



Hewlett Packard
Enterprise

The Internet of Things: Today and Tomorrow



The Internet of Things is heading for mass adoption driven by better-than-expected results. But is your business prepared?

Content

Executive summary	5
The state of IoT today	6
How global organizations are using IoT today	8
• ONE: Using 'smart workplaces' to boost productivity and efficiency	
• TWO: Industrial sector looking to IoT to reduce risk and downtime	9
• THREE: Healthcare increases innovation and reduces costs through IoT	10
• FOUR: Retailers are building IoT services to enhance the customer experience	11
• FIVE: Governments are saving costs with IoT, creating smart cities	12
The IoT business opportunity	14
IoT delivers beyond expectations	15
The IoT threat	16
The road to secure adoption of IoT	18
Research methodology	19

Executive summary

The Internet of Things (IoT) has hit an inflection point in the minds of business executives across the globe. Helped by real-world examples of what it can achieve, IoT is showing strong gains across a range of markets. The story from here to 2019 is clear: IoT is moving from good to great.

That's the view of the majority of the 3,100 line-of-business and information technology professionals we spoke to as part of our international IoT survey. We asked respondents from 20 countries about a range of topics, including the different ways IoT is being used, the opportunities ahead, and the challenges it faces. What we discovered was sometimes surprising, always enlightening and often exciting: IoT has a bright future, but there are road blocks ahead.

Expectations of IoT are sky-high, but the study has revealed that those who implement IoT in the right way have found their expectations surpassed. In fact 88 percent of respondents already report a return on financial investment. It seems IoT is good for business efficiency, innovation and profitability.

These results mean IoT is going beyond industry hype—it's starting to live up to its potential.

Today, over half (57 percent) of companies have already adopted IoT technology, and by 2019 that number is expected to reach 85 percent.

But while IoT grows, it is important to tread carefully. Our research found conflicting definitions of what IoT means, what IoT devices are connected and how to extract value from them. Furthermore, many organizations have failed to take the steps required to protect their networks and the devices connected to them.

Many of the IoT devices in use today are inadequately secured, leaving organizations vulnerable to attacks. This is an immediate issue impacting organizations today:

84 percent have experienced an IoT-related security breach.

This report discusses the different ways each industry defines, uses and benefits from IoT, the applications that are creating value within global businesses, the threats that exist and how to mitigate them.

The state of IoT today

The growth of IoT has been widely discussed over the last few years, but our new research appears to show that IoT is already everywhere.

The phrase 'Internet of Things' can be traced back almost 20 years, yet there remains no clear consensus from businesses on its meaning. Ninety-eight percent of respondents claimed to understand the term, yet the descriptions they gave varied widely.

Two-thirds of respondents declared IoT was 'adding internet connectivity to everyday objects' (67 percent). This is the leading definition of IoT from our research, but it's a definition that differs from Kevin Ashton's, the tech pioneer who coined the phrase 'Internet of Things' in 1999. In his new book, commissioned by Aruba, 'Making Sense of IoT' Ashton takes a smart toaster as an example, claiming: "If the Internet of Things meant products like these—little more than home appliances with the word 'smart' added to their names—the Internet of Things would not be interesting".

Other popular definitions given for IoT included 'a network that connects multiple objects, devices and sensors' (65 percent), 'a platform to connect industrial components' (55 percent), 'automating building services' (52 percent) and 'using wearable technology' (46 percent).

How does Kevin Ashton define IoT?

"The Internet of Things' means sensors connected to the Internet and behaving in an Internet-like way by making open, ad hoc connections, sharing data freely and allowing unexpected applications, so computers can understand the world around them and become humanity's nervous system."

Kevin Ashton, from 'Making Sense of IoT'

When it comes to what IoT can achieve, the picture is much clearer. Over three-quarters (77 percent) of business leaders said that IoT was 'just beginning', and would transform business as we know it.



How global organizations are using IoT today

The early expectations of any new technology almost always surpass what's really achievable. But for IoT, its real-world advantages and applications are beginning to shine through. In order to truly appreciate what IoT can do, we need only look at the specific areas where IoT is helping to transform business.

ONE: Using 'smart workplaces' to boost productivity and efficiency

Seven in ten (72 percent) enterprise organizations have introduced IoT devices and sensors into the workplace—from air conditioning and lighting systems (56 percent) to personal mobile devices (51 percent).

Enterprise respondents cited indoor location-based services as their leading use case for IoT, as well as remote monitoring of utilities, such as energy usage. This is helping enterprises build smart workplaces, where important assets are tracked by location and can communicate with other devices in their proximity.

The survey results also show that smart workplaces really do work. Over three-quarters (78 percent) of enterprises say the introduction of IoT into the workplace has improved the effectiveness of their IT team, while 75 percent find it has increased profitability.



TWO: Industrial sector looking to IoT to reduce risk and downtime

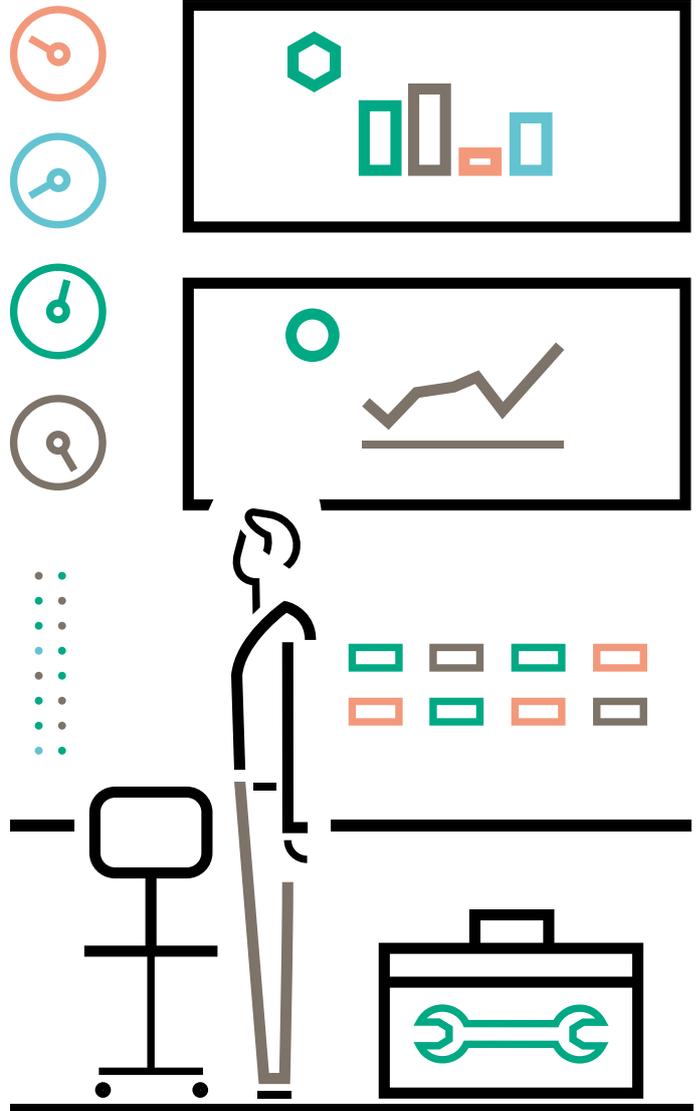
With a 62 percent adoption rate, leaders of industrial organizations reported using IoT devices such as chemical sensors (62 percent) and picking systems (46 percent) to reduce operational risk and address downtime.

IoT has the greatest impact on the sector when it is used to monitor and maintain operating infrastructures (31 percent). This is no surprise: for decades, the industrial sector has understood the need for systems, processes and machines to remain interconnected, from modern equipment to legacy technology.

Adopters of IoT reported significant increases in business efficiency (83 percent), innovation (83 percent), and visibility across the organization (80 percent). These points are important for achieving a long-term vision for IoT in this sector; 40 percent believe IoT will help them expand into new markets and another 34 percent are hoping to see overall industry growth because of their IoT practices.

40%

believe IoT will help them expand into new markets

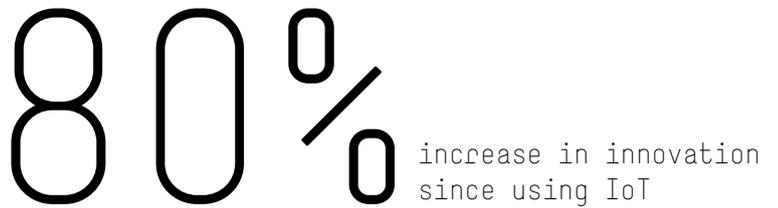


THREE: Healthcare increases innovation and reduces costs through IoT

Six in ten healthcare organizations are already using IoT, with patient monitors (64 percent) and X-ray/imaging devices (41 percent) among the main devices connected to the network.

The biggest IoT benefit for healthcare companies comes from using sensors to monitor and maintain medical devices (35 percent cite it as the top benefit). But with growing pressure on healthcare infrastructures and resources, efficiency is paramount. Perhaps this is why 22 percent of respondents gave their number one IoT use case as 'remotely tracking assets by location'.

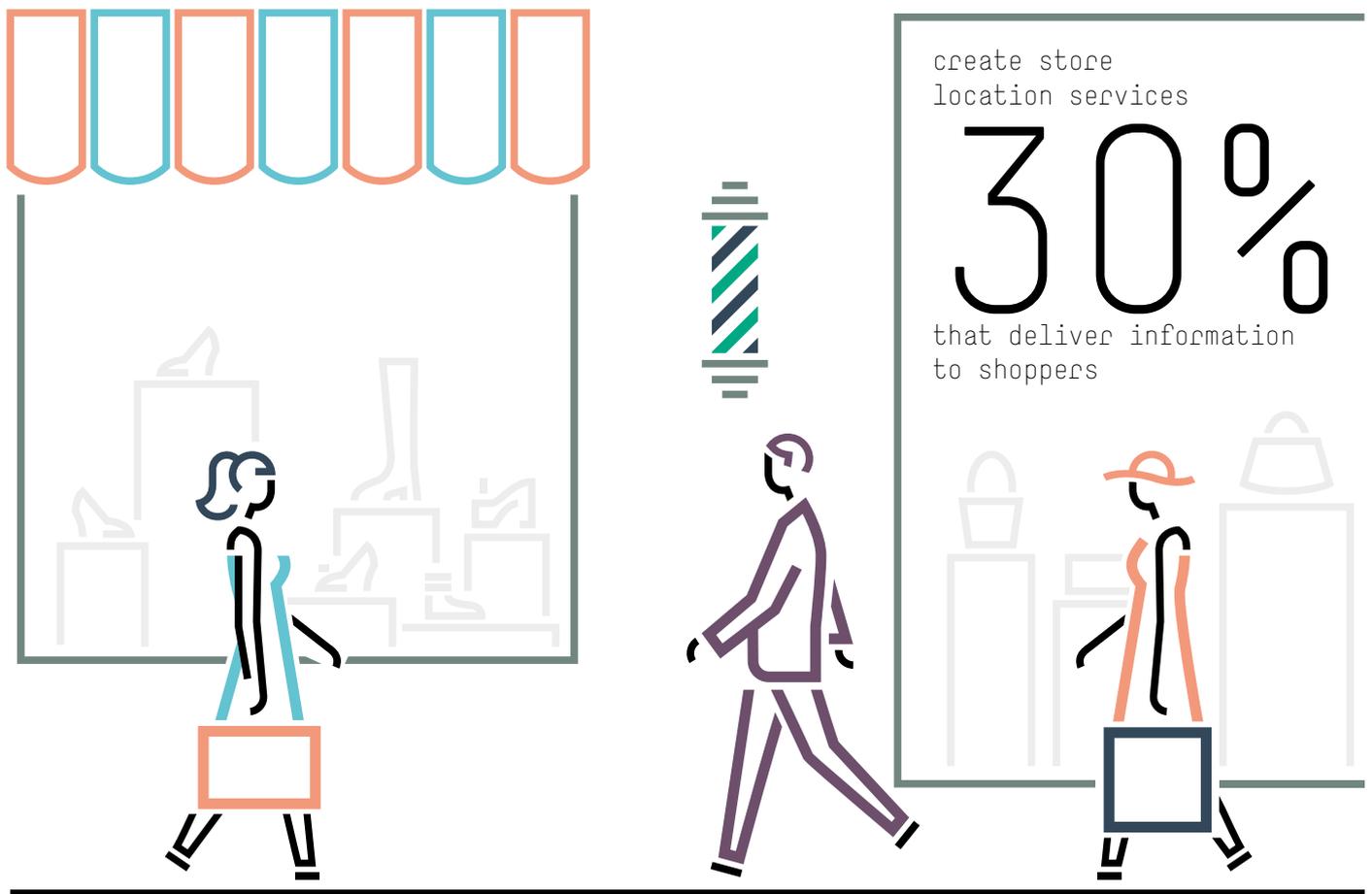
Both applications are proving crucial to the bottom line; 73 percent of respondents declared cost savings as a result of IoT. With more resources saved, the potential for creating new services is also increasing—a fact confirmed by the eight in ten (80 percent) of healthcare leaders who reported an increase in innovation since using IoT.



FOUR: Retailers are building IoT services to enhance the customer experience

Just under half (49 percent) of global retailers have deployed IoT technology, and a large number of those (56 percent) are allowing personal mobile devices to access the network in order to create new and engaging retail experiences.

A leading application of IoT is to create store location services that deliver personalized offers and product information to shoppers (30 percent). A further 18 percent are using IoT to remotely control environmental factors, such as heating and lighting.



All of this is making its mark on consumers, at a time when customer experience is increasingly a winning differentiator. Eight in ten retail organizations (81 percent) said IoT has improved the overall customer experience, and for 88 percent it has boosted business efficiency.

FIVE: Governments are saving costs with IoT, creating smart cities

At 42 percent, governments are further behind in their adoption of IoT. In fact over a third (35 percent) of IT decision makers within government bodies claimed their leaders had little or no understanding of IoT - double the global average.

However, there remain signs of progress being made in IoT. Governments are already connecting building security systems (57 percent), street lights (32 percent) and vehicles (20 percent) to create a coherent technology environment that will underpin the 'smart city' of the future. The most popular application of IoT is the remote monitoring and control of devices within the city boundaries (27 percent name this their number one application).

Within cities, the limitations of legacy technology is proving a key challenge, with nearly half (49 percent) of government IT departments struggling to integrate older technology into their systems.

However, those with a working IoT strategy show why it is worth pursuing: seven in ten (71 percent) public sector IoT adopters reported cost savings, and a further 70 percent said IoT had improved visibility across their organization—a crucial step if the unified infrastructure of the smart city is to be realized.

70%

said IoT had improved visibility across their organization

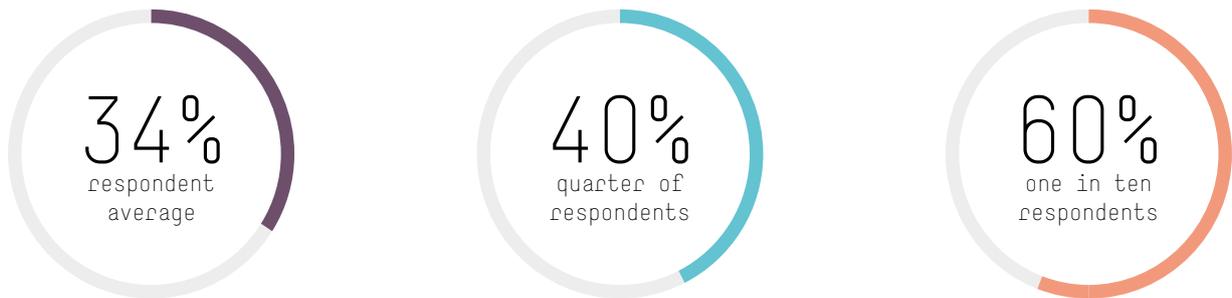




The IoT business opportunity

The real-world applications of IoT show significant promise, and this finding is echoed across the global research. The survey asked businesses that have adopted IoT to explain the results they have seen since deployment. The survey consistently found positive responses.

Return on investment for IoT

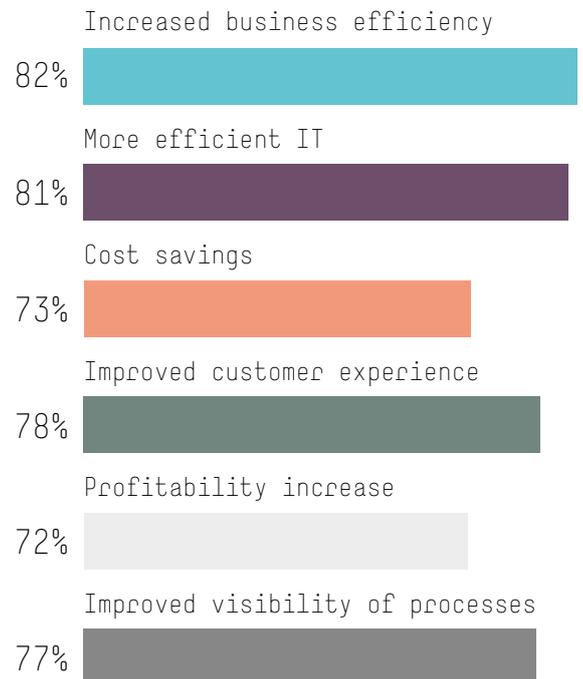


Across the globe, the average return on investment from IoT was 34 percent. Over a quarter of respondents (27 percent) reported more than 40 percent ROI from IoT, and one in ten reported over 60 percent returns.

Just some of the areas IoT is helping transform:

- 82 percent said they had seen an increase in business efficiency since adopting IoT technology
- 81 percent have seen their organization's IT become more efficient
- 73 percent have achieved cost savings
- 78 percent saw an improvement in customer experience
- 72 percent declared a profitability increase
- 77 percent have seen improved visibility of processes across the whole organization

Commenting on the business outcomes they hoped to see in the future, business leaders also said they expected IoT to increase workplace productivity (56 percent), reduce downtime (40 percent) and create new business models through analytics-driven services (36 percent).



IoT delivers beyond expectations

When discussing the returns of IoT, the results reported by organizations who have already deployed IoT were consistently higher than the estimations of those who are yet to get started.

Over seven in ten (72 percent) executives who are planning to adopt IoT believe it will deliver an increase in business efficiency, compared to the 82 percent of those who have already adopted it and are already seeing improved efficiency. Fifty-eight percent of executives planning to adopt IoT believe it will increase profitability, but a much larger 72 percent of executives already using IoT say it delivers increased profitability.

This trend, which Kevin Ashton calls the 'expectations dividend,' is common across all of the business returns discussed in this research. For any business still unsure if an IoT deployment will make good on its promise, this should help instill the confidence to move forward.

The value of the edge

In terms of how to manage IoT from a technological point of view, we found significant advantages of moving compute functions to the edge. In fact, two thirds (66 percent) of organizations who report seeing 60% or more ROI say that they are moving server compute to the edge, compared to 40% overall.

Why the Internet of Things matters, according to Kevin Ashton

- First, the Internet of Things is not only a new way to gather facts but also a way to gather new facts. Most data that is gathered automatically is data that has never been gathered before. When an organization adopts the Internet of Things, it gains knowledge where it was ignorant; moves from assumption to information; and understands new things.
- Second, Internet of Things technologies, like the Internet itself, tend to be open, flexible, and easy to build upon. When an initial Internet of Things deployment uncovers new opportunities, it is relatively easy to expand the system to take advantage of them. There's no need to say "I wish we had thought of that when we designed this thing." If you want to turn your great Internet of Things navigation system into a tool for helping business customers manage their fleets more efficiently, or for predicting where to find parking spots, or for launching a new car sharing service, you probably can. Internet of Things deployments seldom end: most users keep thinking up new ways to get value out of them.

The IoT threat

It's clear that across regions and industries, the opportunities for IoT are vast. But some fundamental gaps still exist in the understanding and preparedness for IoT at scale.

For example, 98 percent of organizations that have adopted IoT claim to be able to analyze data, but almost all respondents (97 percent) think there are challenges to creating value from this data. Nearly four in ten (39 percent) are not extracting and analyzing data within corporate networks and using those insights to improve business decisions.

Further to this, 94 percent of IT decision makers claim they are facing barriers to creating new business value through IoT, with cost of implementation (50 percent), maintenance (44 percent), and integration of legacy systems (43 percent) being key issues.

Overhanging all of this is the threat of attack through IoT systems. Half of our respondents (52 percent) feel external attack is the greatest threat to their IoT systems, and shockingly, 84 percent have already experienced an IoT-related breach. The most common breaches were a result of malware (49 percent), spyware (38 percent) and human error (38 percent).

For all its benefits, IoT deployments risk leaving a back door wide open for attackers to exploit. As the growth of IoT continues, tighter security controls must be adhered to in order to close the door and lock it shut. Even the most seemingly innocuous IoT devices should not go unsecured. If a device is left unmonitored and not considered part of the wider network infrastructure, that must be corrected.

84%

have already experienced an IoT-related breach



What does a good Internet of Things strategy include?

“One of the most important things is a robust plan for keeping your system secure. Eighty-four percent of Internet of Things adopters say they have experienced at least one Internet of Things security breach, with malware, spyware, and human error being the most common problems. Ninety-three percent of executives expect Internet of Things security breaches to occur in the future”.

Kevin Ashton.

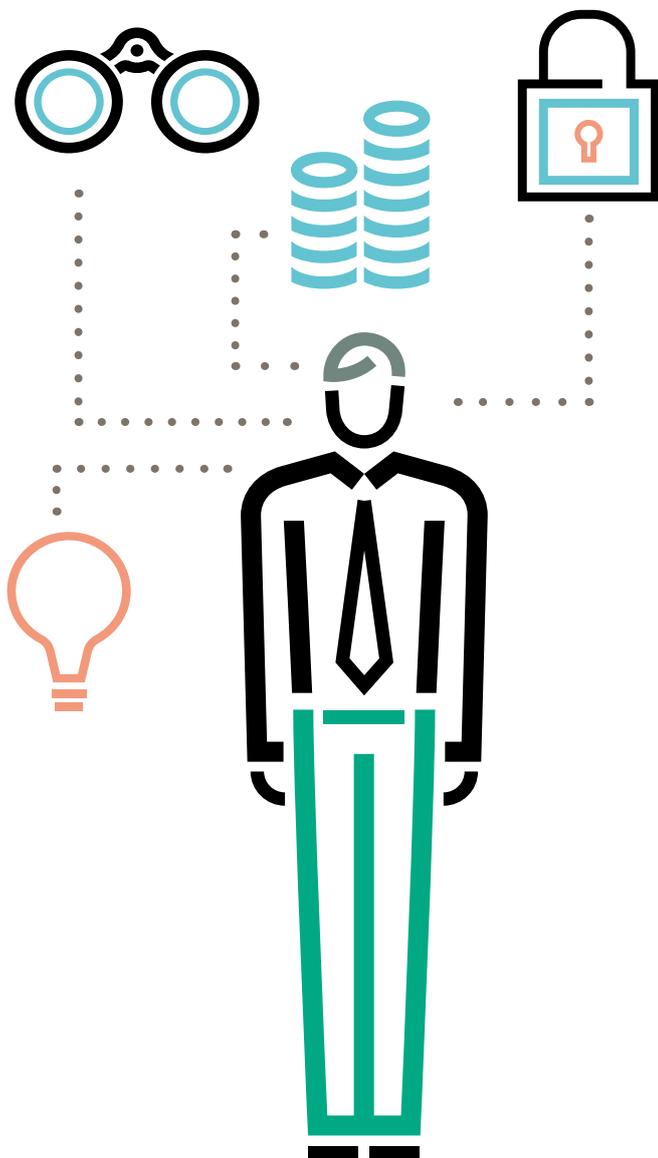


The road to secure adoption of IoT

The adoption of IoT looks set to accelerate between today and 2019, but perhaps a course correction is needed to maintain its growth.

Looking beyond 2019, almost all organizations (97 percent) expect IoT to deliver returns in the next five years. Failure to prevent security breaches could significantly damage this roadmap.

Better control of IoT should come by first understanding the massive impact it has on individual businesses. It should capture the attention of company leaders outside of the IT department, but our research suggests this is yet to happen: half (49 percent) of business leaders, 70 percent of HR employees and 78 percent of finance employees have not asked their IT department about IoT strategy.



Better company-wide dialogue needs to be opened if we are to positively manage the impact of IoT. The ideal starting point is aligning IoT to broad business objectives, and to separate these objectives into four pillars: visibility, security, innovation, and profitability.

IoT has been clouded in mystery and confusion, but it is clearly ready to take center stage. Take the time to define what IoT means to your organization and develop a framework that puts security first to ensure IoT will deliver on its promises.

For detailed guidance on how to take a secure approach to IoT, and to download a copy of Kevin Ashton's new book, 'Making Sense of IoT', visit arubanetworks.com/iot.

Research methodology

A total of 3,100 IT and business decision makers were interviewed in November and December 2016. The respondents were from organizations with at least 500 employees, and were from both public and private sectors, but with a focus on the industrial, government, retail, healthcare, education, construction, finance, and IT/technology/telecommunications sectors. Interviews were conducted both online and via telephone using a rigorous multi-level screening process to ensure that only suitable candidates were given the opportunity to participate. Respondents were interviewed in the UK, Italy, Germany, France, the Netherlands, Spain, Sweden, Norway, Turkey, UAE, Saudi Arabia, the US, Singapore, Japan, Australia, India, Brazil, Mexico, China and South Korea.



Hewlett Packard
Enterprise

