumptions, even if they defied logic. The company was losing customers, revenue and market value.

As the CEO paced the room, pontificating, I shook my head and never took my eyes off him; I wanted to see how far it would go. Finally, he became so frustrated that he snatched a pencil off the table, slammed it down in my direction, shouted "you're wrong!" and stomped to the far side of the room. He refused to acknowledge my presence for the remainder of the meeting. But as time expired, he told my CEO he'd fund our ad campaign. I think we made ourselves a problem and he threw money at us to salve his ruffled ego.

This was a stunning example of a major corporate leader's unwillingness to question his own assumptions in the face of overwhelming data. His stubborn refusal to do so permeated the entire organisation. His unpredictable manner made colleagues fearful or motivated to avoid negative outbursts. This is status quo-keeping at its worst. It's an attitude that enterprises can't sustain in an era that demands rethinks of traditional business tactics.

How to change the status quo

In stark contrast to this example of closed-minded immaturity, I recently interviewed Sorabh Saxena, executive vice president, global operations & services at AT&T Business. Saxena thrives on driving positive change, sees value in challenging assumptions and believes in working tirelessly but compassionately to chip away at negative aspects of the status quo without harming what's good. The challenge, he says, is to prevent the negatives from building back up again.

Sorabh's global operations & services unit in AT&T Business has recently undergone a massive reorganisation. It has removed traditional organisational silos and reduced the number of job roles in the group, expanding every teammate's purview.

It has shifted to customer-focused, multi-disciplinary teams that physically and virtually work together. It has driven team accountability by eliminating process hand-offs. The entire unit is focused on and responsible for improvements in key customer experience metrics, which are reported and shared in real-time.

Saxena argues that status quo is an aspect of human nature and organisational behaviour. People and groups find a rhythm and want to sustain it. "We all get comfortable," Saxena says. "If that happens at an individual level, how do you deal with it with thousands of people?" This is the challenge that enterprises' executive leaders face in driving positive change.

Saxena explains that it takes more than a top-down approach to move a large organisation in a new, positive direction and have people embrace it. "It's a wavelike motion. You start at the top, but you need quickly to get the movement started at the bottom," he says.

"It's a necessary back and forth that has to happen, not just from the top of the mountain. I'm very cognisant of that and everybody has to feel a part of it, be invested in it, or you lose the momentum," explains Saxena.

Bringing people at all levels of the organisation along is the most crucial aspect of challenging the status quo and driving positive change. "You have to carry people with you," Saxena says. "You have to get their mind as well as their heart, so you have to give them logic and facts but also a rallying cry and motivate them," he says.

Choosing listening, facts and data over ego

Motivating people, as we all recognise, isn't done effectively with threats or fear. It comes from real leadership that backs up decisions with data and facts and shares them with the organisation to earn trust. "People are very smart.

If you ask them to do something, it's better to recruit them and be transparent about it or you lose them on trust, and that's the most important thing," Saxena explains. "You have to be a people leader, not just a leader's leader, and infuse everything with data and facts," he says.

Getting at facts and data is also a skill. On an individual level, for a corporate leader, it means having a willingness to listen. "You have to lead with listening," Saxena says. He explains that listening includes picking up signs from people, customers and sales teams.

Listening also comes from reading and by studying relevant data. "As a servant leader, I tell my peers and teams that 'I'm here for your success.' You have to be open to change. As I learn more, I adjust my thesis. You have to be connected to logic and facts, not to ego or false notions of what's right and wrong," Saxena says. "You have to ask yourself every day, 'am I doing these three activities well: excelling at what I'm responsible for, helping others succeed in their roles, and doing something today to help others that I won't get credit for?'"

As a result of this approach to change, AT&T Business has reoriented itself for customer-centricity. This effort has been driven not only with Saxena's described leadership approach, but also with a massive customer experience data collection effort. This data is shared with all teams in real time and everyone's performance is measured against positive changes in key metrics, like Net Promoter Score (NPS).

It's this combined approach, Saxena says, that has led AT&T Business to win multiple JD Power awards for customer satisfaction with Large Enterprise Wireless Service. This combination of positive leadership, team empowerment and groupwide accountability to customers and data has successfully overcome the embedded status quo.

Advice for leaders from an old salt

When you're a director in a big company, you're a bit like a Roman Centurion. You have some authority and rank, but you're there to ensure orders are carried out. Often, that means figuratively grabbing a pickaxe and digging a ditch; marching through foul weather; and wading into the fray. It also means you're among the first to experience whether a leader's decisions make sense.

From this vantage point, part of your responsibility should be to share intel about the situation on the ground. Good leaders will listen, adjust or not, and explain their decisions. Bad ones just don't care. My advice to executive leaders pursuing positive change is to heed Saxena's approach and avoid pencil slamming.

Your Centurions and soldiers will gladly take on challenges if we believe in the decision-making process, even when we don't know enough to agree with your decisions. ■

Ed Finegold is an author, analyst, start-up veteran and former corporate communications director who's seen (and done) enough bad leadership and flawed decision-making to know it when he sees it. He can be reached at **efinegold@silverwolfpro.com**

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AIoT: The powerful convergence of Artificial Intelligence and the Internet of Things

From fictional characters like Joey and Phoebe in the TV show **Friends** to the hamburger and fries combo for foodies, the greatest and most powerful duos have existed throughout the history of humans. They may have a unique individuality but when they club together, together boom! As a combined force, says Dinesh Soundararajan of Contus, they create an awesome and wonderful impact.

Similarly, the perfect amalgamation of the Internet of Things (IoT) with Artificial Intelligence (AI), together known as AIoT, is all geared up to give enterprises the best of both worlds. This is backed up by recent research from **researchandmarkets.com** which states that by 2023, the global value of IoT in embedded the IoT devices market will grow to $26.2 billion. AIoT in simple terms means to make the Internet of Things perform intelligence tasks integrating Artificial Intelligence.

The AIoT of Things helps to connect IoT devices with sensors that are integrated with AI capabilities – all of them without human intervention.

Key factors of AIoT

That being said, let's see how these AIoT help the business world move towards next-gen transformation.

How does AIoT differ from IoT?

Are you wondering why we need AIoT when the IoT market is doing well across several industries? Well, here is a quick look at the differences between these two technologies. We can call AIoT the next version of IoT.

IoT

IoT is like the digital nervous system

It requires hardware sensors to be physically attached to the machines to retrieve data

IoT requires minimal human intervention

Industrial IoT devices collect millions of data sets from various equipment but they don't do any analysis.

AIoT

AIoT is the brain that controls the nervous system, to make better business decisions

AIoT, which provides intelligent decision-making, requires software code developed by programmers to perform certain tasks

AIoT, the next logical step of the IoT development, is primarily designed to work independently with no human support

In the Industrial Intenet of Things (IIoT), AI algorithms and predictive maintenance can enable self-healing IoT devices, which use data analytics to make better decisions.

Benefits of AIoT to shape the future of your business model

In this era of 5G, the AIoT technology will only be enhanced where it connects every object, people, and machines in a more meaningful way.

Having an intertwined relationship between IoT and AI will help organisations move to the next level. Now that AI and IoT have individually marked their presence in the digital world, many IoT app development companies are moving towards AIoT for managing Internet of Things connected devices with artificial intelligence techniques.

AIoT from the business perspective

Let's look at the advantages of AIoT for business:

- **Intelligent business decisions** - The data collected from millions of IoT devices is so massive it makes it difficult to segregate and extract useful information from it. To organise these unstructured data into a meaningful chuck of data, AI-based algorithms are used to eliminate junk data and leverage any business model.

Now the chief technology officers (CTOs) and other decision-makers can make firm business decisions based on the valuable insights retrieved from this data.

- **Enhanced operational efficiency** - Smart automation surpasses the traditional approach by streamlining the organisation's processes. Several industries have implemented these AIoT technologies to save on resources. For example, in office buildings, smart environmental sensors provide data on how many people are safe inside the premises. This includes fire, theft or any other warnings.

The integration of human facial recognition software and other biometric access devices all facilitate remote monitoring of the physical security of office buildings. Any unidentified personnel or abnormal activities are swiftly recorded and alerts or notifications can be sent automatically to the central hub.

AIoT from the customers' perspective

Let's briefly look into the advantages of AIoT for customers:

- **Delightful customer experiences** - Understand your customer's behaviour and their challenges more precisely with Artificial Internet of Things technology. For instance, the surveillance camera is not only used to detect any thefts or crime, it also helps to read the customer's shopping pattern.

AIoT collects and correlates inventory data, such as which aisle needs re-filling fast or where goods are fast-moving, and which aisle has seen no customer visits at all. Hence, large organisations are able to predict the customer's habits more accurately and make it a more personalised experience for them.

- **Accurate predictions** - Artificial Internet of Things provides next-level predictions to get accurate results. One of the powerful use cases of AIoT is the autonomous robot used for delivery. The robots have in-built sensors that collect and store data retrieved from the IoT devices. It stores data like physical addresses, direction details, and traffic information.

After collecting the data, the AI fed into the robot system detects less congested routes and makes a smart decision by detouring to routes where there is less traffic. Then, it delivers the package to the relevant address.

Several other industries have been implementing IoT data visualisation techniques. These include office buildings with smart environmental sensors and facial recognition software to get real-time data and behavioural analysis.

Practical applications of AIoT

DHL – The global logistics company

"By 2028, DHL aims to build 10,000 IoT-enabled truck transportation vehicles. It says AIoT has reduced 50% of their transit time with 90% reliability of real-time tracking."

DHL leverages the innovative IoT solutions along with artificial intelligence through Smart Trucking operations teams using an agile model where it streamlines the businesses by creating a transportation model that decreases the fatigue among the drivers, and helps them to spend less time on the road and provide a better work-life balance.

Board member of DHL, Juergen Gerdes said in an interview, "We expect to transport 100,000 tonnes of cargo and plan to cover 4 million kilometres daily worldwide."

Walmart – US' largest retail chain

With more than 11,000 brick and mortar models with equally numerous online stores for each county or state, Walmart was able to pull it off effortlessly with the help of AI and machine learning (ML) integrated with the Internet of Things.

Facial recognition software, voice-based search by Google Assistant and cross-technology solutions, have made this retail industry scale up to higher revenues for several years.

London City Airport – Travel & leisure industry

London City Airport was the first airport to make use of AI, the Internet of Things and cross-technology networking to monitor every tiny detail of travel to provide the passengers with informed data.

Cabin crew can now track the whereabouts of the passengers through IoT devices, boarding queue traffic, can update gate information, track baggage and so on.

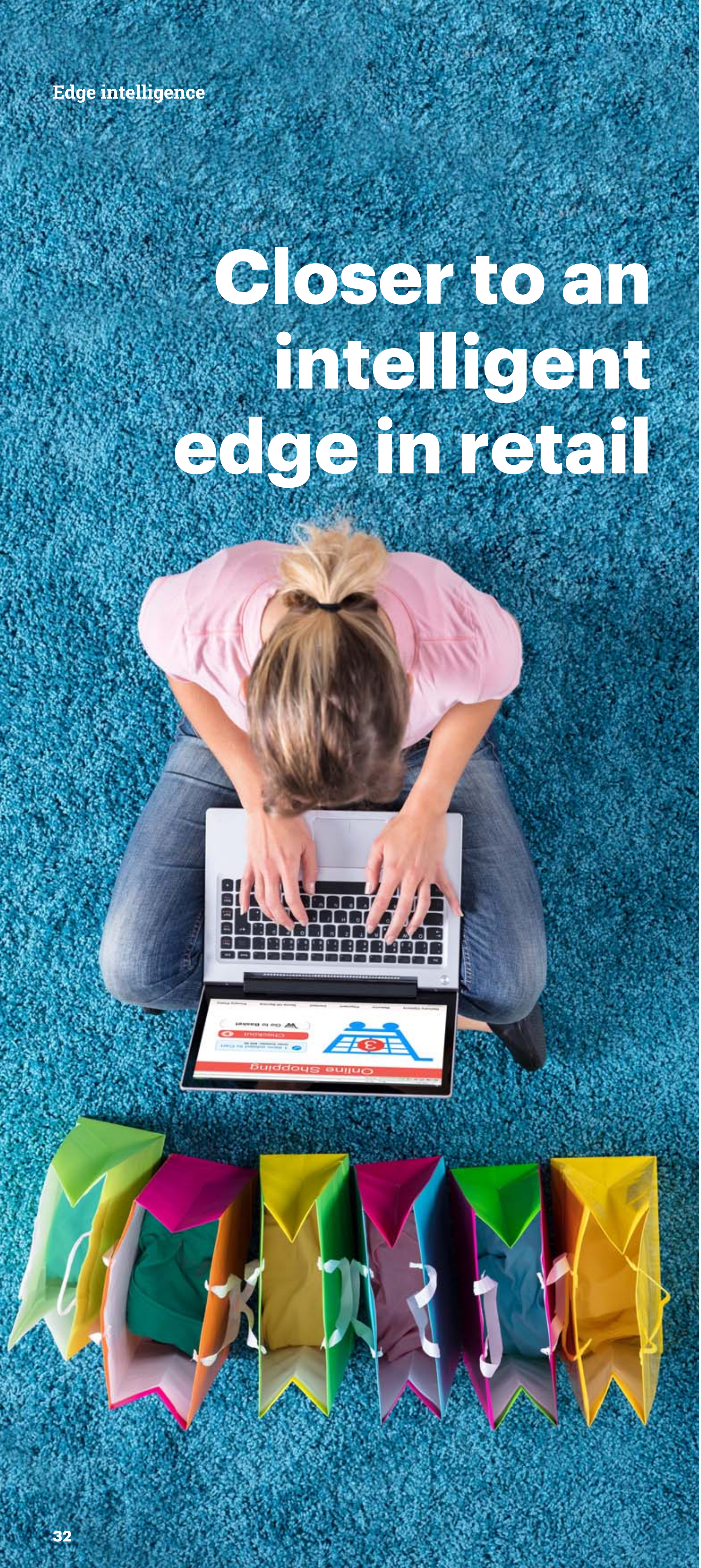
Right from Industrial IoT (IIoT) protocols & Constrained Application Protocol (CoAP) to Web Socket & application program interfaces (APIs), Contus has a solid IoT/IIoT Digital Engine model. Along with the Business Intelligence solutions and IoT dashboard it helps to accelerate the business delivery process effectively.

We help in leveraging the industry-focused IoT App development solutions in a cost-effective way.

Wrapping Up

IoT with artificial intelligence has vast use cases across industries, and it is purely dependent upon the organisation's budget and goals to align them perfectly to increase their productivity. These are one-time investments that will yield them a life-long benefit. Get detailed analytics, precise data processing, and automation techniques all in one place, all built basically to give better results from bigger and meaningful data. ■

The author is Dinesh Soundararajan, co-founder and director for IoT & IIoT Solutions at Contus. His work experience spans spearheading tech product engineering, solution deliveries and quality assurance grounded on SMAC technologies. You can find him at: **www.linkedin.com/in/dineshcontus**



Closer to an intelligent edge in retail

The retail industry, along with other industries, is looking to deploy artificial intelligence (AI) at the edge to enable it to glean quicker and more accurate business decisions with the use of data analytics and cloud technology, writes Tony Savvas.

The AI market for the global retail sector is expected to grow at a compound annual growth rate (CAGR) of 36% between 2019 and 2025, to reach $15.3bn by the end of that forecast period, according to **Meticulous Research**. Analyst house **IDC** is also predicting similar growth across a variety of industry verticals, saying that by 2021, 75% of commercial enterprise apps will use AI. IDC says various Internet of Things (IoT) devices at the edge will create 95% of data volume growth.

"AI and analytics open new opportunities for customers across a broad range of industries, including retail, finance, healthcare, industrial, telecoms and transportation," reported IDC. Market growth in retail artificial intelligence technology is being driven by a growing awareness about both AI and big data analytics, and a high adoption of multi-channel or omni-channel retailing strategies, in order to provide enhanced end-user experience to customers. Several other benefits offered by artificial intelligence, such as visual engagement and personalised experience, chatbots and AI-powered voice recognition tools, are also encouraging retailers to adopt artificial intelligence in their business.

The technology also better supports targeted advertisements, online recommendation engines and digital assistant tools, as well as predictive merchandising, programmatic advertising, market forecasting for consumer behaviour, in-store visual monitoring and surveillance, and location-based marketing. Technological innovations such as blockchain security, 5G connectivity and highly flexible mobile payment systems are also expected to support AI take-up.

When it comes to deployment, cloud-based AI solutions were the most popular in retail in 2019, said Meticulous Research. This was attributed to the decrease in cost of cloud-enabling technology, the growing usage of learning analytics, and the increasing inclination towards cloud computing to enable cost-cutting.

The leading technology companies in the retail AI market include **Amazon**, **Google, Intel**, **Microsoft**, **IBM**, **Nvidia**, **Oracle**, **SAP and Salesforce**, among other niche players.

These companies often make alliances with others to enable their technology to be adopted in the field, and critically, to enable user organisations to benefit from AI right across their business. Point solutions, which enable only a few staff to have access to the technology are no good in a rapidly evolving and dynamic retail market. The data analytics that provide the business insights needed by operations must be extensively available through automated wide access across business units.

For instance, this year, **Johnson Controls** announced that its global retail solutions portfolio, **Sensormatic Solutions**, would collaborate with Intel to deliver scalable, AI-powered systems for retailers. The Sensormatic Solutions AI portfolio at the edge is based on Intel architecture platforms, including the chip company's distribution of the OpenVINO toolkit. The partners' Computer Vision Platform at the edge uses OpenVINO and the Sensormatic Smart Hub and Artificial Intelligence Camera.

Such a solution can assess sales assistants' responsiveness to customers and measure how customers interact with merchandise and more.

Subramanian Kunchithapatham, vice president of engineering at Sensormatic Solutions, said: "The collaboration allows us to deliver smart, connected and scalable solutions that allow retailers to gain real-time insights into inventory, shoppers, associates and the retail environment throughout the entire customer journey."

Joe Jensen, **Intel** vice president and general manager of the Internet of Things group, said: "Retail is one of a few industries really pushing the envelope in how businesses apply and create measurable value with edge AI solutions. Sensormatic is at the forefront of this revolution, applying compute efficient vision at the edge for their customers who stand to gain real world insights and measurable business impacts."

In another key alliance, **ADLINK Technology**, a specialist in edge computing, recently joined forces with **Amazon Web Services** (AWS) and Intel to simplify artificial intelligence at the edge. An integrated solution offers Amazon Sagemaker-built machine learning optimised by and deployed with the Intel distribution of OpenVINO, and the ADLINK Edge software suite with AWS Greengrass.

The ADLINK AI at the edge solution closes the loop on the full cycle of machine learning model building - from design to deployment to improvement - by automating edge computing processes so that organisations can focus on developing applications without needing advanced knowledge of data science and machine learning models.

OpenVINO optimises deep learning workloads across Intel architecture from the edge to the cloud, and Amazon Sagemaker is a service that covers the entire machine learning workflow. AWS Greengrass extends AWS to edge devices so they can act locally on the data they generate, while still using the cloud for management, analytics and durable storage.

In addition, the ADLINK Data River offers translation between devices and applications to enable a vendor-neutral ecosystem to work seamlessly together across the organisation to deliver business insights. The ADLINK Edge software suite builds a set of deployable applications to communicate with end-points, devices or applications, which can then publish and/or subscribe to data topics on the ADLINK Data River.

"We've worked on multiple industrial use cases that benefit from AI at the edge, including a smart pallet solution that makes packages and pallets themselves intelligent so they can detect where they're supposed to be, when they're supposed to be there, in real-time," said Toby McClean, the vice president of IoT innovation and technology at ADLINK. "This enables warehouse customers to yield improved logistics and productivity, while also decreasing incorrectly shipped packages and theft. This use case can be replicated across verticals, including retail, to improve operational efficiency and productivity."
As recently as 2016, it was estimated that US and European retailers only used about 30% to 40% of all the business data available to them, so there is clearly plenty of market growth in the AI space to come. ■

Ten retail AI use cases:

McDonald's drive thru smart voice assistant

Mango and **Vodafone**'s smart digital dressing room

H&M clothes assortment planning

Evans Distribution Systems, a US provider of logistics and supply chain solutions

Pepper Robots at **Nestlé** to sell coffee machines

Olay personalising skin care

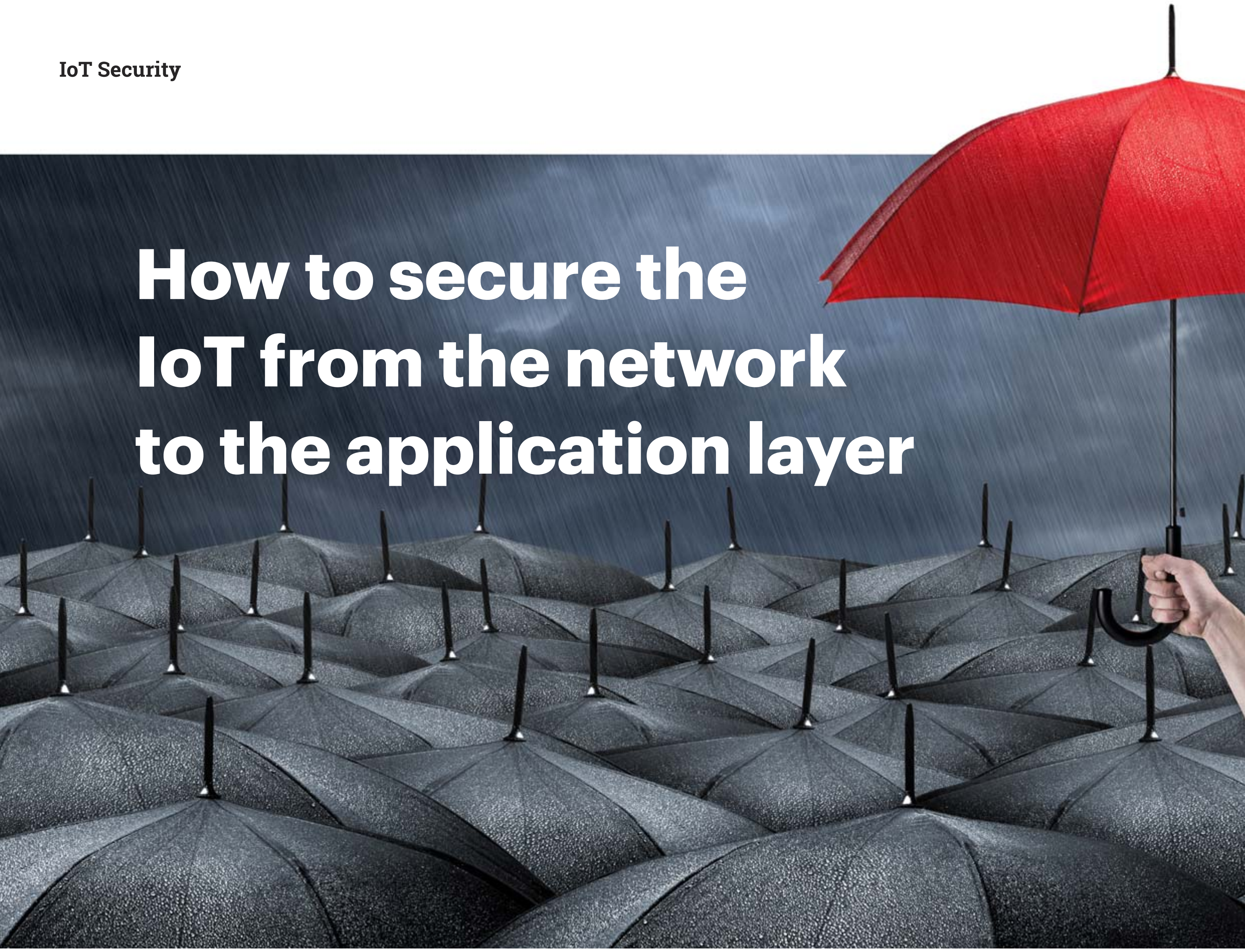
Bosch Automotive sales assistant

53 Degrees North to improve clothes offering

Domino's Pizza using delivery robots

Walmart continuously scans shelves to help replenish them

The author, **Tony Savvas**, is a freelance technology writer



How to secure the IoT from the network to the application layer

Security in the Internet of Things (IoT) has become a critical requirement, with recent legislation mandating 'reasonable security features.' It is very clear that the cost of implementing security within the IoT is necessary, and far outweighs the cost of not doing so. Wouter van der Beek, senior IoT architect, Cisco Systems and Technical Working Group chair, Open Connectivity Foundation, and Bruno Johnson, CEO of Cascoda, a member of the Open Connectivity Foundation, explain why it's all about layers.

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Security is built up in layers; the first layer that needs to be secured is the hardware layer, the second is the network layer. In this article, the network layer referenced is the Thread network layer. Thread is a low-power wireless mesh networking protocol designed for easy integration of connected home devices, and is an IP-based open standard. Thread allows smart home devices to securely and reliably connect directly to the cloud.

However, as the network is a mix of wireless and wired IP technologies, there is a need for application level security. This comes from the Open Connectivity Foundation's (OCF's) application layer, which is a secure domain where all devices and clients can safely talk to each other.

Hardware security

The constrained microcontroller needs features to protect it from malicious code and hardware-based snooping that would compromise security. Secure hardware protects the boot sequence of the microcontroller by validating its signature and protects memory and peripheral access to isolate critical parts of the code. This only allows access through a well-defined and trusted application programming interface (API). These features minimise the attack surface of connected devices, providing a secure foundation for the network and application.

Network security

The network layer needs to ensure that the data sent over the air cannot be altered and that devices that join the network are

legitimate. In order to secure data over the air, Thread uses a network-wide key that employs symmetric key cryptography known as advanced encryption standard-counter with cypher block chaining message authentication code (AES-CCM).

The AES-CCM appends a tag code to each message and encrypts it using this network-wide key. If the recipient has the key, it can decipher, verify the origin, and verify that the message was not corrupted in transit. The key is changed periodically based on the existing key and a specific sequence counter in case it becomes compromised.

However, when a new device needs to join a network, it does not know the network-wide key and therefore needs to obtain it. This process is known as commissioning. Of course, the key cannot be transmitted without encryption, as it could be intercepted by an attacker. To overcome this problem, Thread commissioning uses a process known as password-authenticated key exchange (PAKE), which is part of the datagram transport layer security standard (DTLS).

PAKE uses a low-strength secret in conjunction with asymmetric cryptography to generate a high-strength secret between the two parties. The high-strength secret is used to encrypt the communication of the key from the Thread commissioner – such as a smartphone connected to the Thread network – OCF to the joining device.

Application security

To ensure end-to-end security at the application layer, OCF provides solutions to transfer ownership from manufacturer to purchaser, or from one purchaser to the next. The first step in integration is to establish ownership of the device. For this purpose, OCF issues certificates and maintains a database for each certified device. At this stage, the device is provisioned with those credentials for establishing mutually-authenticated secure connections with other devices in the IoT secure domain, thanks to OCF's public key infrastructure (PKI).

The provisioning instructions are sent across a secure connection, encrypted by DTLS. The process starts with a transfer of the device's ownership, then provisioning of the device, following a set of state transitions. It should be noted that OCF takes into account that during its lifecycle, a device may change ownership. Hence, OCF requires devices to implement a hardware reset to return to their initialisation state.

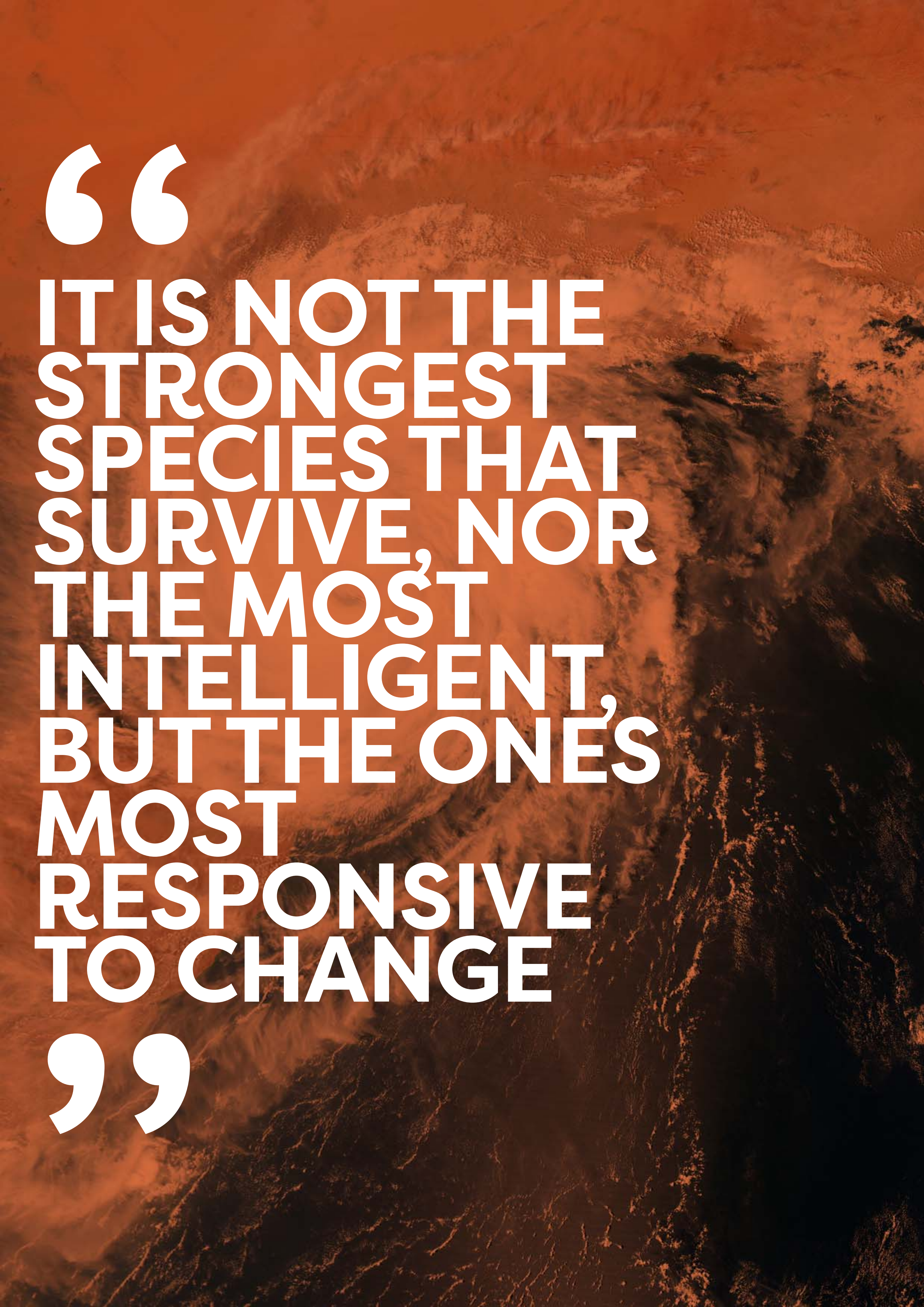
In addition to this onboarding process, OCF devices can be provisioned with varying levels of security. OCF provides a layered approach, such as role-based access control and manufacturer usage descriptions. The former addresses device security, while the latter adds an additional layer of protection from the network.

Using constrained hardware

Implementing OCF-over-Thread on constrained hardware is a challenge due to the very limited code space, memory, and computing power of low-cost microcontrollers. As a result, it is necessary to take advantage of code reuse. The largest code savings comes from sharing the core cryptography library and mbedTLS, common to both stacks. Mbed TLS is an implementation of the transport layer security (TLS) and secure sockets layer (SSL) protocols and their respective cryptographic algorithms and support code. This efficiency is possible because OCF and Thread both being built upon DTLS.

The execution of the core cryptography primitives for DTLS requires access to dedicated hardware for acceleration, which is far more time and power-efficient than pure software. Primitives are well-established, low-level cryptographic algorithms that are frequently used to build cryptographic protocols for computer security systems. This hardware acceleration reduces the Thread commissioning time by orders of magnitude – a significant speed increase to the most computationally-intensive task for which the microcontroller is responsible. Hence managing access to the hardware cryptography functionality for both stacks through the mbedTLS library is critically important.

Both OCF and Thread Group run open source projects for their respective specifications. These concrete implementations eliminate ambiguity for developers and forge interoperability. Technologies that can work together from the application to the network layer form a best-in-class secure IoT platform that can be deployed today.



"IT IS NOT THE STRONGEST SPECIES THAT SURVIVE, NOR THE MOST INTELLIGENT, BUT THE ONES MOST RESPONSIVE TO CHANGE"

Could 5G mean the difference between life and death?

The rollout of 5G has been met with an element of scepticism. There are questions around whether the technology will deliver on expectations, concerns around security for both businesses and consumers and, although not proven, worries about potential health risks. Report by Rohit Gupta, vice president and head of Manufacturing, Logistics, Energy & Utilities, Europe at Cognizant.

Rohit Gupta
vice president and head of Manufacturing, Logistics, Energy & Utilities, Europe,
Cognizant

Whatever reservations people may have, the fifth generation of cellular technology (5G) is upon us, bringing with it an abundance of opportunity for businesses to capitalise on increased data speed and potential new revenue-generating models as well as benefits for society at large.

5G is also set to transform a sector that we all rely on as a matter of life or death: our emergency services. Here are some of 5G's benefits and opportunities for the emergency services industry over the coming years.

Inside the control room

5G reduces latency to one millisecond, speeding up emergency response times. The quicker the data is shared, the faster a response can be triggered, which could massively increase the speed at which critical health information might be shared. A trial by Air Ambulance Kent Surrey Sussex and South East Coast Ambulance Service NHS Foundation Trust in the UK has already used a video-capable mobile phone to stream videos from the emergency scene in real time. The study found that video streaming can reduce the stress of the person reporting the accident, as those at the scene were able to pass information on to the ambulance service more accurately.

The introduction of 5G means we will have access to faster speed, shorter delays in data transmission, and increased connectivity through greater capacity in the

towers. Using 5G, video streaming can stream uninterrupted with less latency, bringing operators closer to the front line and ultimately leading to more lives being saved.

Such on-site capabilities also make it possible for emergency service operators to assess the severity of a situation and determine the best course of action. In the future, we could see this technology used to give remote guidance on how to treat people at the scene of an accident.

5G will enable the large-scale adoption of the Internet of Things (IoT), bringing together critical data and smart traffic systems. Equipping emergency vehicles with 5G SIM-fitted telematics systems will mean the data about their locations, road conditions, and traffic situations can be transmitted to the control room. The operators can then triangulate this information with the data they are getting from smart roads, smart traffic lights, and weather conditions to determine the best possible route to reach the patient in need or to the appropriate hospital.

> **In order to ensure the right course of action is taken and lives are saved, high quality footage is vital**

Taking to the skies

Emergency services in the UK are already experimenting with emerging technologies. It was recently reported that new proposals could see the National Health Service (NHS) use drones to transport blood and chemotherapy kits between hospitals and GP surgeries.

Not only do these developments improve the efficiency of services, they also protect employees. Drone aerial imagery can help firefighters obtain information about the exact location of an accident in a building, help pinpoint an individual's location, or assist with searches at sea.

In order to ensure the right course of action is taken and lives are saved, high quality footage is vital. Verizon states that 5G's millisecond latency and data speeds are up to 100 times faster than 4G, allowing drones to transmit high-definition, real time footage. This imagery can then be shared with operators helping staff work towards their goal of saving lives without compromising their safety.

A smart approach to on-the-road care

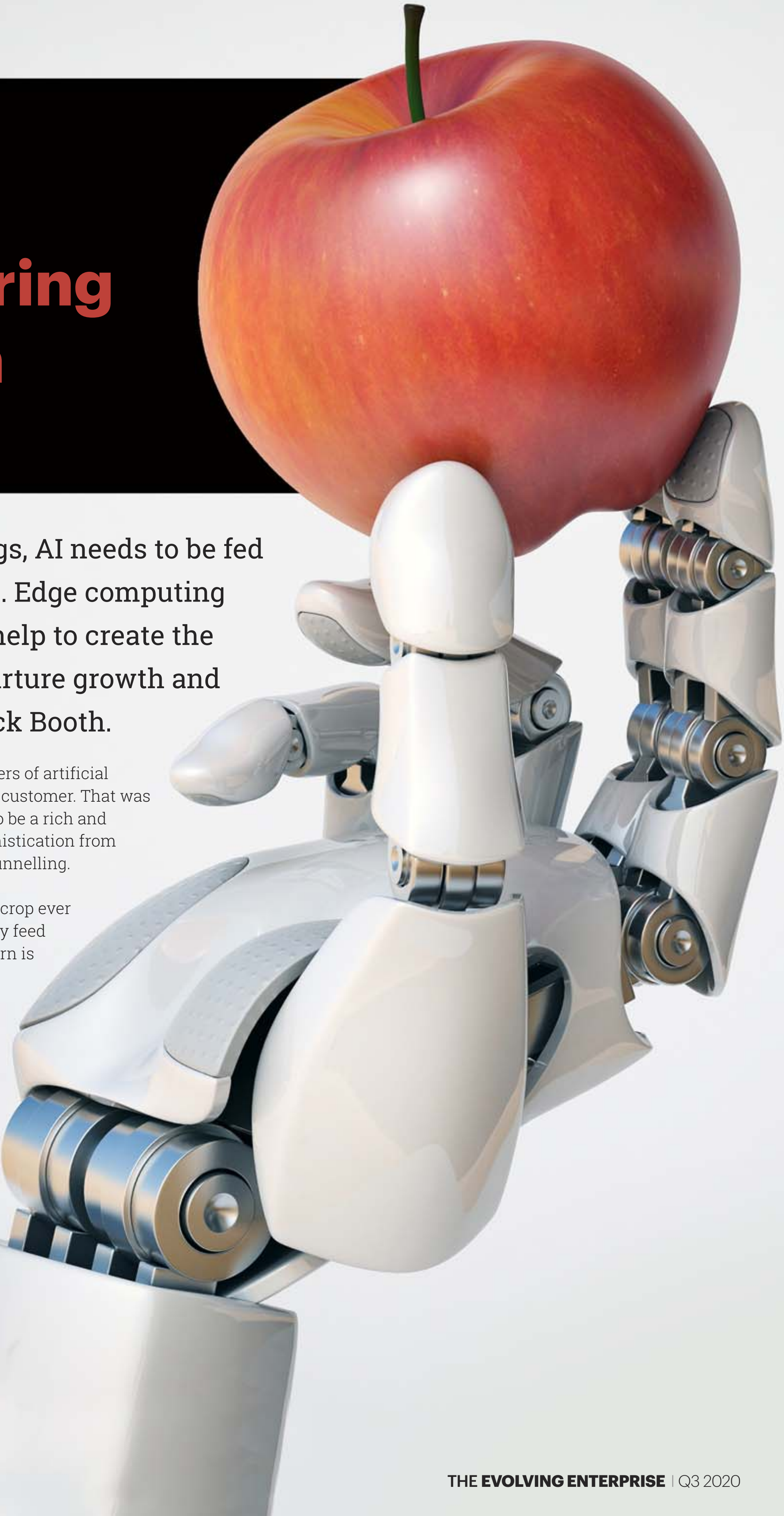
5G should improve digital connectivity including communication between emergency vehicles and their surroundings, helping track emergency vehicles and support smart traffic systems to give ambulances and other vehicles priority on the road.

With vehicle telematics systems transmitting data to the control centre, healthcare professionals in the centre can monitor the patient's

condition through the video, providing care suggestions as well as helping first responders to make on-the-spot decisions. Location details and estimated time of arrival will help hospitals prepare for receiving the patient and preparing the necessary teams. IoT-enabled medical devices can transmit data and test results to the control centre, hospital, and healthcare professionals, thereby reducing patient handover timings at the care centre.

5G is a new technology, and using it is more than a technology challenge. 5G offers the potential to not just do business as usual and quicker, but also to do it differently. As adoption of 5G increases and more and more devices become IoT-enabled, the possibilities in a near-zero latency world will be endless. Designing new processes that take advantage of new possibilities for the good of society is the work ahead of us all. ■

AI needs good diet and nurturing to flourish in retail



Like all intelligent beings, AI needs to be fed in a fertile environment. Edge computing and open connectivity help to create the perfect conditions to nurture growth and development, writes Nick Booth.

The retail industry was one of the pioneers of artificial intelligence (AI) and used it to know the customer. That was the first green shoot of what promised to be a rich and diverse harvest of AI that ranges in sophistication from incoming sentiment to outgoing sales funnelling.

However, as any gardener will attest, no crop ever matures as expected. You must diligently feed the machine daily and waiting for a return is agonising. When the shoots do finally emerge your attention has often been diverted elsewhere. True implementations of AI are rare orchids, isolated and in discrete locations - all because they really need the right conditions.

All AI, whether chatbots or robots, can only thrive on a good data diet, says Celonis's chief product officer Hala Zeine. The data has to be rich in quality and in the right quantity. A machine can only learn if it is fed good data every day.

To keep up, keep open

This is why edge computing and open connectivity have become such important priorities for the retail industry. Together, as we shall exemplify below, they create a fertile seedbed for growth, activity and creativity. Nor will they falter in the process of feeding the learning machines with the right information at the right time.

Another vital seedbed is the Open Retail Initiative (ORI), an **Intel** collaboration with other technology leaders which aims to help some of the less hardy retail breeds. Physical retailers, those with real life shop fronts and warehouses that were built for a different age, don't have the agility to climb and spread on their own and need some support. If they can enjoy some of the liquidity of computing power that cloud offers, their business will close the gap in agility between them and their totally online cyber rivals.

This industry wide technology collaboration involves both source contributions and offerings from each vendor's proprietorial domain. The use cases dictate the ecosystem components.

Members of the ORI community include some of the industry's best mobile phone manufacturers, table makers, independent software vendors, system integrators and consultants. Together they have created a more competitive environment that sustains creative problems solvers.

For example, **ibi** (formerly Information Builders) runs on platform types that span several decades, so it has built AI systems that can understand the way different systems present information and can spot duplicates and overlaps through its Open Visualizations process. "Our engineers clean up the data and get more effective exchanges between systems," says Eric Raab, the senior vice president of Engineering and Products at ibi.

In contrast **Pact Global** used AI to clean up data by finding duplications and anomalies in customer records, then learning from the pattern of judgements that the system's human adjudicators had passed on their preliminary work. Gradually Pact Global's AI will learn and get quicker. It uses its intelligence to edit customer records and improve the efficiency of transport and processing.

Elsewhere, Celonis uses AI to fine tune processes for a retailer. It can create a supply chain that matches a customer with their own very specific demands so that, for example, each shoe buyer can be fitted out with footwear that is customer designed and robotically made for their unique gait. This eliminates huge amounts of waste from the production process, where it is not uncommon for 20% of output to be binned because of the inaccuracy of the one-size-fits-all approach.

These savings are a profitable return on the investment in data harmonisation.

Meanwhile, open connectivity initiatives will ensure the flow of data is unclogged by incompatibility issues. The retail industry has many enterprises that span both the globe and at least two centuries - some shops even span three! Each generation of computing had its own ideas about file formats, database design and even syntaxes and communications protocols. As a result there were many incompatible silos of data and when their owners tried to bring them together there ended up being more duplication than integration. This wastes huge amounts of time and money as outdated records send marketeers on wild goose chases.

It is edge computing that delivers the most immediate impact, by providing the conduits for storage and a reassuring proximity that guarantees instantaneous responses to requests.

Powered from the edge

By individualising the retailers' knowledge of each customer, AI created a massive work load. The information needs to be stored and retrieved and processed for each of millions of transactions. Edge computing is the conceptual term for devolving that responsibility to local devices, be they mobile phones, tablets or the content delivery device on the dashboard of your connected car.

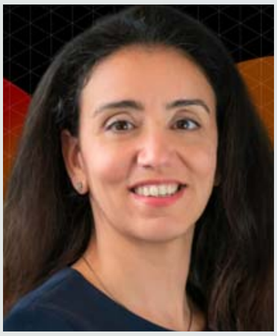
According to Gartner research, in five years three quarters of all the transaction processing for any global retailer will take place outside the data centre.

The key protagonists are those that provide the feed of all this nurturing information.

Cloud computing only provides the raw capacity and this needs to be broken down and fed into the right places. In these data-rich and time-sensitive use cases, there needs to be highly organised and segregated channeling of data. The new possibilities created by 5G connectivity, with its allotments of channels and network slicing is the best way to divide up computing and bandwidth resources.

The teaming up of Intel-powered processing, networking and edge devices gives applications the power they need whatever the requirements. This ability to cope with any workload widens the realms of possibilities. This is why many enterprises are including 5G in their business plans, according to Joe Jensen, vice president at Intel's Internet of Things Group and general manager for Retail. The mobile network now offers the lowest latency and the most reliable connection.

Great patience is needed as you don't always see the results, which is why the feed of data should not be left to humans, who tend to tire and to need instant gratification. ■



Hala Zeine
Celonis

Joe Jensen
Intel

The author, **Nick Booth**, is a freelance technology writer

THE YEAR IS 2020

WHERE IS IoT NOW?

Jacques Bonifay
Transatel

The post-Covid workplace checklist

Companies are increasingly asking how we can make their transition to a mobile, virtual workplace more secure, efficient, and cost-effective in the long term. The answer, says Jacques Bonifay, the CEO of Transatel, is it's all in the (cellular) connectivity.

Still dizzy from the effects of the lockdown on business in general, companies are now letting the dust settle and defining long-term directions for the future of the workplace. The key takeaway: remote work on a large scale is effective and can, in some cases, increase productivity. Management of transverse projects and teamwork can be digitalised to welcome even more participants from across the world, gain efficiency, reduce travel and office space costs, improve tracking, and enrich the knowledge base. This, of course, is made possible with the bevy of collaborative and/or videoconferencing tools and apps available today.

The mobile workplace is forever

Facing employee pressure to continue working from home, companies have only one option, which is to consider that remote work is here to stay. No backtracking is possible with such a demonstration of efficacy as during the past few months. So, one of the key questions becomes: How can we increase staff productivity while (1) controlling connectivity costs and (2) securing both data transmissions and the access to our corporate information systems, globally?

It's worth noting here that, compared to cellular networks that are secured by design, home Wi-Fi is a potential entry point for hackers. First, households do not offer from the same level of security for internet access as companies do, where dedicated teams monitor the network, and where passwords are changed regularly. Second, technically, a company computer connected to a home Wi-Fi network is in direct contact with all the other devices using the same network, namely personal devices. These have a higher probability of malware infection, via the download or streaming of free content.

At Transatel for example, we even add an additional level of security by making sure our clients' data streams never transit via the internet. Our clients control their network and that's what makes all the difference. When you think that your teams will soon be traveling or simply commuting again, you'll be happy they're not using public Wi-Fi.

Last, in the case of critical services that need absolute real-time reactivity, and for which a connectivity outage can have immense legal, financial, and business consequences, the question is: How can we build an airtight back-up system for our regular fibre-optic and ADSL lines? When over half of a company's headcount is working remotely, offices must also undergo serious scrutiny in terms of connectivity backup. 'Always connected' is no longer the stuff of company mottos; it's the signature of a lifeline.

Time for some answers now.

Assess your maturity in the mobile workplace

If you have thus far acknowledged that the post-Covid workplace challenge is one of connectivity, first and foremost, and if you agree that 4G/cellular networks are an integral part of that challenge, then you're coming to the rational conclusion that you should manage and control your employees' mobile connectivity as you would any other overhead cost; across functions, sites, use cases and countries.

To help you kick-start the rationalisation process, I would suggest the following self-assessment as a launch-pad, asking yourself:

1. How do I plan to provide and control the connectivity for my remote workers?
2. How can I make sure that, by using their home's internet access, my employees aren't creating back doors for hackers?
3. Are my employees equipped with cellular-ready devices (laptops, tablets, Mi-Fi)?
4. Is the absence of any connectivity outage critical for my organisation?
5. Do I have any cross-technology back-up plans, including 4G?
6. Do I need an immediate and interim connectivity solution, while waiting for fibre-optic and/or ADSL lines to be installed?
7. Do I need a dedicated routing for my employees' data traffic to enter directly into my premises or my cloud provider infrastructure?

Once you know where you stand, remember, before engaging in a new Employee Mobility Management protocol, to look for a solution that offers:

- Plug & play, instant-on, dependable connectivity, whatever the use case
- A single SIM type, and a single point of control and monitoring
- Airtight security in data transmission
- Flexible pricing models
- Global 3G/4G coverage ■

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13-14 October 2020

usa.industrialiotseries.com

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AI & ASI Expo London 2021

10 March 2021

aisiexpo.com

AR News

Mobile AR sales to hit US$24bn by 2030 as users turn to virtual experiences

The mobile augmented reality (AR) market is showing unstoppable growth, according to a new study by **Future Market Insights**. The company reports that video games, live events, retail, and video entertainment have challenged mobile augmented technology to deliver better solutions.

Designed to create immersive experiences, mobile augmented reality has won a special place for game makers. The growth of mobile AR is attributable to the growing use of smartphones and tablets. From remote places to urban landscapes, the authors have reported that "mobile AR has made an enormous contribution in changing the way experience museums, office spaces, and games.

Since innovations such as **Google** Glass, the world of mobile AR has evolved to be a part of many other sectors, changing the game for military trainings, healthcare consultations, and learning experiences."

In the light of these factors, the study predicts that the global mobile augmented reality market will reach US$3 billion (€2 billion) turnover in 2020, surge at a compound annual growth rate (CAGR) of 23.2% during the forecast period of 2020 to 2030.

Key findings of the mobile AR market study

- East Asia to lead the race in the global mobile augmented reality market at a CAGR of 27.2% between the forecast years of 2020 and 2030
- Gaming segment anticipated to retain its leading position with a share of 28% by the end of 2030
- Smartphones and tablets to revolutionise educational experiences with integration of mobile AR
- Services segment to leap ahead at a CAGR of 24.6% during the forecast period as AR design and development, integration and development, and support services find applications across verticals

The COVID-19 pandemic has deepened the chasm of economic crisis, making the global population rethink education and entertainment in many ways. With no live events to attend, cancelled sporting events, and uncertainty looming over reopening of colleges and schools, mobile augmented reality found its opening to a plethora of opportunities.

The importance of AR has also surged in healthcare consultations as medical professionals and patients are seeking safety first. Furthermore, a quantum leap in online gaming, schooling, and entertainment as artists are taking gigs online, have collectively resulted in a special demand for mobile AR. Biggest chunk is definitely consumed by the online gaming industry, which has been the strongest pillar of the entertainment during the stringent lockdowns.

According to the study, the mobile augmented reality market will grow 6%-8% by Q3 of 2020. The growing e-commerce industry has been identified as key contributor to the increasing adoption of mobile augmented reality. Integration of mobile augmented reality by retailers to make it more accessible for customers to purchase the right item.

Augmented reality helps users to view their products in 3-D, life-like projections in real-time through smartphones and tablets.
Mobile AR offers retailers the opportunity to improve the consumer shopping with real-life experiences. With an augmented reality app, an e-commerce retailer can create a virtual table with a different range of products, projecting it on the customer's living room.

The growing number of purchases via mobile devices and shoppers using smartphones in-store is increasing the demand for mobile augmented reality. FMI concluded, "such enhancement of consumer engagement bodes well for the market in the forecast period." ■

TRANSFORMA INSIGHTS

Global Advisors on IoT, AI and Digital Transformation

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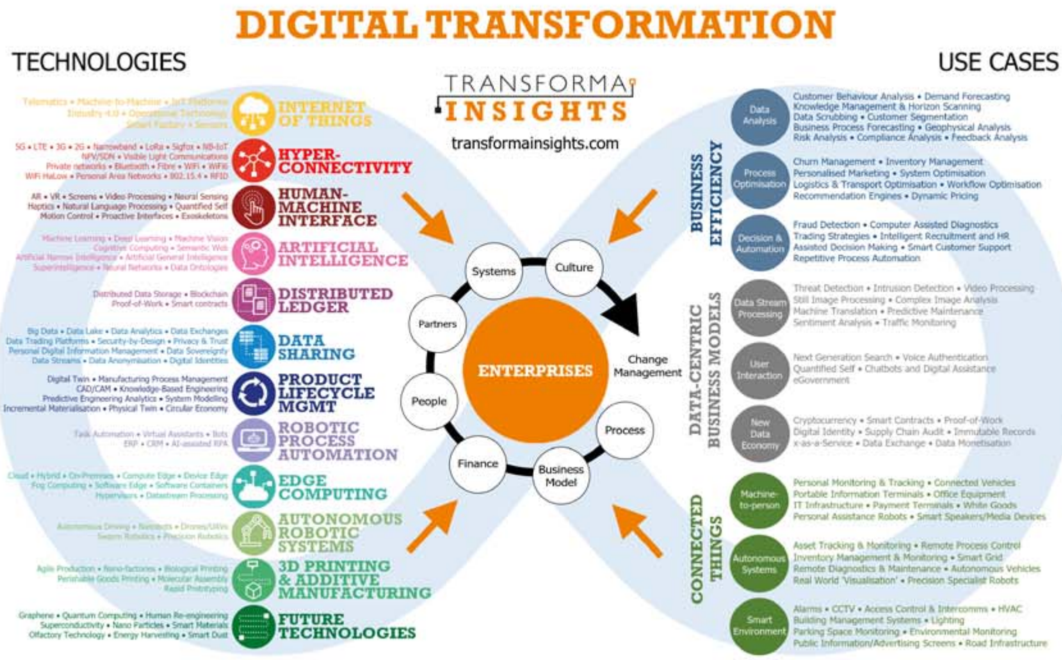
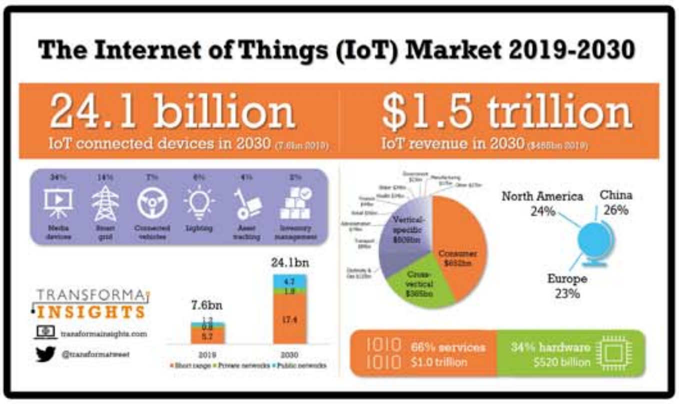
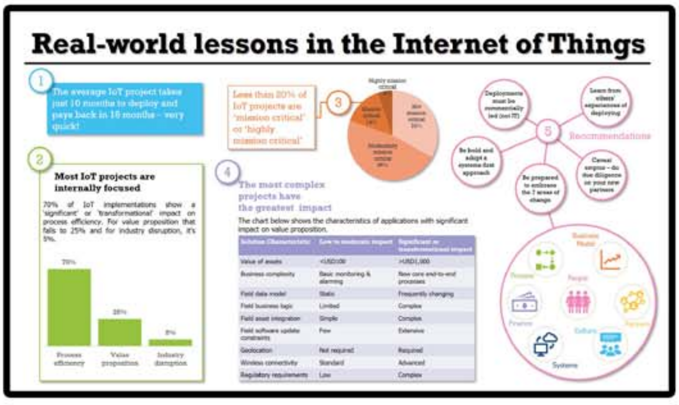




Transforma Insights is the leading research firm focused on IoT, AI and Digital Transformation. Led by technology industry analysts Matt Hatton and Jim Morrish, we provide advice, recommendations and decision support tools (including highly granular market forecasts) for organisations seeking to understand the opportunities and threats associated with new disruptive technologies.



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