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Market
Insight

Internet of Things-based Solutions for Customer Support, US, 2018

**Need to Deliver Timely Support, Improve Process
Transparency, and Enhance Customer Experience Drive
Implementation**

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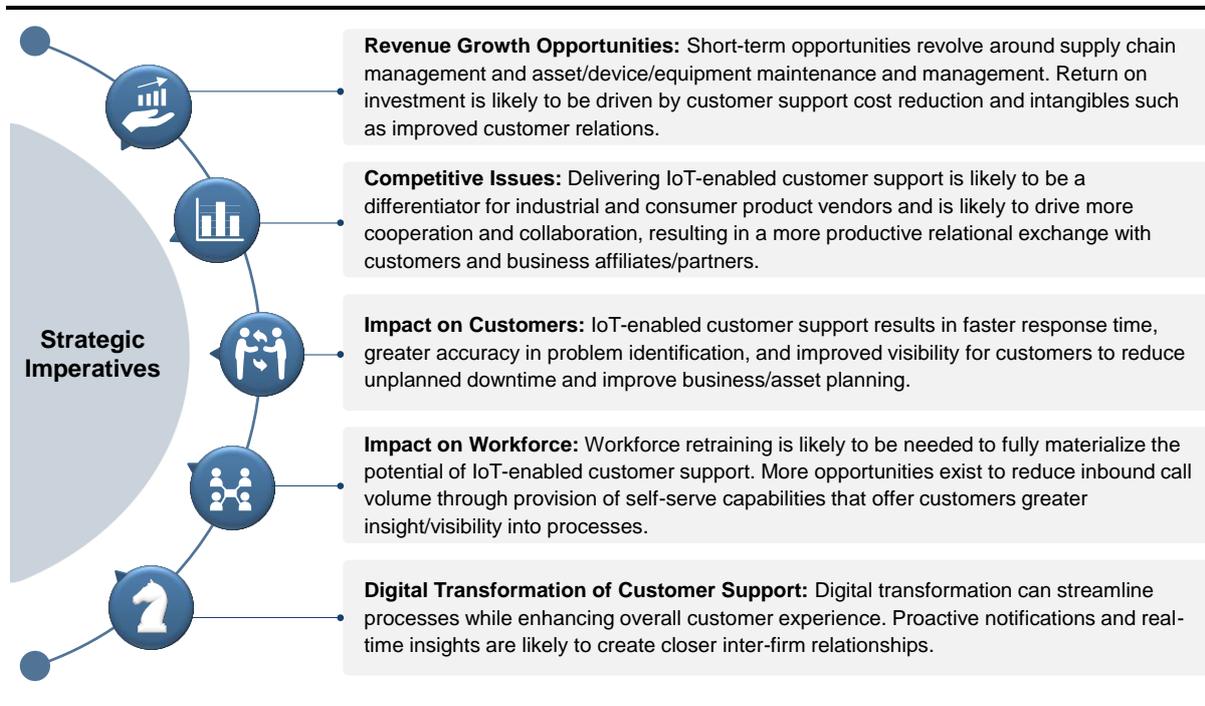
IoT and Customer Relationship: An Overview

Internet of Things (IoT)-based solutions are having a profound influence on how organizations perform various functions ranging from tracking and monitoring physical assets to building and managing customer relations. These solutions, such as predictive maintenance notifications for industrial robotics or provision of real-time insights into supply chains, are helping organizations reduce waste, boost operational efficiency, and gain greater visibility into processes. At the same time, growing adoption of IoT solutions is enabling new business models for both IoT vendors and end users. For instance, growth in implementation of IoT-enabled smart building management systems is driving building system vendors to develop and market new services, thereby improving customer support while also expanding revenue streams.

In the enterprise market, the use of IoT involves embedding sensors to track/monitor and report the status and condition of devices or equipment/assets and inventory. Such information can help improve resource utilization, conduct diagnostics and troubleshooting, deliver remote software-based upgrades, and develop predictive maintenance programs. This insight focuses on the use of IoT-based solutions by a variety of organizations to enhance customer support functions as well as customer experience. Specifically, use of IoT-enabled real-time data to identify and address issues with equipment/devices, supply chains, and in other areas offers greater visibility/insights into operations, thereby improving organizational planning and control functions. Effective and timely customer support can also help organizations improve satisfaction and loyalty while also reducing retention costs. Moreover, embedded sensors that provide remote access to devices/machinery can help technical support personnel quickly diagnose and solve problems, resulting in reduced downtime, greater employee productivity, and potentially higher customer satisfaction.

Exhibit 1 lists the strategic imperatives for growth in the IoT-enabled customer support solutions for the US market in 2018.

Exhibit 1: IoT-Enabled Customer Support Solutions: Strategic Imperatives for Growth, US, 2018



Source: Frost & Sullivan

An enterprise can be both a recipient and a provider of customer support. The organizational IoT-enabled customer support ecosystem reflects a range of internal and external entities as well as a plethora of resources and systems needed.

Exhibit 2 offers a conceptual overview of the organizational customer support function for the US market in 2018.

Exhibit 2: IoT-Enabled Customer Support Solutions: Customer Support Function Overview, US, 2018



Source: Frost & Sullivan

As illustrated in the exhibit, IoT-enabled customer support can include the following interactions:

- **Suppliers/supply chain to enterprise buyers** – the suppliers may be sending semi-finished/unfinished goods or “ingredient” products such as parts/components to original equipment manufacturers (OEMs) or agricultural commodities to food processing plants and may use IoT to track shipments for both internal metrics and for providing real-time insights to enterprise buyers.

- **Manufacturer to distribution channels** – whereby the manufacturer offers real-time insights into inventory delivery status and other relevant information to help channel members with operational planning and their own customer support functions.
- **Distribution channel to customer** – for instance, Web-based retailers offering real-time order processing and shipping details to their customers.
- **Manufacturer to customer** – this includes both enterprise buyers and consumers that are purchasing finished goods. A plethora of products fall into this category, ranging from automobiles to smart televisions. Several industrial products are also included here, such as commercial aircraft, military equipment, building technologies, information technology products such as servers and routers, and operational technology such as industrial robotics or mining and drilling equipment.
- **Third-party intermediaries** – this segment predominantly includes third-party service providers including logistics and transportation service providers that need to provide insights to both shippers and recipients.

Using IoT for customer support is a multifaceted concept and accordingly involves a variety of vendors at each level, ranging from sensor providers to application developers. Moreover, use of IoT for enhancing customer support transcends a broad array of segments including:

- industrial markets, (both discrete and process industries)
- retail and wholesale
- healthcare
- logistics and transportation
- oil and gas
- consumer goods (including electronics, appliances, and other devices)

Significant opportunities also exist in the consumer and enterprise services segment, including utilities and communications services, to employ IoT for boosting customer support as well as user experience. From a functional perspective, use of IoT to enhance and streamline customer support goes across a range of enterprise operational/functional areas including asset management, material tracking, logistics support, remote product updates/diagnostics, and technical support.

It is important to note that the terms customer support and customer experience are intertwined. For instance, in the enterprise market, use of IoT to provide automated, real-time insights about equipment/machinery maintenance is likely to help reduce the incidence/volume of inbound calls to customer support as users rely more on automated, “self-serve” capabilities that consist of analytics-based dashboards. At the same time, insights such as logistics updates are likely to provide customers with greater visibility into—and control over—supply chain, thereby enhancing customer experience. Similarly, in the consumer markets, IoT-enabled smart appliances or other electronic devices that allow remote diagnostics and troubleshooting are likely to reduce the costs and hassles associated with scheduling and performing appliance repair/maintenance for both customers and manufacturers.

This study focuses on three core areas where IoT is helping improve customer support and enhance user experience. They are:

- Industrial/enterprise markets
- Consumer products and services markets
- Smart city/utility/government markets

Industrial/enterprise segment is using IoT solutions to help redefine supply chain and distribution channel management while also improving core operational processes. This segment includes a vast array of solutions that range from IoT-enabled blockchain in supply chains to smart building technology that provides remote monitoring and management of various shop-floor functions such as building access and utility systems.

In the industrial segment, implementation of IoT solutions can help suppliers provide greater transparency regarding shipment of raw materials to OEMs. An OEM can then update and adjust a production schedule, thereby effectively managing productivity. At the front end of the operation, implementation of IoT between a manufacturer and its distribution channels can lead to improved inventory management, thereby reducing the risk of obsolescence and/or perishability, alleviating storage costs, and limiting the incidence of stock-outs. At the distribution channel level, specifically for online retailers, implementation and integration of IoT solutions in the warehousing and shipping functions can help provide timely, automated updates on delivery status, thereby reducing the potential of errors that are typically inherent in manual customer support functions.

Consumer products and services area offers tremendous opportunity to realign and perhaps streamline customer support functions. In the consumer electronics and appliance markets, understanding device usage behavior can provide vendors/sellers with an opportunity to make product improvements while also creating new service- and device-based revenue opportunities. Other IoT-enabled devices, such as home automation and security systems, also help organizations deliver efficient and effective remote customer support, thereby avoiding costly and time-consuming physical service calls. Similarly, for automotive manufacturers, the development, marketing, and adoption of connected cars enhances driver experience through provision of Wi-Fi as well as a variety of other real-time updates. Advanced vehicle systems, when integrated with smart city and smart grid technology, can deliver benefits to drivers and other entities.

Smart city/utility/government segment also offers significant potential to enhance customer support for government customers while also enabling local governments to do the same for their constituents. For instance, the implementation of an IoT-enabled smart grid system can help local electric cooperatives better predict and efficiently perform plant maintenance. Similarly, smart metering vendors can offer a multitude of diagnostics to remotely monitor and fix faulty equipment/meters, thereby helping reduce the potential of unbilled revenue for local government-owned water systems and minimizing the need for costly truck rolls for utilities. Smart street surveillance systems can significantly help support law enforcement and other government agencies by quickly pinpointing crime areas and perpetrators.

IoT-Enabled Customer Support: Drivers and Challenges

While there are many benefits of deploying IoT, and its adoption is expected to continue to grow across a variety of enterprise verticals including government, the idea of using such technology to improve and streamline customer support is still at an early stage. Several factors explain that, including newness of the technology and resulting intricacies in its implementation and post-deployment cybersecurity concerns. This section highlights some of the key factors that are helping drive IoT usage for customer support. At the same time, a review of the challenges in using IoT for customer support is also offered.

IoT for Customer Support – Key Drivers

Although the primary drivers of IoT deployment revolve around operational cost reduction and gaining greater visibility into processes and transactions, several organizations are also seeking to develop IoT-enabled products that provide them with greater insight into customer behavior. Still others are seeking identification of new business models through IoT-enabled hardware, software, applications, and services. In the enterprise segment, while initial IoT deployment may be targeted at a specific operational area, such as quality control or asset management, the technology is likely to gradually spill over in other areas, including customer support. Below are some of the key drivers behind use of IoT to deliver effective and timely customer support.

Rising cost of unplanned downtime – Unplanned downtime has the potential to disrupt internal operations and negatively influence external organizational constituents. Given rising labor costs, any unplanned downtime can equate to significant financial losses for organizations in manufacturing, oil and gas, construction, mining, transportation and logistics, and utilities. Downtime also negatively impacts employee productivity and may adversely affect customers or other business affiliates. Unplanned downtime can be a function of equipment failure, software/application malfunction, human error, or natural calamities such as weather. The use of predictive IoT tools allows manufacturers of industrial equipment and machinery to proactively monitor the devices, predict maintenance needs, and perform timely diagnosis and troubleshooting, thereby reducing the incidence and duration of unplanned downtime for their customers, such as automotive or consumer electronics OEMs.

In the oil and gas industry, for instance, multiple opportunities exist for IoT-enabled customer support including monitoring of offshore rigs and related equipment, refining equipment, pipeline monitoring, wellhead activity, and shipping equipment. Construction and mining equipment vendors can benefit from deploying IoT-enabled solutions that proactively monitor and predict equipment conditions, thereby helping reduce unplanned downtime while improving safety.

For industrial/heavy machinery and equipment manufacturers that develop, sell, install, and maintain operational technology (such as plant robotics, agricultural equipment, and power plant turbines), embedding IoT capabilities in devices can result in fewer unplanned maintenance needs on the part of their customers. This is likely to help industrial equipment manufacturers improve product quality perception, company reputation, and enhance customer satisfaction. Moreover, implementation of IoT-enabled support is likely to increase the stickiness of a solution thereby helping retain customers.

Product/service quality issues – In the food processing industry, for instance, blockchain-enabled IoT solutions, when used by food processors and their suppliers, can help quickly identify the source of foodborne illnesses, thereby reducing the likelihood of a mass health crisis. Such incidents typically invite negative publicity and increase the likelihood of stringent product quality/recall regulation.

Similar quality control issues exist across discrete manufacturing, such as automotive and consumer electronics; IoT can help improve production planning, product quality, and asset management through provision of timely data and insights to the entire production value chain.

IoT-enabled customer support can also be utilized in the service sector to address various quality issues. For instance, in the retail food service segment that includes restaurants, deployment of IoT-enabled customer support by food suppliers and restaurant equipment makers can enhance food safety while prolonging equipment/asset lifecycle. Deployment of IoT can help third-party transportation and logistics companies provide their customers with greater visibility and transparency into the shipping process, and can help mass transit companies, such as commercial airlines or train services, deliver real-time status updates to their users/customers and even help effectively and efficiently track baggage/pets to give travelers greater peace of mind. Delta Airlines, a US-based carrier, has already implemented such solutions for its baggage/cargo handling operations to help its customers track their checked baggage.

Reducing customer support costs while improving effectiveness – Customer support functions are less likely to be classified as revenue and profit centers and more likely to be considered cost centers across many organizations. For instance, to curtail customer support costs, manufacturers of consumer and industrial equipment/devices/appliances often partner with third-party contractors for service, repair, and installation tasks as opposed to using in-house personnel. IoT-enabled solutions streamline customer support functions by providing customers with greater visibility and control over various aspects—whether it is monitoring and tracking shipments or scheduling equipment maintenance. Such solutions also enable remote troubleshooting, thereby avoiding costly service visits/truck rolls for minor issues.

Potential data monetization – The plethora of customer data collected via IoT solutions can help vendors improve products and services to better fit customer needs. At the same time, the data gathered can create monetization opportunities for both customers and vendors above and beyond product/service improvement and redesign. For instance, SAP's Data Network solution, part of SAP Leonardo, helps aggregate, anonymize, and prepare data for data-as-a-service consumption by a variety of entities. For manufacturers that are implementing customer-focused IoT in equipment/devices, such a tool can help streamline internal processes through data intelligence while also creating additional revenue streams. It is important to note, though, that the potential for data monetization is an emerging phenomenon that is likely to have long-term opportunities, more so than short-term, given the concerns surrounding data privacy and security.

IoT for Customer Support – Core Challenges

Although IoT implementation continues to gain steam across a multitude of enterprises, several challenges remain. This section highlights the various challenges and nuances involved in the adoption, implementation, and use of IoT to boost customer support.

Legacy versus new equipment/systems – To effectively utilize IoT for improving customer support and enhancing user experience, organizations must address the issue of equipping legacy (existing) versus new equipment/devices with sensors to collect and report data on various performance metrics. For instance, for industrial equipment makers with a large installed base of legacy devices/machinery at facilities such as automotive plants or hospitals, or in high-rise building elevator systems, deployment of IoT for asset management could involve downtime. Moreover, effective integration with legacy operational technology including software could present significant challenges that lengthen deployment cycle or create other collateral issues. Another related is the cost of such deployments and who will absorb them: the equipment manufacturer, the customer, or both. Still other issues revolve around equipment warranties and to what extent they may be compromised with the addition of non-native hardware and software.

While new machinery/equipment/devices do not face similar technical challenges, not all organizations have the resources to purchase new machinery. In other cases, legacy equipment may still not have reached the end of its life cycle, which would delay the purchase of new equipment.

Inter-firm coordination – To fully capitalize on the potential of IoT in customer support, tremendous inter-firm coordination and collaboration is needed and on an ongoing basis. For instance, a supplier serving the food processing industry must not only deploy IoT but must adapt open-data sharing with the buying organization and vice versa. Further integration may also be needed with third parties, such as logistics companies, to provide real-time insights into the status of a shipment. A produce or seafood shipment with an overseas point of origin may be routed through several intermediaries, thereby increasing the need for multi-firm coordination in monitoring the shipment and tracking its delivery status. Use of IoT to enhance customer support though involves taking a non-conventional approach to inter-firm relationships whereby both the supplier and the buyer/customer become partners in designing systems that improve process effectiveness and eliminate inefficiencies.

Minimizing false positives – IoT solutions, when used for customer support functions such as predictive maintenance notifications, must minimize the incidence of false positives that may arise out of faulty hardware and software. Such incidents may not only affect vendor credibility but also lead to costly and ill-advised downtime. Similarly, any false notifications regarding the status of a shipment or inability to track the materials carry the potential of significant negative outcomes for enterprises. In the healthcare vertical, having a reliable IoT solution that monitors, tracks, and reports performance of a core medical device is even more critical for a variety of reasons, such as the ability to accurately diagnose patient condition and ensure safety. At the same time, real-time and accurate information on system/device operational status is critical from an efficiency perspective given limited availability of care specialists such as surgeons.

Effective information and operational technology integration – Operational technology has historically remained separate from information systems across many industries. While IoT emergence has brought about significant awareness in conveying the value proposition of connecting/integrating operational technology (OT) and IT, several areas remain siloed. This limits the potential of information sharing internally and with external constituents including suppliers/vendors/affiliates and customers. In the context of customer support, for instance, traditional contact center operations and related systems may need to be effectively integrated with customer-owned equipment/devices to deliver real-time insights to frontline agents and supervisors that are handling customer issues. This can be costly and time-consuming.

Privacy concerns with IoT-enabled customer support – While sending proactive notifications about asset maintenance and management may not be perceived as a privacy issue by enterprise customers or even consumers, the question of how else and with whom such information is shared can be a cause of concern. Specifically, in the enterprise market, information that is gathered from digital twins of assets such as core industrial robotics can be deemed proprietary, which if released may lead to negative outcomes such as erosion of competitive advantage. In the consumer market, while IoT-enabled customer support for home automation solutions may quickly resolve device issues, it also provides external entities with access to core aspects of the home such as access/entry points. A disgruntled employee with access to customer information—and more importantly to their core assets—can have ramifications for both vendors and customers. Adequate privacy safeguards must be in place before implementing IoT-enabled customer support.

Cybersecurity risks – Integration of IT and OT is likely to create new/additional cybersecurity challenges for providers of IoT-enabled customer support and the recipients, i.e., customers. Such risks are likely to be more prominent in areas such as shop floor systems and other assets, transportation and logistics systems, and certain consumer markets such as connected cars.

Deployment issues – Various technical and business challenges can also slow the adoption and use of IoT-enabled customer support solutions. From a technical standpoint, interoperability issues across various IoT devices and software as well as connectivity protocols can render greater complexity to deployment initiatives while also driving overall IoT costs. Much work remains in identifying robust yet cost-effective networking technologies, streamlining data collection and data normalization from an array of devices, and developing and implementing systems that are simpler to manage.

From a business standpoint, leveraging IoT for customer support functions such as asset management is likely to require multi-layered investment (e.g., hardware, software) and the redesign or realignment of systems and processes. From a customer standpoint, such an undertaking is also likely to involve downtime. Budgetary issues often lead to slower and/or piecemeal adoption; vendors must account for that as well when pitching IoT solutions.

Personnel challenges – Customer support is an area which has seen a significant degree of technology influx ranging from the introduction of interactive voice response (IVR) systems several decades ago to providing personnel with tools and capabilities that enable remote equipment/device diagnosis and troubleshooting. Most of these changes have had a direct impact on internal customer support processes, with many of these requiring retraining for employees. Similar outcomes are likely with the use of IoT: organizations will either need to hire personnel with specific skill sets or retrain the existing workforce. Customer support—specifically contact center operations—historically has had a rather high employee turnover rate, adding complexity to hiring and training practices.

IoT-Enabled Customer Support – Enterprise Markets

The opportunity to leverage IoT-enabled customer support is likely to be rather significant in the enterprise market. Its scope ranges from providing proactive asset management solutions to real-time insights into logistics. Asset management alone is a broad area and includes the following:

- Operational technology – this includes industrial machinery such as assembly robots, drilling equipment, and turbines. Operational technology can be fixed/stationary or mobile.
- Fleet management – examples include utility company vehicles and related equipment, shipping containers, heavy-duty trucks, and other vehicles.
- Information technology – examples include data centers and mobile computing devices.

Building systems/facility infrastructure – such as elevator systems, heating, ventilation, and air conditioning (HVAC), environment systems, personnel safety gear, and several others.

As discussed, enterprise IoT deployments are multifaceted; often, use of such solutions for customer support is intertwined with other operational areas. It is also likely that primary objectives for IoT deployment may not be driven by the customer support function but by other operational needs. For instance, a supplier may deploy IoT to help its customers, such as manufacturers, improve production planning, and in doing so may also embed additional customer support functionality. Similarly, a consumer device vendor may embed IoT to gain greater insights into usage behavior as opposed to strictly using IoT for support.

This section highlights data from Frost & Sullivan's 2017 survey of 150 manufacturers across discrete and process industries in the US. Survey data highlight areas of opportunity/use cases for IoT-enabled customer support. Below are the sample demographics for the survey.

- 51% of all respondents were employed in an IT function, while 19% were involved with general management and/or corporate strategy/planning.
- 87% of respondents held a managerial, director, executive director, or a C-level position.
- On average, respondents had 9 years of experience in manufacturing operations management.
- Average annual revenue across all respondent organizations was \$1.60 billion.

Manufacturing Perspective

Exhibit 3 offers insight into the top operational challenges identified by manufacturers for the US market in 2017.

Exhibit 3: IoT-Enabled Customer Support Solutions: Operational Challenges in Manufacturing, US, 2017

	Total N=150	Discrete Manufacturing N=75	Process Manufacturing N=75
Quality control	 52%	 60%	 44%
Supply chain management (e.g., sourcing, ordering, fulfillment, deliveries, returns)	 48%	 45%	 51%
Materials management	 38%	 40%	 36%
Inventory management	 35%	 40%	 31%
Logistics and transportation	 35%	 36%	 33%

Base: All respondents (n=150)

Q5. From an operations management perspective (productivity, efficiency, cost control), please identify the most/least challenging areas within your manufacturing operations.

Source: Frost & Sullivan

From an operational perspective, the manufacturing segment is rife with opportunities for IoT-enabled customer support. The quality control aspect of operations, which was identified as the most challenging area, is directly related to having an effective production process that proactively identifies any errors in operational technology or materials/components to prevent defective products. In the discrete manufacturing segment, for instance, a malfunctioning assembly line industrial robot can produce faulty and perhaps unsafe products, resulting in significant product recall issues. For manufacturers of industrial machinery/equipment, IoT-enabled products can generate real-time insights into equipment performance that can be used to enhance customer support and improve quality of their own products.

Similarly, opportunities for IoT-enabled customer support exist in the supply chain management area. Effective supply chain-related customer support is even more important in process industries, such as food and beverage, which may source materials from dozens or hundreds of vendors.

Improving product quality issues via IoT-enabled device/equipment/machinery support, however, is a complex endeavor and requires tremendous internal and external coordination. Implementing IoT to monitor machinery performance and maintenance requires data sharing between the user and the equipment vendor, and in some situations it may also include coordination with third-party maintenance and repair vendors.

Exhibit 4 highlights top IoT implementation drivers in US manufacturing in 2017.

Exhibit 4: IoT-Enabled Customer Support Solutions: Drivers for Implementing Smart IoT in Manufacturing, US, 2017

	Total N=46	Discrete Manufacturing N=29	Process Manufacturing N=17
Need to be on cutting edge of manufacturing technology	50%	52%	47%
Need to improve responsiveness to market conditions	48%	55%	35%
Need to future-proof facilities	43%	38%	53%
Extend manufacturing equipment/asset life cycle	43%	34%	59%
Problems with managing supply chains	37%	34%	41%
Rising labor costs	28%	24%	35%
Dissatisfaction with existing plant processes/workflows	26%	24%	29%
Low employee productivity	24%	21%	29%
Our competitors are using such solutions	22%	24%	18%
Regulatory compliance pressures	22%	21%	24%
Other	2%	3%	2%

Base: Respondents in organizations who have implemented smart IoT solutions already (n=46)
 Q20. Please select the reason(s) that motivated your organization to implement smart IoT solutions.

Source: Frost & Sullivan

Among the leading drivers, the need to be on the cutting edge of manufacturing technology, to improve market responsiveness, and to extend equipment life cycle are the most relevant to IoT-enabled customer support. Modern manufacturing requires state-of-the-art facilities and processes that result in high-quality products and accelerate time to market. In terms of responsiveness, IoT not only helps make timely adjustments to internal processes but also allows the resolution of customer issues. Asset management is another leading driver that helps manufacturers, such as builders of heavy machinery, extend the life cycle of their internal operational technology while doing the same for buyers of such equipment.

Exhibit 5 identifies IoT implementation areas in US manufacturing in 2017.

Exhibit 5: IoT-Enabled Customer Support Solutions: IoT Solutions Implemented by Manufacturers, US, 2017

	Total N=46	Discrete Manufacturing N=29	Process Manufacturing N=17
Supply chain tracking	61%	55%	71%
Equipment and machinery management	57%	52%	65%
Inventory management	50%	55%	41%
Mobile asset management and utilization tracking	48%	52%	41%
Security and surveillance	43%	38%	53%
Integrated mobile workforce management	37%	28%	53%
Fleet management	35%	31%	41%
Industrial wearables for field service	35%	31%	41%
Other	4%	7%	5%

Base: Respondents in organizations who have implemented smart IoT solutions already (n=46)

Q15. Please identify which of the following smart IoT solutions for manufacturing and operations has your organization already implemented.

Source: Frost & Sullivan

Among manufacturers that have implemented IoT, supply chain tracking and equipment management solutions enjoy the highest penetration. Supply chain tracking solutions not only provide manufacturers with greater visibility but also reduce pressure on suppliers' customer support function by pushing self-serve capabilities to buyers. The ramifications of unplanned downtime are a critical factor in deploying IoT-enabled equipment management solutions, which also give industrial equipment vendors the opportunity to improve equipment quality and deliver efficient maintenance and repair support.

Enterprise Market Applications/Use Cases

Below are examples/use cases for IoT-enabled customer support.

Mining equipment – Komatsu is a global manufacturer of heavy machinery including construction and mining equipment. The company has partnered with Cloudera Enterprise and Microsoft Azure to deploy a cloud-based IoT platform to support its mining customers. The JoySmart platform gathers, monitors, and analyzes data from mining equipment to predict maintenance, generate safety alerts, and offer other equipment management-related insights to both Komatsu and its customers. Komatsu is also implementing a robust machine learning capability that would provide operational insights to improve asset utilization and reduce downtime while also helping Komatsu improve product design and performance.

Agricultural machinery – CNH Industrial, a prominent manufacturer of agricultural equipment and transportation vehicles, is leveraging IoT to help its customers improve overall asset life cycle while also providing them with analytics to boost performance. The use of IoT to predict maintenance has helped it reduce downtime for agricultural equipment, such as combines, tractors, and harvest machinery, by 50%. CNH has partnered with a range of IoT platform and analytics vendors, including PTC and Microsoft Azure, to revolutionize its support functions for its global customer base.

Logistics and transportation – Maersk, a premiere shipping vendor that handles more than 18% of all container traffic/cargo, has invested in both IoT and blockchain to render greater efficiency and effectiveness to its shipping business. The company has piloted its IoT-enabled Remote Container Management (RCM) system to collect, monitor, and analyze data from its containers to help its customers with insights into delivery time while also reducing the risk of spoilage for perishable commodities. The company recently entered into an agreement with IBM to employ blockchain in its operations to improve tracking, reduce documentation, and alleviate fraud. Lengthy documentation processes can lead to shipping delays, while the inability to track produce can render it difficult for food processing companies to identify and address the source of food-borne illnesses.

Medical devices – A range of medical devices, such as insulin pumps and defibrillators, are leveraging IoT to help deliver real-time data to physicians and others involved in care delivery to improve patient outcomes. IoT use is also being implemented by medical equipment vendors to enhance performance and improve service and repair activity. Philips Healthcare, a global medical equipment vendor, is employing IoT across a range of consumer and healthcare provider segments ranging from patient monitoring devices to advanced imaging equipment. By leveraging IoT, Philips can improve its product design and performance. At the same time, the company launched its IoT-enabled e-Alert solution, which helps hospitals proactively identify equipment maintenance needs and reduce outages.

IoT-Enabled Customer Support – Consumer Markets

In the consumer market, growing penetration of networked devices, ranging from fitness monitors to connected-vehicles, is providing vendors with opportunities to enhance customer experience and reduce support costs, while also increasing stickiness of their offerings. Moreover, IoT-enabled devices present significant opportunities to develop intimate knowledge of usage patterns and behaviors, which could help improve overall product quality. Below are examples of market segments that are enhancing customer experience and improving support via IoT-enabled technologies.

- **Digital healthcare** – IoT-enabled patient monitoring devices enable real-time alerts to caregivers about health conditions and medication impact. Medical device vendors include GE Healthcare and Philips Healthcare. Such devices enable preventive care, chronic disease monitoring and intervention, and acute care to improve care quality and patient safety while also reducing overall healthcare costs. For instance, post-operative information on customer condition allows timely intervention by caregivers to reduce readmissions. For caregivers, this is likely to boost patient satisfaction in addition to many other critical outcomes.
- **Connected vehicles** – several solutions are being embedded into new and existing vehicles to assist drivers and assess vehicle maintenance needs. Automotive manufacturers and IoT vendors such as wireless carriers are targeting the connected-vehicle market with a range of solutions including onboard Wi-Fi, remote start capability via smartphone apps, remote unlocking in the event of a lockout, vehicle diagnostics, and teen driver monitoring capabilities.
- **Home security and automation** – numerous vendors are actively pushing solutions that enhance overall user experience while also providing detailed insights into product usage. Going forward, integration of home technologies with external entities such as smart grids is likely to create the need for IoT-enabled customer support for both consumers and utilities. Real-time alerts via smartphone apps, whether from home security product/service providers such as Ring, Vivint and ADT or wireless and cable operators such as AT&T, Comcast, and Cox, which are giving consumers greater visibility of their properties when they are away. Gas and water leak alerts can help consumers quickly identify repair needs and limit property damage and insurance claims. Voice-enabled digital home assistants have also created opportunities for device vendors, their affiliates, and third parties to understand customer needs while also creating a seamless user experience by allowing them to shop via voice commands.

- **Smart appliances** – the launch of smart appliances has many implications for both users/consumers and device vendors. IoT-enabled smart home appliances, while presenting new revenue streams and ways to streamline customer support, are likely to require new investments in contact center systems and perhaps workforce training. While the market for these appliances is at an embryonic stage, as prices decline and more consumers adopt them, it is likely to usher in a new era in customer support.

IoT-Enabled Customer Support – Smart City/Smart Government

The smart city/smart government segment is rife with opportunities for IoT-enabled customer support, including proactive asset management solutions (mobile and fixed) to help cities improve citizen engagement and create new revenue opportunities. Smart city operators are not only recipients of IoT-enabled customer support but are also providers. For instance, smart parking solutions allow vendors to remotely monitor and fix errors in city parking systems such as card reading machines. At the same time, having smart parking solutions helps cities provide real-time information on available spots/lots to citizens to help them avoid parking violations. Similarly, the use of digital kiosks offers an opportunity to further engage citizens through provision of Wi-Fi and other local information.

There is a need for IoT-enabled customer support in other areas as well, such as city-owned utilities that employ capital-intensive physical infrastructure to generate, distribute, and store power, water, and gas service to its citizens. For utility infrastructure providers/vendors, IoT-enablement of equipment such as water pumps or turbines can improve asset utilization for city-owned utilities and reduce unscheduled outages through predictive maintenance solutions.

The Last Word

IoT enablement of operational technology, consumer devices, and government systems is expected to continue to grow. As more devices and equipment come online, there is a strong need for utilizing the data they gather to support decision-making in a variety of areas including customer support. Understanding and anticipating issues with customer devices, whether industrial robotics, power plant equipment, or consumer appliances, has the potential to significantly enhance overall product quality while also improving customer satisfaction. Unplanned/unscheduled downtime, whether in industry or healthcare or public services, can result in negative outcomes including loss of productivity and profitability.

For IoT-enabled customer support to fully deliver on its promise, significant and ongoing coordination and collaboration is required among providers and recipients. Moreover, effective integration, including implementation of data sharing protocols, is also needed for IoT-enabled customer support, and data security and privacy concerns must also be balanced. In an increasingly data-driven environment, unauthorized access to customer data can have significant negative repercussions for vendors and any other entities engaged in the collection, storage, and distribution of data.

Operationally, in the near term, IoT-enabled customer support in the enterprise and government segments is likely to revolve around asset management and supply chain tracking, which directly influence core operational activities. In manufacturing, for instance, effective asset management can reduce the number of equipment outages and the resulting impact on productivity. In the consumer market, near-term opportunities are likely to revolve around connected health, home automation and security, and connected vehicles.

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The Frost & Sullivan Story

Frost & Sullivan, the Growth Partnership Company, enables clients to accelerate growth and achieve best-in-class positions in growth, innovation, and leadership. The company's Growth Partnership Service provides the CEO and the CEO's Growth Team with disciplined research and best-practice models to drive the generation, evaluation, and implementation of powerful growth strategies. Frost & Sullivan leverages over 50 years of experience in partnering with global 1,000 companies, emerging businesses, and the investment community from more than 40 offices on 6 continents.

Frost & Sullivan helps clients accelerate growth by accomplishing the following:

- Delivering the broadest industry and market coverage of any research and consulting firm worldwide, 10 industries, 35 sectors, and 300 markets, ensuring clients not only understand their industry challenges and opportunities but growth opportunities in aligned industries and understand competitive pressures from previously unknown sources,
- Providing a 360 degree perspective—integrating 7 critical research perspectives to enhance significantly the accuracy of clients' decision-making and lowering the risk of implementing growth strategies with poor return,
- Leveraging extensive contacts within the chemicals and materials value chain, including manufacturers, distributors, end users, and other industry experts,
- Ensuring clients maintain a perspective of opportunities and threats worldwide through 1,800 analysts in 40 offices, making sure clients receive global coverage and perspective based on regional expertise,
- Researching and documenting best practices worldwide, ensuring clients leverage proven best practice answers to tough business challenges for successful growth, and
- Partnering with the client's team, in addition to delivering best practices research and experience, to ensure success.