Microsoft

Korcomptenz

IoT
Signals

EDITION 2 | October 2020

Table of Contents

Background

The Internet of Things (IoT) is transforming the way people live and work. Beyond just the smart devices you use every day, IoT is revolutionizing the way companies do business – allowing them to become faster, smarter, safer, and more efficient.

Microsoft has been at the forefront of IoT, innovating and investing as IoT continues to gain traction worldwide. The IoT Signals series was created to give the industry a holistic view of the IoT ecosystem – providing insight into adoption rates as well as benefits and challenges.

In 2019, Microsoft and Hypothesis embarked on an IoT Thought Leadership initiative and produced several more reports in the IoT Signals series. The goal of these reports is to better serve our partners and customers, as well as help business leaders develop their own IoT strategies, and to provide the most up-to-date research on IoT use across countries and industries.

Previous reports focused on two pieces of research – an initial round conducted in February 2019, which focused on IoT across industries, and a follow-up in October 2019 that took a deeper look into four key industries (energy, manufacturing, healthcare, and retail).

The broad, impactful coverage and recognition of the prior IoT Signals waves has underscored the importance of updated research for 2020. This paper now builds off the success of the prior Signals paper, offering new learnings and insights around the current and future state of IoT.

Methodology

Microsoft commissioned Hypothesis Group, an insights, design, and strategy agency, to execute the IoT Signals research.

Signals Edition One occurred in February 2019, when a 20-minute online survey was conducted with over 3,000 decision makers involved in IoT decisions at enterprise companies from a range of industries across the US, UK, Germany, France, China, and Japan. In October 2019, a 10-minute industry deep dive wave was conducted specifically with enterprise retail, energy, and healthcare companies in the US, UK, France, and Japan. In both waves, survey participants included business decision makers (BDMs), IT decision makers (ITDMs), and developers.

In April and May 2020, a second wave was carried out in the US, UK, Germany, France, China, and Japan across a similar group of decision makers. 3,000 participants took a 20-minute online survey, which included a five-minute industry deep dive into priority industries (energy, retail, manufacturing, and healthcare). In addition to the online survey, nine in-depth interviews were conducted online in June 2020 among ITDMs from the US, UK, and Germany in a range of priority industries.

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Things To Know About IoT in 2020

1 — **IoT USE IS ON THE RISE AND CRITICAL TO BUSINESS SUCCESS**
Among the global set of IoT decision-makers we spoke to, 91% have adopted IoT in 2020 (up from 85%), with over eight in 10 having at least one project in the use phase (up from seven in 10 in the prior year). IoT continues to be implemented for a range of uses across all industries – chiefly, to optimize productivity and operations and secure the environment. Within industries, unique use cases drive IoT strategy, such as production management and automation in manufacturing, grid asset management in energy, supply chain and inventory optimization in retail, and security, compliance, and inventory/staff tracking in healthcare. Due to its immense breadth of benefits, 90% of IoT decision-makers believe IoT is critical to their company's continued success, and 64% plan to implement even more IoT in the future.

2 — **RESOURCE OPTIMIZATION IS A KEY SUCCESS METRIC THAT IS REALIZED THROUGH IoT, BUT OPPORTUNITY EXISTS FOR GREATER IMPROVEMENT**
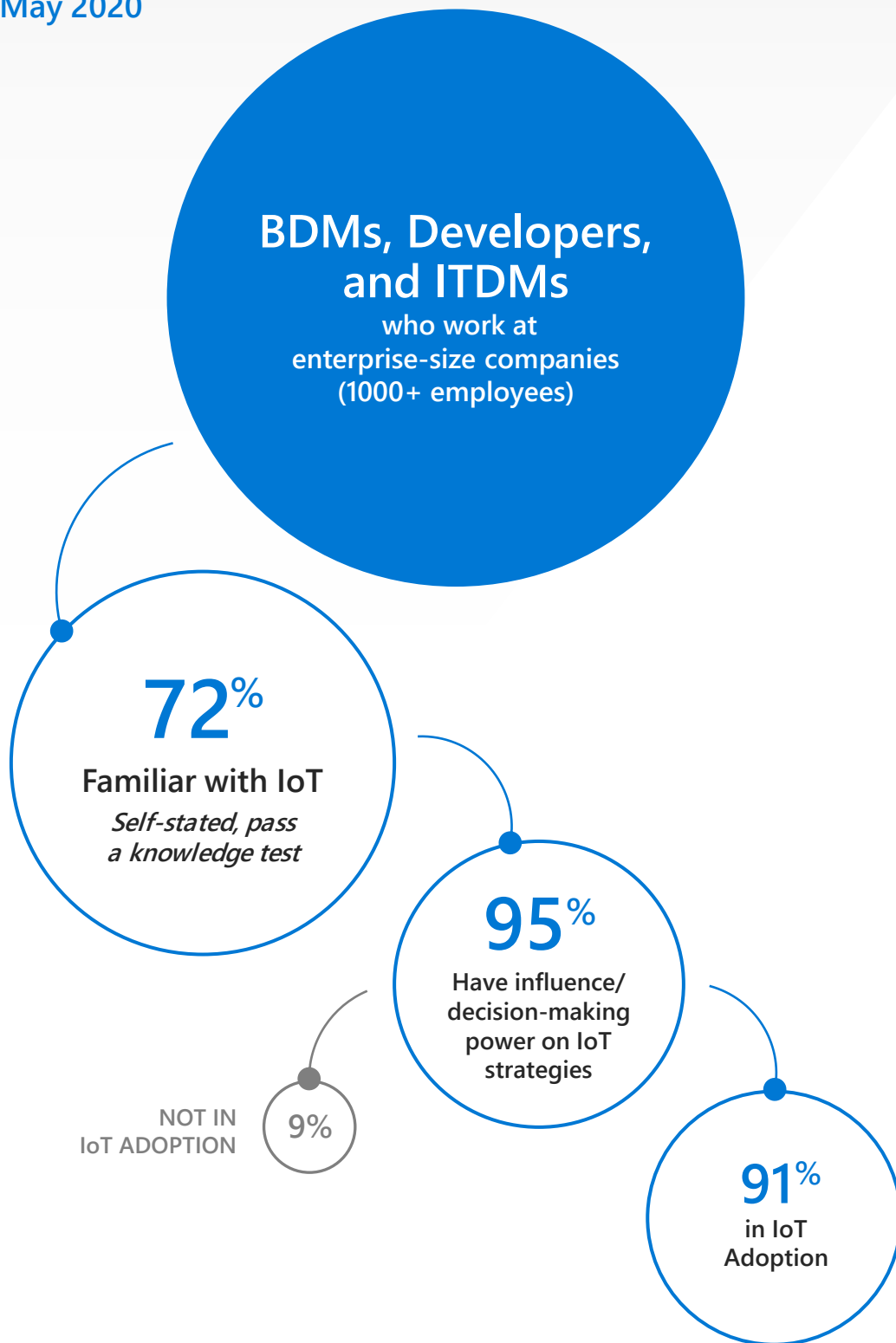IoT continues to enable improved productivity and operational efficiency, and as a result, IoT projects are deemed successful by how much they move the needle against automation and efficiency goals. While organizations have realized early successes with their IoT projects, the marginal impact of subsequent investments will be more difficult to measure. In addition, scaling the IoT solution presents a formidable challenge as organizations struggle with the complexity and technical obstacles. Those who adopt IoT as part of a broader culture change, and who prioritize investing in the right staff could overcome barriers sooner.

3 — **COVID-19 IS ACCELERATING IoT STRATEGIES**
COVID-19 is having an undeniable impact on the world around us, and IoT is no exception. While the pandemic has slowed business across the globe, IoT is an area with upward trajectory in the wake of the virus – one in three of decision-makers state their organizations will increase their investment in IoT due to COVID-19, while another 41% say they'll maintain the same level of commitment. The few organizations not intending to strengthen their investment tend to be in the earlier stages of IoT – and those already behind may struggle to catch up quickly.

4 — **AI, EDGE COMPUTING, AND DIGITAL TWINS TECHNOLOGIES ARE BECOMING MAINSTREAM IN IoT**
Artificial Intelligence, Edge Computing, and Digital Twins are all technologies that are becoming more and more a part of organizational strategies, particularly within their IoT plans. However, there is room to educate more about these technologies to harness their full potential. Substantial opportunity remains for organizations to explore and tap into different uses of AI and Edge Computing, while Digital Twins are still finding a foothold. Those who incorporate emerging technologies into their IoT solution realize more success with IoT overall, because once the value is proven, it's easier to build buy-in across the organization. AI is the most widely adopted emerging technology - 79% of organizations adopt AI as part of their IoT solution, and those who do perceive IoT to be more critical to their company's success (95% vs. 82%), and are more satisfied with IoT (96% vs. 87%.)
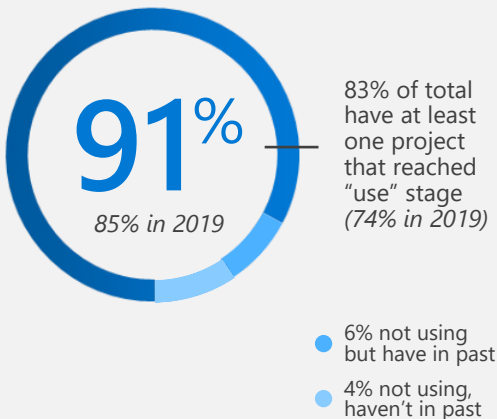
Who We Talked To

April/May 2020

BDMs, Developers, and ITDMs
who work at
enterprise-size companies
(1000+ employees)

72%
Familiar with IoT
*Self-stated, pass
a knowledge test*

95%
**Have influence/
decision-making
power on IoT
strategies**

**NOT IN
IoT ADOPTION**
9%

91%
**in IoT
Adoption**

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State of IoT:
Overall Research Learnings
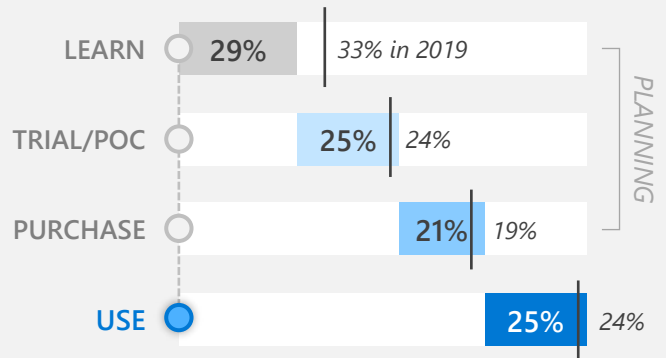
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IoT: The Big Picture

IoT adoption continues to grow from 2019 into 2020, surging from 85% of companies using the technology to 91%. 83% of these adopters have at least one project that has reached the use stage, as opposed to 74% in 2019.

As categorized in prior IoT Signals waves, IoT projects fall into one of four stages: learn, trial/POC, purchase, and use. More projects are in the purchase and use stages this year, with fewer in the learn phase than in the previous year. In 2020, 29% of IoT adopters we surveyed have projects in the Learn stage, compared to 33% in 2019. A quarter of projects are in the Trial/POC stage, a slight gain from 2019's 24%. The percentage of projects in the Purchase phase increases by 2% from 2019 to 2020, and projects in the Use phase hit 25%, up from 24% in 2019. This data signals that companies are shifting from knowledge gathering into implementing what they've learned. **(See exhibit 1)**

EXHIBIT 1

% IoT ADOPTERS

91%

85% in 2019

83% of total have at least one project that reached "use" stage (74% in 2019)
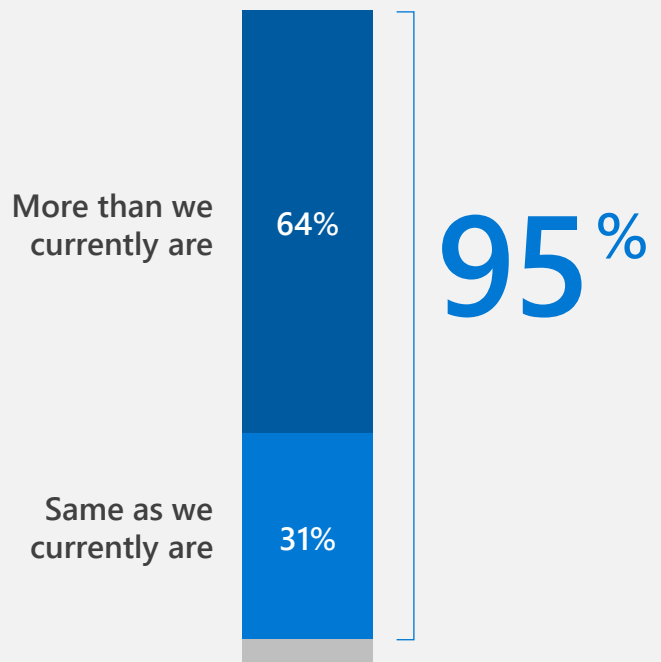
6% not using but have in past

4% not using, haven't in past

% IoT PROJECTS IN 4 STAGES

	2020	2019
LEARN	29%	33% in 2019
TRIAL/POC	25%	24%
PURCHASE	21%	19%
USE	25%	24%

PLANNING

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More companies view IoT as an important element of their business success, and are happy with its performance. 90% of organizations now consider IoT as critical to the overall success of their business, compared to 88% in 2019, and 94% are satisfied with IoT in their organization, up from 2019's 92%.

Looking ahead, it's clear that IoT adoption will not slow down: two years from now, 95% of organizations anticipate using IoT just as much or more than they do today. **(See exhibit 2)**

EXHIBIT 2

% IoT IS CRITICAL TO OVERALL SUCCESS

Very — 47%

Somewhat — 43%

90%

88% in 2019
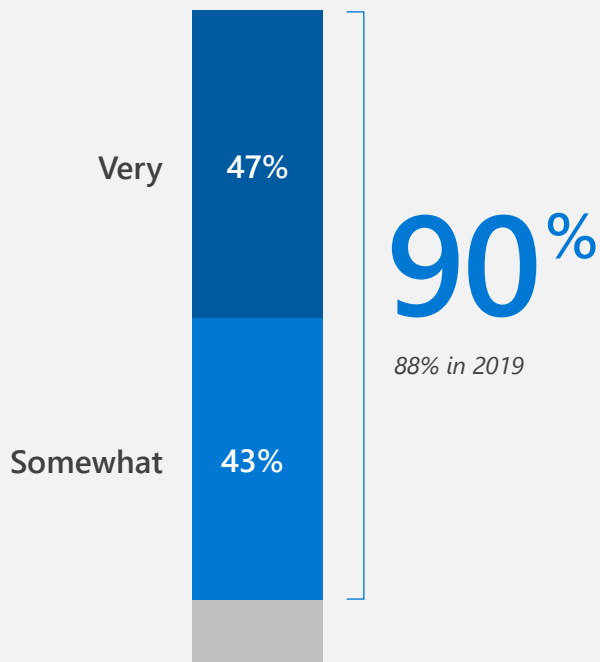
% USING IoT TWO YEARS FROM NOW

More than we currently are — 64%

Same as we currently are — 31%

95%

IoT adoption is strong across countries, with slight variations in speed of adoption and perception of success. The US, France, and Germany, and China have the highest percentages of IoT adopters. All countries surveyed have around a quarter of projects in the use phase. On average, IoT projects in China move into the use phase the fastest (10 months), while German projects take slightly longer (14 months). Despite their different speeds of adoption, China and Germany both feel most strongly that IoT is critical to the success of their company. Adoption is slower within the UK and Japan, with more of their IoT projects in the learning phase, compared to other countries. **(See exhibit 3)**

EXHIBIT 3
IoT ADOPTION AND VALUE

	GLOBAL	US	UK	DE	FR	JP	CH
% IoT ADOPTERS	91%	92%	88%	94%	92%	87%	91%
% OF PROJECTS IN USE PHASE	25%	26%	24%	24%	25%	24%	25%
TIME TO USE STAGE IN MONTHS (MEDIAN)	12	11	12	14	11	12	10
CRITICAL TO SUCCESS OF COMPANY	90%	86%	81%	97%	93%	91%	98%
PLAN TO USE IoT MORE IN 2 YEARS	64%	69%	64%	54%	67%	64%	60%

Similarly, IoT adoption is strong across industries, though lower within healthcare (and less often seen as critical to success). A very high percentage of the decision-makers we surveyed in the retail, healthcare, energy, and manufacturing industries are IoT adopters, and all industries had about a quarter of projects in the use stage. The average time to use was 12 months, except for the energy industry, which generally took about a month longer. The vast majority of those surveyed considered IoT to be critical to their company's success, and an even larger percentage (ranging from 92-98%) were satisfied with their company's utilization of the technology. **(See exhibit 4)**

EXHIBIT 4
IoT ADOPTION AND VALUE

	TOTAL	Manufacturing	Healthcare	Retail	Energy
% IoT ADOPTERS	91%	93%	89%	94%	94%
% OF PROJECTS IN USE PHASE	25%	23%	25%	26%	26%
TIME TO USE STAGE IN MONTHS (MEDIAN)	12	12	12	12	13
CRITICAL TO SUCCESS OF COMPANY	90%	93%	87%	92%	90%
PLAN TO USE IoT MORE IN 2 YEARS	64%	67%	58%	58%	55%

COVID-19: Impact on IoT

The global COVID-19 pandemic is having a unique effect on IoT adoption across the world: one in three organizations will be increasing investment in IoT due to COVID-19, twice as many as will be decreasing. **(See exhibit 5)**

Those who expect to maintain/grow their investment in IoT have fewer projects in the learn phase – indicating it is easier to increase investment after seeing its successes. Companies who anticipate the same or more IoT investment have 27% of projects in the learn phase, compared to those who anticipate less investment or say it's too early to tell, who have 35% of projects in the learn phase.

COVID-19's impact hits all industries: A German ITDM in beverage manufacturing explains how IoT alerted them to an increased demand for glass bottles. "During the coronavirus, we had a problem with the return of empty bottles. We didn't get any back, everybody kept them at home. So we had to contact the glass manufacturers. It wasn't easy to fill in the gap, but we noticed the gap in the first place because of the data that we had through our IoT solution. The manufacturing plant can automatically adapt to increased demand. We also call it the smart factory; we don't have to control and adjust things so much. Based on the data we have, the system knows already in March that we have to increase the production, based on the data from the previous years."

EXHIBIT 5

COVID IMPACT ON IoT INVESTMENT

	More	Same	Less	Too Early To Tell
% will invest in IoT...	31%	41%	16%	12%
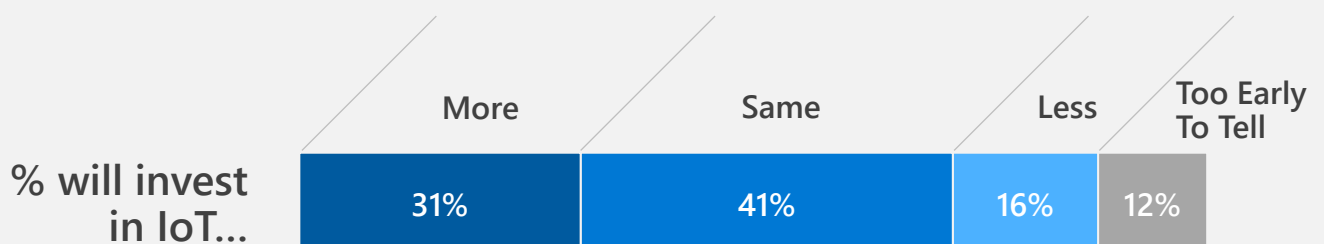
Why Adopt IoT?

Organizations are adopting IoT as part of a broader culture change to optimize their productivity and secure their environment. One of the top reasons for IoT adoption is safety and security, with 47% of businesses citing it as a main focus for the technology. Industry experts tell us this use is more applicable to securing the IT environment, versus securing employee and workplace safety. Another 47% say they adopted IoT to optimize operations, while 45% adopted it for quality assurance. Other reasons for IoT adoption include energy optimization (32%) and sustainability (31%). While sustainability isn't a top reason to adopt IoT, China and Germany lead the way on leveraging IoT for sustainability (53% and 38% use, respectively). **(See exhibit 6)**

EXHIBIT 6
REASONS FOR IoT ADOPTION

Reason	Percentage
Safety and security	47%
Operations optimization	47%
Quality assurance	45%
Employee productivity	43%
Supply chain management	37%
Energy optimization	32%
Sustainability uses	31%
Asset tracking	28%
Sales enablement	26%
Space optimization	25%
Personal comfort	22%
Condition-based maintenance	21%
Health and wellness	19%
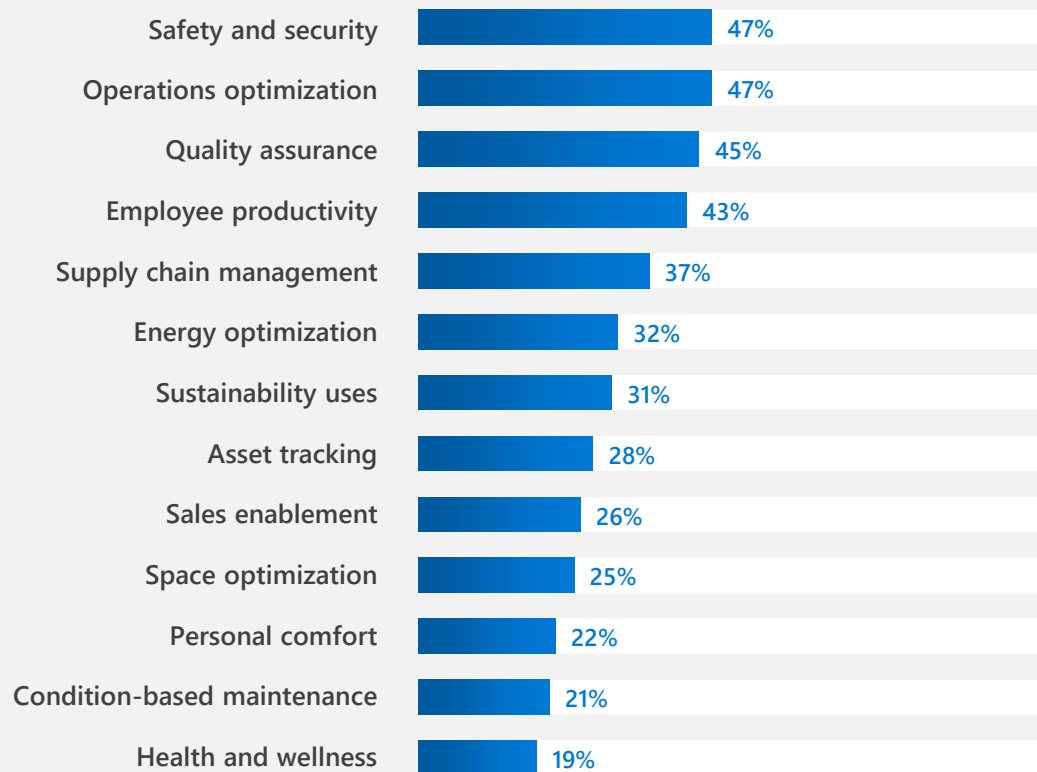
Within industries, IoT is used for efficiency in different ways – production efficiency in Manufacturing, supply chain optimization in Retail, resource monitoring in Healthcare, and asset maintenance for the Energy fields of both Power & Utilities and Oil & Gas. **(See exhibit 7)**

EXHIBIT 7
TOP 5 REASONS FOR IoT ADOPTION BY INDUSTRY

Manufacturing

Production flow monitoring	47%
Industrial automation	44%
Production planning and scheduling	44%
Quality and compliance	41%
Process optimization	39%

Power & Utilities

Grid asset maintenance	46%
Smart metering	41%
Generation optimization & load balancing	41%
Smart grid automation	40%
IT security	40%

Retail

Supply chain optimization	42%
Surveillance and security	40%
Inventory optimization	39%
Connected logistics	36%
Digital distribution center	35%

Oil & Gas

IT security	48%
Asset and predictive maintenance	46%
Emissions monitoring and reduction	42%
Home or building energy management	38%
Remote infrastructure maintenance	37%

Healthcare

Tracking inventory	49%
Tracking staff	45%
IT security	44%
Compliance	41%
Facilities management	40%

Increasing productivity, specifically yield (86%) and efficiency (79%), also carries through as a top benefit of IoT. As they did in 2019, enterprise companies remain highly reliant on the production and operational efficiencies IoT provides. 54% of companies surveyed say that IoT has helped them increase operational efficiency, while 47% cite IoT as a reason for enhanced employee productivity. Businesses also say IoT is instrumental to increasing yield: 46% say it increases production capacity, and 44% report it provides cost savings, with 43% seeing a reduction in business expenses. Other reported top benefits of IoT include quality (77%) and safety (41%). **(See exhibit 8)**

EXHIBIT 8
BENEFITS OF IoT

Category	Benefit	Percentage
Efficiency	Increases efficiency of operations	54%
Efficiency	Allows employees to be more productive	47%
Yield	Increases production capacity	46%
Yield	Provides cost savings	44%
Quality	Reduces human error	44%
Quality	Increases customer satisfaction	43%
Yield	Reduces business expenses	43%
Quality	Increases competitive advantage	42%
Efficiency	Helps make better business decisions	42%
Unplanned Downtime	Allows for better optimization of tools/equipment	41%
Safety	Improves safety conditions	41%
Yield	Increases revenue	40%
Yield	Enables new types of customer offerings	37%
Yield	Enables new revenue streams	34%

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Measuring Success in IoT

The majority of the decision-makers we surveyed consider themselves to be successful in IoT adoption. However, this success is not necessarily measured by increased revenue or number of projects in deployment. More often, companies consider measures like cost and production efficiency as more indicative of their success in adopting IoT. Other common factors of success include quality, reliability, and security. **(See exhibit 9)**

EXHIBIT 9
MEASURE OF SUCCESS IN IoT

| More common measures of success	Less common measures of success
Cost efficiency (e.g. % reduction in operating costs)	**More informed decision-making** (e.g. ability to accelerate timelines)
Quality (e.g. % decrease in human error)	**Direct impact on increased revenue** (e.g. new product innovation)
Production efficiency (e.g. % increase in production)	**Sustainability** (e.g. % decrease in emissions)
Reliability (e.g. % increase in equipment optimization)	**% of projects deployed** using IoT
Security (e.g. % decrease in malware attacks)	

An ITDM in the power and utilities industry described his company's successful adoption of IoT to optimize safety and efficiency: "It took standing the IoT solution up in one of the utilities, and that utility demonstrating the value. I had a hundred thousand avoided truck rolls this year. Ascribe a cost to every one of those truck rolls, and that is impactful to the bottom line. And I've got a hundred thousand customers that I didn't make wait to figure out what their problem was. I immediately started to triage with them."

Challenges of IoT Adoption

As in 2019, complexity, technical issues, and internal resourcing continue to be the top challenges to greater IoT adoption. More than 25% find that IoT solutions are too technically complex to implement, and the same number report that these solutions take too long to implement. In addition, limited resources present a barrier to further IoT adoption: 28% of companies don't have the budget, and another 28% don't have the human resources to implement and manage IoT projects. System architects and cloud developers are in especially high demand. **(See exhibit 10)**

EXHIBIT 10

CHALLENGES TO USING IoT MORE

Still in progress	Still implementing current solution	33%
Complexity/technical	Want to work out existing challenges	31%
Lack of budget/staff	No budget	28%
Lack of budget/staff	No human resources to implement & manage	28%
Complexity/technical	Too complex to implement	27%
Complexity/technical	Too long to implement	27%
Compliance	Too many compliance/regulatory challenges	27%
Security	Concerned about consumer privacy	26%
Lack of knowledge	Not enough training/guidance on how to deploy	26%
Lack of knowledge	Lack technical knowledge	26%
Lack of knowledge	Don't know enough	24%
Security	Security risk isn't worth it	24%
Haven't found right solution	Not a solution that meets our needs	21%
Security	Unwilling to store data in public cloud	20%

Consistent with the previous edition of this report, security does not serve as a large impediment to greater IoT adoption. 26% of organizations name concerns about consumer privacy as a barrier to adopting the technology. 20% are unwilling to store data in the cloud. 24% of companies see IoT adoption as not worth the security risks involved.

Though security is a low hinderance to adoption, it is a universal consideration during IoT implementation. 97% of the companies we spoke with have security concerns when implementing IoT. Almost half say ensuring data privacy is top of mind, while 43% are concerned with ensuring network-level security. 40% state securing endpoints for each IoT device is a consideration, while 38% mention tracking and managing each IoT device. A further 38% of businesses are concerned with ensuring that all employees involved in IoT projects receive comprehensive training. **(See exhibit 11)**

"Security is extremely important – it's paramount when we look to implement IoT solutions," a UK fashion retail ITDM explains. "We are a big brand, and therefore a big target. And obviously, customer data system integrity is very important for us. So we have a very, very talented group of security personnel that are monitoring and developing within IoT all the time. We have different security teams – technical security, physical security, architecture security. It's an area that we invest in a lot."

EXHIBIT 11   TYPES OF IoT SECURITY CONSIDERATIONS

Consideration	Percentage
Ensuring **data privacy**	47%
Ensuring **network-level security**	43%
Security endpoints for each IoT device	40%
Tracking and managing each IoT device	38%
Conducting comprehensive **training programs** for employees involved	38%
Performing **hardware/software tests** and device evaluation	37%
Making sure all existing **software is updated**	37%
Updating firmware and other software on devices	36%
Updating **encryption protocols**	35%
Securely **provisioning devices**	35%
Shifting from device-level to **identity-level control**	31%
Changing default **passwords/credentials**	30%

Almost all companies involved in IoT have experienced failure of a project at the Proof of Concept stage (PoC). Among these companies, almost a third of their projects fail at PoC. The number one reason is the overall high cost of scaling: a full third of businesses cite it as the source of a project's collapse. Additional scaling issues such as lack of resources and trust in platforms contribute to PoC failure as well. The difficulty in scaling during PoC primarily stems from integrating the various components of IoT. This issue becomes more challenging as different solution providers are brought in. **(See exhibit 12)**

While ROI isn't always a measure of IoT's success, it can be the reason a project fails; 29% of companies have had projects scrapped because it isn't clear what value they will add to the business. Other reasons for failure echo challenges that often arise during IoT adoption: lack of technology (27%) and lack of leadership support and attention (22%).

The role of leadership in project failure deserves a closer look, as the majority of companies surveyed say business challenges are another reason for failure at PoC. Buy-in from leadership is a relatively low barrier during PoC. Instead, leadership needs to integrate IoT into long-term strategy: nearly half of companies report challenges in this area.

EXHIBIT 12

REASONS FOR PoC FAILURE

Scaling	High cost of scaling	33%
Business	Pilots demonstrate unclear business value/ROI	29%
Business	Hard to justify business case w/o short-term impact	28%
Technology	Lack of necessary technology	27%
Scaling	Lack of resources/knowledge to scale	25%
Complexity	Pilot is taking too long to deploy	24%
Business	No clear strategy	24%
Complexity	Too many platforms to test	23%
Business	Lack of leadership support and attention	22%
Complexity	Too many use cases to prove out	21%
Scaling	Lack of trust in scalability platforms	21%
Vendors	Vendors not willing to subsidize pilots	17%

IoT Vendor Partners

A vibrant IoT partner ecosystem can help organizations create a complete and simple end-to-end solution.

"What stands out is a **vendor that's actually involved in a lot of the steps**, including implementation and identifying the risks that are associated. IoT is a rather new technology with few standards, and lots of legacy equipment. So companies need **help through all the steps** with support throughout the whole process. The vendor plays a key part in training the staff and providing **ongoing support**. Training is not something you expect at a very early stage, but it should be a key element of this project. They need to be available 24/7, and **scalability is at the core** of that relationship."

UK Healthcare Provider ITDM in Private Hospital System

"We had mixed points of view because **we wanted to move fast** in the prototyping. And quite frankly, **when you get two big companies working together, it's pretty slow** because a lot of it is predicated on hardware. The team that's going to scale the IoT solution wants to know the software was proved out on the features side. In a lot of those cases, it was picking a **partner you felt you could move very quickly** with, and prototype and iterate. But they would still have the **ability to scale** or provide a scale solution that worked with the enterprise architecture. We didn't want to wait a week to schedule a meeting in three weeks. We wanted to have proof in three weeks."

US Retail ITDM in Mass Merchandising

Emerging Technologies Spotlight

The State of Emerging Technologies

Use of emerging technologies, particularly Edge Computing and Digital Twins, was nascent, but on the rise, in July 2019. This year, companies are looking for new ways to utilize IoT by tapping into different uses of these technologies within their IoT solutions, and embedding IoT even more deeply into organizational strategy.

The majority of organizations already adopt emerging technologies (e.g., Artificial Intelligence, Edge Computing, and Digital Twins) as an integral part of their IoT solution. Those who have integrated emerging technologies into their IoT solution **find more benefits from IoT overall, which leads to more investment in IoT solutions**.

Artificial Intelligence and Edge Computing are being used in a variety of ways, but there is still opportunity to expand into different uses. 50% of the companies we surveyed use AI for maintenance or audio/visual processing, with an additional 25% considering other applications of AI beyond their current use cases. Edge Computing is most often used for smart building uses (e.g., sustainability, space optimization), with the most room to expand use of this technology for productivity and efficiency applications. Since fewer Digital Twins projects are currently in the use phase, use cases are still in development.

Decision-makers understand the importance of emerging technologies, but organizational constraints often hold them back from adopting them more. Lack of knowledgeable staff is a top barrier to implementing AI, while Edge Computing and Digital Twins require more testing in PoC to prove their value. The need for Edge Computing is established, but several scaling and business challenges inhibit further adoption.
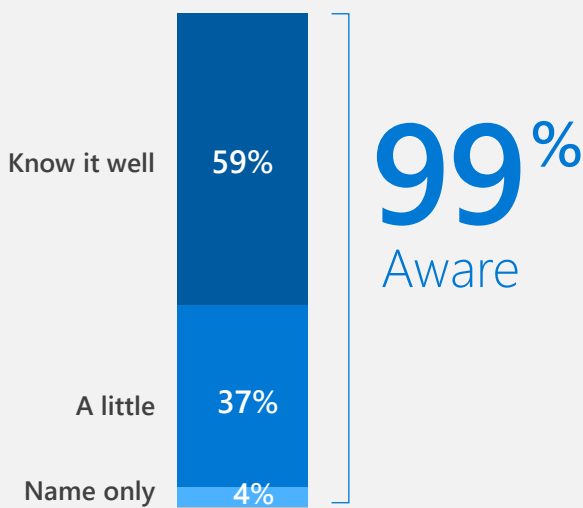
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Artificial Intelligence Deep Dive

Among those in IoT adoption, there is strong familiarity with and knowledge of Artificial Intelligence (AI). AI was defined as the ability of a computer system to deal with ambiguity by making predictions using previously gathered data and learning from errors to generate more accurate predictions about how to behave in the future. Of the 99% of IoT adopters who are aware of AI, 59% say they know it well. Most are also using the technology, with 83% developing or implementing an AI strategy. **(See exhibit 13)**
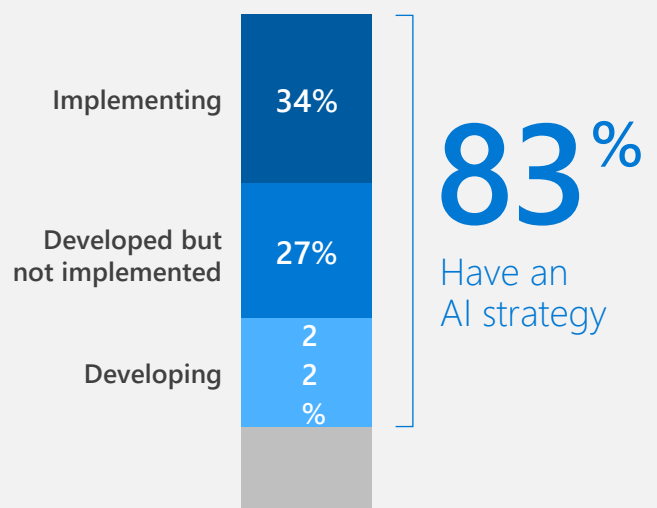
Scalability is the top barrier to using AI more for those with a strategy in place, while the skills gap inhibits those without a strategy. For those with strategies, other challenges include a lack of technical knowledge and the inability of their infrastructure to support digital transformation. Insufficient infrastructure is also a top challenge for those without a strategy, as well as a lack of human resources. The energy industry is particularly challenged by complexity of scaling, likely because they're further along in adopting AI.

EXHIBIT 13

AWARENESS OF AI

Know it well	59%
A little	37%
Name only	4%

99% Aware

AI IMPLEMENTATION PROGRESS

Implementing	34%
Developed but not implemented	27%
Developing	2 2 %

83% Have an AI strategy

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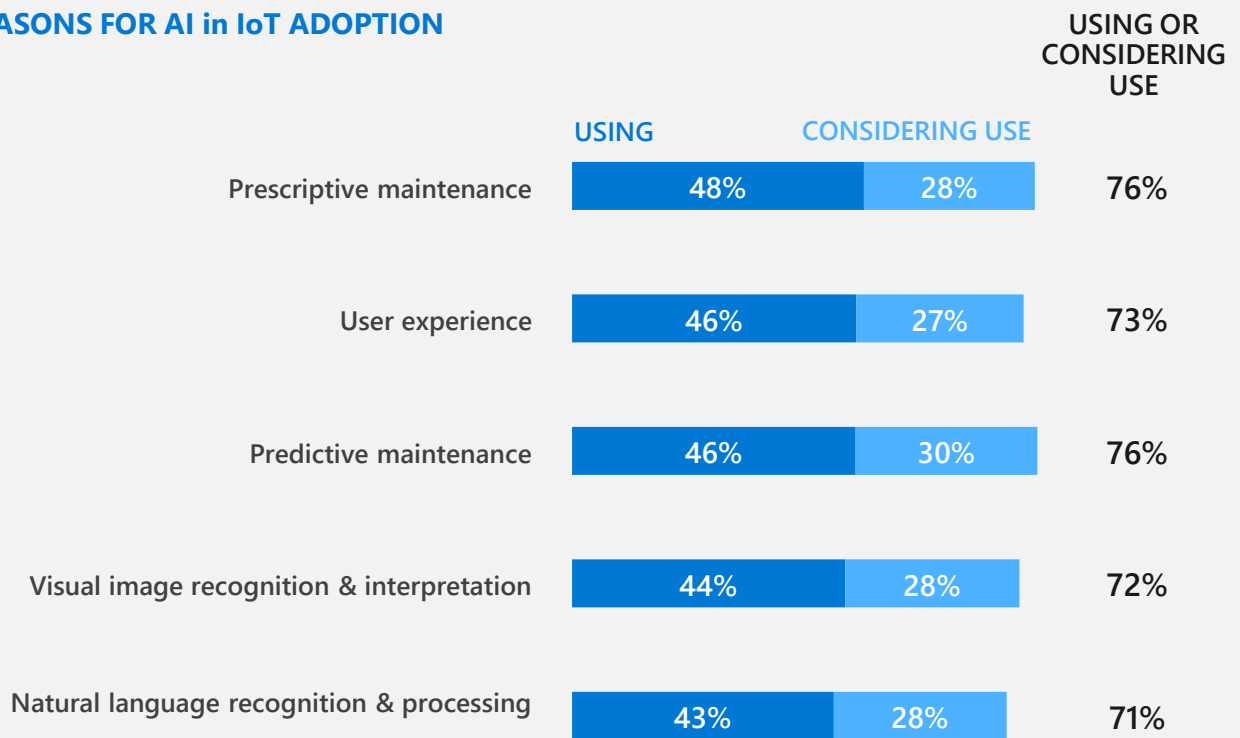
For those with an AI strategy, AI is intrinsically linked as part of their IoT solution. 79% of these companies view AI as either a core or a secondary component of IoT. **(See exhibit 14.)** And those who use AI as a part of their IoT solution benefit more from IoT overall – success with IoT brings about more use of IoT. Companies using AI as a component of IoT have fewer projects in the learn phase and more projects in the purchase phase, as compared with companies who don't use AI as a component of IoT. Companies who integrate AI into IoT have significantly more projects in the use phase than those who don't. They also have a higher level of overall satisfaction with IoT, and believe it is more critical to the success of their business, as well as having a larger average number of IoT use cases.

EXHIBIT 14

USE AND IMPACT OF AI IN IoT SOLUTION

79%

**Core component/
Secondary component**

● **41% Core**
● **38% Secondary**
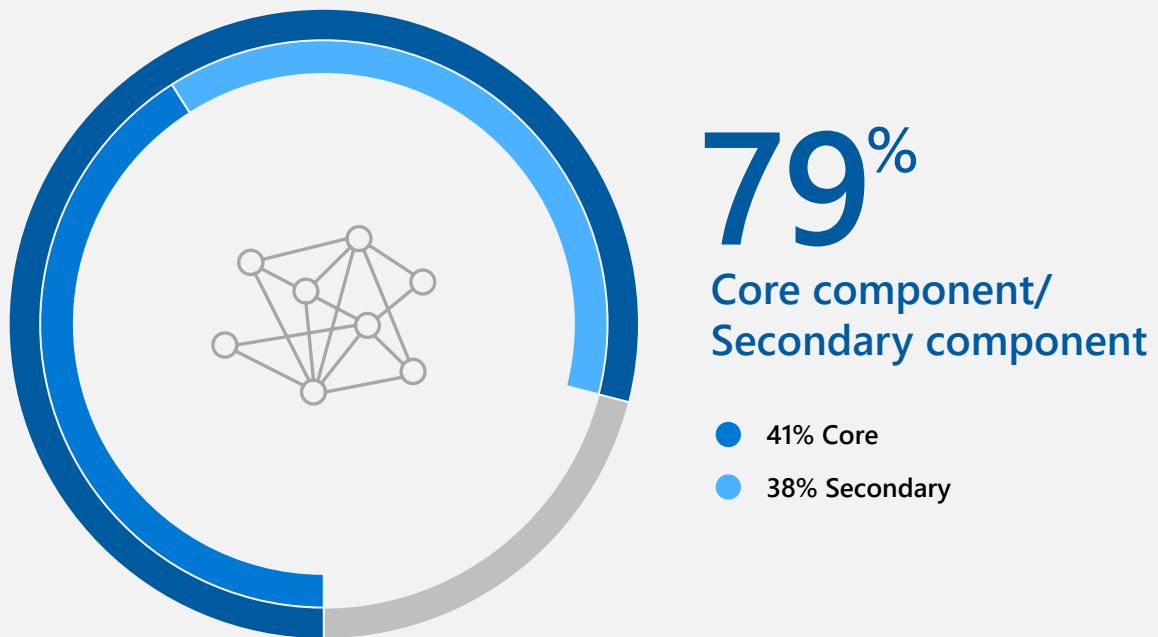
Organizations adopt AI within IoT for a variety of reasons; close to half have cases in use, while another quarter are considering various use cases. The top reason companies integrate AI with IoT is for prescriptive maintenance, with 48% using the technologies for this reason, and 28% considering using it. Other reasons companies may integrate these technologies include user experience, predictive maintenance, visual image recognition and interpretation, and natural languages and processing. **(See exhibit 15)** One healthcare provider ITDM described their company's integration of AI within IoT for predictive maintenance: "We layer AI on top of our IoT solution to do predictive maintenance. We know historically that pump B is going to fail at a specific point, so we can send the technician out before it fails."

EXHIBIT 15

REASONS FOR AI in IoT ADOPTION

USING OR CONSIDERING USE

	USING	CONSIDERING USE	USING OR CONSIDERING USE
Prescriptive maintenance	48%	28%	76%
User experience	46%	27%	73%
Predictive maintenance	46%	30%	76%
Visual image recognition & interpretation	44%	28%	72%
Natural language recognition & processing	43%	28%	71%

Manufacturing and retail organizations lead the way when it comes to implementing projects against an AI strategy, with the majority using the technology as part of their IoT solution. 34% of manufacturing companies are already implementing an AI strategy; retail was not far behind at 32%. While the majority of retail (83%), manufacturing (77%), and energy (76%) companies are using AI in an IoT solution, healthcare organizations lag behind, with only 66% capitalizing on AI in their IoT strategy. **(See exhibit 16)**

EXHIBIT 16
AI ADOPTION AND VALUE

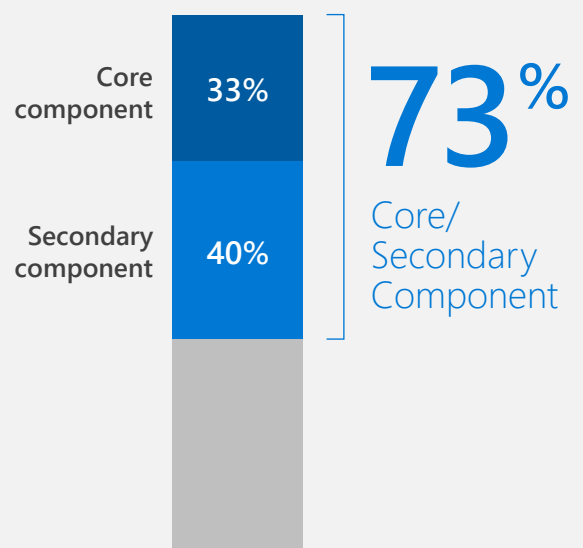|	TOTAL	Manufacturing	Healthcare	Retail	Energy
HAVE AN AI STRATEGY	83%	85%	76%	88%	89%
IMPLEMENTATION PROGRESS AGAINST AI STRATEGY — *IMPLEMENTING* ▷ 34%		34%	20%	32%	25%
DEVELOPED ▷ 27%		29%	27%	32%	39%
DEVELOPING ▷ 22%		23%	29%	23%	25%
USE AI IN IoT SOLUTION	79%	77%	66%	83%	76%

Edge Computing Deep Dive

Most are familiar with and knowledgeable about Edge Computing (defined as enabling cloud analytics and custom business logic to be moved to edge devices so the organization can focus on business insights instead of data management.) Of the 95% aware of edge computing, 42% claim to know it well. Additionally, 73% of those aware of edge computing use it as part of their IoT solution - 33% view it as an essential element and 40% see it as a secondary component. **(See exhibit 17)**

We further surveyed those in IoT adoption with knowledge of edge computing, and found that it is being used for a variety of purposes. Topping the list are health and wellness reasons, sustainability uses (e.g. carbon footprint, emissions monitoring), space optimization (e.g. utilizing meeting rooms, parking lots), and condition-based maintenance. While slightly less common, edge computing is also used for productivity and efficiency applications including supply chain management, employee productivity, and operations optimization.

EXHIBIT 17

AWARENESS OF EDGE COMPUTING

Know it well 42%

A little 40%

Name only 13%

95% Aware
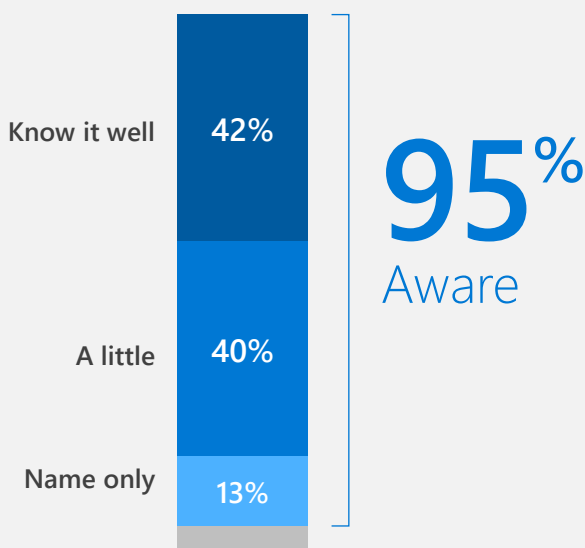
USE AND IMPACT OF EDGE COMPUTING IN IoT SOLUTION

Core component 33%

Secondary component 40%

73% Core/ Secondary Component
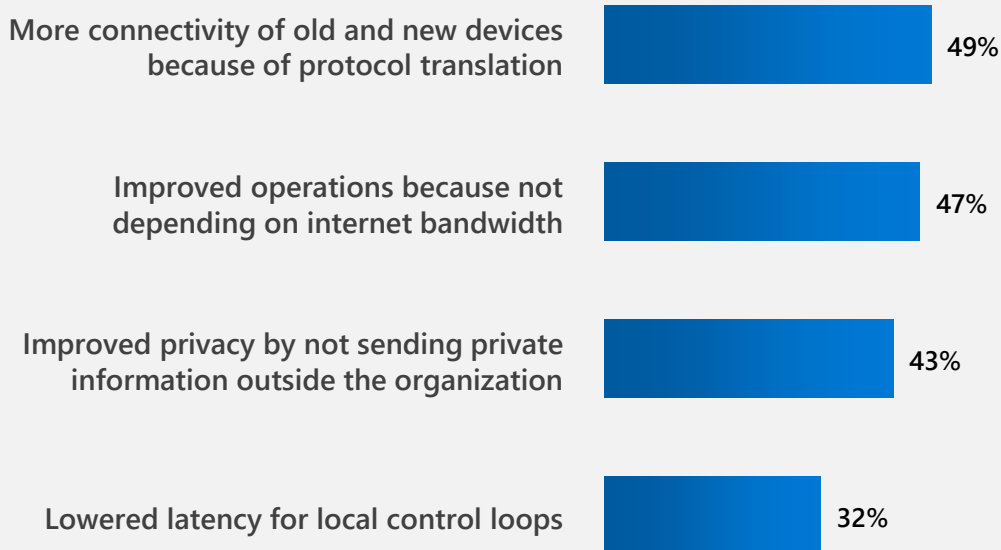
Microsoft | hypothesis

Organizations that use Edge Computing as part of the IoT solution benefit from more connectivity and improved operations, resulting in optimized automation and productivity. Almost half of companies say IoT helps them increase the connectivity of old and new devices, because it aids in protocol translation. Nearly as many report that operations are improved because there is no longer a reliance on internet bandwidth. **(See exhibit 18)**

A US Healthcare provider ITDM in blood labs explains how Edge Computing has increased their organization's efficiency and improved operations: "With Edge Computing, we're moving all of the non-value-added computation away. When an incident occurs, the data goes through an algorithm to determine whether it's an incident that requires action from a person. So we wouldn't need to move that data across the network if it didn't require human intervention; it can stay local. It is these low power consumption CPUs that are taking the burden of having to send all the data back and forth over the network to achieve something and only send the important events."

EXHIBIT 18

BENEFITS OF EDGE COMPUTING WITHIN IoT

Benefit	Percentage
More connectivity of old and new devices because of protocol translation	49%
Improved operations because not depending on internet bandwidth	47%
Improved privacy by not sending private information outside the organization	43%
Lowered latency for local control loops	32%

However, using Edge Computing within IoT is not without challenges. Among the top issues are lack of guidance on how to connect edge technologies and lack of clarity on edge hardware choices (both 34%). One in three companies have difficulty managing the security aspect of edge security computing, with securing the edge network through vulnerability management, perimeter security, and application security seen as most important. Ultimately, though, the business need is there, with only 21% of companies claiming they had no use for the technology. **(See exhibit 19)**

EXHIBIT 19

BARRIERS TO USING EDGE COMPUTING MORE WITHIN IoT

Barrier	Percentage
Lack of architectural guidance	34%
Lack of clarity on edge hardware choices	34%
Lack of infrastructure	33%
Difficulty managing security	33%
Lack of trained personnel	31%
Don't have a business need for Edge Computing	21%
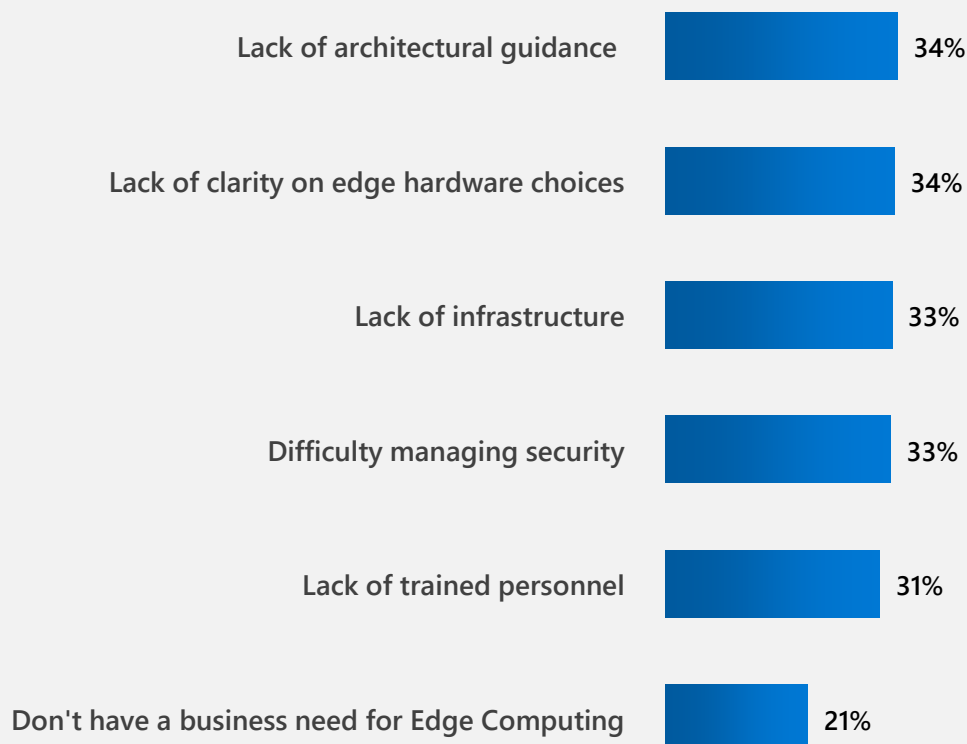
Edge Computing is well known across industries: 95% of the total companies we surveyed are aware of it, with 73% using it in their IoT solution. More energy companies (77%) are currently utilizing it. The industry using it the least is healthcare, at 60%. **(See exhibit 20)** Manufacturing companies face fewer challenges with Edge Computing overall, compared to other types of companies. Retail organizations find it more challenging to get started with this technology. Their challenges include lack of business need and lack of clarity on edge hardware choices.

EXHIBIT 20
EDGE COMPUTING ADOPTION AND VALUE

	TOTAL	Manufacturing	Healthcare	Retail	Energy
AWARE OF EDGE COMPUTING	95%	95%	93%	96%	95%
USE EDGE COMPUTING IN IoT SOLUTION	73%	73%	60%	74%	77%

Digital Twins Deep Dive

There is room to increase familiarity with Digital Twins (defined in the research as a digital replica of real-world things, places, business processes or people, designed to understand, control, simulate, analyze and improve real-world business operations.)

While 86% of IoT decision-makers say they are aware of the technology, only a third are highly knowledgeable about it. Among those companies aware of Digital Twins, over 3 in 4 are developing or implementing a Digital Twins strategy. **(See exhibit 21)** However, many Digital Twins projects are still in the early stages, with 28% in the learn stage, and about half in PoC. Only 11% have reached the use phase.

EXHIBIT 21

AWARENESS OF DIGITAL TWINS

Know it well	33%
A little	38%
Name only	15%

86% Aware
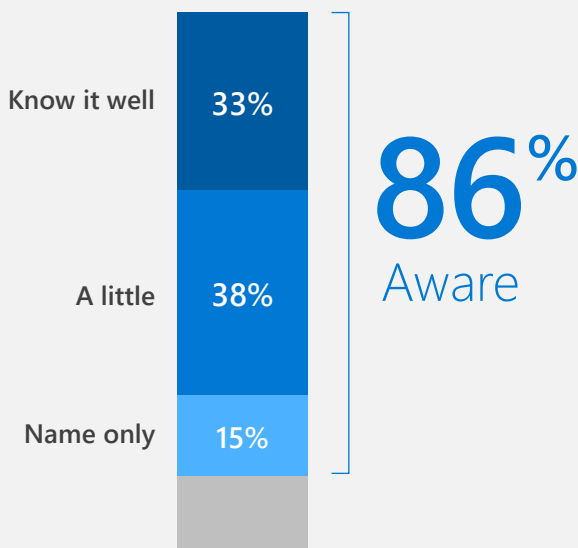
DIGITAL TWINS IMPLEMENTATION PROGRESS

Implementing	27%
Developed but not implemented	28%
Developing	18%
	27%

83% Have a Digital Twins strategy

Microsoft | hypothesis
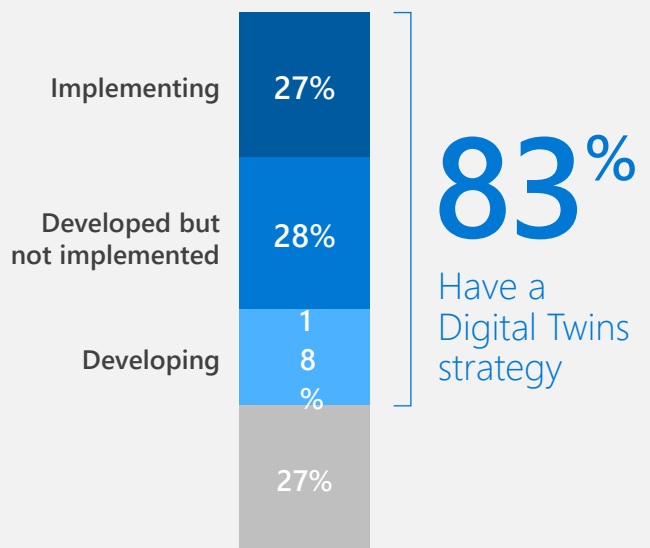
The vast majority of those with a Digital Twins strategy see it as an integral part of their IoT solution: 39% consider it a core component, and 43% call it a secondary component. **(See exhibit 22)**

Digital Twins are being adopted across industries because of their ability to simplify processes like optimization. "Engineering generates a digital 3D point cloud of every part we manufacture, down to the exact physical characteristics," an ITDM in the US water and power technologies industry explains. "We take this digital twin and optimize it mathematically without ever having to put it in the jig in the first place. When we do that, we find much better configurations. The number of combinations would typically be 92 factorialized – that's infinitely more combinations than there are atoms in the universe. Using the digital twin, we can spit out a better outcome virtually than we can physically. We can do it in hours, not in days."

EXHIBIT 22
USE AND IMPACT OF DIGITAL TWINS IN IoT SOLUTION

82%
**Core component/
Secondary component**

- 39% Core
- 43% Secondary
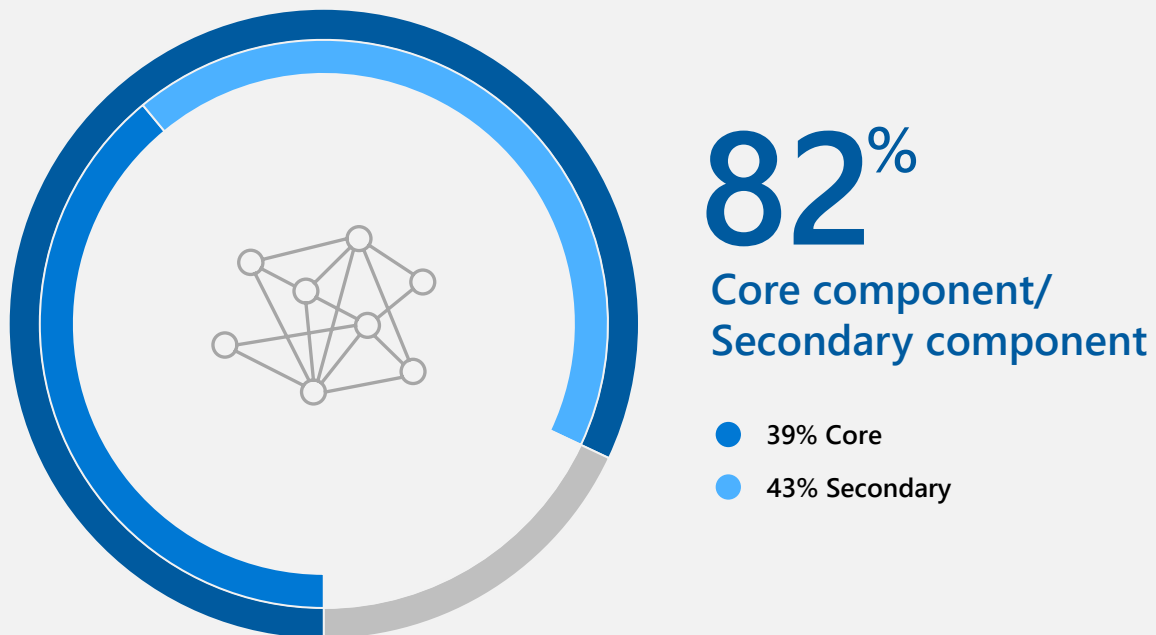
Over 70% of organizations across industries are using Digital Twins in IoT solutions. 80% of retail companies have a Digital Twins strategy, as compared with 60% of healthcare companies and 71% of manufacturing companies. Retail companies also have the highest level of implementation against their Digital Twins strategies: 27%, as opposed to 12% for healthcare and 23% for energy. 86% of retail organizations use Digital Twins in their IoT strategy, compared to 82% of manufacturing and energy companies, and 71% of healthcare organizations. Overall, healthcare implements against a Digital Twins strategy the least, versus other industries. **(See exhibit 23)**

EXHIBIT 23

DIGITAL TWINS ADOPTION AND VALUE

		TOTAL	Manufacturing	Healthcare	Retail	Energy
AWARE OF DIGITAL TWINS		86%	87%	80%	89%	87%
HAVE A DIGITAL TWINS STRATEGY		73%	71%	60%	80%	78%
IMPLEMENTATION PROGRESS AGAINST DIGITAL TWINS STRATEGY	*IMPLEMENTING* ▷ 27%		26%	12%	27%	23%
	DEVELOPED ▷ 28%		26%	26%	34%	32%
	DEVELOPING ▷ 18%		19%	23%	19%	23%
USE DIGITAL TWINS IN IoT SOLUTION		82%	82%	71%	86%	82%

Microsoft | hypothesis

Industry
Spotlights

———

Microsoft | hypothesis

Manufacturing Deep Dive

Manufacturing companies are rapidly adopting IoT – 93% of those we surveyed indicate they have adopted the technology. They turn to IoT to improve efficiency along the entire manufacturing process, from production to field operations to employee productivity. **(See exhibit 24)**

EXHIBIT 24

% IoT ADOPTERS

93%
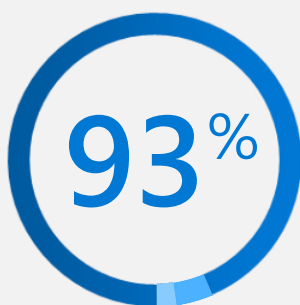
78% of total have at least one project that reached "use" stage

4% not using but have in past

3% not using, haven't in past
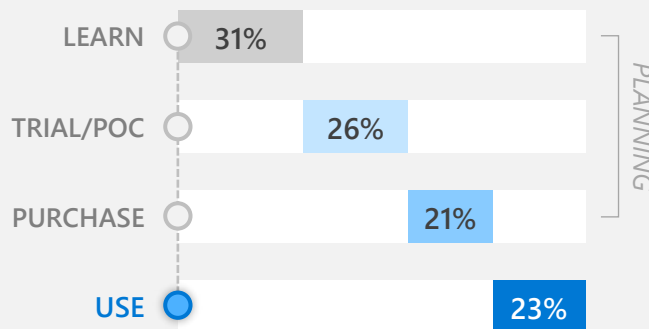
% IoT PROJECTS IN 4 STAGES

LEARN	31%	
TRIAL/POC	26%	PLANNING
PURCHASE	21%	
USE	23%	

TOP BENEFITS OF IoT

#1	#2	#3
Increases the efficiency of operations	Increases production capacity	Allows employees to be more productive

Use cases that employ automation as a key component – for example, production flow monitoring, industrial automation, and production planning and scheduling – are core to manufacturing's use of IoT. Of note, process manufacturing organizations more often use IoT for quality and compliance, condition-based monitoring, and condition-based predictive maintenance than discrete manufacturing organizations. **(See exhibit 25)**

EXHIBIT 25
REASONS FOR IoT ADOPTION

Reason	Percentage	Note
Production flow monitoring	47%	DISCRETE ONLY
Industrial automation	44%	
Production planning and scheduling	44%	
Quality and compliance	41%	
Process optimization	39%	DISCRETE ONLY
Supply chain and logistics	39%	
Plant safety and security	36%	
Overall equipment effectiveness	33%	
Condition-based predictive maintenance	32%	
Connected field service/New business models	31%	
Product-as-a-service	29%	PROCESS ONLY
Condition-based monitoring and service	28%	
'Connected product' engineering	26%	PROCESS ONLY
Worker safety	25%	

Many manufacturing organizations also use AI to make their IoT solution more efficient. More than three quarters of manufacturing companies report using AI, and they use it for a range of reasons including prescriptive and predictive maintenance, managing the customer experience, visual image recognition and interpretation, and natural language recognition and processing. **(See exhibit 26)**

EXHIBIT 26

AI USE AND IMPACT

Core component **41%**

Secondary component **36%**

77% Core Component/ Secondary Component
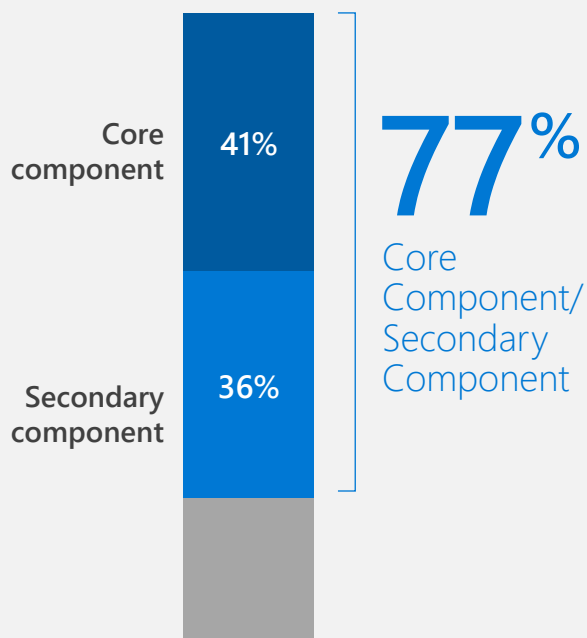
REASONS FOR AI IN IoT ADOPTION

Prescriptive maintenance	49%
Predictive maintenance	48%
User experience (e.g. customer service bots)	48%
Visual image recognition and interpretation	46%
Natural language recognition and processing (sound/speech)	42%

Microsoft | hypothesis

In the manufacturing field, complexity and resourcing challenges can threaten the pace at which IoT is growing. A third of manufacturing companies are still working through implementation of their current solution. Other top challenges in the manufacturing field include lack of human resources to implement the technology, existing challenges needing to be worked out, and the technology being too complex to implement. Lack of budget and staff for IoT are bigger challenges for process manufacturing companies than for discrete manufacturing organizations. Overall, security issues are lower on the list of challenges. **(See exhibit 27)**

EXHIBIT 27

CHALLENGES TO USING IoT MORE

Category	Challenge	Value
Still in Progress	Still implementing current solution	31%
Lack of Budget/Staff	Don't have human resources to implement & manage	26%
Complexity/Technical	Want to work out existing challenges	26%
Complexity/Technical	Too complex to implement	25%
Lack of Budget/Staff	Don't have budget	24%
Lack of Knowledge	Not enough training/guidance on how to deploy	23%
Lack of Knowledge	Lack technical knowledge	22%
Complexity/Technical	Too long to implement	22%
Lack of Knowledge	Don't know enough	20%
Compliance	Too many compliance/regulatory challenges	19%
Security	Concerned about consumer privacy	18%
Haven't Found Right Solution	Not a solution that meets our needs	18%
Security	Security risk isn't worth it	17%
Security	Unwilling to store data in public cloud	14%

Healthcare Deep Dive

IoT is well on its way to being highly adopted in healthcare, as 89% of healthcare companies are IoT adopters. One in three of this group's IoT projects are still in the learning phase, and a quarter of IoT projects are in the use phase. Top benefits of IoT adoption for healthcare companies include keeping track of their staff and inventory, and boosting productivity and operations efficiency. **(See exhibit 28)**

EXHIBIT 28

% IoT ADOPTERS

89%
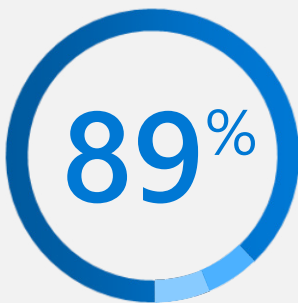
89% of total have at least one project that reached "use" stage

● 6% not using but have in past

● 6% not using, haven't in past

% IoT PROJECTS IN 4 STAGES

LEARN ○	33%	*PLANNING*
TRIAL/POC ○	25%	
PURCHASE ○	18%	
USE ●	25%	
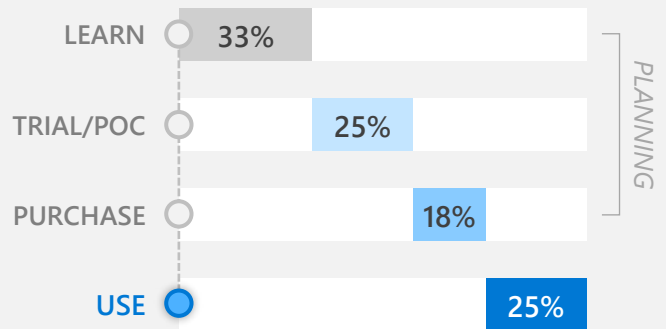
TOP BENEFITS OF IoT

#1
Increases the efficiency of operations

#2
Allows employees to be more productive

#3
Improves the traceability of tools/ medical equipment/ supplies

Ultimately, IoT is adopted to elevate patient and customer care. While tracking and IT security rise above patient monitoring and assistance for top use cases, care elevation remains the end goal **(see exhibit 29).** A UK healthcare provider ITDM working in the hospital system explains that IoT is used to automate many aspects of care: "Our main use for IoT is these smart patient tags as we call them. And they're used by patients for us to be able to identify where they are in the pathways. So we know when they come in the building, we know when they've been seen by the consultant. So it takes out the manual intervention of knowing where the patient is, and if they had an X-ray, if they had any blood test done, it just gets scanned on the tag. And we know automatically that all those things have taken place rather than having manual paper forms to be filled by people and staff."
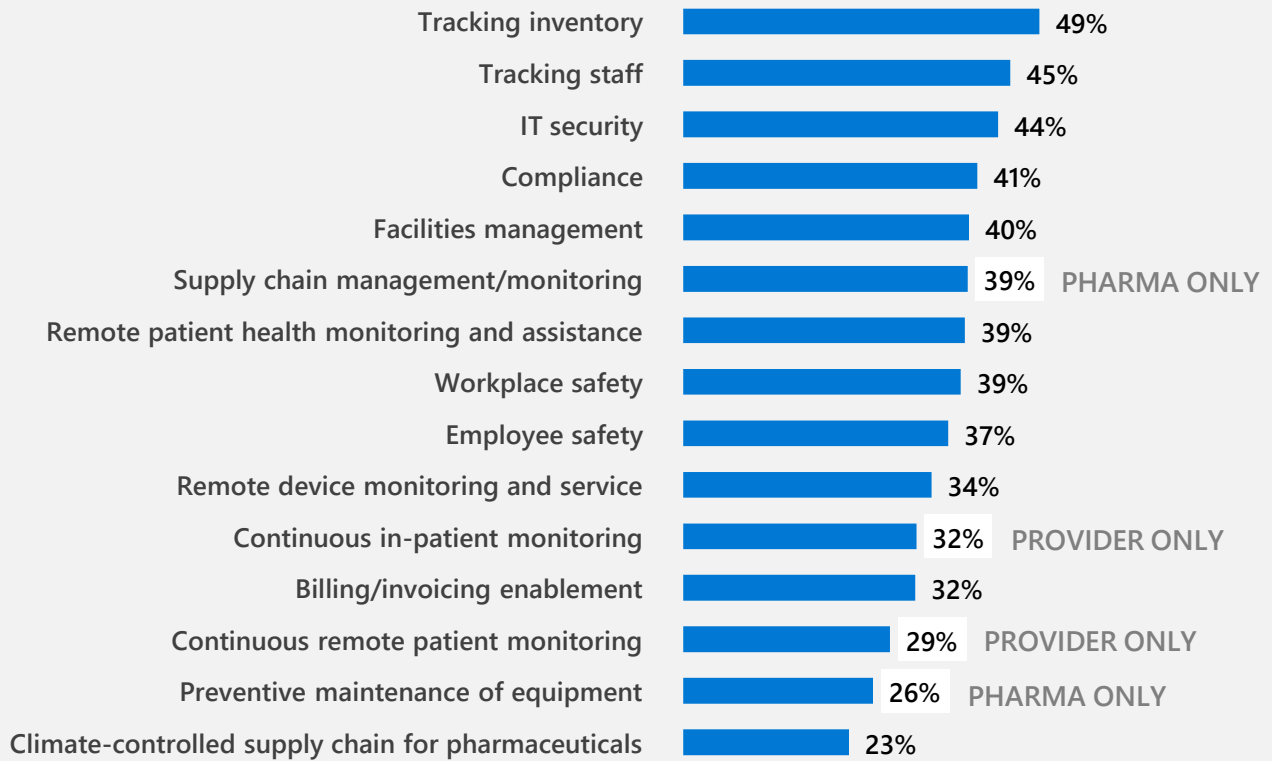
EXHIBIT 29

REASONS FOR IoT ADOPTION

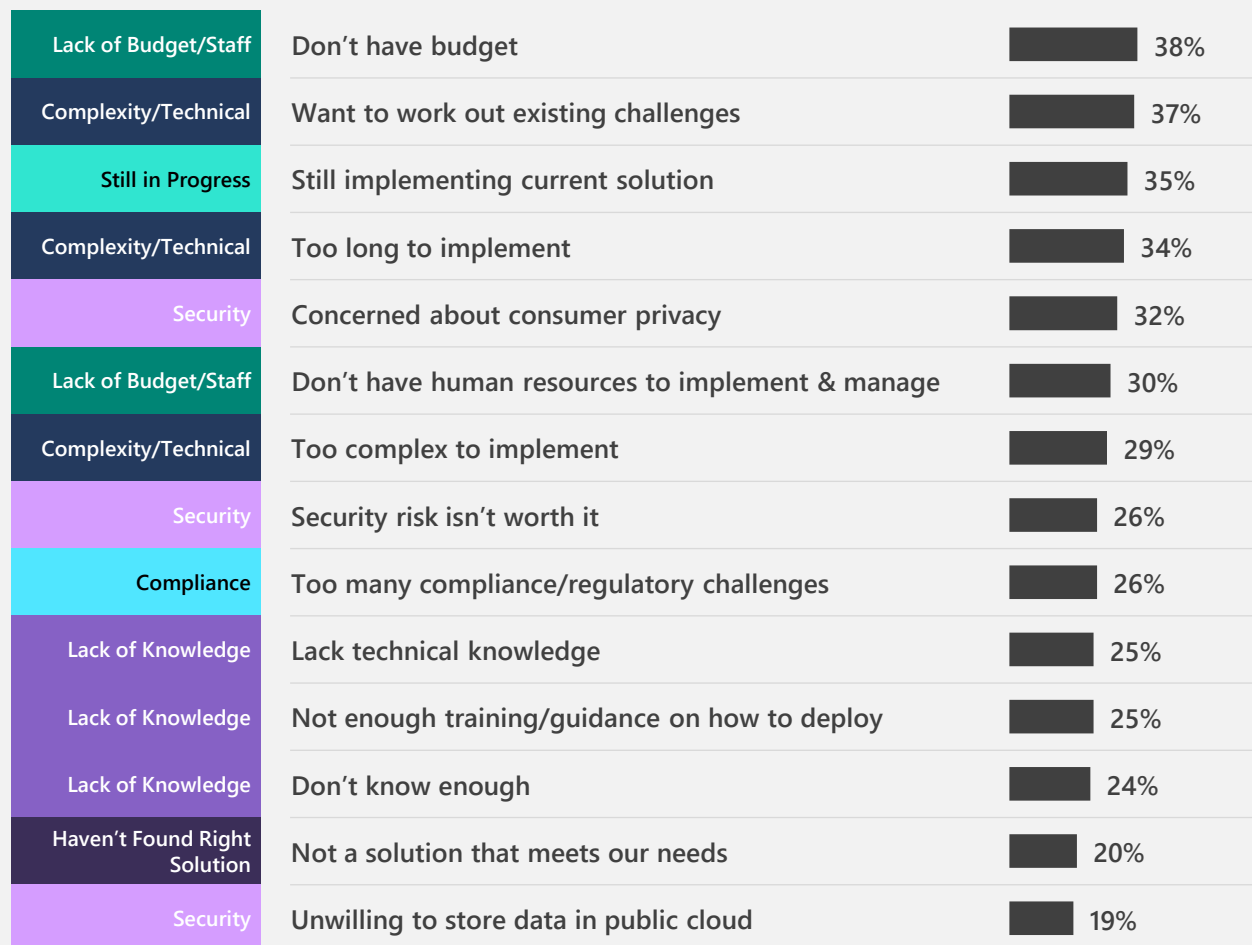| Reason	%	
Tracking inventory	49%	
Tracking staff	45%	
IT security	44%	
Compliance	41%	
Facilities management	40%	
Supply chain management/monitoring	39%	PHARMA ONLY
Remote patient health monitoring and assistance	39%	
Workplace safety	39%	
Employee safety	37%	
Remote device monitoring and service	34%	
Continuous in-patient monitoring	32%	PROVIDER ONLY
Billing/invoicing enablement	32%	
Continuous remote patient monitoring	29%	PROVIDER ONLY
Preventive maintenance of equipment	26%	PHARMA ONLY
Climate-controlled supply chain for pharmaceuticals	23%	

Key challenges for healthcare companies include lack of budget and/or staff, and existing issues with implementation. It's likely that these budget and resource constraints contribute to healthcare organizations falling behind other industries in their adoption and implementation of IoT. Meeting regulatory and compliance goals is also a bigger challenge for pharmaceutical companies than for providers. Additionally, lack of technical knowledge and security risks are more pressing issues for public healthcare than for private. **(See exhibit 30)**

EXHIBIT 30
CHALLENGES TO USING IoT MORE

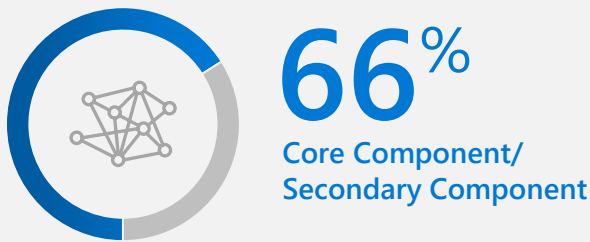| Category	Challenge	%
Lack of Budget/Staff	Don't have budget	38%
Complexity/Technical	Want to work out existing challenges	37%
Still in Progress	Still implementing current solution	35%
Complexity/Technical	Too long to implement	34%
Security	Concerned about consumer privacy	32%
Lack of Budget/Staff	Don't have human resources to implement & manage	30%
Complexity/Technical	Too complex to implement	29%
Security	Security risk isn't worth it	26%
Compliance	Too many compliance/regulatory challenges	26%
Lack of Knowledge	Lack technical knowledge	25%
Lack of Knowledge	Not enough training/guidance on how to deploy	25%
Lack of Knowledge	Don't know enough	24%
Haven't Found Right Solution	Not a solution that meets our needs	20%
Security	Unwilling to store data in public cloud	19%

Microsoft | hypothesis

The majority of healthcare companies are using AI or edge computing as part of their IoT solution, with opportunity for more organizations to integrate the technologies within IoT. Organizations have substantial opportunity to capitalize on IoT even more by using it in tandem with these technologies, but as with IoT overall, they need help overcoming budgetary constraints. 31% don't have the human resources necessary to integrate AI, and 30% say they lack the technical knowledge to see AI projects through. 34% of companies also report that they don't have enough trained personnel to implement edge computing. **(See exhibit 31)**
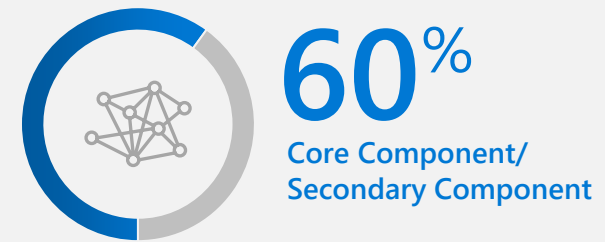
EXHIBIT 31
AI USE & IMPACT IN IoT

66%
Core Component/
Secondary Component

EDGE COMPUTING USE & IMPACT IN IoT

60%
Core Component/
Secondary Component

Challenges To Using More

Don't have the human resources necessary to implement and manage AI projects	31%
Lack technical knowledge to see AI projects through	30%
Infrastructure is not far enough along digital transformation plans	28%
Too complex to scale as we take on more AI projects/unsure about scalability	26%
Implementing AI would be too complex	23%
Don't know enough about how to get started with AI	19%
No solution available that meets our needs	16%

### Challenges To Using More

Difficulty managing security	34%
Lack of trained personnel	34%
Lack of infrastructure	31%
Lack of architectural guidance	27%
Lack of clarity on edge hardware choices	24%
Don't have a business need for edge computing	22%

Microsoft | hypothesis

Retail Deep Dive

Adoption of IoT is strong among retail organizations (94%). The majority have at least one project in the use phase, with approximately 26% of all projects currently in use (while the rest are in various states of development). The greatest benefits for retail IoT include increasing the productivity and efficiency of operations and employees, as well as reducing the opportunities for human error within supply chain management. **(See exhibit 32)**
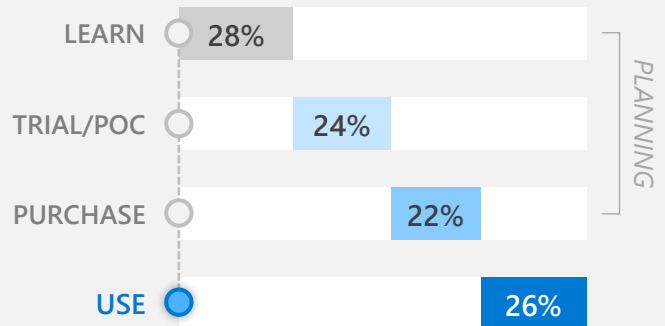
EXHIBIT 32

% IoT ADOPTERS
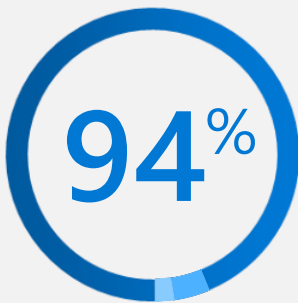
94%

88% of total have at least one project that reached "use" stage

● 4% not using but have in past

● 2% not using, haven't in past

% IoT PROJECTS IN 4 STAGES

LEARN ○ 28%

TRIAL/POC ○ 24%

PURCHASE ○ 22%

USE ○ 26%

PLANNING

TOP BENEFITS OF IoT

#1
Increases the efficiency of operations

#2
Reduces chance for human error in supply chain

#3
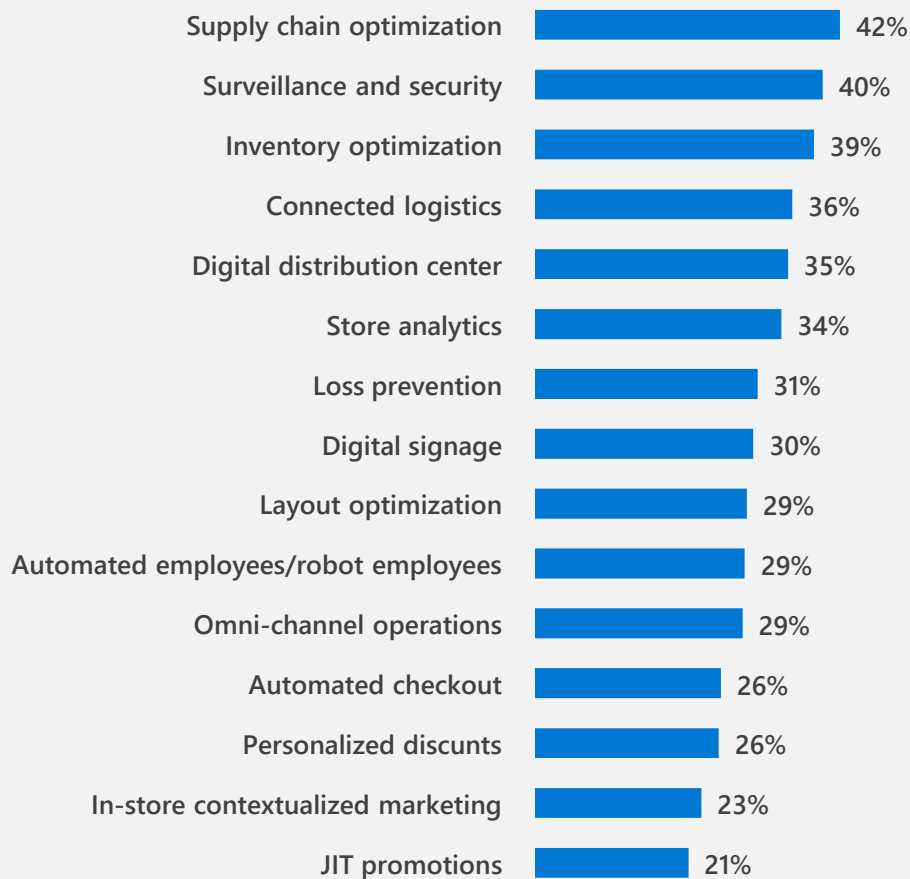Allows employees to be more productive

Overall, IoT is used for operations efficiency and enhancing direct customer touchpoints. Close to half of companies say supply chain optimization is a key use case, and more than a third cite inventory optimization as a primary way they're using the technology. Surveillance and security is a top application of IoT in retail environments – not only for loss prevention in-store, but also to monitor merchandise through the entire supply chain. While slightly less common, organizations are also using IoT for direct customer interactions, including automated checkout and personalized discounts, which builds on operational efficiencies gained on the front end. IoT also assuages concerns around security for retail companies. **(See exhibit 33)**

EXHIBIT 33
REASONS FOR IoT ADOPTION

Reason	Percentage
Supply chain optimization	42%
Surveillance and security	40%
Inventory optimization	39%
Connected logistics	36%
Digital distribution center	35%
Store analytics	34%
Loss prevention	31%
Digital signage	30%
Layout optimization	29%
Automated employees/robot employees	29%
Omni-channel operations	29%
Automated checkout	26%
Personalized discunts	26%
In-store contextualized marketing	23%
JIT promotions	21%

IN THEIR OWN WORDS

"Before if something wasn't in the distribution center, you'd say 'Can't find it. No big deal.' Now with IoT, if an item is not found in a distribution center, it's a major emergency. There's **heavy security** in place if something goes missing – t**here's nowhere to hide things** and **you know where things are.** That's where inventory accuracy has gone from 95% to 99.9999%. Nowadays, it's usually caused by an employee scanning a wrong item, but there are **protocols and systems** that protect against that as well, based on weight of a box and enabling the physical item not to be scanned if it's not part of that order."
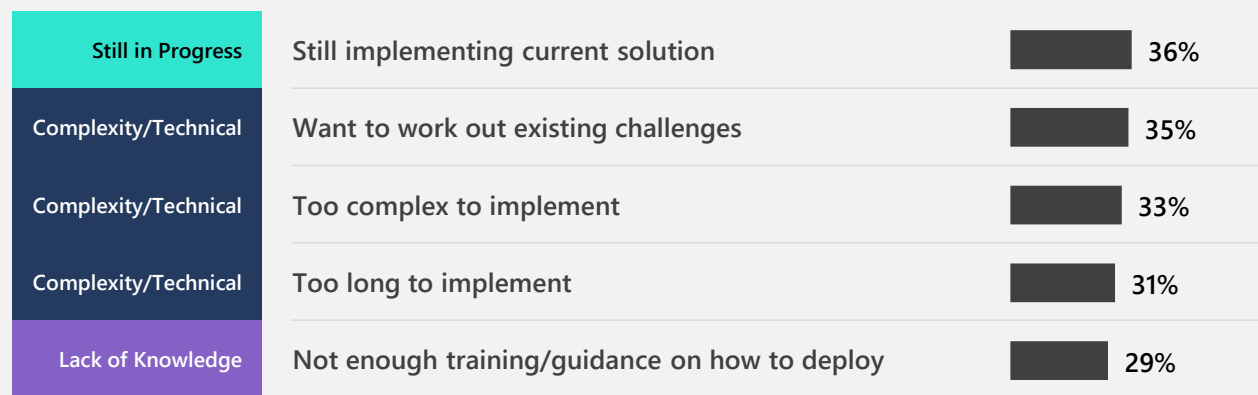
US Retail ITDM in Department Store

Microsoft | hypothesis

As retail organizations implement IoT more, they're discovering that security is less of a barrier than complexity and technical challenges. Retail organizations need the most help working through challenges with their existing IoT solution before they can advance further. They're already thinking about how to get to the next step, but are challenged by the high cost of scaling and demonstrating clear business value during PoC. **(See exhibit 34)**

EXHIBIT 34
CHALLENGES TO USING IoT MORE

Still in Progress	Still implementing current solution	36%
Complexity/Technical	Want to work out existing challenges	35%
Complexity/Technical	Too complex to implement	33%
Complexity/Technical	Too long to implement	31%
Lack of Knowledge	Not enough training/guidance on how to deploy	29%

REASONS FOR PoC FAILURE

Scaling	High cost of scaling	34%
Business	Pilots demonstrate unclear business value/ROI	33%
Business	Hard to justify business case without short-term impact	29%
Complexity	Too many use cases to prove out	28%
Complexity	Pilot is taking too long to deploy	28%

Energy Deep Dive

IoT is embraced among energy organizations – 94% have adopted IoT within their organization, with a quarter of their IoT projects having reached the use phase. Those who adopt IoT most often benefit from improved operational and production efficiency, decreasing the chance for human error along the way. **(See exhibit 35)**
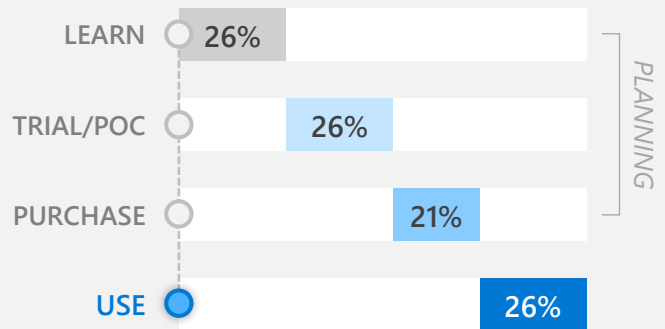
EXHIBIT 35

% IoT ADOPTERS
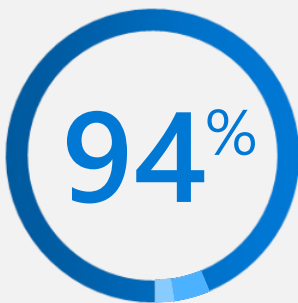
94%

91% of total have at least one project that reached "use" stage

● 4% not using but have in past

● 2% not using, haven't in past

% IoT PROJECTS IN 4 STAGES

LEARN	26%
TRIAL/POC	26%
PURCHASE	21%
USE	26%

PLANNING

TOP BENEFITS OF IoT

#1	#2	#3
Increases the efficiency of operations	Reduces chance for human error	Increases production capacity

Across energy decision-makers in both Power & Utilities and Oil & Gas, a key reason to leverage IoT is for better maintenance of their physical assets. IoT is also frequently used in the energy industry to elevate the customer experience. In addition, organizations use IoT to optimize operations and consequently deliver energy to customers more efficiently. **(See exhibit 36)**

EXHIBIT 36
REASONS FOR IoT ADOPTION

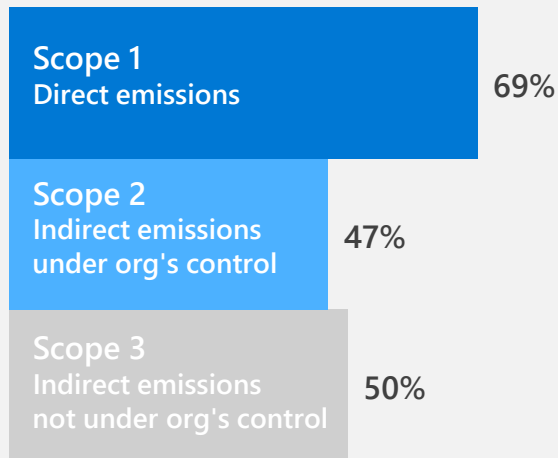| ⚡ Power & Utilities	
Grid asset maintenance	46%
Smart metering	41%
Generation optimization and load balancing	41%
Smart grid automation	40%
IT security	40%
Distributed Energy Resources (DER) management	40%
E mobility (Electric Vehicle) charging optimization and vehicle-to-grid	35%
Predictive load forecasting	32%
Remote infrastructure maintenance	32%
Home or building energy management	32%
Employee safety	30%
Emissions monitoring and reduction	29%
Workplace safety	26%
Digital twin of energy infrastructure	18%
New business opportunity through E mobility	17%

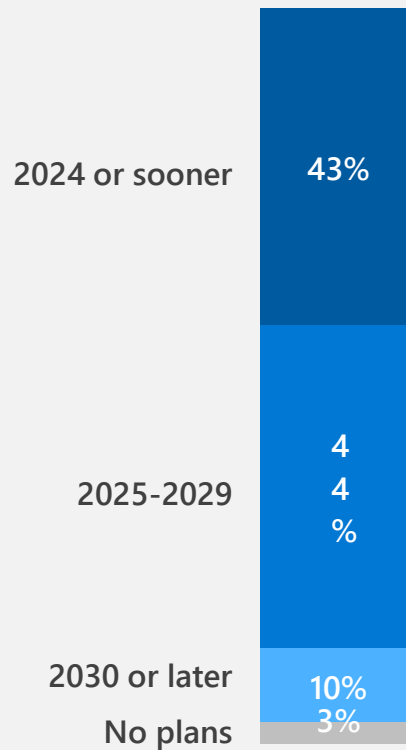| 🔥 Oil & Gas	
IT security	48%
Asset and predictive maintenance	46%
Emissions monitoring and reduction	42%
Home or building energy management	38%
Remote infrastructure maintenance	37%
Employee safety	31%
Workplace safety	31%
New business opportunity through E mobility	31%
Production optimization & load balancing	31%

Energy organizations also often use IoT for emissions monitoring and reduction, with one in three companies doing this. Direct emissions (scope 1) are viewed as the most important emission to reduce (69% say it's very important), though indirect emissions, both those under an organization's control and not under an organization's control, are also being prioritized. The majority of the companies focused on emission reduction plan to be carbon net zero by 2030 or sooner. **(See exhibit 37)**

EXHIBIT 37

VERY IMPORTANT EMISSION TO REDUCE

Scope 1
Direct emissions — 69%

Scope 2
Indirect emissions under org's control — 47%

Scope 3
Indirect emissions not under org's control — 50%

RENEWABLE ENERGY TIMELINE

2024 or sooner — 43%

2025-2029 — 44%

2030 or later — 10%

No plans — 3%
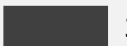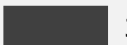
However, for organizations to continue improving the customer experience through IoT, they must overcome scalability hurdles. Consumer privacy is a large security priority within the energy industry, so organizations need to limit the number of vulnerable touchpoints. As a result, energy companies face challenges involving lack of trust in scalability platforms. **(See exhibit 38)**
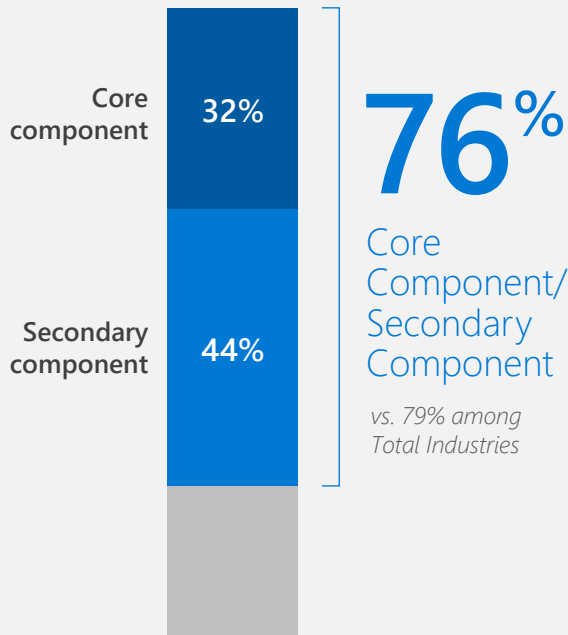
EXHIBIT 38

CHALLENGES TO USING IoT MORE

Still in Progress	Still implementing current solution	37%
Security	Concerned about consumer privacy	36%
Lack of Budget/Staff	Don't have human resources to implement and manage	33%
Compliance	There are too many compliance/regulatory challenges	31%
Lack of Knowledge	Not enough training/guidance on how to deploy	31%

REASONS FOR PoC FAILURE

Business	Pilots demonstrate unclear business value/ROI	38%
Scaling	Lack of trust in scalability platforms	30%
Technology	Lack of necessary technology	30%
Scaling	High cost of scaling	30%
Complexity	Too many platforms to test	28%

Most energy decision-makers are developing or implementing an AI strategy, with 76% of them making it a part of their IoT plans. Scalability hurdles persist for those implementing AI within IoT (43%) – even more challenging than lack of knowledge (37%) or having the right human resources (34%). **(See exhibit 39)**

EXHIBIT 39

USE AND IMPACT OF AI IN IoT SOLUTION

BARRIERS TO AI IMPLEMENTATION

Core component **32%**

Secondary component **44%**

76%

Core Component/ Secondary Component

vs. 79% among Total Industries

Barrier	%
Too complex to scale as we take on more AI projects/unsure about scalability	43%
Lack technical knowledge to see AI projects through	37%
Don't have the human resources necessary to implement and manage	34%
Infrastructure is not far enough along digital transformation plans	34%
Implementing AI would be too complex	32%
No solution available that meets our needs	26%
Don't know enough about how to get started with AI	25%

Final Thoughts

Globally and across industries, IoT continues to enable companies to become more efficient, productive, and safe. Organizations aim to use IoT to optimize their operations, but need solutions they can maintain over time, ideally without increasing their headcounts. In a perfect world, it would be as easy as possible for companies to get started with IoT, since once its value is proven, accelerating adoption becomes easier.

IoT can ultimately help businesses achieve a better customer experience, regardless of industry. However, organizations need help embedding IoT into their long-term strategy and communicating how it can positively impact performance in the workplace. Decision-makers already understand the importance of IoT, but leadership must become more engaged in order to foster an IoT culture. Organizations with internal advocates who can test and implement IoT solutions during proof of concept will be best prepared to move to the next step.

COVID-19 has accelerated investment in IoT by forcing organizations to adopt new technologies that help them get back to work faster and increase organizational productivity. The faster organizations adopt IoT, the easier it will be to double down on adoption and build on existing efficiencies.

Detailed Research Objectives & Audience Recruit

THE OBJECTIVES OF THE RESEARCH INCLUDED

1 — Understand the current state of IoT

2 — Uncover benefits and challenges of adopting IoT

3 — Analyze adoption and uses of IoT

4 — Explore emerging technologies use within IoT, and dive into specific industry learnings

TO MEET THE SCREENING CRITERIA, IoT PROFESSIONALS NEEDED TO BE:

A business decision maker, IT decision maker, or developer at their company

Employed full-time at an enterprise-level company (1,000 employees or more)

Ages 18-65

Familiar with IoT

Involved in decision making for IoT

For Industry Deep Dive: Work in energy, manufacturing, healthcare, or retail industries

OF THE 3,000 IoT PROFESSIONALS INTERVIEWED FOR THE RESEARCH WAVE BETWEEN APRIL AND MAY 2020

In the US, 1,000 IoT professionals were interviewed

In Germany, Japan, China, France, and the UK, 400 IoT professionals were interviewed in each country

In the Energy Deep Dive, 211 IoT Professionals were interviewed across all countries

In the Manufacturing Deep Dive, 591 IoT Professionals were interviewed across all countries

In the Healthcare Deep Dive, 196 IoT Professionals were interviewed across all countries

In the Retail Deep Dive, 355 IoT Professionals were interviewed across all countries