1. Introduction

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On July 12 2019, the Technology Partnerships Office (TPO) at the National Institute of Standards and Technology (NIST) announced a study entitled Economic Research and Analysis of the National Need for Technology Infrastructure to support the Internet of Things (IoT).

In support of this study, we are interested in your perspectives and opinions on current and future opportunities for IoT technologies for the USA economy.

Your name and your organization's name will not be disclosed. We do not wish to discuss specific products or strategies but rather your thoughts about industry needs and how investments in technology infrastructure to meet those needs would improve services.

Our research products will be an economic analysis, final report and presentation materials. All deliverables will be publicly available in 2021 and these will be shared with you as soon as they are released.

The survey should take less than 15 minutes to complete. If you have questions, please contact Christopher Reberger at christopher@strategyofthings.io

More information on the work can be found at https://strategyofthings.io/nist

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Public Burden Statement

A Federal agency may not conduct or sponsor, and a person is not required to respond to, nor shall a person be subject to a penalty for failure to comply with an information collection subject to the requirements of the Paperwork Reduction Act of 1995 unless the information collection has a currently valid OMB Control Number.

The approved OMB Control Number for this information collection is 0693-0033. Without this approval, we could not conduct this survey/information collection. Public reporting for this information collection is estimated to be approximately 15 minutes per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the information collection.

All responses to this information collection are voluntary to obtain benefits. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden to the National Institute of Standards and Technology at 100 Bureau Dr., STOP 8962 Gaithersburg, MD 20899-896, Attn: Kathleen McTigue, kathleen.mctigue@nist.gov

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1. Where is your principal market?

- [ ] North America
- [ ] South America
- [ ] Europe
- [ ] Africa
- [ ] Oceania
- [ ] Asia

2. Which category best describes your organization?

- [ ] Manufacturer
- [ ] Franchise
- [ ] Service delivery
- [ ] Wholesaler
- [ ] Import/Export
- [ ] Policy development
- [ ] Other (please specify)

3. Which single area best describes your industry?

- [ ] Agriculture
- [ ] Healthcare
- [ ] Telecommunications
- [ ] Construction
- [ ] Manufacturing
- [ ] Transport
- [ ] Energy/Utilities
- [ ] Retail
- [ ] Smart Cities
- [ ] Financial Services
- [ ] Public Sector
- [ ] Tech focused across multiple industries
- [ ] Other (please specify)

4. Thinking broadly about IoT devices and machines, what do you feel will be the overall impact on your industry over the next 5 to 10 years?

No impact | Some impact | Significant impact

The remainder of the survey looks at a number of use cases, the technology required to deliver them and their impact.

Use cases describe the practical benefits of a technology and their impact would be considered high if they would change day to day operations in your industry.

2. Use Cases: Smart Cities

We are interested in your opinion on the following IoT use cases that are likely to impact city operations and citizen experiences

1. Video based information
Connected IP video meras installed in the city to improve the efficiency and effectiveness of the local policies.

2. Smart lighting
Sensors on each street light monitor for outages to speed repair minimizing crime and other concerns. Smart lighting will also adjust intensity based on vehicle/ pedestrian activity and ambient lighting

3. Smart buildings
Sensors monitor and control HVAC and electricity in all City owned buildings (eg. public schools, administration buildings) driving reduced energy costs and more effective management and maintenance

4. City WiFi
A city-wide Wi-Fi platform can be used as a common infrastructure to support the City's smart services. Also, additional capacity on the Wi-Fi can be made available for limited public access for tourist, healthcare & municipal use

5. Disaster Response
Integrate live data from fire, road and weather agencies with demographic population data to provide a statistical representation of the emergency situation to inform appropriate response.

5. How confident are you that vendors will deliver the services that city managers need from these technologies over the next 5-10 years?

	No opinion	Not confident	Slightly confident	Confident	Very confident
1. Video based	○	○	○	○	○
2. Smart lighting	○	○	○	○	○
3. Smart buildings	○	○	○	○	○
4. City WiFi	○	○	○	○	○
5. Disaster response	○	○	○	○	○

6. In your view, what will be the impact of these uses cases on city operations and the citizen experience over the next 5-10 years?

	No opinion	No impact	Slight impact	Moderate impact	High impact
1. Video based	○	○	○	○	○
2. Smart lighting	○	○	○	○	○
3. Smart buildings	○	○	○	○	○
4. City WiFi	○	○	○	○	○
5. Disaster response	○	○	○	○	○

3. Use Cases: Retail

We are interested in your opinion on the following IoT use cases that are likely to impact retail operations:

1. Workforce experience
For example the use cases of In-store analytics, Checkout optimizer, Remote expert, Mobile advisor, Smart lockers, Interactive kiosks

2. Customer experience
For example the use cases of Remote expert, Self-serve channels, Endless aisles, Smart lockers, Checkout optimizer

3. Business operations
For example the use cases of In-store analytics, Interactive kiosks, Assortment optimization, Out of stock reduction, In-store navigation, Theft reduction, Physical security

7. How confident are you that suppliers will deliver the services that retailers need from these technologies over the next 5-10 years?

	No opinion	Not confident	Slightly confident	Confident	Very confident
1.Workforce experience	○	○	○	○	○
2.Customer experience	○	○	○	○	○
3. Business operations	○	○	○	○	○

8. In your view, what will be the impact of these uses cases on retail operations over the next 5-10 years?

	No opinion	No impact	Slight impact	Moderate impact	High impact
1.Workforce experience	○	○	○	○	○
2.Customer experience	○	○	○	○	○
3.Business operations	○	○	○	○	○

4. Use Cases: Energy/Utilities

We are interested in your opinion on the following IoT use cases that are likely to impact energy and utilities operations:

1. Asset performance management
Low-cost field sensors providing real-time information, predictive maintenance available by aggregating all asset data

2. Grid optimization
Distributed energy resources and ability to model the generation output profile of each of these resources

3. Consumer energy technologies
"Transactive Energy" with advanced metering, a dynamic balance of energy supply and demand

9. How confident are you that suppliers will deliver the services that operators need from these technologies over the next 5-10 years?

	No opinion	Not confident	Slightly confident	Confident	Very confident
1. Asset performance management	○	○	○	○	○
2. Grid optimization	○	○	○	○	○
3. Consumer energy technologies	○	○	○	○	○

10. In your view, what will be the impact of these uses cases on utility operations over the next 5-10 years?

	No opinion	No impact	Slight impact	Moderate impact	High impact
1. Asset performance management	○	○	○	○	○
2. Grid optimization	○	○	○	○	○
3. Consumer energy technologies	○	○	○	○	○

5. Use Cases: Public Sector

We are interested in your opinion on the following IoT use cases that are likely to impact the delivery and effectiveness of services:

1. Remote workforce
The ability to work remotely without impacting efficiency or effectiveness

2. Connected citizen
The provision of detailed citizen based information to public sector authorities and improved communication from authorities.

3. Mobile collaboration
The ability to deliver public services where and when they are required

4. Open data
The provision of APIs to allow third party access to data with appropriate privacy constraints

11. How confident are you that suppliers will deliver the services that public sector managers need from these technologies over the next 5-10 years?

	No opinion	Not confident	Slightly confident	Confident	Very confident
1. Remote workforce	○	○	○	○	○
2. Connected citizen	○	○	○	○	○
3.Mobile collaboration	○	○	○	○	○
4. Open data	○	○	○	○	○

12. In your view, what will be the impact of these uses cases on the public sector and citizen experience over the next 5-10 years?

	No opinion	No impact	Slight impact	Moderate impact	High impact
1. Remote workforce	○	○	○	○	○
2. Connected citizen	○	○	○	○	○
3. Mobile collaboration	○	○	○	○	○
4. Open data	○	○	○	○	○

6. Use Cases: Telecommunications

We are interested in your opinion on the following IoT use cases that are likely to impact the delivery and effectiveness of services:

1. Asset utilization
Reduced energy use, fleet optimization

2. Employee productivity
Remote working and improved decision making

3. Supply chain
Efficiency improvements from real time and location information

4. Customer experience
Detailed information on the customer experience

13. How confident are you that suppliers will deliver the services that operators need from these technologies over the next 5-10 years?

	No opinion	Not confident	Slightly confident	Confident	Very confident
1. Asset utilization	○	○	○	○	○
2. Employee productivity	○	○	○	○	○
3. Supply chain	○	○	○	○	○
4. Customer experience	○	○	○	○	○

14. In your view, what will be the impact of these uses cases on service providers and their customers over the next 5-10 years?

	No opinion	No impact	Slight impact	Moderate impact	High impact
1. Asset utilization	○	○	○	○	○
2. Employee productivity	○	○	○	○	○
3. Supply chain	○	○	○	○	○
4. Customer experience	○	○	○	○	○

7. Transport: Use Cases

We are interested in your opinion on the following IoT use cases that are likely to impact transport operations:

1. Safety
With the ability to communicate in real-time using data from various sources

2. Fleet management
Preventative vehicle maintenance and regulatory compliance

3. Geo fencing
Delineation of permitted areas. Turn location data into decisions

4. Inventory
Real time information on status and tracking information

5. Public transit
Improvements in the rider experience

15. How confident are you that suppliers will deliver the services that operators need from these technologies over the next 5-10 years?

	No opinion	Not confident	Slightly confident	Confident	Very confident
1. Safety	○	○	○	○	○
2. Fleet management	○	○	○	○	○
3. Geo fencing	○	○	○	○	○
4. Inventory	○	○	○	○	○
5. Public transit	○	○	○	○	○

16. In your view, what will be the impact of these uses cases on transport and warehousing operations over the next 5-10 years?

	No opinion	No impact	Slight impact	Moderate impact	High impact
1. Safety	○	○	○	○	○
2. Fleet management	○	○	○	○	○
3. Geo fencing	○	○	○	○	○
4. Inventory	○	○	○	○	○
5. Public transit	○	○	○	○	○

8. Manufacturing: Use Cases

We are interested in your opinion on the following IoT use cases that are likely to impact manufacturing operations:

1. Predictive maintenance
Analyzing production data to identify patterns and predict issues before they happen

2. Digital signage
Production floor, displays easily communicate reliable and timely production metrics, such as quality control, up-to-the-minute production totals, inventory levels and assembly line alert

3. Energy management
IoT sensors to collect, analyze, and convert the energy data into information to make intelligent business decisions to improve energy efficiency.

4. Remote monitoring
Check the status of on object, pinpoint the location of an object and display the object's relevant information.

5. Wearables
On person tools designed to improve workplace productivity, safety, and efficiency

17. How confident are you that suppliers will deliver the services that manufacturers need from these technologies over the next 5-10 years?

	No opinion	Not confident	Slightly confident	Confident	Very confident
1. Predictive maintenance	○	○	○	○	○
2. Digital signage	○	○	○	○	○
3. Energy management	○	○	○	○	○
4. Remote monitoring	○	○	○	○	○
5. Wearables	○	○	○	○	○

18. In your view, what will be the impact of these uses cases on manufacturing over the next 5-10 years?

	No opinion	No impact	Slight impact	Moderate impact	High impact
1. Predictive maintenance	○	○	○	○	○
2. Digital signage	○	○	○	○	○
3. Energy management	○	○	○	○	○
4. Remote monitoring	○	○	○	○	○
5. Wearables	○	○	○	○	○

9. Financial services: Use Cases

We are interested in your opinion on the following IoT use cases that are likely to impact financial services:

1. Sales transformation
Improve the sales process of existing products (e.g. identification of cross-sell opportunities, more personalized contextual messages) and the customer relationship (e.g. churn detection, more accurate customer segmentation

2. Risk Management
Fine tuning of risk management algorithms. Credit risk , insurance risk and operational risk to managing internal and external fraud risk

3. Mobile payments
Identification and authentication, i.e. use IoT devices to identify and authenticate a person more accurately

4. Product innovation
Making products and services more personalized, i.e. products and services will be even more centered around the customer's needs and preferences.

19. How confident are you that suppliers will deliver the services that financial services need from these technologies over the next 5-10 years?

	No opinion	Not confident	Slightly confident	Confident	Very confident
1. Sales transformation	○	○	○	○	○
2. Risk management	○	○	○	○	○
3. Mobile payments	○	○	○	○	○
4. Product innovation	○	○	○	○	○

20. In your view, what will be the impact of these uses cases on financial services over the next 5-10 years?

	No opinion	No impact	Slight impact	Moderate impact	High impact
1. Sales transformation	○	○	○	○	○
2. Risk management	○	○	○	○	○
3. Mobile payments	○	○	○	○	○
4. Product innovation	○	○	○	○	○

10. Healthcare: Use Cases

We are interested in your opinion on the following IoT use cases that are likely to impact healthcare:

1. Decision support tools
Integrate and analyze diverse types of diagnostically relevant data and move it to clinical decision-support systems

2. Advanced Electronic Medical Records (EMR)
Real-time data from sensors being automatically added to patient records

3. Inventory management
Track expensive or vital equipment more effectively

4. Improved compliance
Improve patient and operator compliance such as knowing the temperatures of refrigerator, hand hygiene compliance, smart medicine containers

21. How confident are you that suppliers will deliver the services that healthcare services need from these technologies over the next 5-10 years?

	No opinion	Not confident	Slightly confident	Confident	Very confident
1. Decision support tools	○	○	○	○	○
2. Advanced Electronic Medical Records (EMR)	○	○	○	○	○
3. Inventory management	○	○	○	○	○
4. Improved compliance	○	○	○	○	○

22. In your view, what will be the impact of these uses cases on healthcare services over the next 5-10 years?

	No opinion	No impact	Slight impact	Moderate impact	High impact
1. Decision support tools:	○	○	○	○	○
2. Advanced Electronic Medical Records (EMR)	○	○	○	○	○
3. Inventory management	○	○	○	○	○
4. Improved compliance	○	○	○	○	○

11. Agriculture: Use Cases

We are interested in your opinion on the following IoT use cases that are likely to impact agricultural operations:

1. Drones
Detailed information from aerial services, analyzed w/ recommended actions

2. Weather
Advanced, local real time weather information and forecasts

3. Soil patterns
Information on soil chemistry and conditions

4. Animal health
Detailed real time information on animal welfare

5. Indoor farming
Indoor vertical high density farming

6. Irrigation
Targeted irrigation integrating local soil and weather conditions

7. Supply chain
Detailed real time information on supplier status, availability and timing

23. How confident are you that suppliers will deliver the services that operators need from these technologies over the next 5-10 years?

	No opinion	Not confident	Slightly confident	Confident	Very confident
1. Drones	○	○	○	○	○
2. Weather	○	○	○	○	○
3. Soil patterns	○	○	○	○	○
4. Animal health	○	○	○	○	○
5. Indoor farming	○	○	○	○	○
6. Irrigation	○	○	○	○	○
7. Supply chain	○	○	○	○	○

24. In your view, what will be the impact of these uses cases on agriculture over the next 5-10 years?

	No opinion	No impact	Slight impact	Moderate impact	High impact
1. Drones	○	○	○	○	○
2. Weather	○	○	○	○	○
3. Soil patterns	○	○	○	○	○
4. Animal health	○	○	○	○	○
5. Indoor farming	○	○	○	○	○
6. irrigation	○	○	○	○	○
7. Supply chain	○	○	○	○	○

12. Construction Use Cases

We are interested in your opinion on the following IoT use cases that are likely to impact operations and management in the construction industry

1. Site safety:
Wearable technologies that monitor environmental conditions and staff locations

2. Inventory tracking:
Placement of RFID tags, barcodes or QR codes for inventory

3. Utility monitoring:
The management of fuel, water and electrical power use

4. Building information monitoring (BIM):
Providing coordination and simulation of a project covering planning, design, construction and maintenance

5. Equipment management and servicing:
The management of construction tools and remote monitoring of operations

25. How confident are you that vendors will deliver the services that the construction industry needs from these technologies over the next 5-10 years?

	No opinion	Not confident	Slightly confident	Confident	Very confident
1. Site safety	○	○	○	○	○
2. Inventory tracking	○	○	○	○	○
3. Utility monitoring	○	○	○	○	○
4. BIM	○	○	○	○	○
5. Equipment	○	○	○	○	○

26. In your view, what will be the impact of these uses cases on building operations and other stakeholders over the next 5-10 years?

	No opinion	No impact	Slight impact	Moderate impact	High Impact
1. Site safety	○	○	○	○	○
2. Inventory tracking	○	○	○	○	○
3. Utility monitoring	○	○	○	○	○
4. BIM	○	○	○	○	○
5. Equipment	○	○	○	○	○

13. Technology

27. Thinking about the technology required to deliver IoT services in your industry, choose up to five that you feel are the most important.

- [ ] Hardware: IoT Sensors
- [ ] Hardware: Actuators
- [ ] Hardware: Processing
- [ ] Hardware: Edge devices
- [ ] Software: Sensor F/ware
- [ ] Software: Edge F/ware
- [ ] Software: Data collect
- [ ] Software: Data store
- [ ] Network: Gateways
- [ ] Network: Connectivity
- [ ] Apps: Device Management
- [ ] Apps: Network Mngt
- [ ] Apps: Data manage
- [ ] Apps: Data analytics
- [ ] Apps: Visualization
- [ ] Apps: Usability
- [ ] Systems: Middleware
- [ ] Systems: Alerts
- [ ] Systems: Security
- [ ] Systems: AI
- [ ] Systems: Resiliency
- [ ] Standards: Security
- [ ] Standards: Data
- [ ] Standards: Privacy
- [ ] Other (please specify)

28. In your view, what is the most important IoT technology gap in your industry?

29. In your view, is research and development in the most important areas mainly undertaken by the private sector or by either the state and federal public sectors?

Mainly private R&D | Equal contribution | Mainly public R&D

30. Can you suggest one broad issue that would slow the adoption of IoT technologies in your industry?

31. Can you suggest one broad issue that would accelerate the adoption of IoT technologies in your area?

32. How many employees are in your organization?

- ◯ less than 5
- ◯ 5-99
- ◯ 100-1000
- ◯ More than 1000

33. Feel free to add any comments on IoT issues or any other use cases that would significantly affect your industry.

As we are interested in a wide range of views, feel free to send the link to this survey to any colleagues who are knowledgeable in IoT in your area. And if you'd like to be considered for a 30 minute interview just contact us.