The Rise of the Internet of Things

Wi-SUN Alliance IoT Industry Research

Contents

Prioritizing Internet of Things (IoT) enablement, by respondent country

67% Total

73% United States

64% United Kingdom

62% Sweden
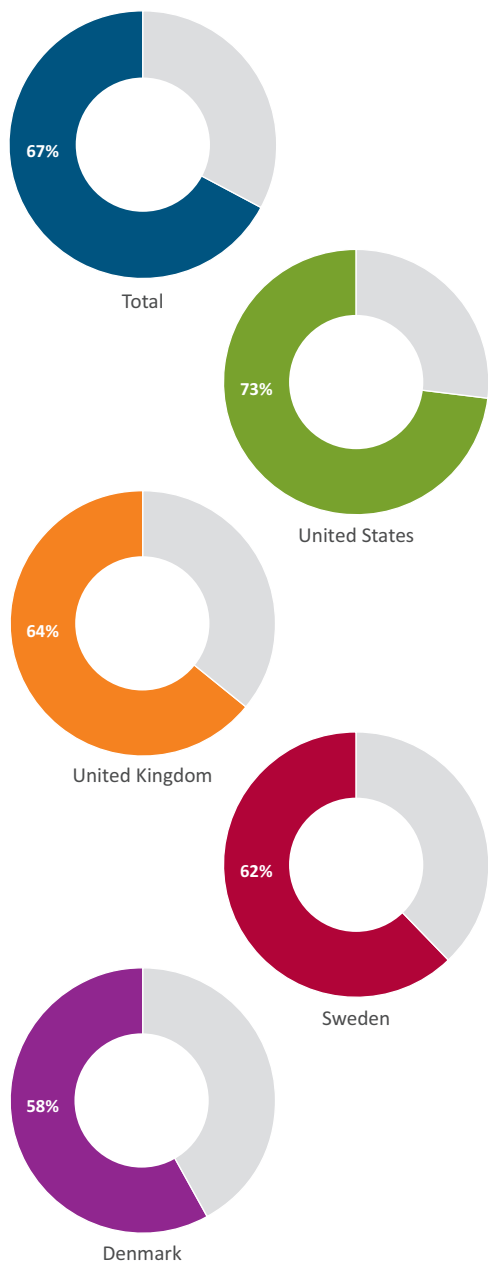
58% Denmark

67% Total
73% United States
64% United Kingdom
62% Sweden
58% Denmark

Figure 1: *Analysis showing the percentage of respondents who identify IoT enablement as an IT priority for the next 12 months.*

Executive Summary

Organizations on both sides of the Atlantic are realizing the benefits of the Internet of Things (IoT). Companies across a range of verticals who are involved in at least one IoT initiative have highlighted IoT enablement as a key driver for the coming year, and are already well on the way to success in deploying a range of IoT-enabled applications.

The Wi-SUN Alliance worked with market research company, Vanson Bourne, to interview representatives from 350 organizations in the US, the UK, Denmark and Sweden who are already implementing an IoT initiative, including smart cities, smart utilities and other industrial IoT applications. It asked them for their views on IoT technology, the drivers, barriers and benefits, together with their future plans. The results provided a detailed picture of the hopes and concerns around IoT projects across two continents.

Over half of all those investing in IoT have fully implemented their strategy, while around a third are rolling it out.

Among those most interested in IoT are organizations in the Oil and Gas sector, and Utility companies. Both of these sectors are more advanced in their implementation of an IoT strategy, and are already enjoying efficiency benefits as they use the technology to control intricate technology infrastructures at scale.

Nevertheless, some companies are struggling with IoT. The research found that 94% of organizations with a plan for IoT have experienced challenges around areas including security, cost, and leadership buy-in.

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Introduction – Priorities Point to IoT

The Wi-SUN Alliance chose to focus on industry verticals that could benefit from the introduction of industrial IoT solutions. For this reason, some sectors, such as education and finance, were not surveyed. Instead, it targeted industries, including Oil and Gas, Government, Telecommunications, Energy and Utilities.

The survey, which explored organizations of varying sizes, from under 1,000 employees to over 5,000, found that IoT has captured their imagination. It featured second on the list of IT priorities for the next 12 months. Two-thirds (67%) of companies that are investing in IoT initiatives highlighted IoT enablement as a key area, although they were not prompted to do so. (See Figure 1.)

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Wi SUN Alliance

Drivers for IoT implementation

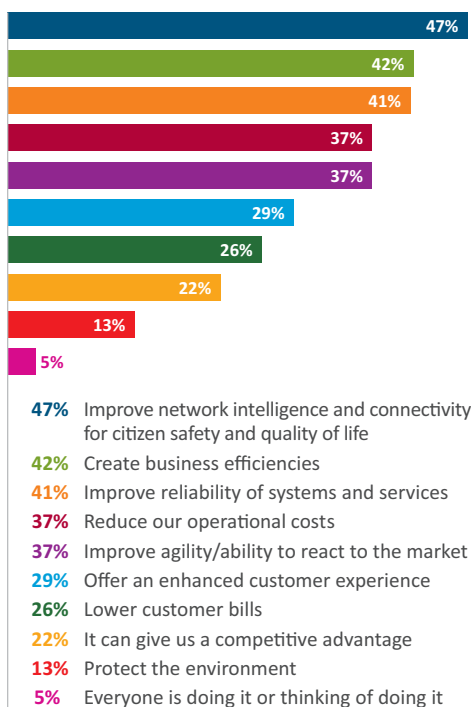|	
47%	Improve network intelligence and connectivity for citizen safety and quality of life
42%	Create business efficiencies
41%	Improve reliability of systems and services
37%	Reduce our operational costs
37%	Improve agility/ability to react to the market
29%	Offer an enhanced customer experience
26%	Lower customer bills
22%	It can give us a competitive advantage
13%	Protect the environment
5%	Everyone is doing it or thinking of doing it

Figure 2: *When implementing IoT (including industrial IoT) initiatives and processes, what are the top three drivers for your organization?*

Oil and Gas companies, with a long history in supervisory control and data acquisition (SCADA) and industrial control systems, are the most eager to embrace IoT technologies. It was revealed that 88% of those investing in IoT viewed IoT enablement as a priority. Utility companies, which also face the challenge of monitoring and controlling large, complex infrastructure systems, were the next most excited about IoT enablement. In addition, 78% of these companies, who are also investing in IoT initiatives, highlight it as a top priority for the coming year.

One reason that companies are focusing so heavily on IoT is that it supports or relates to many other of their IT priorities. Nearly two-thirds (64%) of respondents cited increased IT automation as a key area, making it the third most important issue for their organization in the next year. In addition, 55% point to better use of big data analytics as a focal point for improvement, while 49% highlighted improved organizational connectivity as a focal area over the next year. These priority areas all relate directly to IoT projects, which provide the infrastructure and data to support them.

What's Driving IoT?

Some distinct factors are driving IoT to the top of respondent organizations' IT priorities. The most popular, which appeared in the top three drivers for 47% of respondents, was "to improve network intelligence and connectivity for citizen safety and quality of life". It is encouraging to see the top driver focusing on improving the end-user experience, but it was skewed by interest from US respondents. Also 63% of those had this in their organization's top three reasons.

Other popular drivers were focused on internal benefits. Overall, 42% of respondents highlighted business efficiencies among the top three drivers. Improving the reliability of systems and services (41%) and reducing operational costs (37%) were the next most popular drivers among all respondents' top three. (See Figure 2.)

Reaping the Rewards

When it comes to the benefits of IoT, the proof lies in what happens post-deployment. Almost all (99%) respondents said that their organization had seen some tangible benefits after implementing IoT projects.

> *99% respondents said that their organization had seen some tangible benefits after implementing IoT projects.*

The benefits were both internal- and external-facing. The most cited benefit was better business efficiency, which 54% of respondents reported that their organization enjoyed. However, an improved customer experience came

**Benefits Seen as a Result of
IoT Implementation**

54%	Better business efficiency
49%	An improved customer experience
48%	Better organization-wide collaboration
47%	Better agility/ability to react to changes in the market
45%	Reduced costs
41%	Higher customer satisfaction
40%	Faster time to market for new products/services
33%	More engaged and motivated employees
32%	Allow us to remain competitive
1%	There has been no benefit to my organization

Figure 3: *What benefits has your organization seen as a result of implementing IoT (including industrial IoT) initiatives and processes?*

a close second, at 49%, potentially leading to higher customer satisfaction (highlighted by 41%). Other top benefits included better collaboration across the organization (48%), increased agility (47%) and reduced costs (45%). (See Figure 3.)

One anomaly was the effect of IoT projects on competitiveness. Overall, the vast majority (94%) of respondents believed that an investment in IoT over the next year was important to remain competitive. It was discovered that 62% completely agreed with that statement, and 31% somewhat agreed.

In spite of that concentration on competitiveness, this was the least-cited benefit in the US and the UK, quoted by just 32% and 20% of respondents respectively. Comparatively, respondents in Denmark (42%) and Sweden (46%) were far more likely to report that IoT initiatives have helped their organization remain competitive.

When it comes to industry sectors, Oil and Gas enjoyed significant business efficiency gains compared to other verticals. 63% of respondents in that sector cited better business efficiency as a benefit of their IoT initiatives, as did 62% of Energy and Utility companies, highlighting the potential for IoT solutions in these industries.

Maturity in IoT Strategy and Execution

The drivers behind IoT projects mapped somewhat to the strategies that organizations developed for implementing them. Across all respondents, improving customer experience stood out as a key element included in IoT strategies, with just over two-thirds (67%) citing this. The US was by far the most focused on customer experience, with 78% of respondents from that region highlighting it as a strategic issue.

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Other strategic areas for IoT projects included planning for continuous IoT improvement (60%), and planning how to use the data gathered by IoT devices (58%). Half of respondents (51%) also factored future expansion of IoT operations into their organization's strategies, and 50% strategized how to evolve their organization's business models using IoT. These considerations demonstrate that respondents are thinking about IoT as a platform for future innovation.

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State of IoT Strategies

51% A fully implemented strategy
36% A partially implemented strategy; rolling out in phases
10% Our plan is under review and needs funding
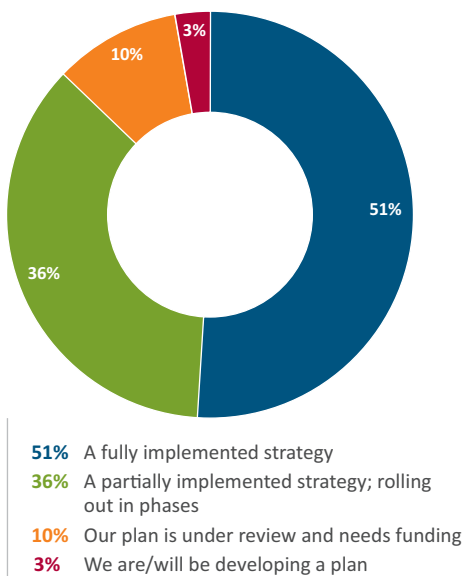3% We are/will be developing a plan

Figure 4: *How would you best describe your organization's IoT (including industrial IoT) strategy?*

Many Still Working to Execute

Responses to the survey suggested that many organizations that are investing in IoT initiatives had already made significant headway in executing their IoT strategies. 51% of respondents' organizations had a fully implemented strategy. (See Figure 4.)

Execution varied widely by region. Almost two-thirds of US respondents (65%) described their organization's IoT strategy as fully implemented, compared to 47% in the UK. In Denmark, less than one in four respondents (24%) reported that their organization had fully rolled out their IoT strategy.

This tells us that even among those companies that have embraced the IoT concept, not everyone is fully ready to execute. A little over a third (36%) are rolling out in stages, but 13% of all respondents' organizations were not ready to begin executing an IoT strategy in any form.

One bright star among industry verticals was again Oil and Gas. Not only are Oil and Gas companies that are investing in IoT initiatives prioritizing IoT on paper, but they are executing, too. Three-quarters of respondents describe their organization's IoT strategy as fully implemented, with the rest partially rolled out.

The least advanced industry when it comes to implementing IoT is Logistics. Only 38% of companies that are investing in IoT in that sector had fully executed their IoT strategies, which is puzzling, as Logistics companies can enjoy many benefits.

A Constellation of Challenges

The general lack of progress on implementation stems from several key challenges facing organizations as they execute on their IoT strategies. Most respondents reported their organization experiencing some difficulties when implementing IoT. Over half (54%) described those challenges as moderate, 23% said that they struggled to overcome "very difficult" challenges, and 13% described them as "extremely difficult", admitting that they were still struggling. (See Figure 5, page 7.)

54% of respondents described moderate challenges when implementing IoT, 23% said that they struggled to overcome "very difficult" challenges, and 13% described them as "extremely difficult"

Of all countries, the UK was most likely to have encountered difficulties, with only 3% describing the process as challenge-free. Sweden experienced its fair share of challenges, but seemed more stoic about them, overcoming the difficulties methodically. Only 4% of Swedish respondents said that their organization was still struggling with extremely difficult IoT implementation challenges.

**Challenges When Implementing
an IoT Strategy**
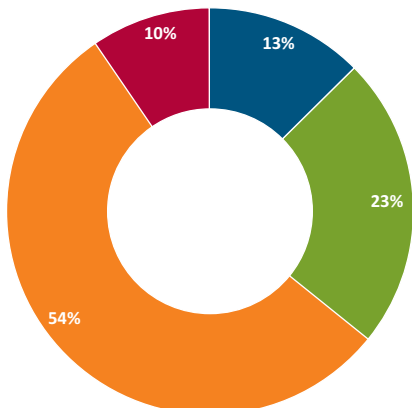
- **13%** Extremely difficult: still struggling with some of the challenges
- **23%** Very difficult: encountered challenges that were a struggle to overcome
- **54%** Moderately difficult: we encountered some challenges and barriers
- **10%** It has not been difficult at all, the process has gone without a hitch

Figure 5: *How difficult has it been so far for your organization to implement an IoT (including industrial IoT) plan?*

What hurdles have companies faced along the road to IoT? Security was by far the biggest concern across the board, with 59% of respondents' organizations that are implementing IoT citing this as a concern. Next was cost, with 46% of respondents worried about how much it will cost to implement IoT.

Significantly, leadership is an issue in IoT projects. 32% of respondents cited reluctance among leaders to commit to projects, with the same number mentioning funding barriers. Around a third (30%) of respondents said that their organization's leaders didn't understand the benefits, which may explain the 33% of respondents who said that the need for proven ROI was holding back implementation.

Some managers are still looking for immediate deliverables rather than viewing IoT as a long-term strategic investment, which is leading many companies to prioritize other projects. In addition, 37% of respondents said that competing priorities were a barrier.

Security Still a Concern in IoT Projects

Security has long been understood as a challenge for those implementing IoT projects. Creating and managing large networks of connected devices can widen an organization's attack service unless it thinks seriously about protecting its infrastructure and IoT data from the ground up.

Respondents to the survey already understood the need for general IT security. Improving IT security was their organization's biggest priority among the survey base, with 74% highlighting it.

The US and the UK scored higher in their concern over security issues, with 83% and 79% of respondents in those countries labelling it a priority. Those in Denmark and Sweden saw security as less important than IoT enablement.

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It is not surprising, then, that respondents to the survey highlighted security as a barrier to IoT solutions. Well over half (59%) of them cited security concerns as a challenge; with US (65%) and UK (64%) firms far more concerned than those in Denmark or Sweden.

Only 38% of all respondents report that their organization included protecting the network from the threats posed by IoT devices in their IoT strategy. Barely more than half (51%) said considering how to secure the data collected by IoT

Uptake of 'Smart' Initiatives

- **Yes, we have already implemented IoT initiatives**
- **Yes, we are planning some IoT initiatives**
- **Yes, we are piloting/testing some IoT initiatives**
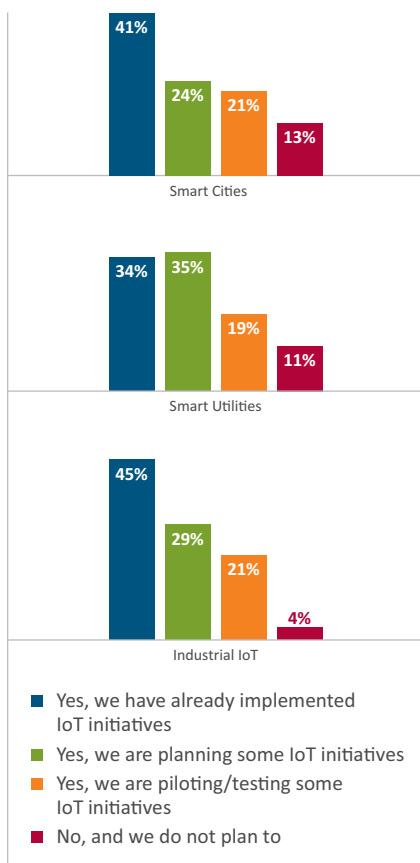- **No, and we do not plan to**

Figure 6: *Analysis showing the percentage of respondents' organizations that have already implemented or are planning to implement any of smart cities, smart utilities, or industrial IoT initiatives.*

devices was a part of their strategies. Not all of those respondents appeared to be considering data protection from a compliance perspective; just 43% said that their organization included this in their strategic considerations for IoT.

One explanation for these low figures could be that they are being covered by a separate security function within the organization. As the General Data Protection Regulation (GDPR) looms, many companies are pointing senior executives to own the entire security and privacy process.

The Wi-SUN Alliance believes that enterprise-grade security is the gold standard among IoT networks and only Wi-SUN-based networks have achieved this— the equivalent to that used by banks and the military. Organizations need to understand which networks implement the highest security level available for their IoT networks, ensuring they can plug into a complete interoperable ecosystem that can be firmware upgradable 'over the air' ensuring devices support the very latest security functions.

Building Smarter Cities and Utilities

Smart city and smart utility projects have traditionally been fertile ground for IoT technologies, and efforts are already well underway in these areas. In fact, 41% of respondents' organizations have already implemented smart city-based IoT, while 34% have rolled out a smart utility solution. Responses were highest among US companies, 45% of which had rolled out smart city or smart utility initiatives. (See Figure 6.)

41% of respondents' organizations have already implemented smart city-based IoT, while 34% have rolled out a smart utility solution.

Of those that had not fully implemented, many were in the pilot stage. Around a quarter (24%) of all respondents' organizations were testing smart city initiatives, with 35% piloting smart utility IoT. The move to improve public infrastructure with intelligent data projects is progressing well.

What smart initiatives were organizations planning to roll out over the next 12-18 months? The most popular was security and surveillance—44% of all respondents said that their organization would definitely implement this in that timeframe, with another 32% calling it "very likely".

Water and gas metering was also high on respondents' organizations' lists, with 72% either certain or very likely to roll this out. Smart energy and its applications played a big part in their plans. Solar inverters were popular on respondents' organizations' IoT wish lists, as were electric vehicle charging initiatives.
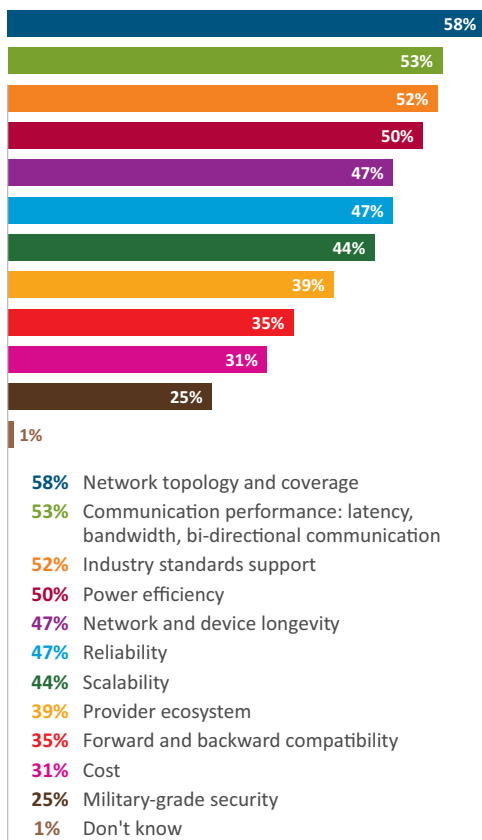
**Desired Characteristics
of IoT Technology**

58%	Network topology and coverage
53%	Communication performance: latency, bandwidth, bi-directional communication
52%	Industry standards support
50%	Power efficiency
47%	Network and device longevity
47%	Reliability
44%	Scalability
39%	Provider ecosystem
35%	Forward and backward compatibility
31%	Cost
25%	Military-grade security
1%	Don't know

Figure 7: *What is your organization looking for when it is evaluating which IoT (including industrial IoT) technology to move forward with?*

Wi-SUN is an ideal technology for a range of challenging environments, particularly for utility networks and dense urban neighborhoods. Use cases include smart utility and smart city networks, which have many common communications requirements and can be supported by a common networking architecture.

Technology Choices

When it comes to choosing IoT solutions, a couple of characteristics stand out as especially important for any organization planning an IoT initiative.

The first was security. Half of respondents said that proven security with multi-layer protection and continuous monitoring was crucial for a smart city IoT solution, while 44% felt the same about smart utility IoT solution.

The Importance of Network Topologies

Respondents were also very clear on the kind of networking topology they wanted in an IoT solution. Network topology and coverage topped the list of criteria that organizations look for when evaluating IoT technology, at 58%. Energy and utility companies that are implementing IoT were particularly interested in this feature, with 73% citing it as a factor. (See Figure 7.)

> *58% of respondents placed network topology and coverage topped the list when evaluating IoT technology.*

Impressively, only 5% of respondents were not aware of the networking topologies discussed. Around one in four (23%) said that their organization would prefer a star-based network, in which devices connect to a central point in a hub and spoke configuration, while one in five (19%) preferred a mesh-based network, in which devices connected to each other directly in a peer-to-peer-style arrangement.

However, most respondents' organizations would like a combination of both; 53% wanted to use the two in a complementary manner. Respondents with involvement in their organization's IoT initiatives are clearly advanced in their understanding and planning of network infrastructure.

Performance and Standardization Are Key

The other most-cited characteristics considered when evaluating IoT solutions were communication performance (53%), and support for industry standards, while 52% of respondents cited standard support during technology evaluations.
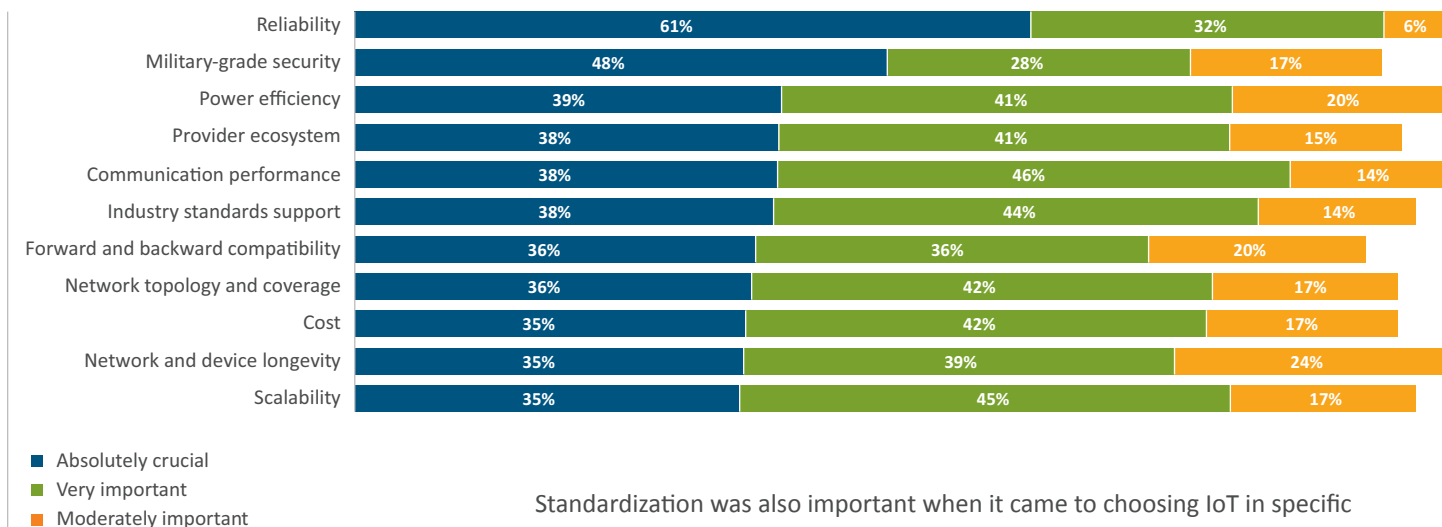
Importance of IoT Technology Characteristics

Characteristic	Absolutely crucial	Very important	Moderately important
Reliability	61%	32%	6%
Military-grade security	48%	28%	17%
Power efficiency	39%	41%	20%
Provider ecosystem	38%	41%	15%
Communication performance	38%	46%	14%
Industry standards support	38%	44%	14%
Forward and backward compatibility	36%	36%	20%
Network topology and coverage	36%	42%	17%
Cost	35%	42%	17%
Network and device longevity	35%	39%	24%
Scalability	35%	45%	17%

- ■ Absolutely crucial
- ■ Very important
- ■ Moderately important

Figure 8: *Analysis showing the percentage of respondents who rate the above characteristics as absolutely crucial, very, or moderately important to their organizations when evaluating which IoT technology to move forward with.*

Standardization was also important when it came to choosing IoT in specific applications, and 45% of respondents demanded that smart city IoT solutions be built atop industry-wide open standards, while 43% said it was absolutely crucial in a smart utility environment. (See Figure 8.)

The surprising statistic on this list was cost, which was not a major consideration for those evaluating IoT technologies. Only 31% listed it as a factor in their organization's evaluation.

Wi-SUN featured highly in specific technology choices, and was the most commonly supported among the base of respondents—44% said that their organization's products and solutions supported technology from the Wi-SUN Alliance. This maps directly to awareness, as Wi-SUN was also the most commonly known technology, with 56% of respondents from organizations undertaking IoT describing themselves as familiar with it. Swedish and Danish respondents were particularly familiar with Wi-SUN (74% and 62%, respectively).

44% said that their organization's products and solutions supported technology from the Wi-SUN Alliance.

Conclusion

The world is now some years into IoT deployments. Gartner has documented 3.2bn enterprise IoT endpoints installed across the world in 2017. It believes that this will grow to 7.5bn in 2020, representing a 140.8% increase. These devices will make their way into industrial applications and smart cities, changing the way that we live and work. They will revolutionize our water and electricity grids, making them more efficient and reducing waste.

Organizations continue to face challenges as they move towards this future, but the responses to the Wi-SUN Alliance survey in this report suggest that they are gradually overcoming them and successfully rolling out sustainable, scalable IoT infrastructure systems. IoT has hit the mainstream, and we are only just getting started.

Methodology

Using a mixture of online and telephone questionnaires, Vanson Bourne interviewed 350 IT decision-makers across the US, the UK, Sweden and Denmark during October and early November 2017. It screened respondents to ensure that they were personally involved in their organization's IoT initiatives, and currently implementing at least one IoT project.

About the Wi-SUN Alliance

The Wi-SUN Alliance is a global non-profit member-based association comprised of industry leading companies. Its mission is to drive the global proliferation of interoperable wireless solutions for use in smart cities, smart grids and other Internet of Things (IoT) applications using open global standards from international standards organizations, such as IEEE 802, IETF, TIA, TTC and ETSI. With more than 170 members worldwide, membership of the Wi-SUN Alliance is open to all industry stakeholders and includes silicon vendors, product vendors, services providers, utilities, universities, enterprises and municipalities and local government organizations.

Membership Information

Wi-SUN is positioned to be the leading technology that succeeds in large-scale outdoor networking. Companies can join the Wi-SUN Alliance to gain access to the Wi-SUN specifications. **More information on our membership benefits can be found here. The Membership Fee structure can be found here.**