IoT FOR BUSINESS

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Distributed in
THE TIMES

Published in association with
DIGITAL LEADERS

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BARRIERS TO ADOPTION

What the future holds for IoT

The transformative power of the internet of things has been demonstrated during the coronavirus pandemic, but uptake in the UK remains relatively low

Jonathan Weinberg

If you don't already know the benefits of the internet of things (IoT) for business then it's high time you found out because your competitors already will. IoT is a key element of the Fourth Industrial Revolution, often referred to as Industry 4.0, and as we end 2020, it is clear the landscape has changed so much in a year.

According to Microsoft's *2020 IoT Signals* report, 91 per cent of the global IoT decision-makers researchers spoke to have adopted IoT in 2020, up from 85 per cent last year. Nine in ten believe IoT is critical to their company's continued success and 64 per cent plan to implement it even more in the future.

The impact of coronavirus has been stark in propelling the industry forward, some say by years, with one in three (31 per cent) stating their organisations will increase investment in IoT due to the pandemic, twice the number that will decrease it. A further 41 per cent will maintain the same commitment.

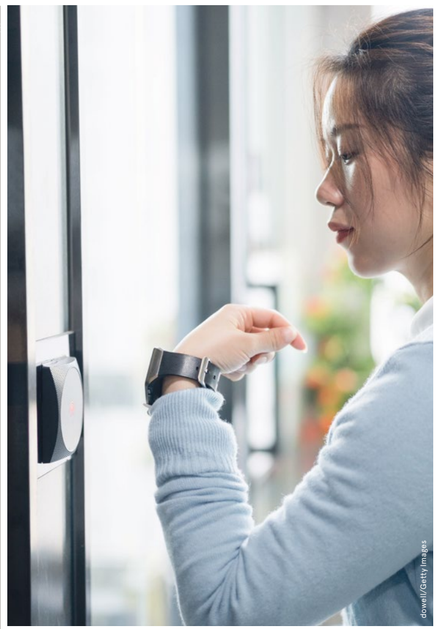
So, what exactly are the benefits of IoT for business? They are numerous, largely due to its ability to collect, analyse and send data in seconds. Outcomes range from the ability to enhance productivity and production through automation, to using networks of interconnected sensors for greater visibility, clarity and security of the supply chain.

All industries can, and will, benefit but it is within healthcare and manufacturing that IoT came into its own this year. Smart tracking and connected devices helped employees keep their distance, while remote monitoring of machinery was used frequently when staff were unable to be on site due to factory closures.

Colin Crow, managing director of digital transformation specialist Sigma Dynamics, says: "IoT technology has been used to reduce the risk to employees while also ensuring productivity and efficiency remain as high as possible, crucial in the current economic climate."

According to the Microsoft report, France, Germany, China and the United States have the highest percentages of IoT adopters currently; 83 per cent of adopters have at least one project that has reached the use stage, up from 74 per cent last year.

It is cited as being instrumental in increasing yield, with nearly half (46 per cent) reporting increased production capacity and 44 per cent signalling cost-savings. Quality and safety were other named benefits of IoT for business.



dowell/Getty Images

However, according to *The Future in 2020* survey from BT: "UK plc risks falling behind other developed nations because companies are not embracing transformational technologies." The survey of 1,000 business leaders found just one in five said IoT existed within their organisation.

There does seem to be a divide, however, because among large businesses this was 28 per cent, perhaps demonstrating small and medium-sized enterprises lag behind when it comes to seeing the benefits of IoT. Nonetheless, just 19 per cent of respondents overall believed IoT technologies would be critical in the next five years in enabling their business to achieve its ambitions and stay competitive.

For Martin Garner, chief operations officer at CCS Insight, identifying these comes down to focusing on the business outcomes of IoT first and developing a strategy based on that. He says: "It is essential to focus on business outcomes with IoT. No one buys 'IoT'. Instead they buy a system that helps them improve, optimise or change some part of their business. IoT is just a part of the system, which helps to collect the right data.

"Although IoT systems can involve lots of different data types, brought together in quite a complicated system architecture, the system will be of no use if it's not usable by people in the business doing their daily jobs. It is essential to keep a focus on the user, their workflows, the way data is presented to them, how they make decisions using that data, whether those decisions can be automated and how outcomes of the decisions are fed back into the system."

With the benefits of IoT for business now felt across industries as wide and varied as automotive to building management, retail to mining and shipping to utilities, investment in these technologies looks likely to soar.

Daniel Bailey, investment manager at ECI Partners, a private equity firm, says: "The market for IoT is exciting. It's large and growing rapidly, driven by reducing data costs, improving underlying technologies, such as 5G, and the ever-increasing viable use-cases for connecting 'things'. The benefits of this to businesses are far reaching, anything from ensuring construction regulations are complied with to tracking cows across a farm."

A new global study from Juniper Research also signals a bright future with the number of industrial IoT connections predicted to increase from 17.7 billion in 2020 to 36.8 billion in 2025, fuelled by smart manufacturing.

However looking ahead to 2021, Paul Haimes, vice president of European technical sales at industrial IoT platform PTC, says: "If I hope for one thing it is that these adoptions of technologies have a better uptake in the small and medium-sized business space. That's really important for the recovery and health of our manufacturing industry."

And he adds something all leaders may wish to consider: "IoT, augmented reality, blockchain or cloud, whatever it might be, all can offer a solution to the typical challenges facing businesses. The core starting point is the business plan. What are you trying to do, what does your company need to do and then how can digital technologies impact and support this?"

91% of global IT decision makers say their company has adopted IoT

83% of these say they have at least one IoT project that has reached the use stage

90% of surveyed organisations consider IoT as critical to their business's success

Microsoft 2020

Commercial feature

Q&A

IoT: part of the new age of predict and prevent

The internet of things (IoT) allows us to collect the data fuelling the new era of predict and prevent, enabling a shift away from claims and loss, however it should never be viewed in isolation, says **Stephen Chadwick**, chief executive of risk mitigation data science experts Shepherd

Q What is the traditional approach to risk in the property sector and why is it flawed?

A The traditional risk transfer model for property insurance is outdated, based on the risk and the payout and the claims and the loss. This transfer is the least best way of managing risk. It perpetuates a cycle of avoidance. A property owner transfers the risk to an insurance company to avoid its consequences, when in fact it is this person or organisation that is best placed to reduce or mitigate the risk in the first place. Rather than a property owner transferring the risk to an insurer, which prices that risk based on a notional assessment, it is much better to incentivise the owner to take steps to mitigate the risk through detection and predictive analytical insight.

Q How is IoT technology enabling this more intelligent, proactive approach?

A Real-time, data-driven insights empower a predict and prevent approach, allowing companies to move away from claims and loss. Insurers wait for a claim to happen, investigate it and then have systems that allow it to be paid to a client. Powered by data science and IoT capabilities, we precisely predict and prevent the risk occurring in the first place. The new Shepherd risk mitigation model allows both property owners and insurers to gain a true understanding of risk in real time. This is game-changing and empowers all stakeholders to better manage and mitigate risks, resulting in improved loss ratios for insurers while reducing costs and disruption for the property owners.

Q Can you expand on how Shepherd is helping to facilitate predict and prevent?

A Shepherd creates new knowledge about the way a property is performing and its inherent risks. We do this by precisely exposing and understanding the causality of risk and therefore empowering the owner and insurer to better manage them. For example, in a sawmill, we are providing a deeper understanding into the causes of fire. This powers our predictive capability to prevent a loss event. Another example is English Heritage where we're preventing catastrophic loss to priceless artefacts and heritage property. With Kenwood House, we've taken an 18th-century building and put it onto the same data level as the Shard to provide many actionable insights enabling the smarter management of the property and environment.

> It's important to embrace the power of IoT but understand that it is not the end game

Q How do you work with companies to ensure they are collecting and processing the right data?

A Data derived from IoT needs to be aligned to the wider business objectives. To this end, we work backwards with the insurer and property owner, starting by identifying the inherent risks that are specific to a property or portfolio of properties. From there we pinpoint what information is required to mitigate those risks, so we understand what data inputs Shepherd requires for analysis. We utilise numerous methods to extract and collect data, including IoT-enabled sensors, building management systems and external data. It's important to embrace the power of IoT, but understand that it is not the end-game. Data analysed is new information and information layered and shared creates new knowledge. It is this new knowledge that enables businesses to make better, smarter and more-informed business-critical decisions.

Q What does this new innovation mean for property management?

A It's an enormous step forward, a digital transformation in the true sense and a way for insurers to attract and retain more clients while improving their claims-loss ratio by facilitating better decision-making. Moving from claims and loss to predict and prevent encourages new revenue streams and new ways of thinking on how to reduce rather than just transfer risk. Meanwhile, risk mitigation doesn't just apply to the insurability of a property. These IoT insights are hugely valuable to property owners in terms of energy consumption, typically driving a 25 per cent energy reduction, and help optimise assets and reduce downtime. Rather than a facilities management team waiting for something to break while carrying out a regular maintenance schedule, Shepherd's condition-based monitoring system can tell them the expected lifetime of assets. We can also monitor oxygen and CO_2 levels and measure air quality as well as footfall and the usage of things like heating and air conditioning so they can operate at optimum levels.

Q What is the future of IoT in the property risk space?

A Real-time knowledge promotes better decision-making, minimising risks and improving your ability to act. We're already seeing a lot of consumer products coming out with embedded IoT, such as smart fridges and ovens, but next we'll see this proliferation of smart devices move into the industrial scale. We'll see smart pumps, boilers, heating systems, recirculation systems and fans, and this will bring a lot more data that can be ingested by Shepherd. From there we can provide richer analytical insights, allowing property owners to make better decisions about how properties are managed and maintained. At Shepherd, we're in the business of creating new knowledge and insight. We see IoT as a fundamental part of providing this value-added service of building and property knowledge.

For more information please visit www.shprd.com/iot-report

SHEPHERD

£317m

underwriting profitability fell to a 10-year low in 2018 as insurers recorded a loss of £317m

Global Data 2019

since 2015

the amount of property insurance claims paid in the UK has seen a year on-year increase

Statista 2020

SUSTAINABILITY

Greater connection can save water

Water management using the internet of things can reduce leaks and ensure vital resources are not wasted

Duncan Jefferies

Samira Bouaou/Unsplash

More than 50 per cent of the world's population will be living in water-stressed regions by 2050, according to the United Nations. It's therefore vital we reduce the 126 million cubic metres of water lost annually due to leaks, poor metering and theft, and not just for the good of the planet.

The cost of lost water amounts to $39 billion (£29 billion) a year. Meanwhile, consumers want businesses to do more than pay lip service to environmental issues. They expect to see real evidence of how companies are reducing their impact on the planet's resources, including their approach to water management.

It's an issue that's particularly pertinent for water-intensive industries such as manufacturing and agriculture, which use large amounts of water to produce cars, clothing, crops and other vital goods. But thankfully there's a solution.

Smart water systems based on internet of things (IoT) sensors, big data and analytics can reduce the amount of water that's wasted during agricultural and manufacturing processes, improve the efficiency of water distribution systems and alert companies if toxins or other impurities are detected.

"Advances in IoT sensors, communications and cloud computing have dramatically lowered the cost of gathering, storing and analysing data, whether this is from specific equipment, like pumps or valves, or entire processes like water treatment or irrigation," explains Joseph Vesey, chief marketing officer at Xylem, which creates smart technology solutions to meet water and energy needs.

"They allow us to go beyond basic monitoring to efficiently access new types of data, at a level of granularity that wasn't cost effective in the past, especially for small and medium-sized organisations."

In short, utilities, farmers and manufacturers of all sizes can use IoT technologies to improve their water management processes. Sensors can monitor tank filling levels, for instance, as well as control the quality of water used in manufacturing processes and detect leaks.

Better management of the water system means "energy is also reduced when leaks are eradicated, as the energy to treat and pump leaked water is no longer required", says Nigel Harley, IoT sales specialist with the Internet of Things Centre of Excellence team at Software AG, which provides platform integration and IoT for enterprises.

"In agriculture, the use of soil moisture sensors can increase yields by applying just the right amount of water to satisfy plant needs and not saturating the root system," says Laurie Reynolds, managing director of AquamatiX, a software company that specialises IoT solutions for water and wastewater infrastructure. "The amount of water to achieve ideal growing conditions can be varied during the growing season."

Due to the size of many water company networks and the fact that their pumps and treatment equipment are often spread out over large areas, IoT offers an opportunity to gather data for water management on a far larger scale than was previously possible.

"While it's practically impossible to install enough sensors to measure water quality changes everywhere in a network, IoT helps by presenting us with the bigger picture," says Vesey. "It can interconnect a smaller number of sensors — ones that measure flow, pressure, water level and water quality — and link them together with models to 'fill in the gaps' and provide a complete picture of water quality changes across the entire system."

> While it's practically impossible to install enough sensors to measure water quality changes everywhere in a network, IoT helps by presenting us with the bigger picture

Using IoT across water networks in this way allows operators to make better decisions about water management, and even automate decision-making to respond to demands in real time, including when and how to operate treatment plants, pumps and valves.

"In addition to providing precision, this technology eliminates many procedures that, until now, have been carried out manually," says Alicia Asín, co-founder and chief executive of Libelium, which designs and manufacturers IoT solutions. She adds that this not only saves money, it means staff can be reassigned to other tasks, adding value to the business.

SES Water, which provides water in Sutton and East Surrey, has been working with a number of its key supply chain partners to trial a range of specialist digital water meters, sensors and acoustic loggers on underground mains water pipes, which are connected using Vodafone's narrowband IoT (NB-IoT) network.

"These partnerships we have developed are helping us create an intelligent water distribution network that aims to cut leakage by 15 per cent over the next five years and provide a better, more resilient service to our customers," says Daniel Woodworth, network strategy manager at SES Water.

The water company is getting near real-time data from the sensors, and artificial intelligence and machine-learning alerts them immediately to leaks, low pressure or other supply interruptions. "As a result we can be made aware of any leakage occurring on our customers' pipework, allowing us to pinpoint the precise location before it can cause any damage to property, the environment or an interruption to supply," says Woodworth.

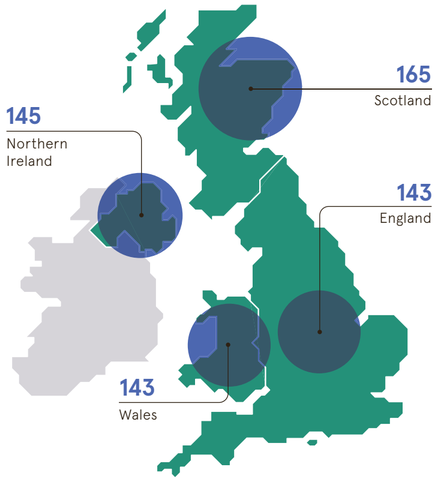
After seeing significant benefits of moving to NB-IoT, SES Water has now begun a full company-wide rollout of the technology. In future, it could even enable the water provider to predict and prevent pipeline failure before it happens.

Whatever the industry, Rik Gunderson, utility client director at Software AG, says there are ultimately three elements to improving water management and reducing wastage: capturing the data, analysing that data and using these insights to drive a business outcome.

"The hardest part in any industry is the ability to access the data, make both it and the resulting analytics easily accessible yet secure, and to have the business foresight to use the data in a way that drives decisions," he says. While this might be a challenge in some instances, the results, both environmentally and economically, seem well worth the effort.

HOW MUCH WATER DO WE USE EACH DAY?

Annual daily water usage per person in the UK, by country (litres)

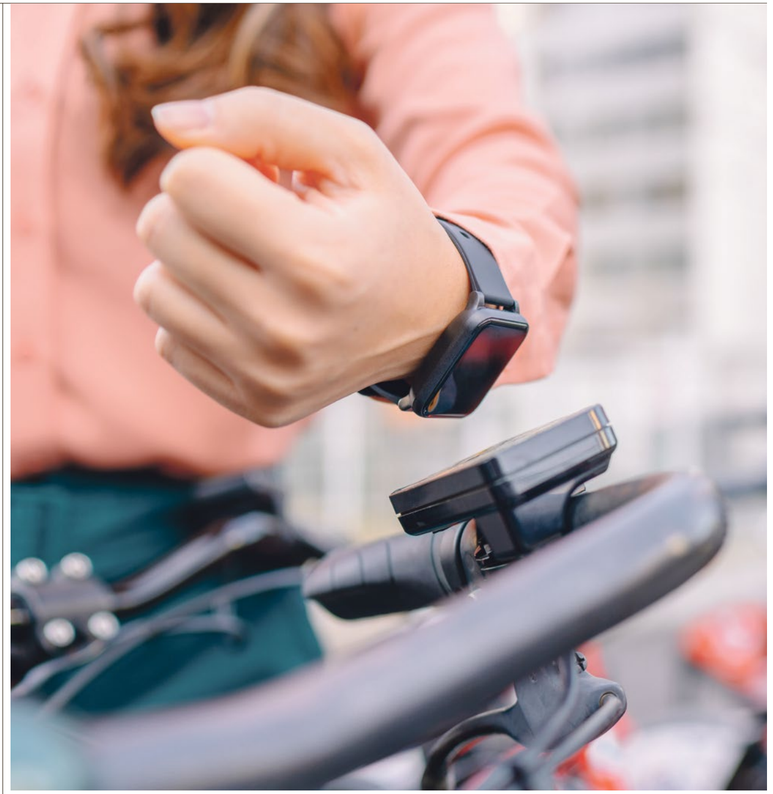


Waterwise 2020

Commercial feature

Trust is the key to achieving the promise of trillions of IoT devices

A trillion internet of things devices within the next 15 years is a real possibility, but realising their potential relies on people's trust. Integrated SIM, or iSIM, is the foundation of secure cellular IoT



A confluence of events is accelerating the internet of things (IoT) and its potential to transform businesses, industries and wider society. While devices are getting cheaper, lower powered and more functional, coronavirus has forced organisations and consumers online much faster than anybody would have expected. The result is a clear opportunity to reach a trillion IoT devices globally in the next 15 years.

There is one overarching challenge standing in the way: trust. IoT promises a huge amount of value to businesses, industries and wider society, enabling monumental efficiencies, incredible new innovations and vital advancements in sustainability. But it is fundamental that IoT devices and the insights they generate can be really trusted.

A trillion may sound like a lot, but it starts with small devices generating tiny amounts of data. Scary stories in the media can quickly fuel wariness and, if people don't trust those individual devices, the whole idea of big data is polluted and the opportunity is lost. To achieve trust on a large scale, it first needs to be baked into every single device.

"To get trust in a device, you have to build it in from the start," says Vincent Korstanje, chief executive of Kigen, the security leader for cellular IoT. "A SIM is a vital technology for trust. A lot of the internet now runs on two-factor authentication and that runs on SIM. It gives a device an identity. To achieve trust, you then need to track where a device has been, who is loading software onto it and what its life cycle is. But it all starts with identity."

People are familiar with SIMs as the small cards in their mobile phone, providing the connectivity to make calls and use data. If you change your mobile network provider, you take the SIM out and put a new one in. Yet while this may work well for mobile, it is hugely impractical to design holes for SIM cards into IoT devices, many of which need to withstand harsh environments and in the future could be as small as a grain of rice.

With this in mind, Kigen invested heavily in standardisation and pioneered integrated SIM (iSIM) technology, which provides the strongest foundation of identity for secure cellular IoT. When the IoT devices are tiny, remote and updated over the air, their lifespan is restricted by their battery life, putting high demand on efficiency. Kigen's iSIM offers 70 per cent lower power consumption than a traditional SIM, making it suitable for all devices to be kinder to the planet too.

Some of the first products based on Kigen's iSIM technology include an innovative smart label now used by pharmaceutical and life sciences firm Bayer to constantly monitor the status of its products and receive immediate insight into their global inventory. The smart label connects via public mobile networks and delivers a continuous service for three years, streamlining Bayer's operations. The idea of a paper-thin connected device is striking, but Kigen's iSIM technology is also going into connected consumer electronics, healthcare and even smart streetlights.

> To get trust in a device, you have to build it in from the start

What stands out about Kigen is that as a provider of secure operating systems and enabler for advanced connectivity, it is driving this change through a standardised path for devicemakers. This derisks their path so they can focus on enabling new business models and increasing productivity.

"Every IoT device should have an iSIM in it," says Korstanje. "It's a fraction of a square millimetre on the silicon so the decision on if your product will ever use IoT becomes easy. iSIM is trusted as it implements certificate based security, and allows the devices to be updated over-the-air, which are both important for trust. iSIM enables security everywhere, while its small size makes it practical and affordable."

By driving down the cost and power, and increasing the performance, iSIM technology unlocks all kinds of IoT use-cases to come to life, in growing areas such as smart cities, ebikes and escooters, and equally in more traditional industries such as healthcare, shipping and retail. IoT is becoming core to these industries, but they don't manufacture in the same way as the smartphone or PC industries.

Kigen is looking to do for IoT what its parent company Arm did for smartphones. Arm pioneered a new way smartphones could be manufactured, with intellectual property for the silicon market, licensing a chip design so multiple vendors could collaborate, compete and bring different solutions to market.

The company is bringing a similar horizontal play to IoT, allowing multiple solutions to come to market much faster in areas such as healthcare and smart metering. By making iSIM the foundation of embedded trust for all IoT, traditional businesses can have the freedom to manufacture through their preferred suppliers and deliver services that matter most to their customers.

"We make IoT possible through the whole supply chain, enabling a highly flexible approach both for the business model and for how people can use our technology" says Korstanje. "We need to look at the supply chain as a multitude of players coming together and playing together, where everybody around the world can bring their best components to those devices and make a trillion devices a reality."

Digital transformation not only has huge promise to make all our lives better but also is increasingly critical to our fabric of life as has been highlighted during the pandemic. However, with IoT, there is just so much more to come. That's trillions of devices helping us live our lives in incredible ways. Though businesses need to innovate and collaborate so they can solve the trust conundrum for everyone involved.

65%

of enterprises have deployed IoT solutions as part of a broad digital transformation strategy [1]

GSMA Intelligence, August 2020

12bn

IoT [2] **devices surpass the number of non-IoT devices in 2020**

IoT analytics, November 2020

2bn

SIMs enabled by Kigen secure operating system

Industry estimates

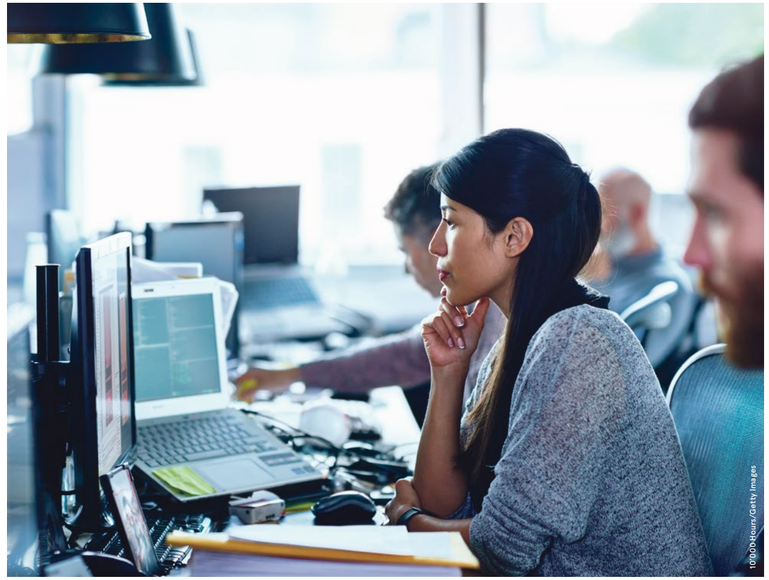
Sources:

[1] Based on August 2020 data, per the GSMA Intelligence IoT revenue: state of the market 2020 report

[2] IoT Connections are defined as connected cars, smart home devices, connected industrial equipment, whereas non-IoT connections consider smartphones, laptops, and computers.

For more information please visit kigen.com or sign up to our upcoming webinar at kigen.com/solving-iot-trust

Kigen



10bis/D4Hours/Getty Images

SKILLS

Closing the gap to improve workforce productivity

Having the technology is merely the first step for internet of things implementation. The next, and most important, is having the skills in-house to ensure the tech is used to its full potential

Sophia Waterfield

The coronavirus pandemic has brought about an overnight digital transformation for many sectors, creating a sudden need for everything to be connected. Enter the internet of things (IoT). Unfortunately, due to the exponential need for specialists in cloud computing and data science, there is also an IoT skills gap that needs to be filled.

"COVID-19 is the radical transformation IoT has been waiting for," says Richard Robinson, managing director of Econsultancy. "At the heart of this, for many, is the IoT and adoption of the 168-hour week, when customers can purchase a product and consume content whenever they like.

"IoT is the answer to the mathematical equation of how to bend time to deliver goods and services just in time or in real time with every customer contact."

Outsourcing and professional services company Capita found 70 per cent of businesses said IoT was relevant to them, but more than three-quarters had an IoT skills gap in their workforce and couldn't capitalise on it. This aligns with research by LinkedIn that found cloud computing, artificial intelligence (AI) and user experience design, which are all related to IoT, were in the top ten most in-demand hard skills in 2020.

"Traditional developers have some of the skills required, but IoT's complexity demands more and helps to create the current skills gap," says Tom Canning, vice president of global sales in IoT and devices at Canonical. "The reality is, in an industry as dynamic and fast-changing as IoT, it's impossible to predict more than a few years into the future." He also believes most companies are not in a position to hire at scale just yet, but this won't last long.

"Similar to developments within AI, IoT is an example of technology and academia intersecting at a broader level. An increase in the number of courses and other specialised degrees in recent years is helping to promote new practices in connected technologies which, in turn, trickles down to physical developments."

> Every employee and entrepreneur can learn, they just need to be given the permission and the tools to make it happen

While IoT skills can help end-users and consumers, this can also enhance job roles that traditionally wouldn't be associated with the technology.

"There are swathes of job roles that can be enhanced by using connected devices and many sectors are already making use of it," says Pilgrim Beart, co-founder and chief executive of DevicePilot. "The largest impact will be felt by engineering, customer service and operations teams.

"A great example is Winnow, a company that uses connected tech to reduce food waste in industrial kitchens. It uses a camera, scales and some clever AI around bins to identify and weigh food waste; examples might be carrot peelings or fruit that has gone beyond its use-by date.

"This, in turn, gives kitchens a lot of data about exactly what they are throwing out and how much of it, enabling them to reduce waste and improve their bottom line. All of this is done without the need for any human intervention."

Working from home under tiered lockdowns is continuing at least for the time being, so businesses will need to be ready with their solutions and close the IoT skills gap in 2021.

Robinson at Econsultancy believes upskilling will be essential in helping companies succeed. "To prepare for demand, every business must encourage and enable their people to think differently about the thing they do 38 hours a week," he says. "Their minds must open to how they will use the IoT to close the 130-hour gap between how they work and how the customer consumes, acts and buys.

"Every employee and entrepreneur can learn, they just need to be given the permission and the tools to make it happen."

Beart concurs, believing IoT will show its potential throughout 2021. "As companies look to increase efficiency, particularly with a workforce that I expect to be working remotely for much of next year, connected devices will show their worth as they can monitor and control a huge number of processes remotely," he says.

"My advice to IoT service providers is to get organised and ready for growth. This means having the infrastructure in place to properly monitor and manage their devices as customers will quickly lose patience if providers are unable to deliver the level of service and efficiencies they promised."

To help close the IoT skills gap, LinkedIn has made nearly 1,000 hours of free courses available for in-demand skillsets associated with IoT.

THE TOP 10 MOST IN-DEMAND SKILLS

Based on the top skills companies are hiring for

● Position change from 2019

1. **Blockchain** — ★ New entry
2. **Cloud computing** — ▼ -1
3. **Analytical reasoning** — — No change
4. **Artificial intelligence** — ▼ -1
5. **UX design** — — No change
6. **Business analysis** — ▲ +10
7. **Affiliate marketing** — ★ New entry
8. **Sales** — — No change
9. **Scientific computing** — ▲ +3
10. **Video production** — ▼ -3

LinkedIn 2020

Anna Serqubam/Shutterstock

The jobs under threat from IoT

The internet of things (IoT) has vast potential across all sectors in terms of productivity and revenue, but it could make some jobs redundant. In developing countries, especially, organisations might find themselves attracted to automated processes, which are more efficient and cost effective, than hiring locally.

One job IoT could automate is pest control. Researchers in Italy studied how wireless sensors could help with identifying codling moths attacking apple crops. They found IoT sensing devices could run machine-learning algorithms, which could collect data over a wider area and run immediate data analysis and anomaly detection.

Automatically sending a notification to the farmer removes the need for local workers to check each insect manually. However, this would impact the local economy negatively, as there would be no seasonal work. According to the World Economic Forum, these types of jobs, which require "low educational attainment," are at risk.

In manufacturing, jobs such as production supervisors are also at risk. Ericsson has worked with Worcester Bosch to create the UK's first 5G factory, using technologies such as 5G and IoT to optimise machine performance and increase output by as much as 2 per cent.

Part of the Worcestershire 5G Testbed, the factory now runs real-time machine sensors that enable them to address problems on the production line before they happen. However, this removes the need for supervisors or machine operatives, potentially costing them their jobs. The hope is IoT will create more meaningful work for which redundant workers could be retrained.

INVEST & IMPLEMENT

Enterprise spending on the internet of things has jumped over the past few years and 2020 has been no exception. Despite the disruptions caused by the coronavirus pandemic, executives remain positive for the outlook for investment. This infographic explores past investment, future plans and how different industries are implementing IoT across their organisations

82%

of business executives say IoT investment has grown over the past three years

Gartner 2020

47%

of organisations surveyed in October plan to increase investments in IoT despite the impact of COVID-19

Gartner 2020

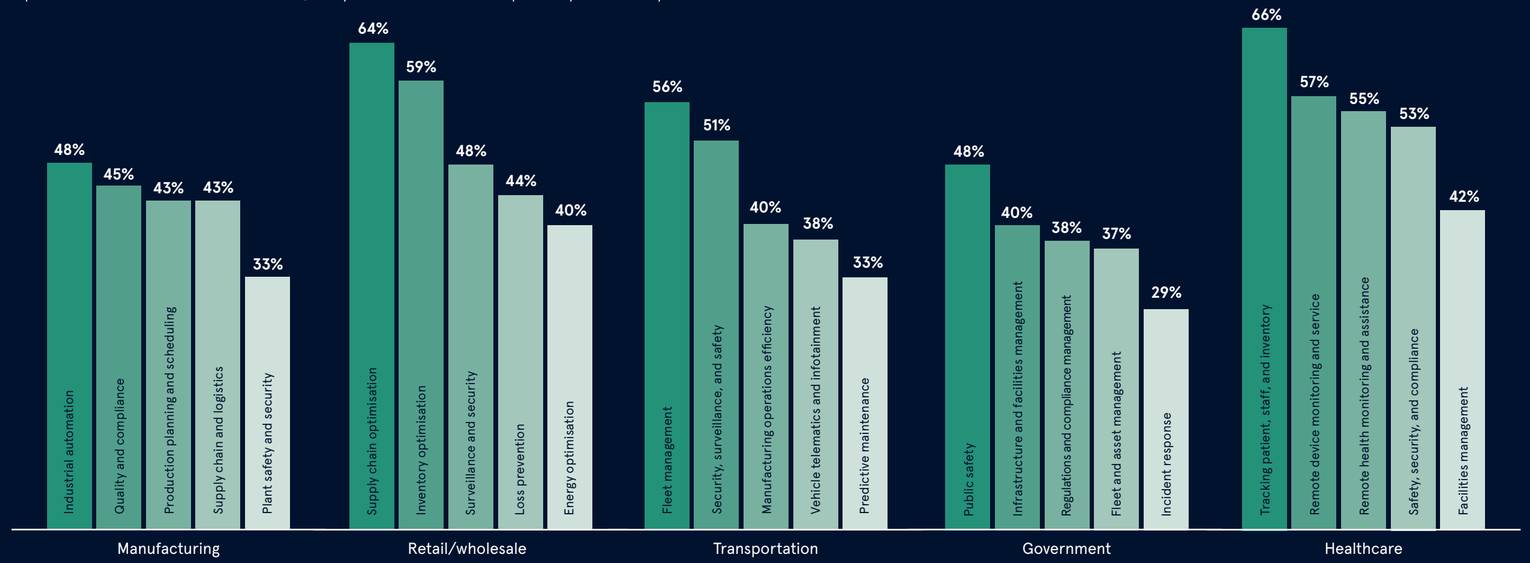
19%

say investment has jumped by over 50 per cent

Economist Intelligence Unit 2020

INDUSTRIAL ADVANTAGES

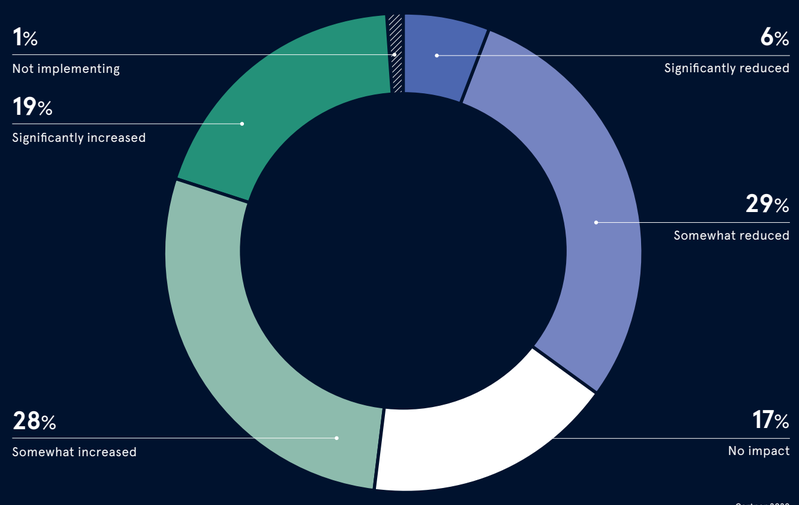
Top use cases of IoT across five different industries; survey of decision-makers at enterprise companies currently involved in IoT



Microsoft 2019

COVID-19'S IMPACT ON INVESTMENT

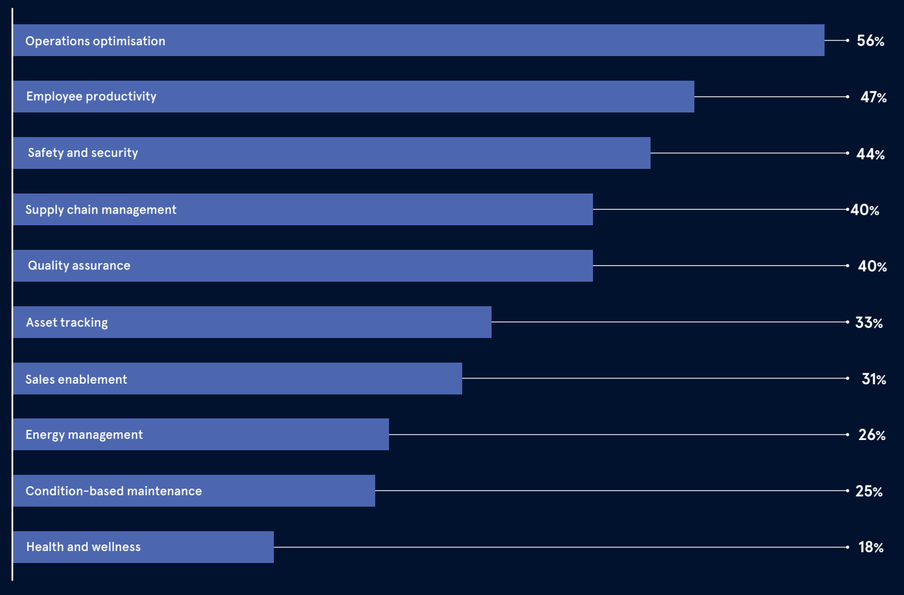
How COVID-19 impacted plans to implement IoT to reduce cost



Gartner 2020

TOP REASONS FOR IOT ADOPTION

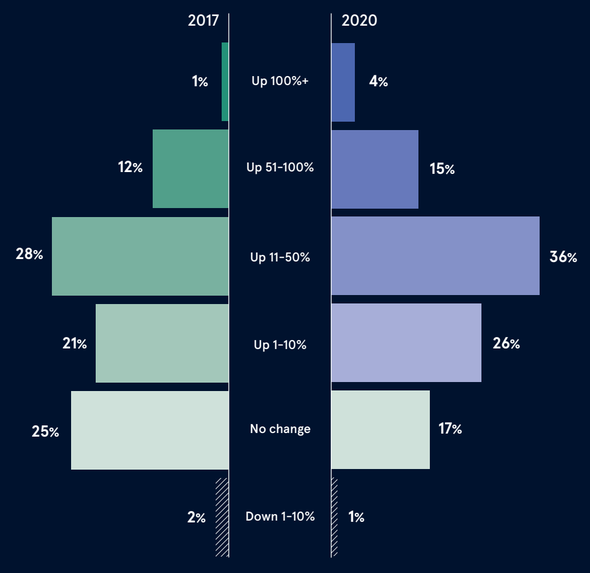
According to decision-makers at enterprise companies currently involved in IoT



Microsoft 2019

INVESTMENT HAS ACCELERATED

How business executives say IoT investment has grown in the past three years



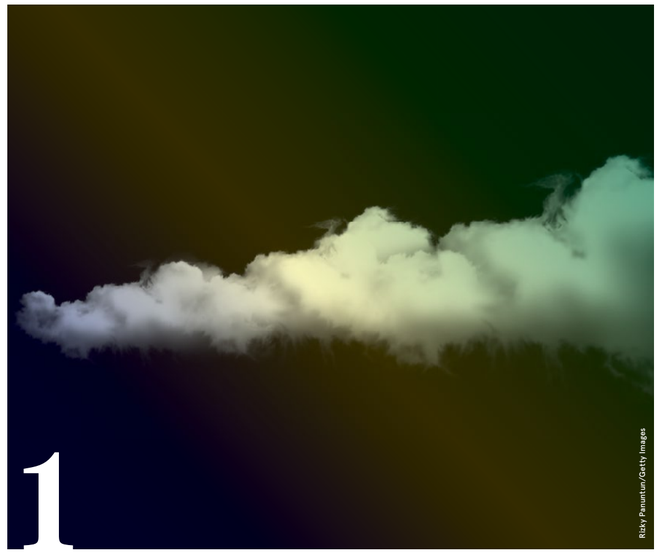
Economist Intelligence Unit 2020

EMERGING TECH

Understanding the tech ecosystem

Coronavirus is proving a tipping point for tech adoption; cloud, IoT and 5G are at the heart of this acceleration into digitalisation, but are their benefits interdependent?

Heidi Vella



Cloud computing

For many companies that were forced to shutter their business premises due to coronavirus restrictions, the cloud has helped their newly decentralised enterprise remain operational.

Research from Deloitte found those firms that fared better in the pandemic had already adopted virtualisation and cloud technologies. Those that hadn't invested scrambled to do so; PwC reports spending on cloud rose 37 per cent during the first quarter of 2020.

Essentially, cloud computing allows businesses to run sophisticated applications and store data on several dispersed computers, accessible via an internet connection. During the pandemic, this meant company data and software applications could be accessed easily at home, instead of being locked into office-based servers.

Nabil Bukhari, chief technology officer of networking firm Extreme Networks, says pre-pandemic many businesses had avoided cloud adoption, either because of fear of the technical complexity or lack of budget. "The pandemic, however, has been a catalyst to overcome these fears," he says.

In fact, Tim Devine, a technology expert at management consultancy PA Consulting, says with Microsoft Office moving to the cloud, it is now "endemic" in everything we do.

"Almost every smartphone app is connecting to a cloud service or application, so everyone is effectively using it," he explains.

The shift from the cloud as a place to store data to computation processing was the game-changer, says Dr Jeremy Silver, chief executive of Digital Catapult, a digital technology innovation centre, as it allowed businesses to run virtual machines and services which created new applications.

"In the film and media sector, production companies are using cloud services to collaborate on editing and production of films. And it's being used to exchange and manage data from sensor deployments in factory environments, which is one of the ways internet of things (IoT) technology and cloud are increasingly working together," says Silver.

The increasing proliferation of IoT devices, therefore, could drive the adoption of cloud services. This will include hybrid cloud – a public, private and on-premise storage and computing environment – and edge cloud, where computation happens closer to the IoT device, as companies seek more control over their systems, says Chris Dando, chief technologist at HPE.

"Not everything captured at the edge will be processed in central datacentres, but at the edge for mission-critical reasons. Therefore, part of the IT environment is going to become more distributed, but this will very much depend on the individual use-case and the amount of processing power needed," he explains.

IoT

Interest in IoT use-cases has also been boosted by the pandemic. According to a recent McKinsey & Company survey, the share of digital or digitally enabled products in company executives' portfolios has been accelerated by seven years. Another report by Vodafone found 84 per cent of executives thought IoT applications were key to maintaining business continuity during the pandemic.

From connected household lightbulbs and thermostats to industry 4.0 applications, IoT networks encompass a huge range of capabilities that can vary wildly between sectors. And while the notion of IoT has been around for some 20 years, adoption had previously been slow. Is this because the cloud is first needed to facilitate it?

"No," says Digital Catapult's Silver. "The cloud enhances IoT, but it's possible to run machine-to-machine data-gathering and to collect and deploy sensors across equipment and machinery in factories and receive the sensor data on a local area network, such as wifi, and to do analysis locally."

However, the power of combining IoT and cloud can be "extraordinary", he adds. "The cloud allows companies, for example, to sensor-monitor five different factories and create an aggregated view of the data, which can then be analysed by artificial intelligence for insights," Silver explains.

Whether edge or central cloud services are required depends on the operation but, as a rule, for critical applications, such as deploying IoT-supported autonomous machines on factory floors, servers making decisions should be close by for reduced latency. Adding 5G networking could improve efficiencies further.

"The cost benefit is really strong when you combine 5G, IoT and, increasingly, cloud," says Silver.

Furthermore, the cloud makes many less critical IoT applications, such as smart lightbulbs and thermostats, affordable, says PA Consulting's Devine.

"Without the cloud, the cost of running the application would be expensive; sensors need to be low power and low cost, which wouldn't be possible if embedded with operational software," he says.

According to Dando at HPE, the acceleration in the adoption of IoT use-cases driven by the pandemic has included installing thermostatic cameras to monitor fever levels at building entrances and enabling hands-free access. This has required a scaling up of computing capacity, but not necessarily in one specific network.

IoT devices, he says, are likely to always connect across multiple communication methods, depending on the individual use-case.

"Things will be connected across Bluetooth, wifi, cellular and physically cabled networks; this will continue for a long time because the requirements of individual devices vary," says Dando.

5G

The impact of 5G, which offers ultra-fast speeds, increased spectrum and lower latency, on IoT and cloud technologies remains to be seen, according to Devine.

"5G will be required for massive IoT or many millions of devices all connected in a small area and the business case for those solutions are yet to be proven," he says.

Massive 5G-enabled IoT is expected to be most valuable for industrial applications, including hospitals, railways and manufacturing, to support remote surgery and wireless autonomous machines that could utilise private 5G networking.

"In an industrial environment, with mission-critical processes that need real-time information, 5G is probably the only solution," says Alicia Asín, chief executive of Libelium, an IoT applications company.

Early applications are being considered in manufacturing and German manufacturers, in particular, have been keen to buy private 5G spectrum, says Devine. It is also being explored in film production for wireless mobile automated cameras.

"For companies that already have an IoT solution in place, 5G will allow for a tremendous expansion of opportunities. We'll begin to see more and more devices connecting together on the same network at speeds, and with an ease, that currently do not exist," says Kevin Hasley, managing director of RootMetrics, a network performance measuring company.

But if speed and performance are not critical, 5G won't be needed, says Asín. "A smart-parking network, for example, that requires low power and performance doesn't need 5G. IoT is not really dependent on 5G or the cloud, it just depends on what you're doing and how that might add to it or not," she says.

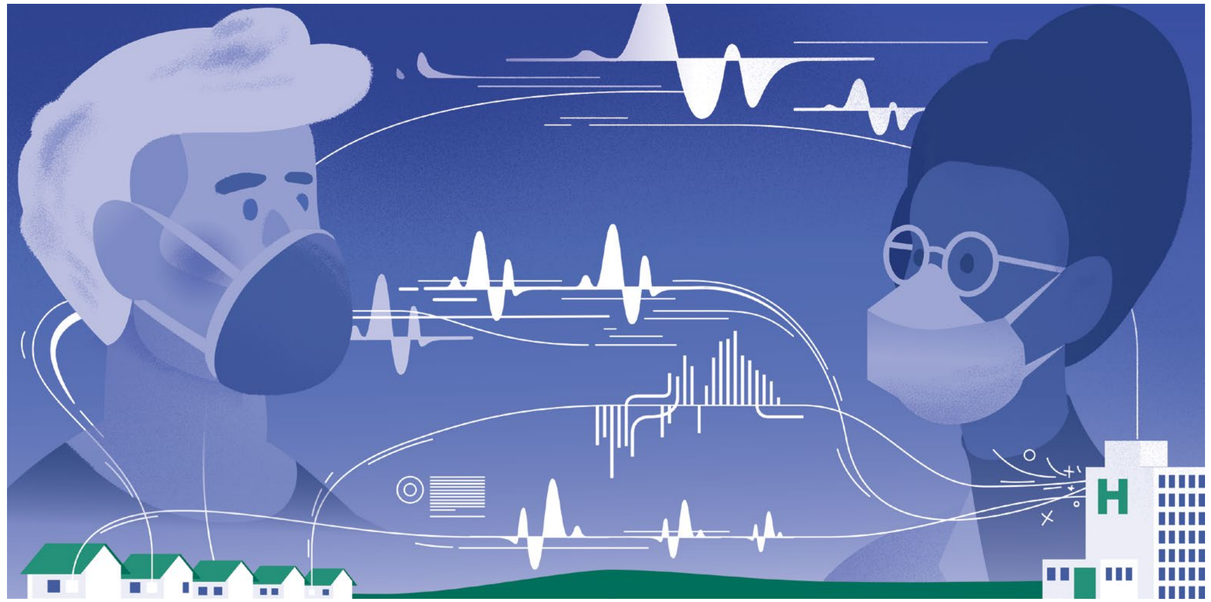
For homeworkers, 5G will have to compete with fibre broadband, unless in an area with poor connection, then the next generation cellular network "might be a very convenient and speedy way of delivering that bandwidth", says Devine.

"What's going to happen first, I think, is with more IoT devices automating more workplaces over time, people will access the sensor data remotely over the cloud and that will mean demand for bandwidth and 5G will increase," he adds.

For implementation, the difficulty will be integrating new generations of technology onto old generations. "It's possible existing cloud services won't be robust enough to support the new IoT 5G-led services that will be available," says Devine.

Asín adds it's also important to support training and education "because otherwise adoption of these technologies won't happen".

Therefore, cloud, IoT and 5G are far from mutually exclusive, but as Dando says, together they are most likely "better than the sum of their parts".



TELEHEALTH

Connecting healthcare to cope with COVID

The internet of things is transforming healthcare, enabling patients to be treated at home and improving the medical data available to clinicians

Abby Young-Powell

From wearable technologies, such as Apple watches, to ingestible sensors and connected inhalers, the internet of things (IoT) has the potential to revolutionise the healthcare industry. It is already giving patients greater control over their own health and, at the same time, enabling clinicians to work more efficiently and effectively.

Global healthcare services have relied on remote telehealth services and technology more than ever during the coronavirus pandemic. The IoT enables doctors and nurses to monitor patients remotely, helping to keep people safe from the virus.

So how is IoT medical equipment being used? And can it really change the lives of patients? Dr Harpreet Sood, NHS England's associate chief clinical information officer and a practising doctor, says IoT is currently being used in two main ways.

Firstly, IoT can be used to measure the oxygen level and temperature of patients who might have COVID-19 or who are at high risk. Secondly, it can be used in chronic disease management to measure things like weight and blood pressure.

IoT monitoring devices are especially helpful for chronically ill patients who may have disabilities, as well as for older people and those who live alone, says Dr Vincent Grasso, global practice lead for healthcare and life sciences at AI company Amelia.

IoT in healthcare also enables patients to have more control over their own health. Dr Barney Gilbert, co-founder and joint chief executive of Pando, a messaging app for NHS staff, says the technology will ultimately put patients in the driving seat. "The biggest shift is the patient being at the centre of their data; you are the CEO of your own healthcare," he says.

This can improve compliance rates when it comes to taking medicine, according to Tom Russell, programme manager for health and social care at techUK. "From a behaviour perspective, if you show people what's going on and enable them to check all the different assets of their own body and care, people take ownership and are more responsive," he says.

It also means the sector can be focused on preventative medicine, easing the burden on healthcare workers and improving patients' lives and wellbeing.

IoT medical devices can help doctors optimise working practices. Such devices enable care to be delivered remotely, on demand and informed by real-time data, reducing a logjam of appointments, cutting waiting lists and allowing clinicians to spend more time on complex cases.

Dr Alex Young, founder and chief executive of Virti, which creates virtual reality training technology for healthcare settings, says: "We can use Fitbits or Apple watches [when a trainee is being shown a patient] in a virtual environment," says Young.

A barrier for IoT in healthcare is building the right data infrastructure. "At this point, there's no infrastructure to collect all the data that's coming from patients," says NHS England's Sood. There isn't a dashboard set up that allows clinicians to see the data and to act upon it. "So that's a big challenge, in terms of how we manage and curate and collect that data," he says.

Many patients also don't have access to good wifi, which is another challenge. "We have to ensure there's no digital divide and that the people who need this technology most have access to it and are using it."

In recent years, the NHS has set up the Strategic Data Collection Service, a secure system used by health and social care services to submit data. But as hospitals collect more patient data from technology and IoT devices, it will be a challenge to maintain and manage security and privacy.

Importantly, telehealth and telemedicine have been fundamental in stopping the spread of COVID-19. IoT medical equipment is helping curb the spread of the virus. Devices can be used to help track down people who may have been exposed and help improve patient compliance with quarantines.

> **The biggest shift is the patient being at the centre of their data; you are the CEO of your own healthcare**

IoT devices also enable remote monitoring, helping to curb the spread of the virus, and can assist early detection, which is one of the key methods used to help prevent outbreaks.

"Technology has evolved to such a point that we can now use AI and machine-learning to derive insightful analysis about the virus through accessing a wide range of patient data," says Amelia's Grasso.

$15bn

spent by healthcare on IoT in 2020 (up from $5bn in 2015)

iPropertymanagement, 2020

Sood adds: "It is a real opportunity that we're seeing with IoT and telemedicine."

But there are barriers to be overcome, including ensuring a digital divide does not exclude millions from access, securing funding, building the data infrastructure, making sure IoT has the right regulation to ensure quality and safety, and gathering enough evidence that devices are superior to practices currently in place.

Russell at teckUK concludes: "The biggest barrier to using IoT isn't the tech itself, it's the cultural barrier and getting people to understand its value."

OPINION

'It's now about you as senior leaders recognising IoT's impact and understanding the art of the possible'

Only four years ago, a survey found that four out of five Americans had not heard of the internet of things (IoT).

IoT describes the network of physical objects that are embedded with sensors, software and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.

For people like you and I, the most real example of that is the smartphone we take everywhere with us. Your smartphone has been getting cleverer in your pocket and now IoT is accelerating change in our lives and ushering us rapidly into a period of dramatic change. Again.

We have more than 50 billion devices already connected to the internet – that's seven per human – but it's the next ten years which should really grab your attention, with this number expected to grow to over 500 billion by 2030.

As leaders, if you have not already begun to embrace data and opportunities to collect it and analyse it, you are about to be submerged by a data tsunami. This should matter to all leaders because it will shape the future of all organisations. McKinsey's Global Institute predicts IoT will have an economic impact of between $4 trillion and $11 trillion by 2025.

The question is not do I need to swim? But rather, if you want to survive this next disruption, can you swim?

Alongside this massive growth in data availability, the second accelerator of IoT has been advances in connectivity. If we take just one area of IoT, say, remote sensors in water utilities, we have had technology for some time, which was robust in terms of connecting sensors, but was only useful as monitors that could say "I'm too hot" or "I'm broken, please fix me".

With GPRS, and now 5G, offering us a continuous data stream, we can have a two-way dialogue with a device, which means we can add control. When I say control, I hope your senses are raised. This has revolutionised IoT from an intelligence perspective, because centralised decisions can be made which allow the control of remote devices. For example, the device might say "the water level is too high in the reservoir" and the central system replies "please discharge water downstream".

Of course, if the wrong reservoir was emptied the consequences would be serious and so we reach the third element of IoT's recent rapid development: security. The biggest IoT security risks involve software. Software attacks can exploit entire systems, steal information, alter data, deny service and compromise or damage devices.

Many IoT devices still present a cybersecurity risk because they are based on old protocols and easily hackable, but this is changing rapidly and security is increasingly being baked in at the design stage. However, as we move towards a future when more and more processing is done at the point of data collection, the edge, there is still much to address.

So what does all this mean for us as digital leaders? We have to see IoT as an opportunity or face a bleak future. As leaders, we should already be shaping overall strategy by placing particular emphasis on how digital technologies are continually changing and the opportunities this presents our organisation.

It's now about you as senior leaders recognising IoT's impact and understanding the art of the possible, starting with the culture of your organisation, not strategy. It's about moving to a culture that can keep pace with constant change, where new models of working and plenty of collaboration are energising rather than frightening. So, as leaders, let's ensure we accept we truly face the internet of everything and learn to swim.

Robin Knowles
Chief executive
Digital Leaders

Commercial feature

Can all businesses reap IoT rewards?

Most businesses see the opportunities the internet of things (IoT) can offer and yet six in every ten IoT projects fail at the proof-of-concept stage

A common problem with IoT innovations is devices are not designed to be market ready and struggle to prove their business case. But the options available to businesses are growing and help is at hand.

When a healthcare startup needed to realise an innovative new concept for a health monitoring solution for the elderly, it sought help from AND Technology Research, a pioneering UK product development consultancy.

The startup had created a sophisticated algorithm to detect when an eldery person had fallen over, which ran on a sensor to be placed within a person's shoe.

The idea was this would remove the need for the user to wear or interact with the device, but off-the-shelf hardware made the product too big to fit and therefore unsuitable for manufacture. It was hard to prove the business case to investors and developing a whole new bespoke product would have been too costly.

Using its c2 platform of plug-and-play IoT solutions, AND Technology Research reengineered a low-powered and Bluetooth-enabled design that fitted. It also created an app so it could be used through a smartphone, making the device production ready.

"From beginning to end, that job took us two weeks," says Dr Nicola Thorn, chief executive of AND. "It meant the startup could show stakeholders a scalable design that could be taken forwards without crippling costs to the startup."

The number of connected IoT devices, including machines, sensors and cameras, is forecast to hit 43 billion worldwide by 2023, opening up huge commercial opportunities.

> **Too often much of the effort is spent just reinventing the wheel and creating unnecessary costs**

THE IOT DEPLOYMENT JOURNEY IN NUMBERS

90% of enterprise leaders say IoT is critical to their success
Forbes

60% of IoT projects fail at Proof of Concept stage
IOT Now

47% of businesses say cost and ROI are the main barriers to IoT
Internet of Business

50% time reduction using c2
AND internal data

But many developers feel lost about where to start when bringing new solutions to market and nervous about the risks involved.

Many IoT consultancies charge prohibitive prices to help firms develop bespoke hardware and software solutions, where they build everything from scratch. Meanwhile, do-it-yourself alternatives are usually difficult to turn into viable, market-ready products and often come with security vulnerabilities.

AND Technology Research offers businesses from all sectors an alternative. Its carefully curated c2 platform comprises a suite of fully tested modular tools and reference designs that allow bespoke solutions to be easily built which meet their needs.

The firm then manages the product life cycle of those solutions to ensure they run smoothly for years to come.

"Businesses may feel they need to spend large amounts with consultancies to design their sensors and products from scratch, but too often much of the effort is spent just reinventing the wheel and creating unnecessary costs," says Thorn.

"Guided by decades of expertise, we achieve the same results for a fraction of the cost by piecing together easy-to-use modules."

As the IoT market becomes more accessible to businesses, they need to think carefully about how they will invest in and capitalise on digital transformation. Those that cannot turn innovations into minimum viable products ready for the manufacturing process will fall at the first hurdle.

Similarly, if they do not redesign pre-existing products that are under-performing, they will miss out on revenue and efficiency gains.

AND Technology Research has been working in the connected devices space since 1980 and offers a wealth of expertise. By shepherding clients' concepts from drawing board to market, it removes the hassle and high costs of the innovation process, dramatically reducing the risks of failure.

As more devices are connected to the internet worldwide, competition in the IoT sector will intensify. There is a risk that a handful of well-resourced giants will come to dominate if developers do not tear down the barriers to entry.

By ensuring products have a strong business case from the outset, innovators will give themselves the best chance of carving out a space in this fast-growing market, putting them on a clearer path to success in the connected future.

If you are looking for an award winning partner to implement an IoT initiative in your business, please visit www.andtr.com or email and@andtr.com

AND Technology Research

SMART CITIES

Cities are only as smart as their businesses

A truly smart city is one which is built on a free and open exchange of data, supplied by businesses and enabled by the internet of things

Aaron Black/Getty Images

Las Vegas is using IoT technology to help city personnel make better decisions

Jonathan Weinberg

Science fiction provides fantastic visions of a connected city, but as this futuristic reality dawns, its success will be driven by companies using the internet of things (IoT).

From smart energy grids to traffic logistics, public transportation to waste management and street lighting to connected living or working, vast networks of sensors across smart cities will harness masses of data collected in ways we've never seen before.

But unless the C-suite prepares right now to lead, and is willing to fund innovation, it may fail to satisfy the demands of employees, customers, suppliers and citizens.

José Manuel Benedetti, director of strategy and digital transformation at Insight, says: "A smart city means more than allocating free parking spaces or optimising street lighting with smart lamps. C-suite executives need the technology to take advantage of the huge amount of data connected cities will create.

"Many organisations still rely on human employees to review data from IoT applications and make decisions. The volume of data from even a small smart city would make this impossible. They need layers of automated decision-making algorithms to complement the process and give human decision-makers only the information they need."

Establishing itself at the heart of a smart city ecosystem will also be a key challenge for business. As Benedetti explains, each must consume and use data, while generating and feeding back its own so the streams react to each other.

> **Cities that invest, cities that learn, cities that understand the technology, will be the cities of the future**

"One of our clients uses drones with smart image processing software to monitor railway tracks for faults," he says. "In a smart city, a similar application for roads would, when combined with businesses' own data from their vehicles, identify when infrastructure, such as bridges, is overloaded and needs repair. Data from these vehicles then helps the city plan any extra traffic control measures."

With so much being promised, experts believe the C-suite needs a long-term, structured approach to harness these opportunities and help them cope with new policies and rules.

Nick Sacke, head of IoT and products at Comms365, says digital-twin programmes can be the answer. Cities create a digital copy of the infrastructure and operations and this updates dynamically when data from sensors and other sources is received and processed.

He explains: "This is a fantastic resource and facility for companies that want to play a role in the planning and delivery of infrastructure, utilities and services, as potential complexities and problems can be modelled upfront.

"Access to the digital-twin data in many cities is planned to be made available to all businesses, with some data sources freely available, while others are chargeable. The return on investment for using their enhanced data should be well worth the investment."

One current example of smart city ideas using IoT is in Las Vegas. With 40 million visitors a year, it worked with NTT, in partnership with VMware and Dell Technologies, to create a real-time network of information that uses artificial intelligence and machine-learning to remove a significant burden from key city personnel when it comes to critical decision-making.

Michael Sherwood, director of innovation and technology for the City of Las Vegas, says: "Cities that invest, cities that learn, cities that understand the technology, will be the cities of the future."

Smart cities will also offer companies the chance to develop better logistics over time, creating agility for stock supplies and storage plus efficiencies in delivery, while informing demand-driven manufacturing in smart factories. Much will be driven by 5G, resulting in data transfer speeds and the responsiveness of multiple devices being used at once increasing greatly.

Kevin Hasley, chief executive at RootMetrics, says: "Smart cities can be crucial for businesses by enabling them to better understand the urban realm and powering game-changing tech applications like autonomous vehicles and drones.

"Pitfalls though could lie in timing the investment needed, varying 5G adoption rates and speeds of implementation, plus regulatory barriers, which could cause issues and delays in future. Understanding the local performance standards of 5G is going to be crucial in helping businesses to navigate this and make the most of the smart cities opportunity."

Applied futurist Tom Cheesewright thinks data literacy as another challenge. "Most organisations are struggling to make good use of the data they have to drive evidence-based decisions. Companies won't realise the benefits of IoT technologies unless they address this," he says.

"The technology investment is probably quite small. It's more about skills and culture. Who has access to the data? Who is responsible for extracting answers? How do different functions collaborate around that data?

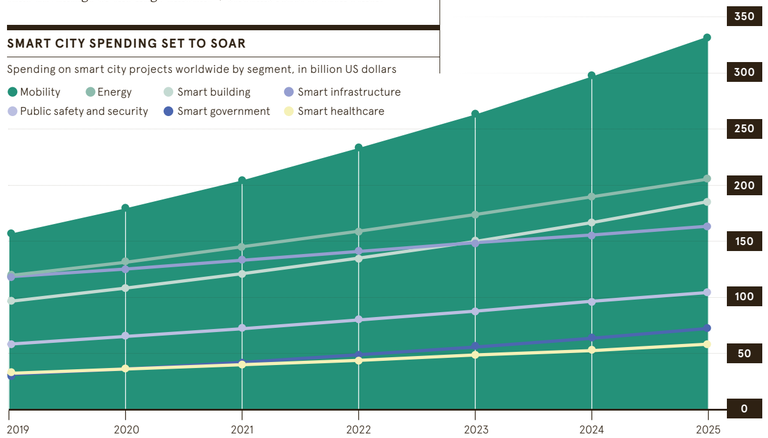
"A technology-first approach is the biggest trap; a whole city monitored and controlled from a tablet is attractive to some in leadership, but the most successful cities are necessarily messy and organic. You need to start by laying out a coherent framework, but then pick single problems you can solve and build those as point solutions."

Alicia Asín, chief executive of Libelium, says companies must not forget the end-user. "For any of these smart city solutions to work, experience tells us that citizen buy-in is critical," she says.

"None of us would have thought we would need to encourage people to use contact-tracing and social-distancing apps. It has required building trust and ensuring transparency as not everyone will be skilled at using some of the new technologies. More than ever, we need to address this end-user audience and make sure they become part of the smart city solution."

SMART CITY SPENDING SET TO SOAR

Spending on smart city projects worldwide by segment, in billion US dollars



Statista 2020

CONSULTING AND SOFTWARE DEVELOPMENT

AQUAQ Analytics

AquaQ Analytics provides consultancy and software development assistance to clients on both a project team, and on an individual consultant basis. This can be directly on client-site or working from our Belfast offices through our near-shore model.

Our project teams can deliver full end-to-end development projects for clients, from project inception to go-live, including business analysis, development, testing and project management services. We can also assist clients on projects where they are implementing some of the offerings from the AquaQ Product Suite.

AREAS OF CONSULTING & SOFTWARE DEVELOPMENT EXPERTISE INCLUDE THE FOLLOWING:

kdb+, TorQ and Time Series Analytics

AquaQ are at the forefront of Consultancy and Software Development efforts around the kdb+ technology with a team of in excess of 150 kdb+ Developers. The people in our kdb+ Division are not only skilled in kdb+, but also in associated areas ranging across devops, python, UI technologies, analytics and integration with other technologies.

To assist clients in their kdb+ related projects, AquaQ has created a suite of Products based around our TorQ Framework for kdb+. In many of our client projects, we will utilise these products to enhance service offerings and get projects to Production ready system status more quickly.

Data Science Services

AquaQ provides project teams to tackle both data projects and data analytics projects. Our Data Scientists are skilled in data storage technologies, data integration tools, data quality analysis and analytics – ranging from data aggregation right through to data modelling using machine learning, AI and statistical techniques. Project engagements range from Broker Report consolidation to Trading Data Analytics to Retail Bank Scenario Analysis to Source of Funds modelling to Utilities data analytics to Health data analytics.

UI Visualisation Technology

AquaQ specialises in UI development of bespoke, reactive web applications in message driven architectures. AquaQ build UIs which can analyse timeseries data in real-time and integrate with big data ecosystems. We are also a Professional Services Implementation partner to Altair Panopticon which is frequently used to visualise kdb+ and other sourced data.

Enterprise Java

AquaQ specialises in serverside development of bespoke data solutions, legacy re-platforming and feature addition, using a blend of mature technologies coupled with leading edge innovations. All backed with a wealth of industry domain knowledge and database technologies. AquaQ are specialists in high performance feedhandler development, messaging systems, real-time data pub-sub and analytics with experience in IOT sensor data, Healthcare, Energy and Finance sectors.

Cloud Solution Implementation

AquaQ operate at scale with enterprise devops, continuous delivery and cloud computing. Our cloud adoption service helps organisations with architectural, technical and governance issues whether that is in cloud migration, using hybrid cloud approaches and achieving secure technology platforms. AquaQ has expertise across MS Azure, AWS and Google Cloud technologies and the toolkits and software that allow delivery of modern solutions such as Containerisation, Compute, Storage and Distributed Databases.

Our Cloud expertise spans both kdb+ and non kdb+ technologies.

For more information on any of the above services, please email us at **info@aquaq.co.uk**