



## Industrial IoT Trends: WSN, LPWAN & Cloud Platforms

*Wireless sensor networks (WSN), low power wide area networks (LPWAN) and cloud-based platforms are driving growth for the industrial Internet of Things (IoT)*

The burgeoning industrial Internet of Things (IoT) is being driven by low-cost, low-power wireless components, battery-powered wireless sensors with multi-mile network coverage, mature wireless mesh network protocols and ubiquitous cloud-based platforms. Wireless mesh protocols using 802.15.4 such as WirelessHART, ISA100 and Wi-SUN are becoming widespread for process automation and utility networks while WiFi, Bluetooth and ultra-wide-band are rapidly growing for asset tracking and factory automation. Low power wide area networks (LPWANs) such as LoRaWAN™, Sigfox and NB-IoT are enabling new applications for agriculture, logistics, machine health and environmental monitoring.

ON World, in collaboration with the International Society of Automation (ISA) and the LoRa Alliance, completed an extensive survey on WSN and IoT in Q2 2018 with 159 industrial automation vendors, end users, systems integrators and service providers. In this article, we analyze the latest adoption trends and compare these with our previous survey completed in Q4 2016.

The 2018 survey focused on three primary technology areas for industrial Internet of Things (IoT):

- Wireless sensor networks (WSN)
- Low power wide area networks (LPWAN)
- Cloud-based IoT platforms

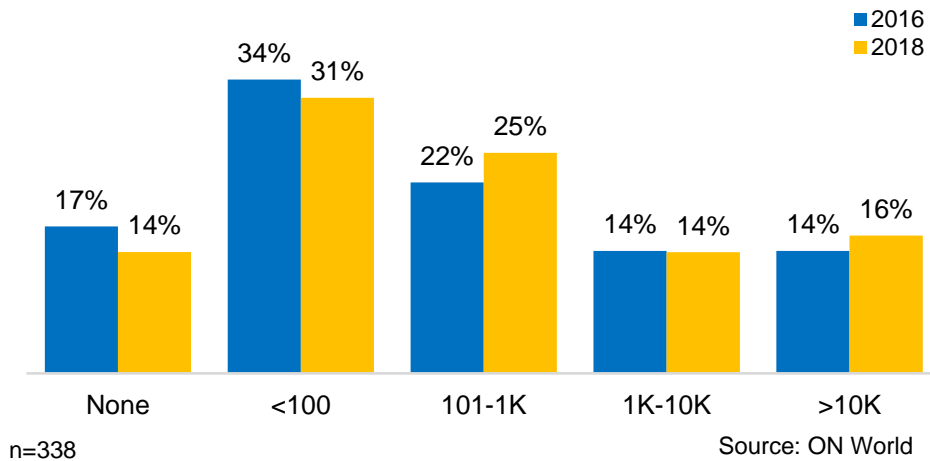
## Wireless Sensor Networks

Wireless sensor network adoption continues to expand for process automation with even faster growth for factory automation, agriculture and construction. The fastest growing industrial WSN applications are asset tracking, corrosion/structural monitoring and machine health monitoring.

### Total Installed WSN Devices

About 30% of the survey respondents have deployed at least 1,000 wireless sensor network (WSN) nodes, slightly up from our previous survey.

**Figure 1: Number of WSN Devices Installed (All locations)**

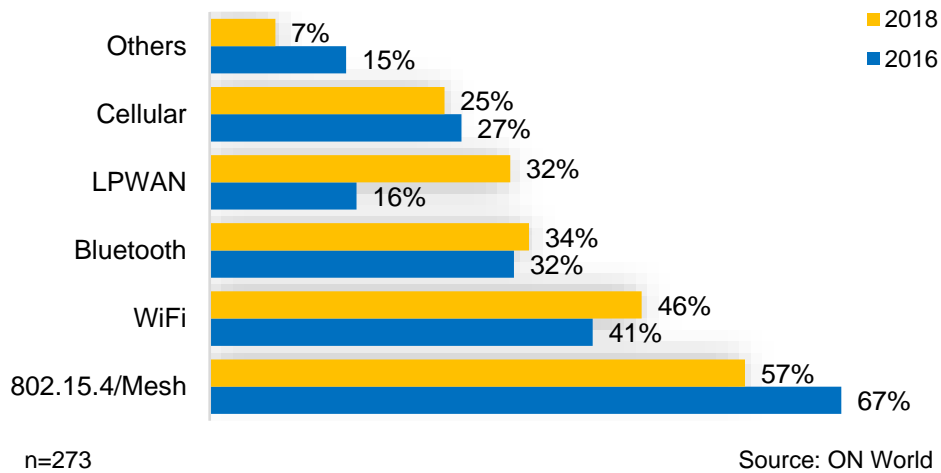


### Wireless Sensor Network Protocols

Fifty-seven percent are using 802.15.4 with a wireless mesh protocol including WirelessHART, ISA100 Wireless, Zigbee, Wi-SUN or other proprietary network stacks, from two-thirds in the previous survey. We attribute this to a broader range of respondents in the current survey rather than an actual drop in wireless mesh adoption.

WiFi is used by nearly half and Bluetooth by 1 in 3. LPWAN technologies such as LoRaWAN, Sigfox and NB-IoT is used by 32%, twice as many as in our previous survey even when we factor out the respondents from the LoRa Alliance<sup>1</sup>.

**Figure 2: Industrial WSN Technologies Used**



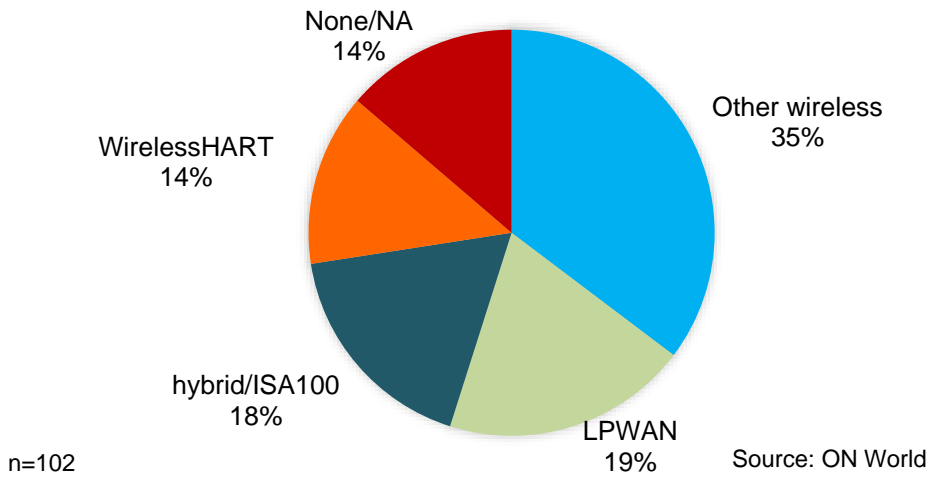
\*Excludes LoRa Alliance

<sup>1</sup> Note: The 45 respondents (28%) from the LoRa Alliance are omitted from some charts to more accurately compare the two surveys.

### Planned Standards Approach

WirelessHART is the most commonly planned industrial wireless mesh protocol with 14% planning only WirelessHART going forward. In addition, another 18% are planning both WirelessHART and ISA100 or primarily ISA100. About 1 in 3 are planning WiFi, Bluetooth or other wireless technology and 1 in 5 are focused on LPWAN technologies.

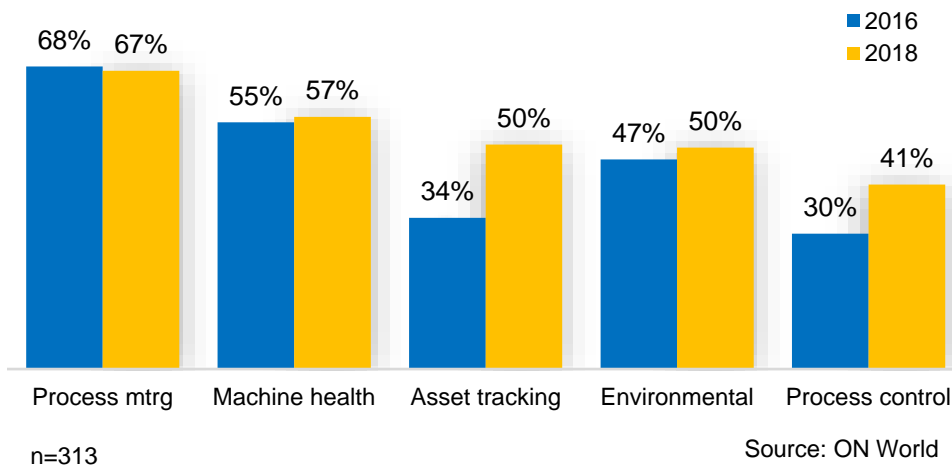
**Figure 3: Planned Standards Approach**



### Planned WSN Applications

Process monitoring, machine health, asset tracking, environmental monitoring and process control are the top five planned WSN applications in the next 18-24 months. Forty-eight percent (48%) more respondents are planning asset tracking compared with a previous survey in Q4 2016.

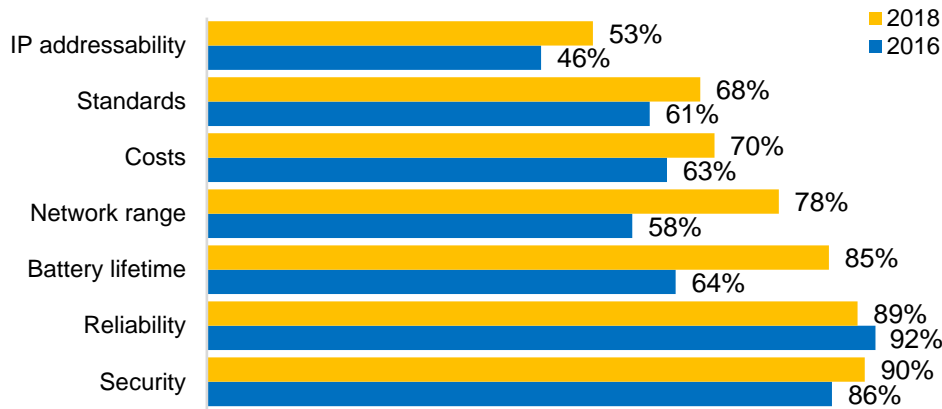
**Figure 4: Planned WSN Applications**



### Most Important Features

After data reliability and security, battery lifetime, network range and costs are rated the most important WSN features. All features are rated more important in our current survey with the biggest difference for network range and battery lifetime.

**Figure 5: Most Important WSN Features**



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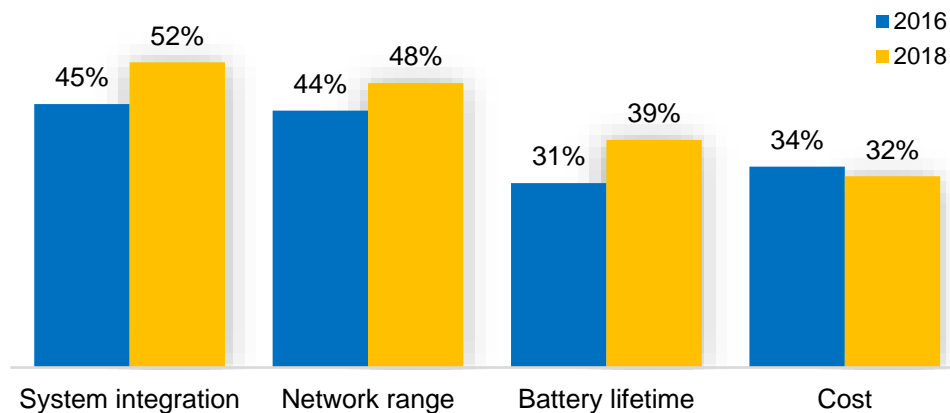
Source: ON World

From a 1-5 rating scale. Chart shows the % indicating “Important” or “Most Important”

### Satisfaction Levels

Satisfaction with WSN systems increased the most for battery lifetime, network range and system integration. Respondents continue to be the least satisfied with costs.

**Figure 6: Satisfaction with Current WSN Systems**



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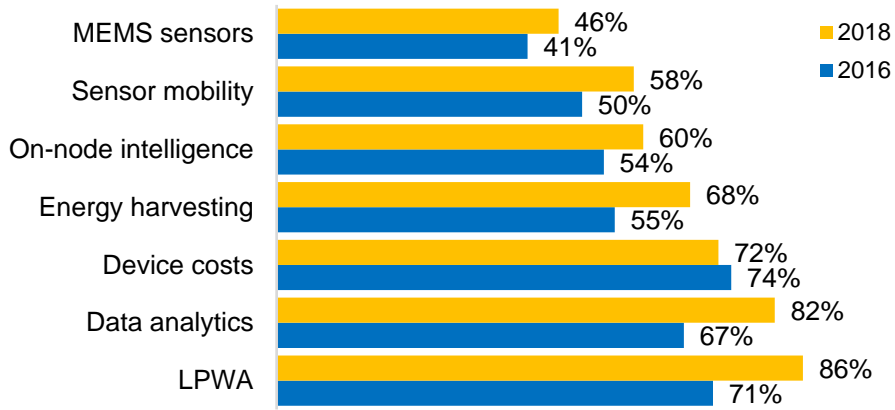
Source: ON World

From a 1-5 rating scale. Chart shows the % indicating “Satisfied” or “Most Satisfied”

**Innovation Areas**

LPWAN, energy harvesting and data analytics have increased the most as important innovation areas over the last two years.

**Figure 7: Most Important WSN Innovation Areas**



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Source: ON World

From a 1-5 rating scale. Chart shows the % “Important” or “Most Important”

## Low Power Wide Area Networks

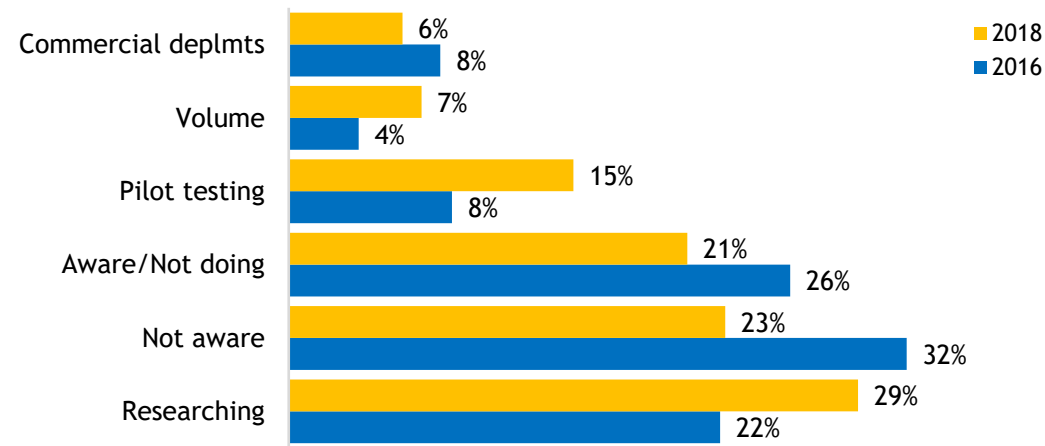
Low Power Wide Area Network (LPWAN) technologies such as Sigfox, LoRaWAN™ and NB-IoT are disrupting industrial IoT with multi-mile network ranges, multi-year battery lifetimes and cloud-integrated network stacks. In addition to significantly reducing access costs with very small transmission payloads and the ability to scale to thousands of nodes per gateway, a key LPWAN differentiator is that these manage network complexity in the cloud or edge-server rather than from LAN based network controllers.

Unlicensed LPWAN technologies such as Sigfox and LoRaWAN™ have the strongest ecosystems currently but rollouts of licensed technologies such as NB-IoT and LTE-M are accelerating worldwide by some of the world’s largest telecom operators including Deutsche Telecom, SoftBank, Verizon and Vodafone.

### LPWAN Adoption

LPWAN adoption has accelerated over the last two years with 57% now researching, developing or currently offering LPWAN products and services up from 42% in the previous survey.

**Figure 8: LPWAN Adoption Status**



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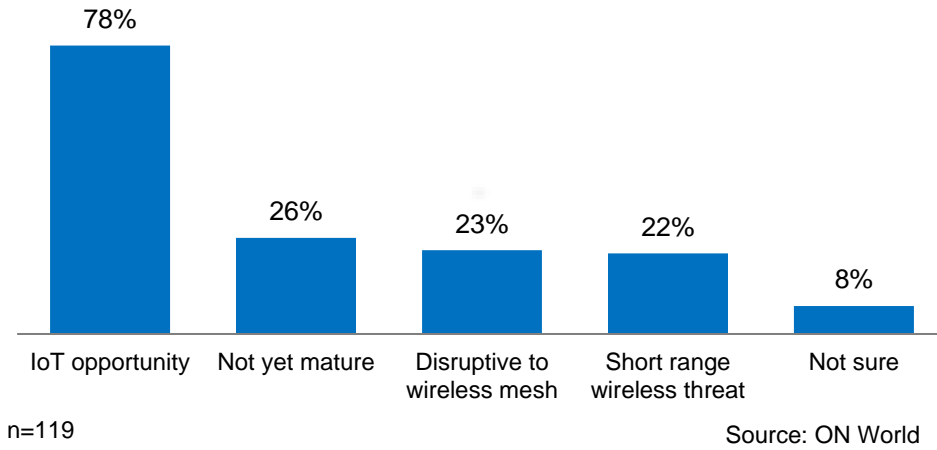
Source: ON World

\*Excludes LoRa Alliance

### LPWAN Impact

Most see LPWAN as an IoT opportunity rather than a threat to short-range or wireless mesh technologies.

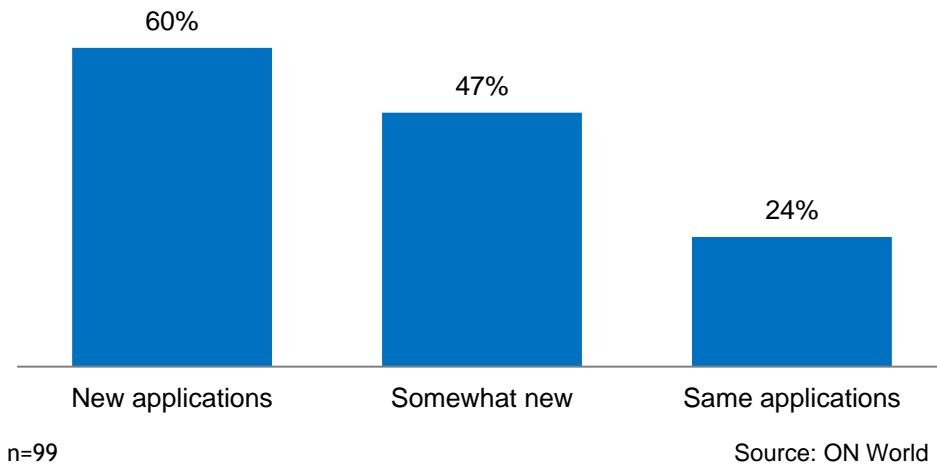
Figure 9: Opinions on LPWAN Impact



### LPWAN Applications

Most are targeting new applications that cannot be supported by existing technologies.

Figure 10: LPWAN Applications

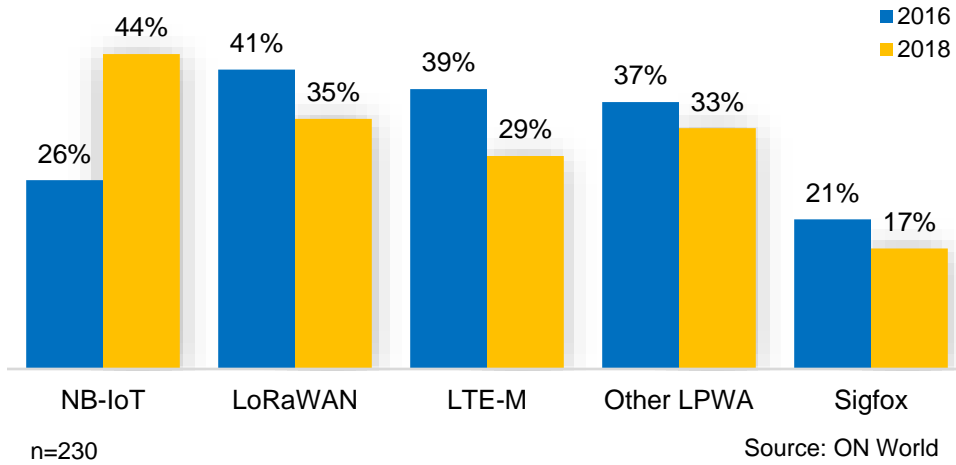




## Most likely LPWAN Technologies

NB-IoT is rated the most likely LPWAN technology to have significant market share in ten years followed by LoRaWAN and LTE-M. NB-IoT increased by 67% over the last two years while all other LPWAN technologies decreased as likely future LPWAN technologies.

**Figure 11: Most Likely LPWAN Technologies by 2028**



\*Excludes LoRa Alliance

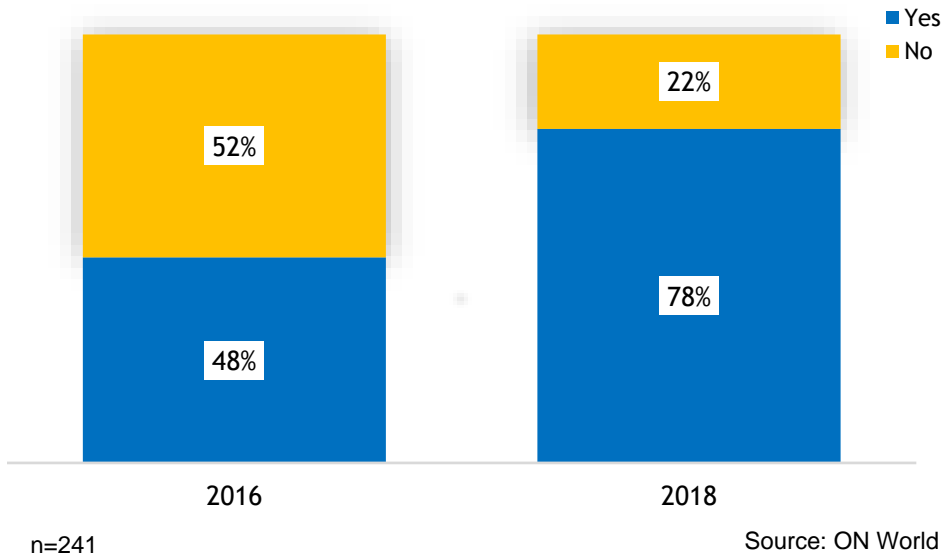
## Cloud IoT Platforms

Cloud-based IoT platforms has transformed industrial automation with new business models, seamless system integration and advanced data analytics methods such as artificial intelligence (AI). The number of respondents using a cloud IoT platform nearly doubled over the past two years from 52% to 78%.

### Most Commonly Used IoT Platforms

Over three quarters are currently using a cloud IoT platform up from a little less than half in our previous survey. Microsoft Azure is the most commonly used platform followed by AWS, Google Cloud and IBM BlueMix.

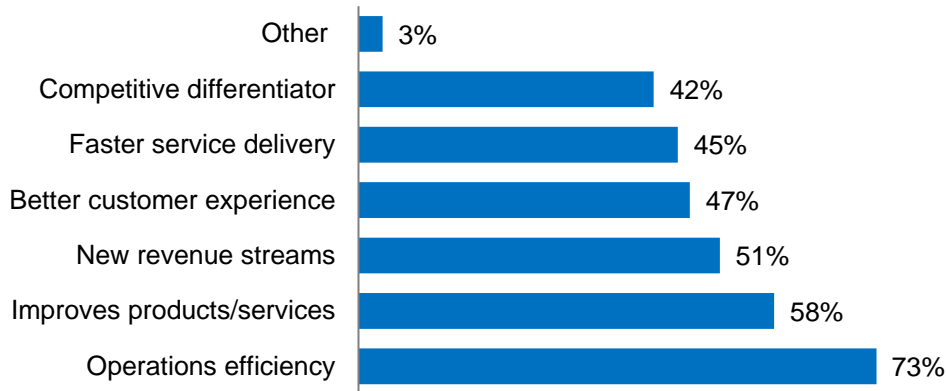
**Figure 12: Cloud IoT Platform Used**



### Cloud IoT Platform Benefits

Operations efficiency is the most commonly named benefit for adopting a comprehensive cloud-based IoT platform.

**Figure 13: Cloud IoT Platform Benefits**



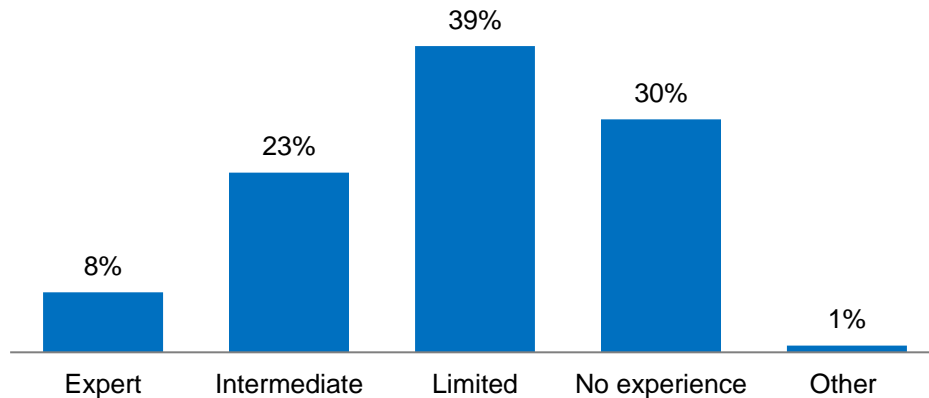
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Source: ON World

### Data Analytics

Only about 1 in 3 of the respondents rate themselves at the intermediate level or above for experience with IoT data analytics.

**Figure 14: Personal Data Analytics Experience**



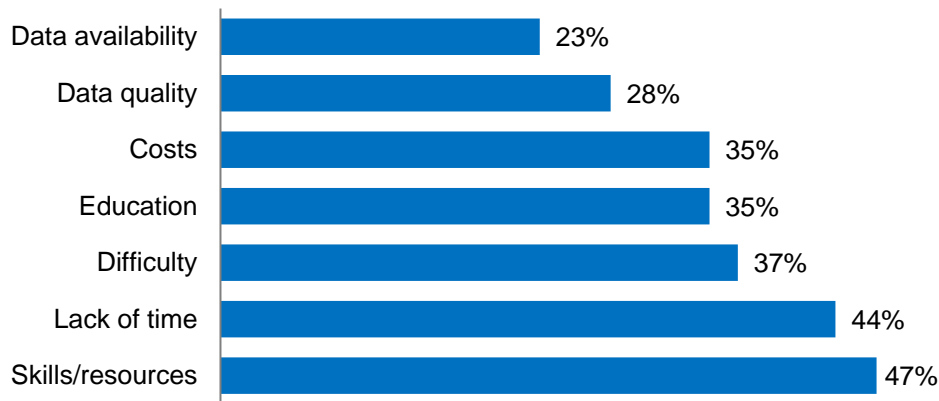
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Source: ON World

## Data Analytics Barriers

Lack of skills/resources is the most commonly named barrier for adopting data analytics at their organization.

**Figure 15: Data Analytics Barriers**



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Source: ON World

Three-quarters rate WSN and IoT cloud platforms as important strategic investments. Industrial automation professionals today understand the IoT benefits but concerns about security, costs, complexity and battery life has increased. In addition, companies want to get more value out of their data through cloud-based systems, seamless system integration and increasingly sophisticated data analytics.

ON World’s ongoing research on industrial wireless sensing and IoT will continue to provide insights on the adoption trends and technology developments.

**About ON World:**

Mareca Hatler is the director of research for ON World, a global Internet of Things research firm.

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