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# The IoT Business Index 2020:

a step change in adoption

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## Contents

- 2** Executive summary
- 4** About this report
- 5** Introduction: The state of the IoT
- 7** Chapter 1: From planning to practice
- 13** Chapter 2: Creating value from IoT data
- 20** Conclusion
- 21** Appendix 1: Index methodology
- 22** Appendix 2: Survey results

## Executive summary

Back in 2013, The Economist Intelligence Unit launched the inaugural Internet of Things (IoT) Business Index to measure commercial adoption of the then-emerging technology. Unsurprisingly, companies were in the nascent stages of IoT integration at that time. More surprising was the first follow-up study in 2017: despite considerable discussion, business adoption of the IoT had advanced only marginally in the intervening years.

The index, which is based on a global and cross-industry executive survey, is now in its third edition, providing a rare longitudinal measure of IoT implementation. This edition shows that between 2017 and 2020, a step change in IoT adoption took place.

This report, which is sponsored by Arm, examines the results of the IoT Business Index survey and draws on in-depth interviews with executives who have led or advised on IoT initiatives within companies or founded IoT-based businesses.

The key findings of the study include:

- **Since 2017, both internal and external-facing IoT adoption have advanced substantially.** The score for the application of IoT to products and services jumped from 4.43 (“in planning”) in 2017 to 5.96 (just shy of “early implementation”), meaning the average company is now on the cusp of early implementation of IoT-powered products and services. The score for IoT adoption in internal operations (such as monitoring the status of plant and equipment, tracking energy consumption, etc) jumped even further, from 4.34 to 6.82, firmly in the “early implementation” bracket.
- **This progress reflects increased investment.** Of the executives surveyed, 82% say their organisations grew their IoT investment in the past three years, up from 62% who said the same in 2017. One in five businesses (20%) grew that investment by 50% or more. For 10% of manufacturers, it more than doubled. This investment is delivering returns, respondents say: most agree either “somewhat” (38%) or “strongly” (19%) that their use of IoT has delivered “more than its expected return on investment”.
- **A “path to business value” for the IoT has emerged.** Companies’ first forays into the IoT typically focus on single, application-specific projects that provide a clear return on investment. But value increases as IoT data are merged with other data sets, incorporated into predictive or prescriptive analytics, and used to integrate processes that cross divisional and organisational boundaries. Successful companies are those that plan a multi-year path towards these higher-value capabilities.

- **The next frontier of progress will be to use IoT data strategically.** More than two-thirds of respondents agree that understanding the value of data helps them articulate the business case for IoT investments. However, only 16% “strongly” agree that “the use of the IoT at my organisation has been informed by an overarching data strategy”. Correspondingly, most implementations to date have focused on monitoring products or operations rather than prediction and design.
- **Artificial intelligence (AI) is viewed as vital to realising the value of IoT data.** Just over a quarter of survey respondents (26%) say that IoT data are pivotal to their current or planned use of AI, with 56% identifying IoT as “one of many important sources” for AI initiatives. Furthermore, 64% agree that “the value of IoT data to my organisation has increased as we have developed our AI capabilities”. Many interviewees view IoT and AI as two components of an advanced analytics capability. Reportedly, algorithms trained on data sources including IoT provide the greatest value and competitive differentiation.
- **Security concerns still hamper IoT adoption.** Forty-five percent of respondents believe that security concerns have held back consumer adoption, although respondents from the consumer goods and retail industry were the least likely to agree. Thirty-seven percent says these concerns have discouraged their companies from pursuing an IoT strategy. More positively, the survey reveals that security capabilities grow as companies progress with adoption: 55% of respondents whose organisations have reached “extensive” IoT adoption say they have the internal expertise and resources that IoT security requires.

## About this report

*The IoT Business Index 2020: a step change in adoption* is written by The Economist Intelligence Unit and sponsored by Arm. It examines the results of our latest IoT Business Index, a measure of IoT adoption by the global business community. The index draws on a survey of 825 business executives, conducted in late 2019.

Survey respondents were drawn from Europe (30%), North America (30%), Asia-Pacific (30%) and the rest of the world (10%). Seventy-five respondents work in each of the following industries: financial services; manufacturing; healthcare, pharmaceuticals and biotechnology; information technology; energy and natural resources; construction and real estate; automotive; infrastructure; agriculture/food; and outsourced facilities management. Half were drawn from companies with annual revenue of more than US\$500m and half from smaller companies. See Appendix for a note on the index methodology.

We interviewed the following executives for the report (listed alphabetically by organisation name):

- Nancy Hartsoch, co-founder and CEO, AquaSeca
- Dr Frank Maddux, global chief medical officer and member of the management board, Fresenius Medical Care
- Nathalie Wright, group digital and IT transformation director, Rexel
- Luke D'Arcy, co-founder, Sensize
- Regu Ayyaswamy, global head of IoT and engineering services, TCS

We would like to thank all interviewees and survey respondents for their time and insight.

## Introduction: The state of the IoT

When we last measured business adoption of the IoT in 2017, we found a technological transformation that had yet to begin in earnest. “Most companies are (perhaps to their frustration) still in the early phases of their IoT journey,” we wrote at the time.

However, the IoT Business Index 2017 also predicted that faster progress was imminent, as two-thirds of companies expected to grow their investment in the following three years. “With this level of executive backing and planning investment, the IoT promises to be in a very different—and more advanced—state in three years’ time,” we noted. That prediction has been vindicated.

Even before this year’s study, there was ample evidence that the long-predicted advent of the IoT was at last coming to pass. Since 2017, the most common metric of the IoT—the number of Internet-connected devices (excluding PCs, smartphones etc)—has grown faster than anticipated. According to IoT Analytics, this figure grew to 9.5bn at the end of 2019, substantially ahead of the market research company’s prediction of 8.5bn<sup>1</sup>.

This growth was driven by three factors, IoT Analytics notes: an explosion in smart-home products, much stronger growth in mobile machine-to-machine connections, and especially rapid adoption in China.

Certainly, the expansion of the market for connected consumer products is the most visible sign of the IoT’s growth since 2017. E-commerce giant Amazon’s category-creating Alexa smart speaker was launched in 2014 but adoption has snowballed in the

past three years: according to research from broadcaster NPR, the number of smart speakers in use in the US grew by 135% from 2017 to 2019, from 67m to 157m.<sup>2</sup>

“If you look at the retail and consumer-device segment [of the IoT], adoption is far greater than it was in 2017,” says Regu Ayyaswamy, global head of IoT and engineering services at IT services provider TCS. “If you go into a [US electronics retailer] Best Buy today, there will be an aisle full of smart home products, from cloud-connected security cameras to garden sprinklers that react to weather data.”

A handful of major acquisitions in the consumer IoT industry signified a maturing market. Most notably, Amazon acquired connected home security camera provider Ring for US\$1bn in 2018, and Google purchased Fitbit, creator of the market-leading fitness wearable, for US\$2.1bn later the same year. The deal is expected to bolster the search titan’s burgeoning healthcare business.



<sup>1</sup> Knud Lasse Lueth, “IoT 2019 in Review: The 10 Most Relevant IoT Developments of the Year”, IoT Analytics, January 7th 2020. <https://iot-analytics.com/iot-2019-in-review/>

<sup>2</sup> NPR, The Smart Audio Report, January 2020. <https://www.nationalpublicmedia.com/uploads/2020/01/The-Smart-Audio-Report-Winter-2019.pdf>



**If you look at the retail and consumer-device segment [of the IoT], adoption is far greater than it was in 2017.**

*Regu Ayyaswamy, global head of IoT and engineering services, TCS*

It was not all rosy for the consumer IoT, however. News reports of security breaches included the disturbing story of a hacker threatening an 8-year-old girl through her family's connected security camera.<sup>3</sup>

But there is more to the IoT than consumer devices. The IoT Business Index tracks

business adoption, with respect to both products and services (which may be consumer- or business-facing) and to internal operations. Industrial applications of the IoT may not have seen the same rapid expansion as their consumer counterparts—not least because they require more time and investment—but there was certainly evidence of implementations gathering pace.

According to research company Berg Insight, by 2018 there were 34m vehicles with connected telemetry systems on the road globally, 10m connected street lights and 61m cargo tracking devices in operation.<sup>4</sup> IoT Analytics estimates that 14% of the world's utility meters are now smart.<sup>5</sup>

Hence the headline finding of this year's IoT Business Index: *a step change in adoption.*



<sup>3</sup> Minyvonne Burke, "Man hacks Ring camera in 8-year-old girl's bedroom, taunts her: 'I'm Santa Claus'", NBC News, December 12th 2019. <https://www.nbcnews.com/news/us-news/man-hacks-ring-camera-8-year-old-girl-s-bedroom-n1100586>

<sup>4</sup> Berg Insight, various reports, 2019. [http://www.berginsight.com/News.aspx?m\\_m=6&s\\_m=1](http://www.berginsight.com/News.aspx?m_m=6&s_m=1)

<sup>5</sup> Pdraig Scully, "Smart Meter Market 2019: Global penetration reached 14% – North America, Europe ahead", IoT Analytics, November 19th 2019. <https://iot-analytics.com/smart-meter-market-2019-global-penetration-reached-14-percent/>

## Chapter 1: From planning to practice

The IoT Business Index comprises two 10-point scales, tracking the adoption of IoT in the context of products and services and internal operations respectively. These measures are based on a global survey that asks executives to rate their organisation’s adoption in both contexts on a scale from “non-existent” to “extensive”. Responses are then converted into numerical scores and aggregated.

In 2020, the aggregate score for the application of IoT to products and services jumped from 4.43 (“in planning”) in 2017 to 5.96 (just shy of “early implementation”), meaning the average company is now on the cusp of early implementation of IoT-powered products and services. The score for internal operations jumped even further, from 4.34 to 6.82, firmly in the “early implementation” bracket (see figure 1).

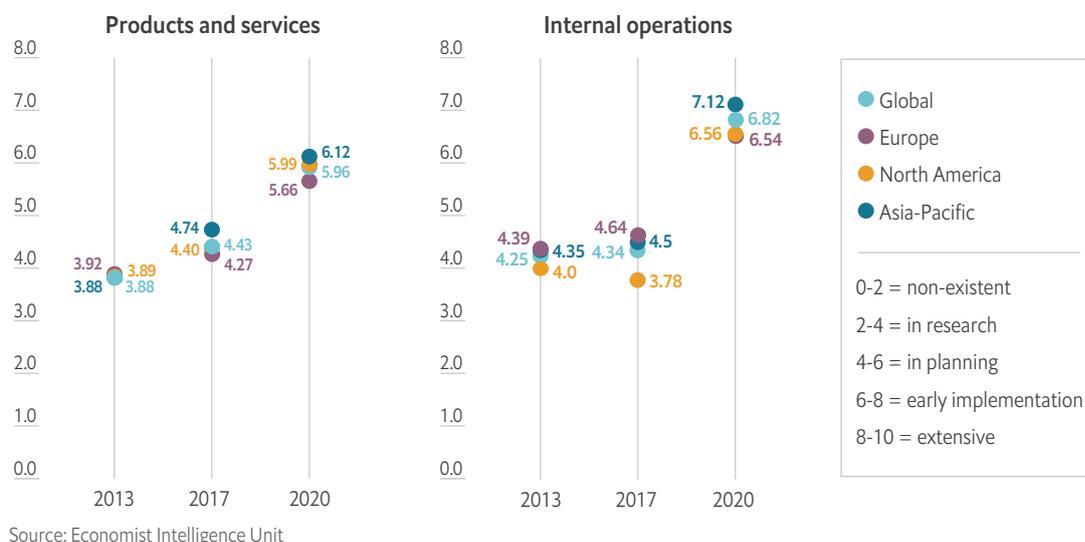
In short, between 2017 and 2020 the typical company’s IoT initiatives went from planning to practice, the index reveals.

Businesses based in Asia-Pacific, the world’s manufacturing base, were ahead in both measures. At 7.12, the index score for Asia-Pacific companies’ use of IoT in internal operations is well on its way towards “extensive implementation”. Europe and the US were roughly equal in both measures.

All industries included in the study progressed in both internal and outward-facing IoT adoption. The most advanced in terms of products and services are information technology (IT) (6.4), manufacturing (6.37) and, most surprisingly, food and agriculture, which leapt up to 6.4 from 2.83 in 2017 (see figure 2).

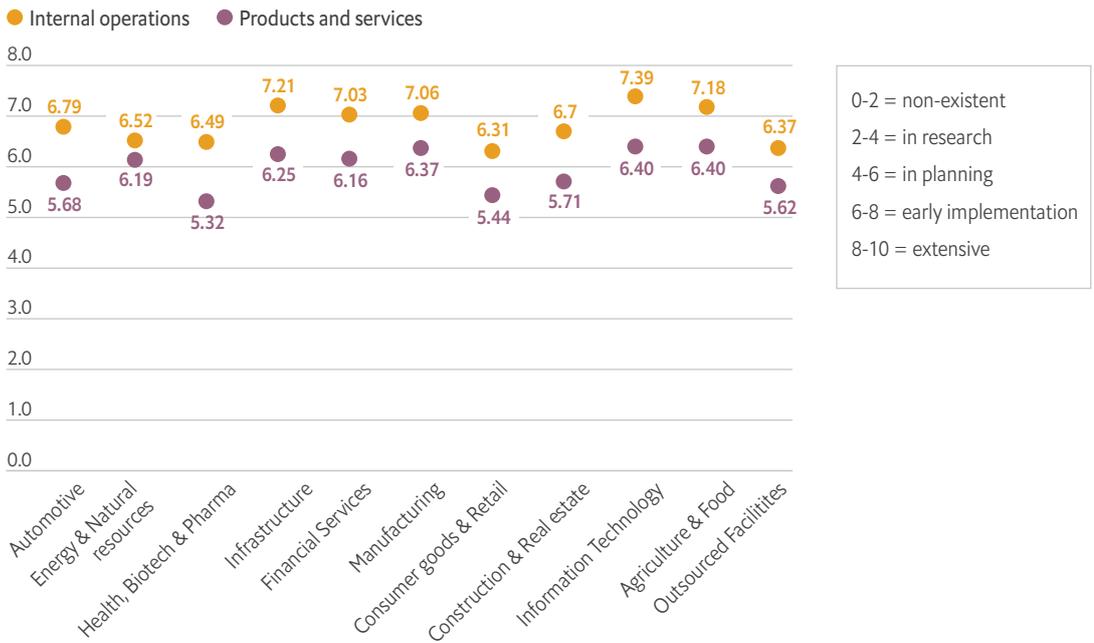
**Figure 1. How the IoT Business Index has progressed**

Advances in IoT adoption from 2013 to 2020



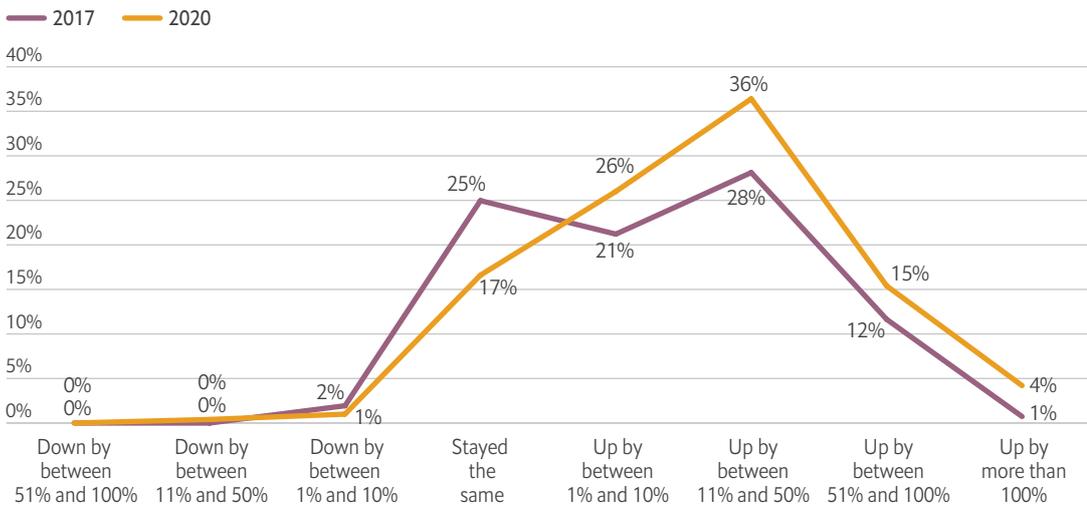
**Figure 2: Progress by industry**

Industry scores for the IoT Business Index 2020



**Figure 3: Accelerating investment**

How IoT investment grew in the past three years, 2017 vs 2020 (% of respondents)



Source: Economist Intelligence Unit.

For internal operations, the IT (7.39), infrastructure (7.21), and food and agriculture (7.18) industries led in IoT adoption, with all sectors being firmly in the “early implementation” phase.

This progress was driven by accelerated investment, the survey reveals: 82% of respondents say their organisations have grown their IoT investment in the past three years, up from 62% who said the same in 2017. One in five (20%) grew that investment by 50% or more (see figure 3). For 10% of manufacturers, it more than doubled.

### Return on investment

That investment is paying dividends, respondents report. The majority agree either “somewhat” (38%) or “strongly” (19%) that their use of IoT has delivered “more than its expected return on investment”.

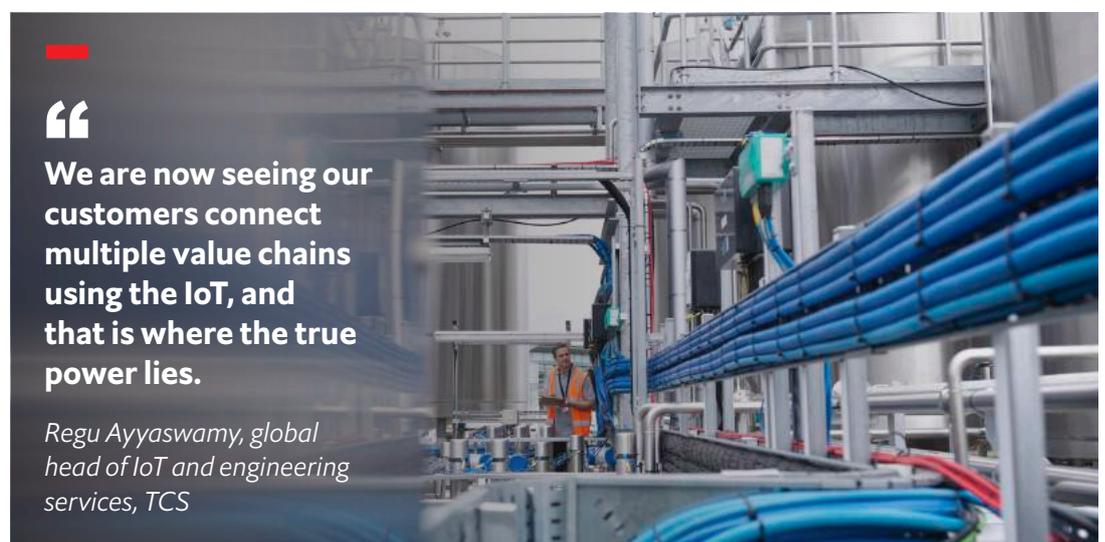
Crucially, agreement with this statement grows as organisations’ IoT initiatives progress: 32% of respondents who have reached “extensive” implementation in either internal or external IoT “strongly” agree, compared with 19% who have progressed only as far as early implementation.

This chimes with the experience of TCS’s Regu Ayyaswamy, who identifies three phases of IoT adoption, each returning greater value to the business than the last. “The first, basic stage is when you are collecting data from a device—let’s say a motor that is operating at a customer site—and you visualise that data and it provides some intelligence,” he explains.

“The next stage is when you build analytics into the system, and add more dimensions to the data, so you can start to make predictions and take corrective action, such as predictive maintenance.

“The third stage is when you put that IoT data in the context of your value chain, either within the enterprise or across your ecosystem,” he adds. An example might be a manufacturer collecting data from its delivery trucks so any delays to production can be anticipated well in advance.

“When you start with the IoT and just use it for data collection, it may not yield much business value until you connect [that data] with other systems and eventually value chains,” Mr Ayyaswamy explains. “We are now seeing our customers connect multiple value chains using the IoT, and that is where the true power lies.”



“

**We are now seeing our customers connect multiple value chains using the IoT, and that is where the true power lies.**

*Regu Ayyaswamy, global head of IoT and engineering services, TCS*

Companies who have succeeded in deriving the maximum value from their IoT initiatives are those who have planned a multi-year route through these phases of implementation, he adds. These firms “look at IoT as part of a holistic business transformation. They lay out a clear path to value, describing which systems should be integrated to create additional value in a step-by-step manner, with a clear timeline.”

There is some evidence that companies increasingly view IoT adoption in this light: 65% of respondents agree “somewhat” or “strongly” that the IoT is one of the most important parts of their organisation’s digital transformation strategy. In 2017, this proportion was 46%.

However, most companies’ first steps in IoT adoption are likely to focus on single-application systems that provide a straightforward return on investment.

Sensize is a UK-based start-up whose system allows businesses such as retailers and logistics companies to track the pallets, roll-cages and other “packages” they use to move goods. According to co-founder Luke D’Arcy, customers are typically interested in the low-hanging fruit, to begin with at least. “It’s good to have a short-term, easy win to get

started,” he says. “We talk about the problem of lost packages. Some of these companies are losing up to 10% of their packages a year: you can put a cost on that and build a return on investment.”



**It’s good to have a short-term, easy win to get started.**

*Luke D’Arcy, co-founder, Sensize*

He acknowledges, though, that these short-term gains do not represent the full potential of IoT adoption. “For our technology to reach its full potential, we want our customers to match up the package tracking with the contents of the packaging, so they can track the contents throughout the supply chain. That means, for example, if a supermarket rejects some goods because they’re damaged, the supplier can track the supply chain and identify if the package was dropped somewhere.”

To do that, he says, “we need to capture the imagination of the wider business, not just the packaging department”.

For Fresenius Medical Care, a company that is highly vertically integrated and whose IoT-powered analytics efforts touch on every part of the company’s value chain (see box), the return on investment of those efforts is indistinguishable from the company’s overall success.

“The return on investment is really embedded in our overall performance and productivity as a company,” explains Dr Frank Maddux, the company’s global chief medical officer. “This is a long journey of investment and it is integral to the work we do.”



## Vertical integration helps Fresenius Medical Care fight kidney disease



**There is some aspect of this strategy involved in improving every patient's ability to live with this disease.**



A subsidiary of a more than century-old German healthcare company, Fresenius Medical Care is dedicated to the treatment of kidney diseases. Its various businesses include the manufacture and support of kidney dialysis machines, at-home and in-patient care services, and, in North America, health insurance for kidney disease patients.

As such, the company operates at every stage of the kidney health “value chain”. Its application of IoT sensors and advanced analytics shows the potential of this combination to integrate and optimise the links in these chains.

The treatment of kidney disease has always been a highly analytical pursuit, says Dr Frank Maddux, global chief medical officer and member of the management board. The company started building complex mathematical models to predict treatment outcomes over 20 years ago.

But in the past decade, multiple divisions of the business have recognised the potential of IoT technology. A range of sensors now monitor its dialysis machines and treatment facilities, enabling the firm to apply advanced analytics techniques to the resulting data.

These sensors and accompanying analytics help patients in a variety of ways, some of which are straight-forward. “Many patients with kidney disease cannot get rid of fluids, which creates increased stresses on the heart,” explains Dr Maddux. “We have sensing devices that allow us to

analyse the blood that is flowing through our dialysis machines, so we can measure blood volume and assess the appropriate volume to remove.”

Others are more complex. “One of our first forays into AI has been to model how anaemic patients react to the medication we give them to stimulate the body to produce red blood cells. Using the data from sensors in our dialysis machines, we’ve been able to create mathematical avatars of individual patients that allow us to predict what the precise response of a given quantity of medication will be.” This system now governs 95% of dosage decisions at its North American division.



**We’ve been able to create mathematical avatars of individual patients that allow us to predict the precise response of a given quantity of medication.**

The volume and variety of data Fresenius Medical Care collects has grown dramatically over the years, Dr Maddux says. “In our North American operation,

we have aggregated over nine petabytes of data to create these predictive models.” That has forced the company to adopt ever-increasing computing firepower. “The first avatar model that we built, five or six years ago, took close to six weeks to complete all the computations. Now we can do hundreds in one day.”

Dr Maddux argues that the company’s ownership and integration of multiple layers of the kidney treatment ecosystem put it in a strong position to exploit these technologies. “Our vertical integration—from devices we manufacture through to the service network—means we can test out new functionality, roll it out, scale it up, and see what works well. It gives us the advantage of being able to move new techniques from idea to utility in a shorter period of time. And when the speed of adoption of good ideas increases, that changes what the standard of care is.”

The strategy is so fundamental and far-reaching that its commercial impact cannot be isolated from the company’s overall performance, says Dr Maddux. But its clinical impact is evident, he adds. “For every patient we touch, there is some aspect of this strategy that is involved in improving their ability to live productively with their disease.”

## Chapter 2: Creating value from IoT data

Whether they are measuring blood pressure during kidney dialysis or tracking the whereabouts of pallets of groceries, the value of IoT instruments derives from the data they produce and the ability of organisations to put them to use.

Survey respondents appear to confirm this: 69% agree “somewhat” or “strongly” that understanding the value of data has helped them articulate the business case for IoT investments.

The most widely adopted applications of IoT data are monitoring and optimising the performance of products or internal operations (43%) and using IoT data to inform operational decision-making (41%). The least common are using that data to influence product design and predictive maintenance (both 33%, see figure 4).

This last fact most likely reflects the need for both large, diverse data sets and a high degree of analytical sophistication. The industries where predictive maintenance has been most widely adopted are construction

and real estate (44%), automotive (41%), and infrastructure (36%). However, manufacturing—an industry highly vulnerable to technical interruptions to production—lagged behind with just 25% adoption, ahead of only agriculture.

Data management and analysis is the business function that the greatest proportion of respondents say has benefitted from IoT adoption (38%, see figure 5). And more than any other qualitative impact offered for selection, over a quarter (27%) agree with the statement: “the IoT has sparked a new wave of innovation thanks to data that give us better insights”. Among respondents whose organisations have reached “extensive” IoT adoption, either internally or externally, this proportion is 41%.

Given this acknowledgement that data are the conduit from IoT devices to business value, their use is not handled with as much strategic consideration as they might be, the survey suggests. Only 16% “strongly” agree that the use of the IoT at their organisation

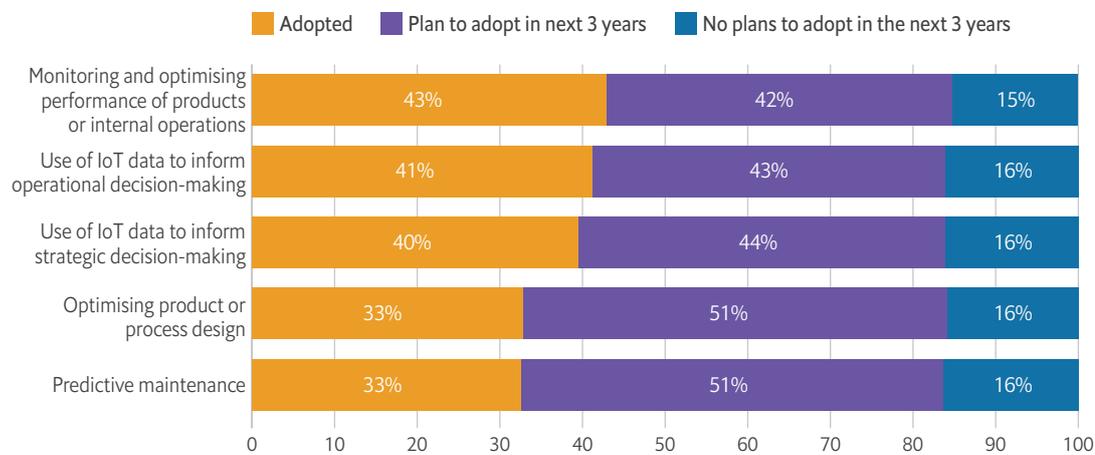


has been informed by an overarching data strategy, with another 42% agreeing “somewhat”. This strategic consideration of the IoT increases as adoption progresses:

73% of those who have reached “extensive” IoT adoption attest to an overarching data strategy directing their efforts, compared with 33% of those still in the research phase.

### Figure 4. Applications of IoT data

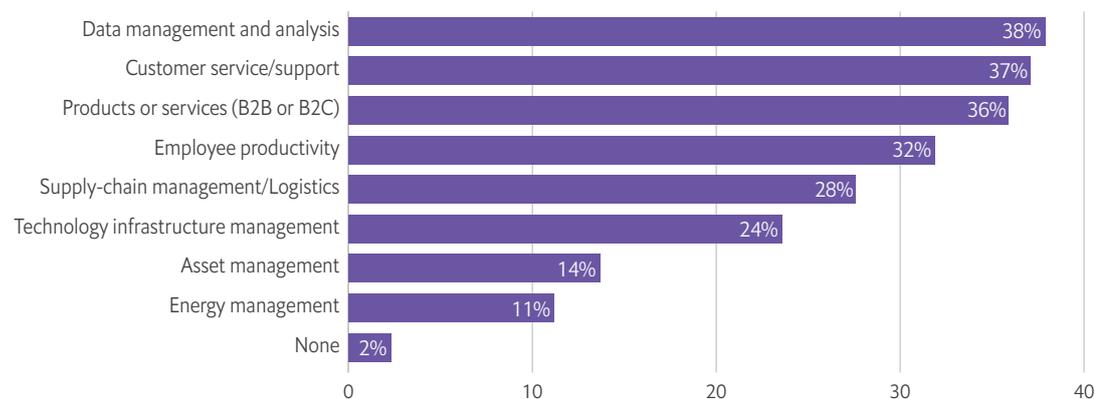
Most adopted or planned uses of IoT data  
(% of respondents)



Source: Economist Intelligence Unit

### Figure 5. Functional benefits

The business functions that have benefited most from IoT adoption  
(% of respondents)



Source: Economist Intelligence Unit

## Strategic direction

How can businesses ensure that the development, analysis and integration of IoT data are directed in the strategic interests of the company?

One crucial component is cross-functional collaboration. At Fresenius Medical Devices, the company's data-led digital strategy (to which connected sensors embedded in its products make an important contribution) emerged from multiple sources within the organisation simultaneously.

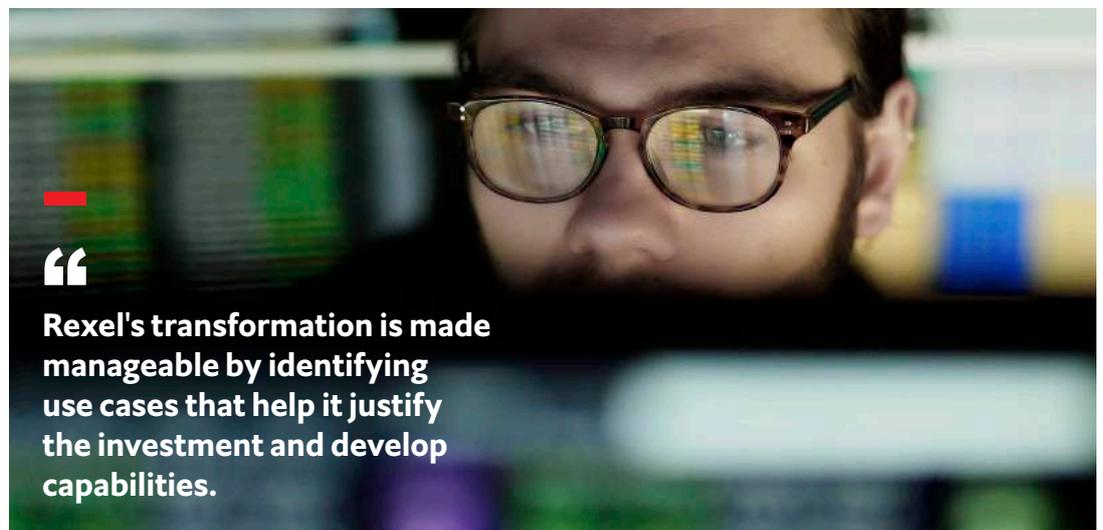
"The way we looked at our use of data has really sprung from seeds that germinated in many parts of the company," explains Dr Maddux. "Our engineering and manufacturing side began to recognise the value of [adding sensors and analytics] as we began looking at making the machines more reliable. On the clinical side, we began using advanced analytics to model human physiology and how that worked within the context of kidney disease care. And the business began to build its analytic capabilities to monitor traditional operational and financial key performance indicators. So, we have multiple areas of the

company that are actually developing these capabilities."

To ensure these efforts pull together in a single, strategic direction for the company, a cross-functional cohort of advanced analytics experts work in close collaboration. "We have applied advanced analytics teams in all of those areas," he says. "They are coming together to form a digital strategy, and although they are organisationally separate they act as a collective and highly collaborative group."

Another requirement is to prioritise projects with a clear business value. At Fresenius Medical Care, for example, "we don't embed our IoT and [analytical] capabilities in strictly the scientific part of our initiatives," Dr Maddux explains. "Every project is prioritised based on its clinical relevance and whether we believe we can create an output that a caregiver would benefit from in a reasonable amount of time."

A similar principle is guiding an IoT-powered digital transformation at Rexel, a French distributor of energy equipment and infrastructure.



**Rxel's transformation is made manageable by identifying use cases that help it justify the investment and develop capabilities.**

The industry is undergoing a process of rapid digitisation. “Even cable manufacturers are creating connected products,” explains the company’s group digital and IT transformation director, Nathalie Wright. What is lacking, however, is clear thinking on how to use the data produced by these instruments to create business value, she says.

Part of Rexel’s strategy is to use the data it collects from its customers’ facilities—either through the connected products it sells or through specially installed sensors—to build a bank of knowledge about how certain equipment performs in certain circumstances. This transformation is made manageable by identifying a series of high-value use cases that help Rexel justify the necessary infrastructure investments and development of the required capabilities.

“For example, we are working on a project called ‘next best offer’ to help us decide what alternative product or service we should be offering to particular clients based on the infrastructure they have now and their environment,” explains Ms Wright. “As we work through these use cases, we are building capabilities that can then be applied in new scenarios.”

In both organisations, IT has played a crucial role by creating a platform on which this innovation can flourish. “The first thing I did was to strengthen our IT platform,” Ms Wright says. “We are creating a new data layer that sits across our legacy enterprise resource planning systems.”

At Fresenius, while its advanced analytics initiatives are not led by the IT department, it nevertheless plays a crucial role. “Our IT division has become a huge part of the applied analytics team because they’re the ones that are managing how we’re acquiring this data,

how we’re storing it and making it available, and then especially how we’re actually delivering the insights back into the systems of care.”

Mr Ayyaswamy of TCS says this is common among successful IoT adopters: the IT department leads the infrastructure transformation that underpins a “path to value” identified by the business. Indeed, if the IT function is not brought into the IoT vision, he says, it can be difficult to progress along this path. That is by no means the norm, however: in fact, it is often the chief information officer who first identifies the potential value of the IoT for the organisation, he adds.

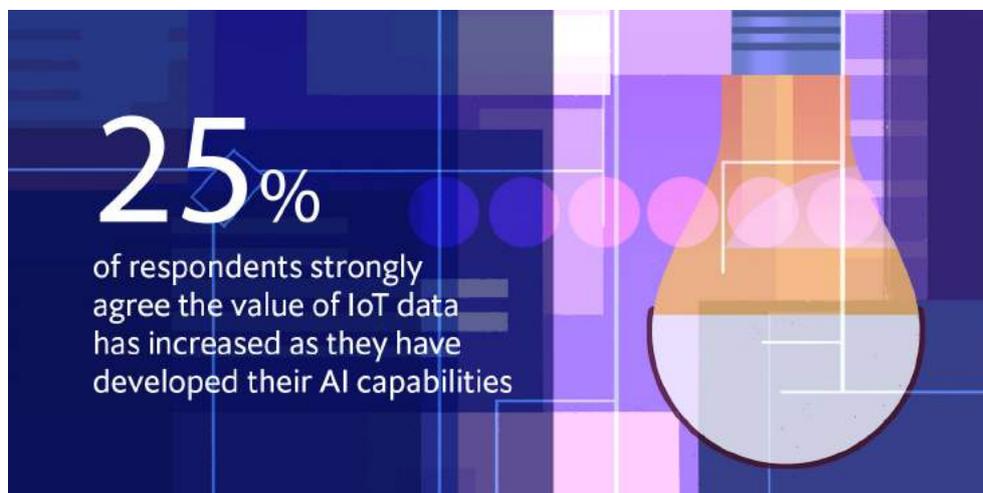
## Applied intelligence

There is one catalyst to the creation of business value from IoT data that was referenced by all our interviewees, and one whose adoption has advanced significantly since 2017: artificial intelligence (AI).<sup>6</sup>

“The data that IoT gives you can only provide so much value on its own,” says Mr Ayyaswamy. “But prediction is where the true value of that data comes from, and AI is what delivers that.”

Just over a quarter of survey respondents (26%) say that IoT data are pivotal to their current or planned use of AI, with a further 56% identifying them as “one of many important sources”. IoT data are most likely to be pivotal to the AI initiatives of manufacturing (35%) and facilities management (35%) companies, the survey reveals. Over half (53%) of respondents whose organisations have attained “extensive” adoption say IoT data are pivotal to AI efforts, compared with 23% at the “early implementation” stage (see figure 6).

<sup>6</sup> This topic is explored in greater detail in the accompanying article, “When IoT meets AI”



Furthermore, a quarter of respondents “strongly” agree that “the value of IoT data to my organisation has increased as we have developed our AI capabilities”; 39% agree “somewhat”.

Indeed, while AI is the driving force behind value creation and competitive advantage, many executives interviewed for this report view the IoT as one pillar of an overall transformation in their use and analysis of data.

An example is AquaSeca, a US startup whose offering helps building operators manage their plumbing infrastructure. Sensors attached to pipes and other components “listen” to acoustic vibrations and transmit any evidence of unusual activity to AquaSeca’s cloud. This data is then subjected to proprietary algorithms that infer signs of a leak or other abnormal usage, helping operators reduce the risk of water damage. “In the US alone, US\$10bn in damage to building assets is caused by leaks or malfunctioning equipment every year,” says co-founder and CEO Nancy Hartsoch.

The company holds a patent describing the way in which data from multiple sensors is combined to triangulate the location of a disturbance. “Having data from diverse

sensors is incredibly important to the richness of the database,” says Ms Hartsoch. Nevertheless, this is not the company’s most valuable intellectual property (IP), she says. “Our most important IP is our algorithms, edge computing methods, and the way we process the data in our cloud.”



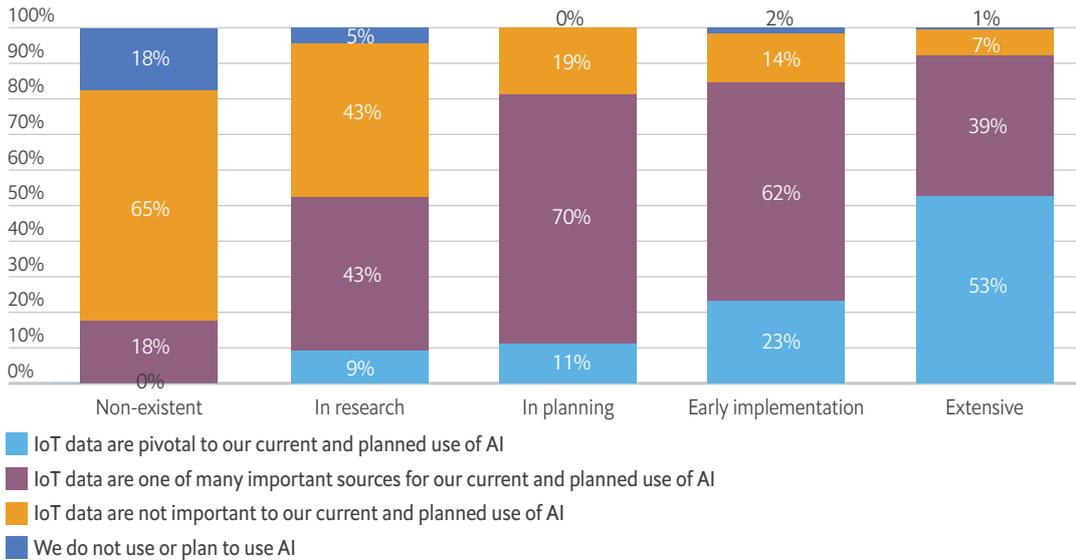
**The hardware is a tool to collect data. It is the amalgamation of IoT, AI, and cloud computing which enables transformational intelligence.**

*Nancy Hartsoch, CEO, AquaSeca*

For companies such as AquaSeca, the features and functions of the IoT are an important bridge between the physical and digital worlds. That bridge allows them to apply the latest advances in machine intelligence to physical environments, capturing knowledge that can then be applied to new settings and challenges. “The hardware is a tool to collect data,” says Ms Hartsoch. “It is the amalgamation of IoT, AI, and cloud computing which enables transformational intelligence.”

### Figure 6: IoT data and AI

Importance of IoT data to AI initiatives by most advanced stage of IoT adoption  
(% of respondents)



Source: Economist Intelligence Unit.

### IoT security concerns linger

IoT adoption may have leapt ahead since 2017 but this does not mean that concerns about security have abated. The IoT Business Index survey suggests that news reports of IoT-related data breaches (that have continued to pepper the headlines since 2017) had some negative impact on demand.

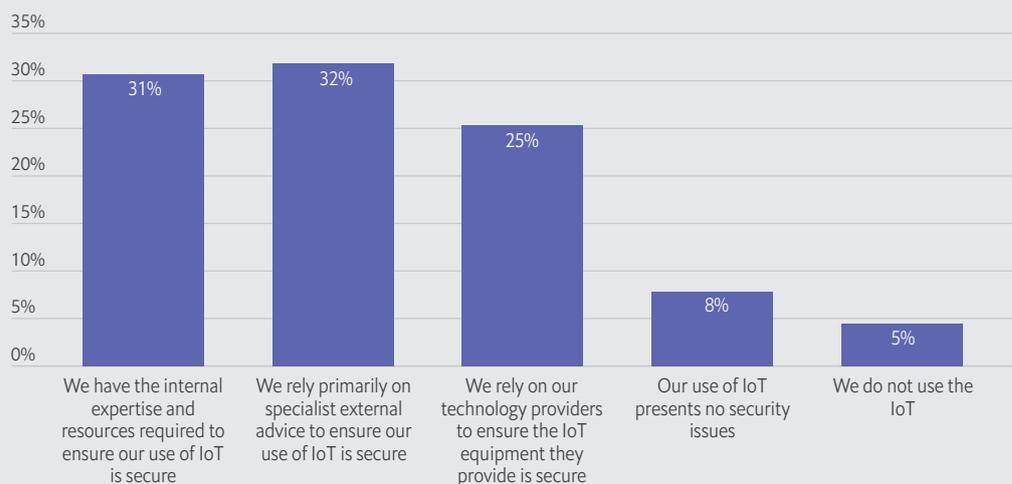
Forty-five percent of respondents agree “strongly” or “somewhat” that security concerns have held back consumer adoption. Interestingly, respondents from the consumer goods and retail industry were the least likely to agree with this statement (32%), suggesting either greater knowledge or wishful thinking. Thirty-seven percent say these concerns have discouraged their companies from pursuing an IoT strategy.



The provision of IoT security differs between companies, the survey reveals. A quarter say they rely on technology providers to ensure the IoT equipment they provide is secure; 32% say they

**Figure 7: Security self-reliance**

Which of the following best describes your company's approach to IoT security? (% of respondents)



Source: Economist Intelligence Unit

draw on specialist external advice. A similar proportion (31%) say they have the necessary expertise in-house (see figure 7).

Closer inspection reveals that this self-reliance is associated with the extent of IoT adoption: 55% of respondents whose organisations have reached “extensive” IoT adoption claim to be self-reliant, compared with just 10% of those in the research phase.

According to TCS’s Regu Ayyaswamy, security practices in the consumer IoT fall far short of those in the industrial arena. “Many consumer IoT devices are made by small companies, and their customers aren’t businesses who will audit the security of their products before adopting them,” he explains. “There is not much a consumer can do to determine the security of a product.”

“Discipline towards security is far greater in an industrial setting,” he adds. “IT departments at those companies do not allow any implementations of any kind to progress unless a very clear security architecture review is in place.”



**Discipline towards security is far greater in an industrial setting.**

However, he adds that industrial equipment may fall outside the IT function’s remit, and therefore may not be subject to its established information security practices.

## Conclusion

The IoT Business Index 2020 reveals that, after slow movement between 2013 and 2017, adoption finally progressed from planning into practice in the three years leading up to 2020. This report synthesises some of the lessons learned during this period of gestation.

Put simply, companies have made progress by concentrating on the value of IoT data. Applying the IoT to one area of operation, particularly one with a clear return-on-investment, is a viable first step. But the value of IoT data grows as it is integrated into other data sets, subjected to advanced analytics, tied into cross-functional business processes and, beyond that, cross-organisational value chains.

Many of our interviewees remarked that moving along this “path to value” often requires a leap of imagination for a company to overcome its traditional silos and assumptions.

“You need someone who is a real visionary and is prepared to put their neck on the line and invest in something that is new,” says Luke D’Arcy, co-founder of Sensize. Without that, he says, it can be hard for companies to move beyond the “low-hanging fruit” of application-specific implementations.

“There isn’t enough reflection on how companies can use this technology to create value,” says Rexel’s Nathalie Wright. “I spend a lot of my time educating colleagues and customers on the potential of our platform strategy. You need to think beyond the existing barriers.”

“You’ve got to get out of your own mindset” about what data is valuable to the business, Dr Maddux adds. “Weather data ended up being really important to us, both because of the impact that a patient’s environmental has on their physiology and because it affects whether patients will adhere to their therapy. We incorporate all kinds of data related to weather, major sporting events, cultural and environmental factors, into our models—anything that might impact a patient’s ability to follow through with their treatment.”

Finally, he says, “you’ve got to open your mind to recognise that these devices are not just devices: they are in fact platforms—in our case, platforms for therapy, for diagnostics and platforms for connected health allowing us to extract insight. That’s a paradigm shift”.



**You need to think beyond the existing barriers.**

*Nathalie Wright,  
group digital and  
IT transformation  
director, Rexel*

## Appendix 1: Index methodology

The Internet of Things Business Index 2020 is based on an online survey conducted by The Economist Intelligence Unit in October 2019. (See Appendix 2 for survey details.)

The index scores are generated from the responses to two questions in the survey:

- To what extent is your organisation using, or planning to use, the IoT in its products or services (eg, embedding sensors in products, developing services utilising data generated by IoT technology)?
- To what extent is your organisation using, or planning to use, the IoT in its internal operations (eg, to reduce energy consumption, monitor status of plant and equipment)?

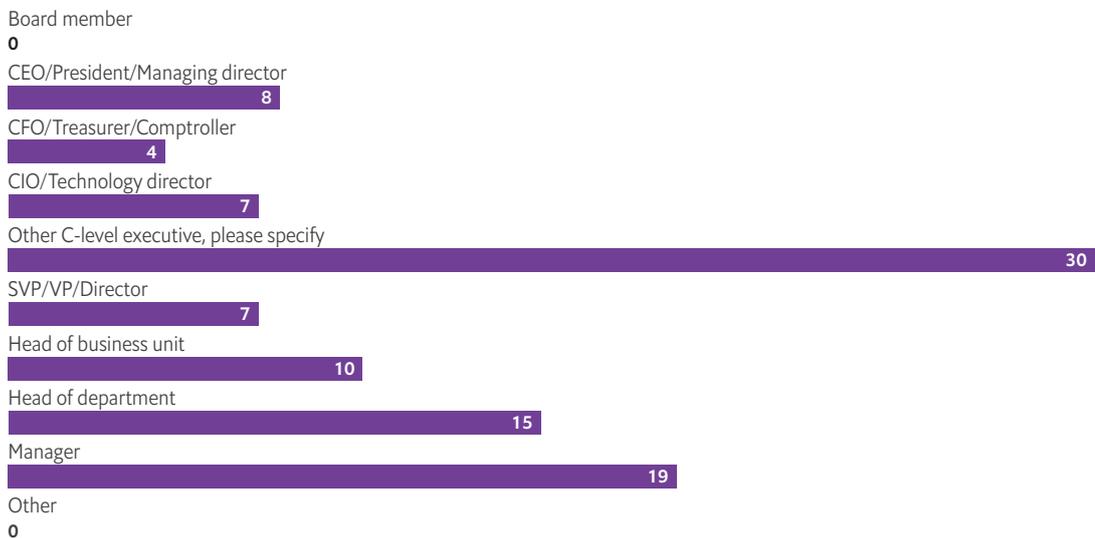
The response options to each question are: non-existent; in research; in planning; early implementation; and extensive. Each response option is assigned a score ranging from 1 (non-existent) to 5 (extensive). The responses to the questions are fed into a model which converts the scores—for the entire sample and for each regional and industry sub-sample—to a 1-10 scale, where:

- 0-2 = non-existent (or virtually non-existent)
- 2-4 = in research
- 4-6 = in planning
- 6-8 = early implementation
- 8-10 = extensive

## Appendix 2: Survey results

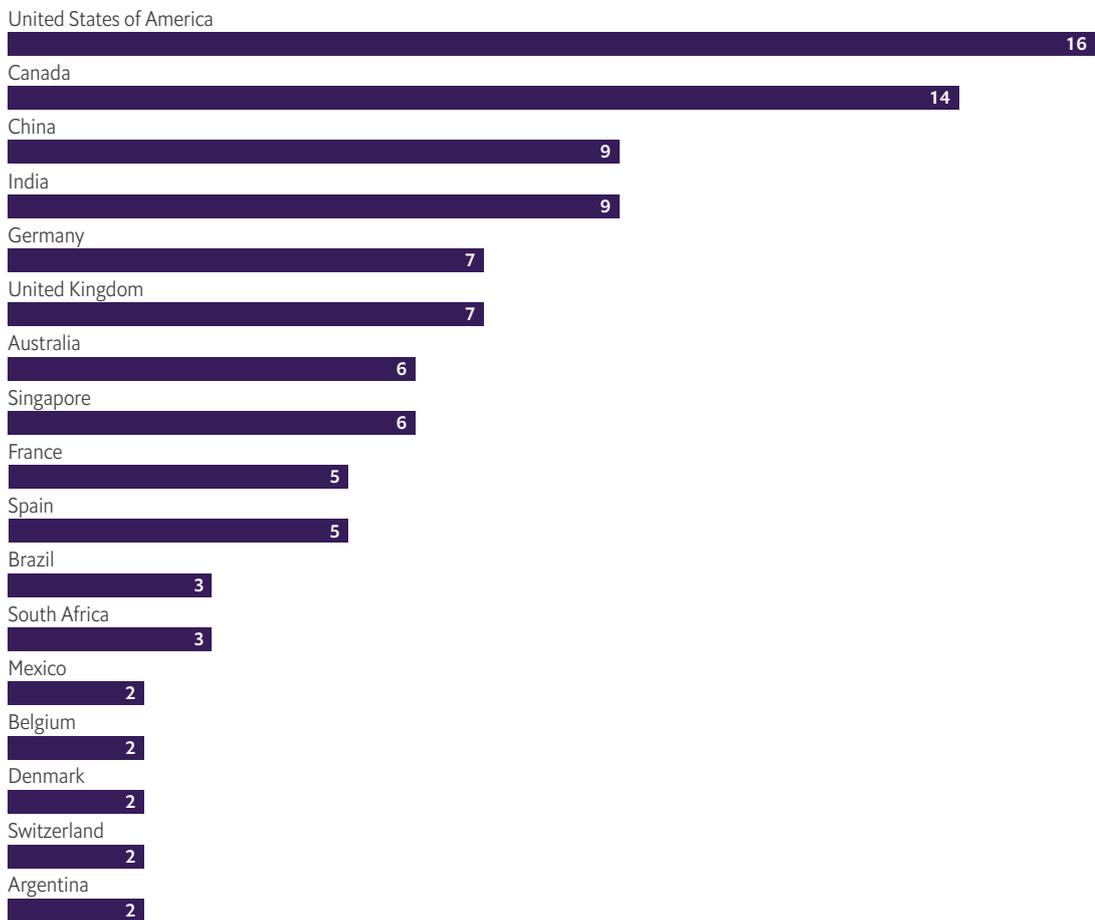
### D1. Which of the following best describes your title? Select one

(% respondents)



### D2. Where are you personally located? Select one

(% respondents)



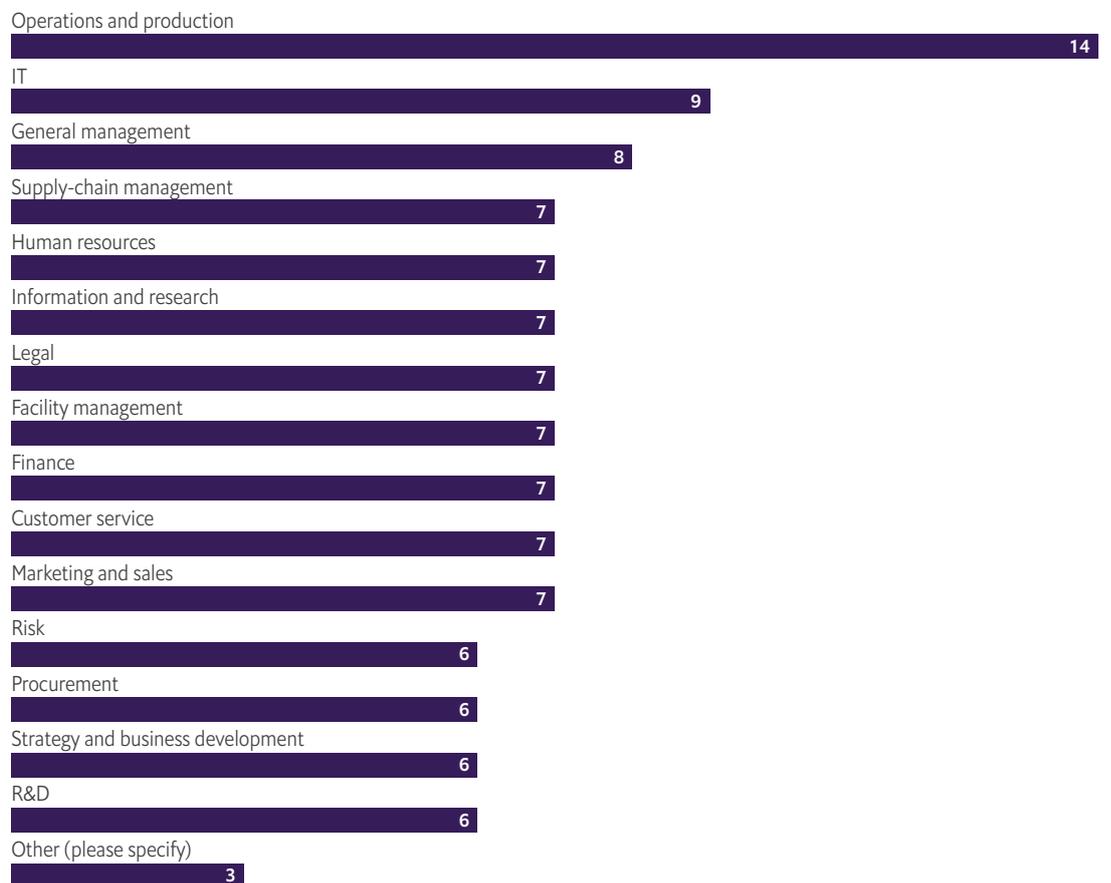
**D3. What is the primary industry your organisation is in?** Select one

(% respondents)



**D4. What are your main functional roles?** Select all that apply

(% respondents)



### D5. Roughly how often are you involved in a formal conversation or structured meeting about the IoT at your organisation? Select one

(% respondents)

Daily basis

8

Generally once a week

43

At least monthly

33

Annually or semi-annually

13

It has been mentioned to me only once or twice

3

I have never discussed the IoT at my organisation

1

### D6. What is your organisation's annual global revenue? Please select the most appropriate option if your company does not report revenue in US dollars. Select one

(% respondents)

US\$50m or less

20

US\$50m to less than \$100m

16

US\$100m to less than \$500m

14

US\$500m to less than \$1bn

22

US\$1bn to less than \$5bn

20

US\$5bn to less than \$10bn

6

US\$10bn or more

2

### Q1. Which of the following statements best describes the impact IoT has had on business in general so far?

Select one

(% respondents)

It has had a major impact

41

It has had a limited impact so far but I expect it to have a major impact in future

37

It has had a limited impact so far and will continue to have a limited impact in future

14

It has had no impact so far but I expect it to have a major impact in future

8

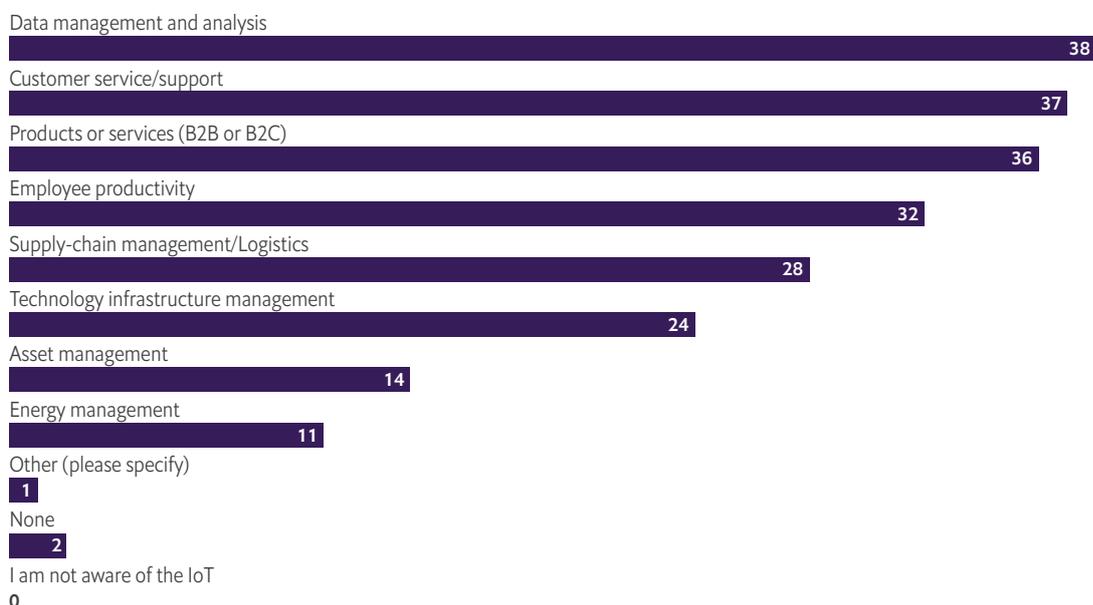
It has had no impact so far but I expect it to have a limited impact in future

1

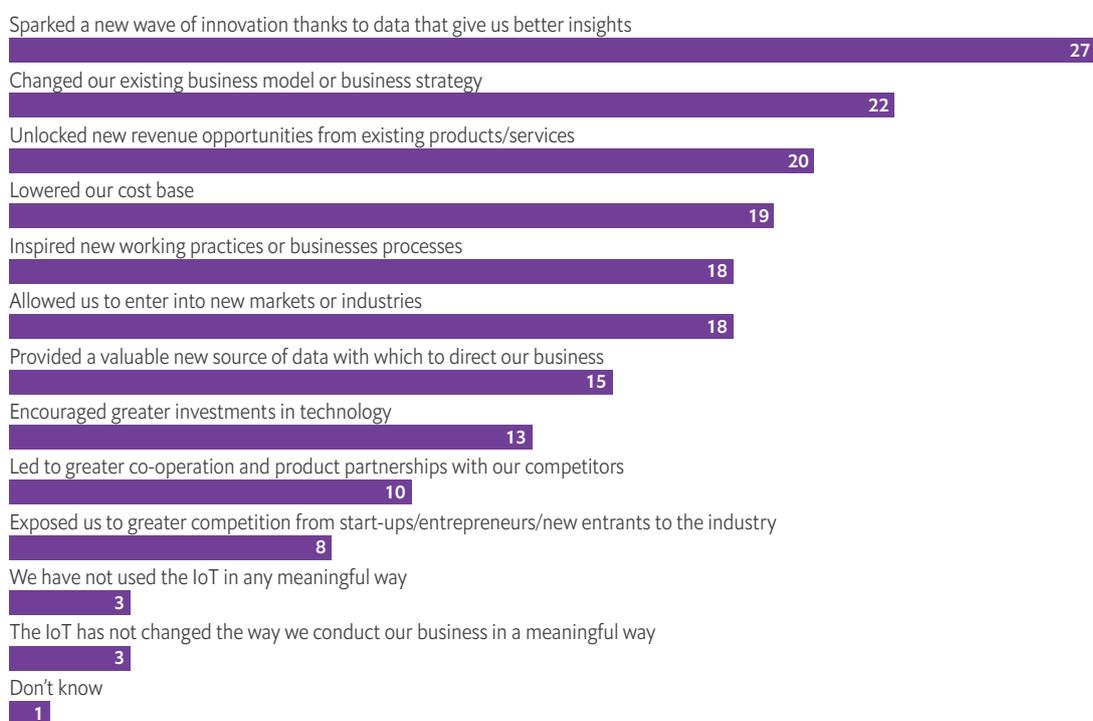
It has had no impact so far and I don't expect it to have any impact in future

0

**Q2. Which parts of your business have seen the greatest positive change from the IoT so far?** Select one  
(% respondents)



**Q3. In which, if any, of the following areas has your organisation's use of the IoT had the greatest impact?**  
Select up to three  
(% respondents)



### Q4. To what extent is your organisation currently using, or planning to use, the IoT in its products or services? (eg, embedding sensors in products, developing services utilising data generated by IoT technology) Select one

(% respondents)

Non-existent: we have not yet begun to consider it, or have decided not to proceed with it

6

In research: we are researching how it can be utilised in our products/services

26

In planning: we have completed research and are planning or piloting roll-outs

23

Early implementation: we have begun to introduce products/services utilising it

32

Extensive: it is utilised in several products/services and supported by marketing

13

### Q5. To what extent is your organisation currently using, or planning to use, the IoT in its internal operations? (eg, to reduce energy consumption, monitor status of plant and equipment) Select one

(% respondents)

Non-existent: we have not yet begun to consider it, or have decided not to proceed with it

4

In research: we are researching how it can be utilised to support our operations

12

In planning: we have completed research and are planning to utilise it

27

Early implementation: we have begun to utilise it to support our operations

36

Extensive: it is utilised in several areas of our internal operations

22

### Q6. Which of the following uses of data produced by IoT devices has your organisation adopted, or plans to make, in the next three years?

(% respondents)

■ Adopted ■ Plan to adopt in next 3 years ■ No plans to adopt in the next 3 years

Use of IoT data to inform strategic decision-making

40

44

16

Use of IoT data to inform operational decision-making

41

43

16

Monitoring and optimising performance of products or internal operations

43

42

15

Predictive maintenance

33

51

16

Optimising product or process design

33

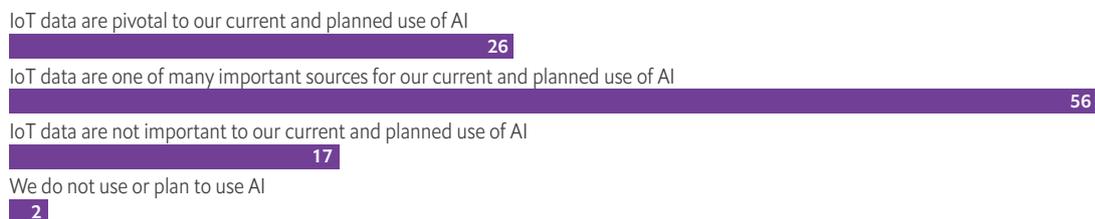
51

16

**Q7. To what extent does the use of IoT data feature in your organisation's artificial intelligence (AI) strategy?**

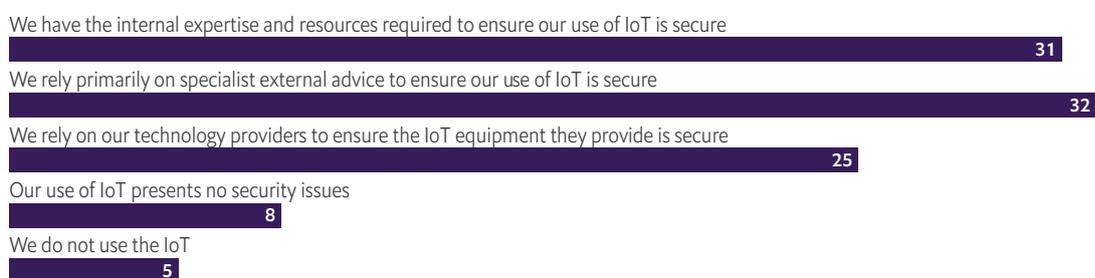
Select one

(% respondents)



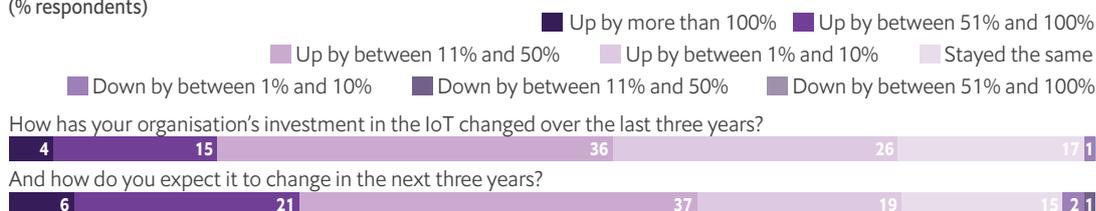
**Q8. Which of the following best describes your company's approach to IoT security?** Select one

(% respondents)



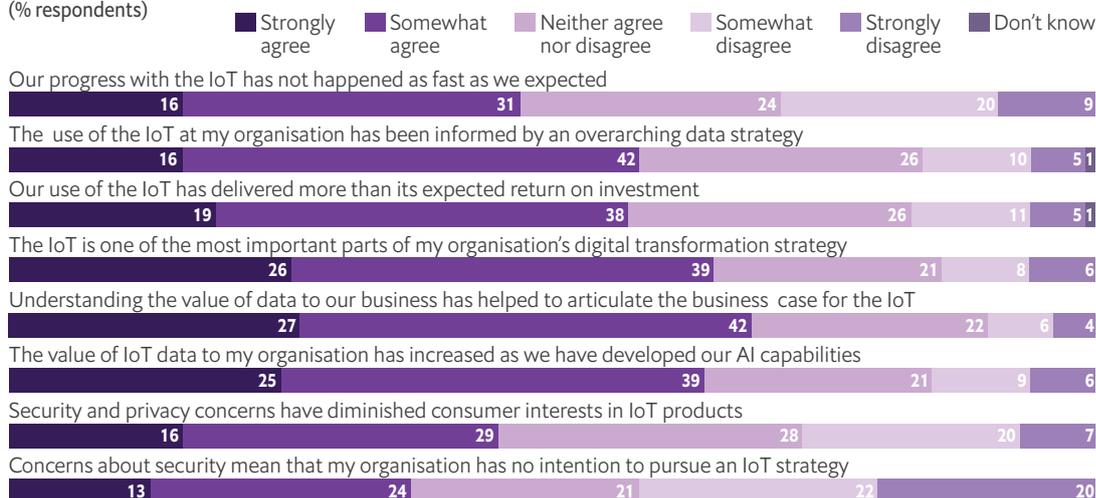
**Q9. How has your organisation's investment in the IoT changed over the last three years? And how do you expect it to change in the next three years?**

(% respondents)



**Q10. To what extent do you agree or disagree with the following?**

(% respondents)



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