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The Internet of Things: Are Organizations Ready For A Multi-Trillion Dollar Prize?

The Digital Universe is Expanding: Are You Ready for the Internet of Things?

If you think of the Internet as a domain driven solely by humans, think again. Androids are the coming force. We are talking of the Internet of Things (IoT) – a world where sensors allow machines to talk to one another. And, as with our human-driven Internet, the IoT is a game-changing, hugely significant opportunity for the economy and business organizations. Various research studies have pegged the value of the IoT at multiple trillions of dollars. Cisco[1] and GE[2] estimate that the size of the IoT pie is over $10 trillion. Research firm IDC estimates that, in 2020, over 40% of all data in the world will be data resulting from machines talking to one another[3]. Estimates may vary but the underlying message is loud and clear – the value at stake is too large, and the impact too wide-ranging, for any hint of complacency.

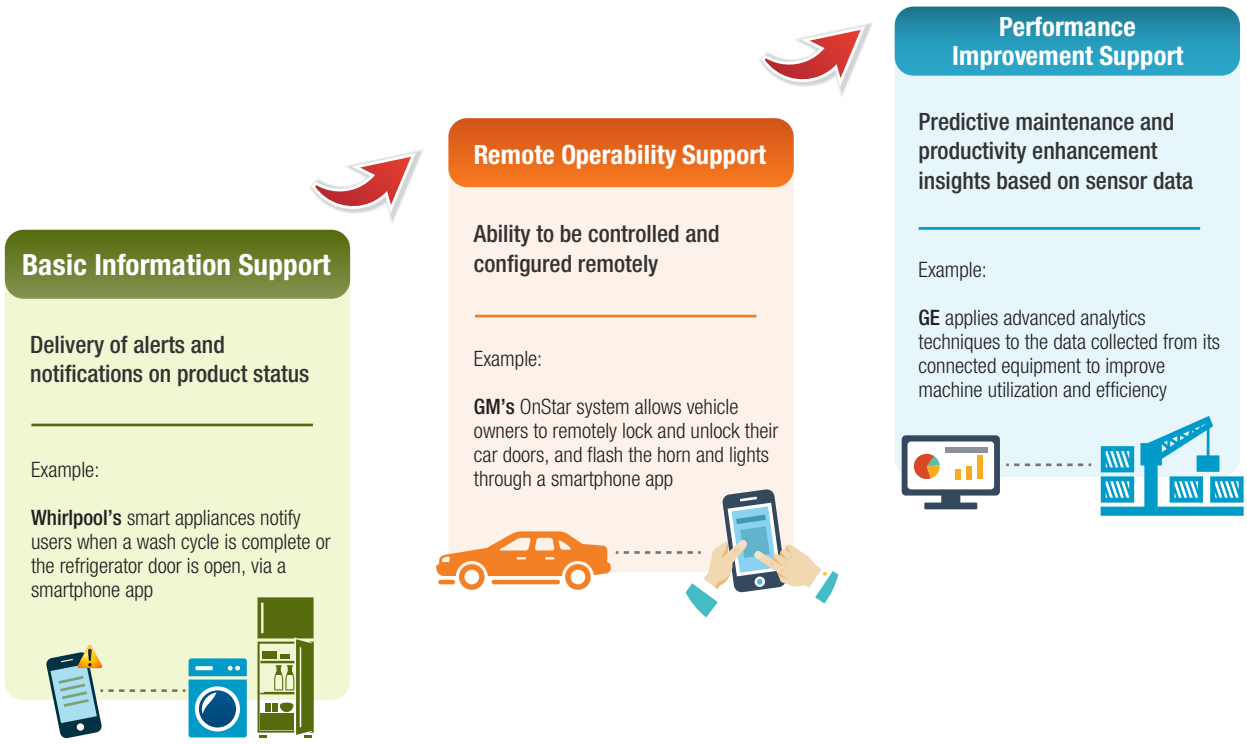
But do organizations recognize the scale of the opportunity? Are they prepared to take advantage of the growing wave of sensor data? In the following pages, we assess the current state of organizational readiness, examine why many organizations seem slow to react, and set out a roadmap for organizations that are determined to succeed in this next chapter of our ever-expanding digital universe.

For Most Organizations, These are Early Days in the Adoption of IoT Solutions

Most organizations are still in the early stages of adapting their offerings to the new IoT world. Our research – covering over 100 leading organizations in North America and Europe (see Research Methodology at end of paper) – revealed that IoT solutions, defined as sensor-enabled products offered in conjunction with services, vary significantly in their levels of sophistication (see Figure 1). The basic start point is connected products that generate alerts and notifications based on sensor readings. More advanced solutions allow remote operation using sensors. And the most mature solutions allow organizations to use sensor data to provide customers with high-value performance improvement insights. The majority of organizations provide solutions that offer only a basic level of functionality. Our research revealed that less than 30% support remote operability and fewer than 40% utilize sensor data to offer performance improvement insights.

> *"Cisco and GE estimate that the size of the IoT pie is over $10 trillion."*

Figure 1: Levels of Maturity for IoT Solutions



Source: Capgemini Consulting Analysis

Our study also revealed significant differences across industries. For instance, industrial manufacturing and medical device companies are clearly ahead of other industries in the maturity of their IoT solutions. Utilities and auto manufacturing firms offer basic levels of functionality, but lag when it comes to more advanced offerings. Insurance, home appliance and pharmaceutical companies lag behind other industries in providing even basic functionality (see Figure 2).

John Deere, a leading company in agricultural machinery, is among the few organizations that provide a full suite of functionality spanning basic information, remote operability as well as performance improvement support. With its PowerSight solution, for example, John Deere gathers data from its customers' connected equipment, generates machine health alerts, allows equipment to be remotely programmed, and goes a step further by providing customers with recommendations on improving machine utilization and lowering operating expenses[4].

Over Two-Thirds of Companies Do Not Monetize their IoT Solutions

Early adopters of IoT solutions, such as GE and General Motors, have shown how connected products can be the platform for service revenues. General Motors has been a pioneer in the use of telematics to create new revenue streams. With its OnStar telematics system, the company generates nearly $1.5 billion in revenues annually, through several paid safety, security and navigation services[5]. Similarly, GE launched its "Predictivity" line of IoT services in 2012, to help industrial customers manage the data from their connected equipment. Within just a year of launch, "Predictivity" generated $290 million in revenues for GE[6].

However, these two organizations are the exception, and not the rule. Our research indicates that less than 30% of organizations generate service revenues from their connected products. And the concerns around monetization are clearly top of mind for organizations. An executive at a leading car manufacturer we interviewed said, "Offering the telematics hardware for free with the car is not a sustainable option. We need to have a clear strategy to generate revenues from services[7]."

> *"Less than 30% of organizations generate service revenues from their IoT solutions."*

Figure 2: Maturity of IoT Solutions by Industry

Industry Group	Basic Information Support (Alerts and Notifications)	Remote Operability Support (Remote Control and Configuration)	Performance Improvement Support (Predictive Maintenance/ Productivity Enhancement Insights)
Industrial Manufacturing	High	High	High
Medical Devices	High	Low	High
Utilities	High	Medium	Low
Auto Manufacturing	High	Medium	Low
Insurance	Medium	Low	Low
Home Appliances	Low	Low	Low
Pharmaceuticals	Low	Low	Low

Low Maturity : <40% of firms provide IoT solutions that support the feature *Medium Maturity : 40-60% of firms provide IoT solutions that support the feature* *High Maturity : >60% of firms provide IoT solutions that support the feature*

Source: Capgemini Consulting Analysis

> *Offering the telematics hardware for free with the car is not a sustainable option. We need to have a clear strategy to generate revenues from services.*
>
> *— A leading car manufacturer*

Our research uncovered two monetization models that are emerging in the IoT solutions space. In the first model, connectivity services are offered free for a limited period of time and charged-for subsequently through a tiered mechanism. The idea is to allow the customer to experience the service value before migrating to a more regular tiered package. For instance, Eaton, the US-based power management major, offers the "eNotify Remote Monitoring" service that provides 24x7 remote monitoring of connected Uninterrupted Power Supply (UPS) systems[8]. The service is offered free for one year after product purchase, but is charged for in subsequent years[9]. In the second model, organizations offer multiple tiers of services, where each tier is priced differently, based on the breadth of services offered. For instance, John Deere offers four different levels of remote monitoring services under its PowerSight range of telematics solutions[10].

Most IoT Solutions Do Not Play Well With Third-Party Products and Services

The integration of connected products and sensor data with third-party solutions enables organizations to enhance their IoT solutions' value. By integrating the service with larger platforms, organizations stand to tap into a larger ecosystem of services that can significantly enhance the customer experience.

A few industrial manufacturing and automotive firms have taken initial steps in connecting their offerings with third-party services. For instance, German manufacturing major Bosch offers remote vehicle diagnostics services to vehicle owners and dealers through its telediagnostics system[11]. To make the service attractive and most effective for the consumer, Bosch's system enables information exchange with third-party services such as car workshops and roadside assistance[12].

However, our research indicates that less than 15% of organizations offer IoT solutions that integrate with third-party products and services.

> *Only a small minority of companies are using acquisitions or development of platforms and APIs as a means of building Internet of Things capabilities.*

Many Organizations are Forging Partnerships but Other Options for Capabililty Build-Up Lie Unexplored

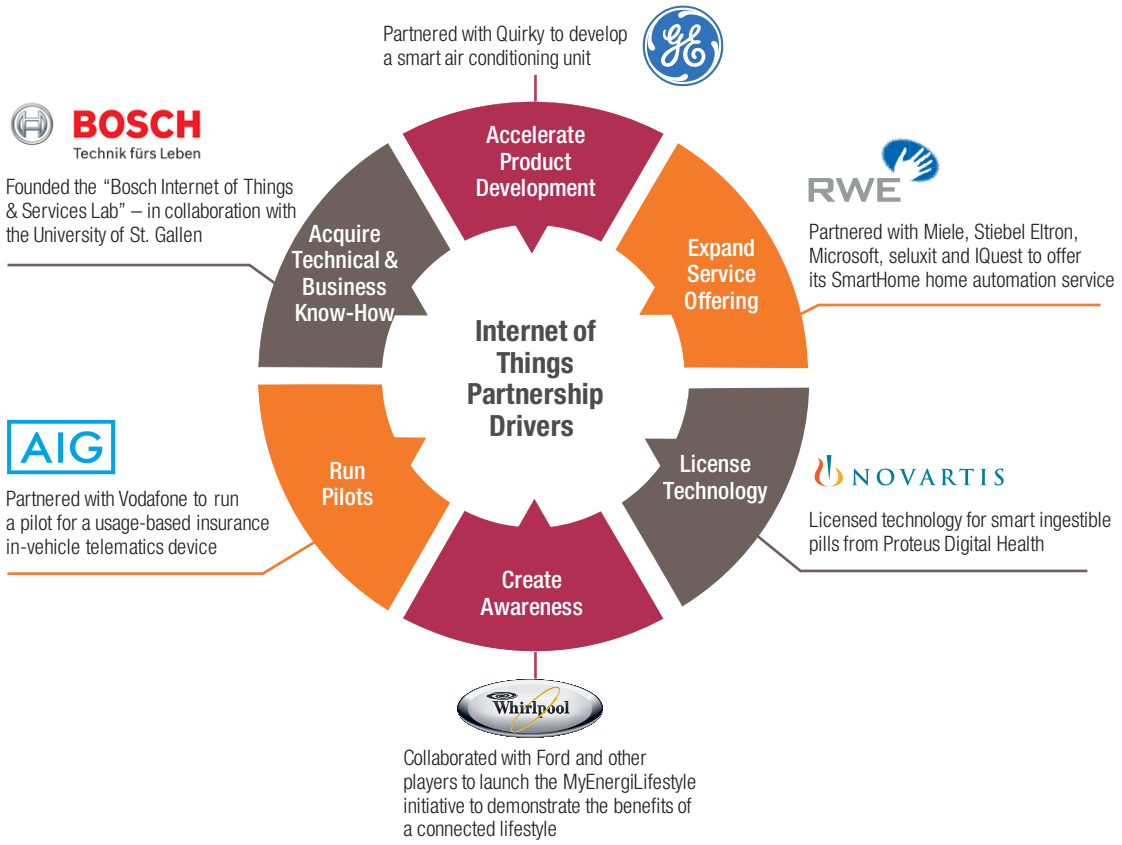
Developing IoT solutions often requires capabilities that organizations do not possess. Partnerships, acquisitions and the opening up of platforms or APIs[13] can quickly arm organizations with the capabilities they need. Our research indicates that close to 60% of organizations are using partnerships as a viable approach to develop IoT solutions, with varying objectives (see Figure 3). An executive at a leading security systems firm provided affirmation of this approach, saying, "We certainly see the need to partner with Machine to Machine (M2M) technology providers and data mining specialists, as well as with our channel partners, to build future connected solutions[14]."

Some organizations have looked beyond partnerships to develop capabilities. For instance, Honeywell offers APIs that allow developers, product integrators and retailers to create custom applications that integrate with Honeywell's Wi-Fi thermostats[15]. Another approach is seen with medical device manufacturer Medtronic, which has acquired Cardiocom, a provider of telehealth services, with the aim of using Cardiocom's expertise to design telehealth services that work with Medtronic's wireless patient monitoring devices.

Honeywell and Medtronic are in the minority when it comes to using multiple approaches to skill development. Our research revealed that only 10% of companies use acquisitions, or develop platforms and APIs, as a way to build capability.

The picture that is emerging is one where organizations are fighting shy of IoT, despite the disruptive impact it may have on their markets and despite the size of the trillion-dollar prize. In the next section, we look at some of the reasons for this surprising reaction, examining the key challenges that organizations face in the IoT sphere.

Figure 3: Objectives of Internet of Things Partnerships



Source: Capgemini Consulting Analysis

Are Organizations Exploiting the Full Potential of the Internet of Things?

42% of companies do not provide any **IoT solutions**

Maturity of IoT Solutions

58% offer **basic information** support

27% offer **remote operability** support

34% offer **performance improvement** insights

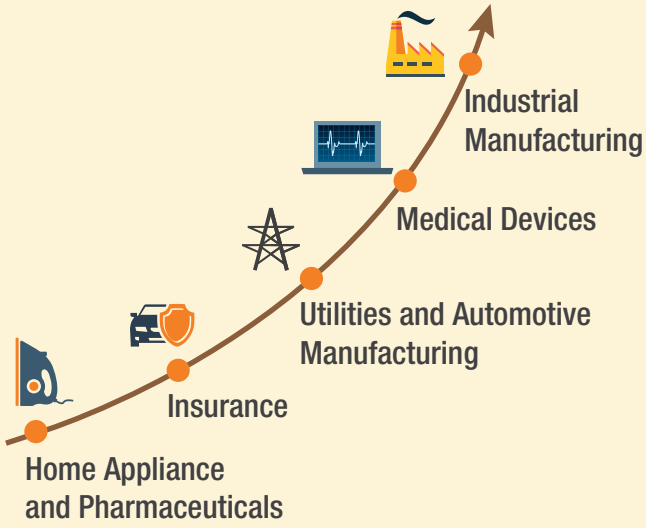
Monetization of IoT Solutions

70% do not **generate service revenues** from their IoT solutions

Integration with Third-Party Solutions

13% provide IoT solutions that **integrate** with third-party offerings

Maturity of IoT Solutions by Industry



Increasing order of maturity

Methods of Capability Build-Up

57% are **partnering** to develop IoT solutions

10% have made **acquisitions**

10% have developed **open platforms** or APIs

Source: Capgemini Consulting Analysis

Why Have Organizations Been Slow to Get Off the Blocks?

IoT, like many attractive prizes, comes with its own unique and significant challenges. These issues, which mainly revolve around IT infrastructure and skills, are putting the brakes on the IoT train (see Figure 4).

> *67% of organizations have little to no infrastructure for analyzing and acting on streaming Big Data.*

The Internet of Things Creates Significant Technical Challenges

Existing IT Infrastructure is not Suited to Manage Rapidly Growing Volumes of Sensor Data

Managing large volumes of sensor data from a widely distributed base of connected devices challenges the conventional data storage and management capabilities of organizations. For instance, nearly 60% of UK-based firms in a survey agreed that they do not have the data centre infrastructure required to extract real-time insights from their Big Data sets[16]. This is a challenge, as research indicates that data from embedded systems will grow from 2% of the digital universe in 2013 to 10% in 2020[17].

Organizations Lack Real-Time Data Analytics Technologies Critical to Drawing Insights from the Internet of Things

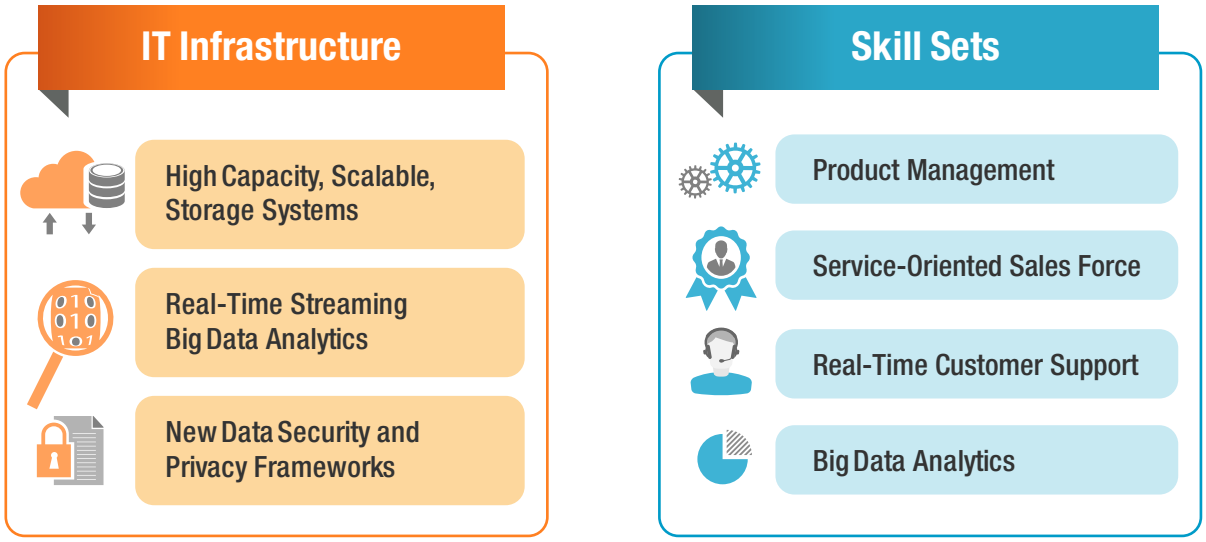
The volume and velocity of sensor data flowing into the organization makes drawing insights particularly challenging. Many organizations lack stream processing capabilities, which are essential for the collection, integration, analysis and visualization of data in real time. Sixty-seven percent of organizations in a survey reported that they lack the technology support required for analyzing and acting on streaming Big Data[18].

The Internet of Things Magnifies Data Security and Privacy Challenges

Protecting Internet-connected devices from security threats, as well as dealing with data privacy risks, are key challenges in the IoT environment. Recent events have revealed the enormity of these challenges. A case in point is the global attack that took place in late 2013, where botnets were used to send more than 750,000 malicious emails from connected household appliances[19]. Research indicates that organizations are not adequately equipped to deal with these new security challenges. For instance, in a survey of US-based IT professionals, 50% of respondents reported not being ready to secure an ecosystem of connected devices[20].

> *50% of US-based IT professionals report not being ready to secure an ecosystem of connected devices.*

Figure 4: Prerequisites for the Development and Rollout of IoT Solutions



Source: Capgemini Consulting Analysis

Organizations Need New Skill Sets across a Range of Functions

Traditional Product-Centric Organizations Lack Capabilities in Developing and Marketing Internet of Things Services

The development of IoT solutions demands a new set of competencies from traditional product-centric organizations. They now need to be able to envision new services, develop commercial models and design service contracts that result in continuous revenue streams. Our discussions with senior executives revealed that these are not areas of strength for many product-centric organizations. A leading car manufacturer told us, "We need new skill sets to be able to offer connectivity services. We need to bring in people who are more used to developing and selling services[21]." Similarly, a leading security systems company highlighted the need to complement existing product management capabilities - "The buyers of our IoT services could potentially be different from those of our products. Our product managers will have to understand and address the needs of these new customers[22]."

Today's Product-Focused Sales Force is not Equipped to Sell IoT Services

For IoT solutions, a sales force needs to be comfortable in articulating the value proposition and potential benefits, which is critical to convincing often-reluctant customers to pay for a new class of services. This is a challenge for today's sales force. An executive at a leading medical technology company highlights this when he says, "Our sales force has been used to selling equipment, but now they need to sell IT solutions. They need to be able to convince customers on the value received by connecting their equipment[23]." This sentiment is echoed by a director at a leading auto manufacturer, who said, "Training the sales force in selling connectivity services is certainly a challenge. In fact, we see this challenge intensifying in the future as we expect the services space to become even more complex[24]."

The Internet of Things Places New Demands on Customer Support Capabilities

Our research indicates that IoT solutions are likely to increase the complexity of queries that reach customer support teams. Moreover, since connectivity reduces the time lag between the occurrence of an event and the time taken for information to reach the support center, customers are also likely to expect faster response times. A senior executive at a leading car manufacturer highlights the changing nature of customer requirements when he says, "The proliferation of Internet-enabled devices has raised customer expectations from service providers. Customers now expect to be informed about device problems and the required remedial action, in real-time[25]."

Organizations Lack Big Data Analytics Talent to Effectively Interpret Sensor Data

Most organizations currently lack the analytics skill-sets required to effectively interpret sensor data. A survey reported that lack of employee skills/knowledge is the biggest obstacle facing their organizations in using IoT[26].

While these infrastructure and skills challenges are significant, they are not the only issues that organizations face. Resistance, for one, is a major problem. An executive at a medical technology company outlined how resistance can come less from the customer – and more from *within* the organization, explaining, "We only have 20% resistance from the customer and 80% from our own organization. Consequently, it is a significant challenge to align our existing business processes with new IoT-based service offerings[27]."

The scale of the challenges organizations face – infrastructure, skills, resistance – is significant. Therefore, in the following – and concluding – section, we outline a roadmap that provides organizations with some clarity and direction for overcoming these hurdles and driving their IoT initiatives to success.

> *"Our sales force has been used to selling equipment, but now they need to sell IT solutions. They need to be able to convince customers on the value received by connecting their equipment."*
>
> *– A medical technology leader*

How Can Organizations Build a Successful Internet of Things Solution?

The IoT prize will be won by those who achieve a change in mindset, from a product world to a service world. However, that fundamental mind-shift is not the only requirement. Organizations need to get the right IT infrastructure in place, quickly acquire capabilities in analytics, and strengthen a whole host of functional capabilities.

Put the Right IT Infrastructure in Place and Acquire Data Analytics Capabilities

Organizations must invest in alternative data storage architectures that can be scaled quickly and cost effectively. This will allow the business to keep pace with rapidly growing volumes of sensor data. Open source distributed data processing frameworks, such as Hadoop, as well as cloud-based technologies, lend themselves to managing vast quantities of data in an affordable and efficient manner. Organizations should also invest in stream processing applications that enable real-time analysis of sensor data.

Analytics capability also needs to be acquired, with the CEO of a leading smart meter firm outlining their comprehensive approach to this need: "We recruited analytics professionals, developed internal training programs, established partnerships in the area of Meter Data Management (MDM) and even acquired a smart meter data management firm[28]."

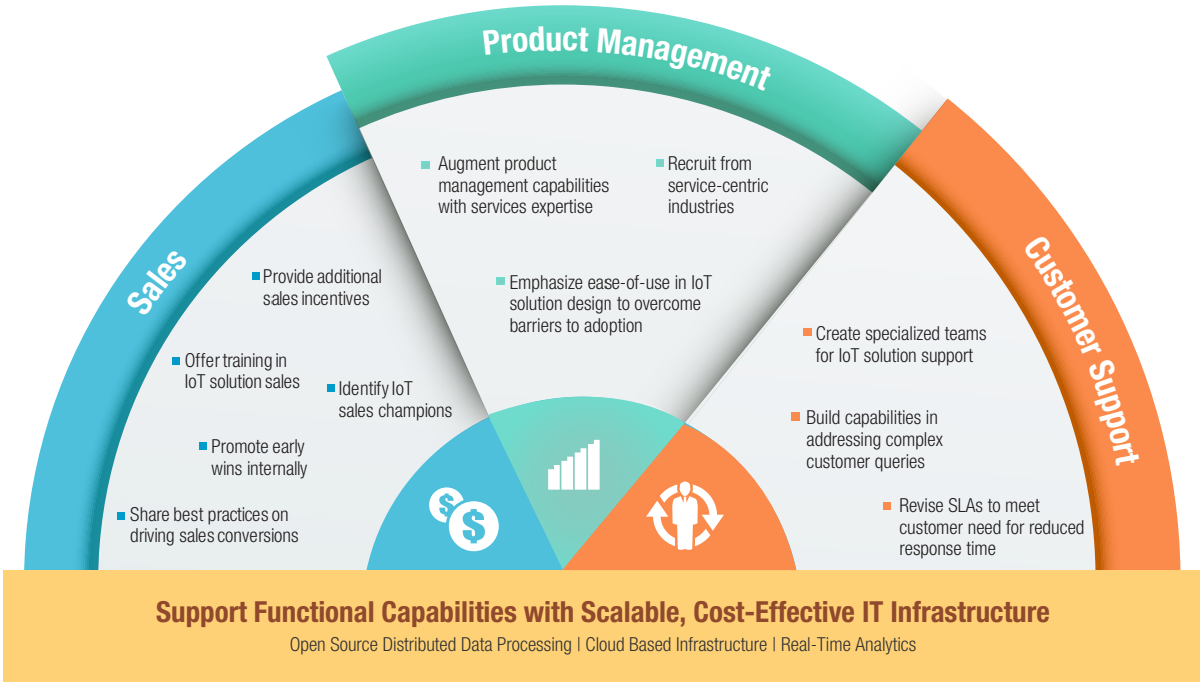
Strengthen Functional Capabilities across Product Management, Sales and Marketing and Customer Support

Launching effective IoT solutions will require organizations to strengthen their capabilities across a range of areas. Key among them are sales, product management, and customer support (see Figure 5).

Use Trainings and Incentives to Prepare the Sales Force to Sell IoT Solutions

Organizations must take active steps to stimulate their sales force to promote IoT solutions. However, training alone will not be sufficient and organizations must also offer adequate inducements in the form of additional sales incentives. Finally, organizations must actively promote early wins internally to create awareness as well as share best practices in driving sales conversions. An executive from a medical technology company explains how they encouraged their sales force to push IoT solutions, "We identified individuals within our sales force who could act as champions for our remote equipment monitoring services[29]."

Figure 5: How Can Organizations Strengthen Functional Capabilities?



Source: Capgemini Consulting Analysis

> *Open source distributed data processing frameworks, such as Hadoop, as well as cloud-based technologies, lend themselves to managing vast quantities of data in an affordable and efficient manner.*

Augment Product Management Capabilities with Services Expertise and Emphasize Ease-of-Use in Product Design

Organizations must augment their product management teams with the skill sets required to develop services. To do so, organizations should consider recruiting product management professionals from service-centric industries. Further, connected solutions must be designed with a focus on ease-of-use, to overcome barriers to adoption from internal sales teams, channel partners and customers. A senior executive at a leading auto manufacturer explains how this approach has proved successful for them - "We focused on making our fleet management offering as easy to use as possible, so that they could be handled by traditional product-focused salesmen. This has proved to be quite successful[30]."

Develop Customer Support Capabilities to Drive Real-Time Issue Resolution

Organizations will need to create specialized customer support teams capable of responding rapidly to complex customer queries. At the same time, existing Service Level Agreements (SLAs) will need to be revised in order to meet customer expectations of reduced response times. Some organizations are already beginning to do this. A senior executive at a leading medical technology company explains their plans to build customer support capabilities for its remote equipment monitoring platform: "We are setting up a first response team consisting of experts and service engineers. Consumers calling in with issues related to their connected equipment will be directed to this team for faster and more effective resolution of queries[31]."

The IoT represents the next evolution of the digital universe. The speed at which nimble startups and Internet players are capturing IoT opportunities should serve as a wake-up call to larger, traditional organizations. Analyst estimates point to a world where startups will dominate the IoT market. Fifty percent of IoT solutions are expected to originate in startups less than 3 years old, by 2017[32]. They may be less nimble, but bigger organizations need to step up to the plate. As with all digital disruptions, being an organization that is in catch-up mode will be a deeply uncomfortable place to be.

> *We are setting up a first response team consisting of experts and service engineers. Consumers calling in with issues related to their connected equipment will be directed to this team for faster and more effective resolution of queries.*
>
> *— A leading medical technology company*

Research Methodology

Analysis of IoT Solutions

We conducted a comprehensive study of IoT products and services offered by over 100 leading companies in North America and Europe across 7 industry groups. The industry groups covered in our study included Home Appliances, Industrial Manufacturing, Utilities, Insurance, Pharmaceuticals, Healthcare Products, and Auto Manufacturing. We selected a representative sample of companies that cumulatively account for 50% of the revenues generated by all firms belonging to these industry groups, in North America and Europe.

Our research covered four key areas. First, we analyzed the maturity of IoT solutions based on their use of sensor data. Second, we assessed how organizations are monetizing IoT services. Third, we evaluated the degree of integration of these IoT solutions with third-party products and services. Finally, we studied the approaches adopted by organizations to accelerate the development of IoT solutions.

Internal Capability Assessment

To understand the challenges in developing IoT solutions, we conducted wide-ranging interviews with senior executives from leading global organizations that have undertaken IoT-based initiatives.

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***For more information on the Internet of Things,** please refer to the series of reports from Sogeti's VINT Labs titled "Things". You can find them at http://vint.sogeti.com/category/things/*

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