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The State of the Industrial Internet of Things 2017

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The State of the Industrial Internet of Things is part of a series of market research and analysis reports published by PTC. This report examines the what, where, why, how, and when of the rapidly evolving opportunities in the industrial Internet of Things (IoT) market.

The insights in the State of Industrial Internet of Things report were developed in part from an analysis of survey data from the largest single source (by market share) of industrial enterprises developing IoT applications – ThingWorx Platform customers. PTC surveyed these customers from October 2015 to the present to understand how they are using the IoT to create business value. The organizations surveyed represented various industries, including industrial equipment; automotive; electronics and high tech; life sciences; government, aerospace and defense; software; and professional services.

To supplement this proprietary data and illustrate real-world examples, PTC incorporated market data from leading research firms as well as publically available case studies from industrial IoT adopters (i.e. companies applying IoT technologies in an industrial setting). The objective of this research is to provide data-driven visibility into the rapidly evolving industrial IoT market. We uncover the industries that are leading deployments, the functions within a company using the IoT, and the types of business value generated. We also explore to what degree companies are experiencing success in implementation of IoT use cases and where they are in the transition from pilots to production deployments.

It is clear from the data here that the IoT market has matured beyond the point of a truly nascent technology, and the value proposition is readily understood. It is also apparent that to create real business value and fully take advantage of the IoT successfully, companies must execute on the right use cases across their value chain.

The Potential Value of the Overall IoT Market

The transformative potential of IoT technology is no secret. It represents a fundamental shift in the very nature of the smart "things" we depend on for many aspects in our lives. The influence of the IoT reaches across an entire ecosystem of things from consumer products to advanced manufacturing automation solutions. From industry to industry, IoT solutions impact the way companies design, manufacture, operate, and service products, as well as, redefine and optimize existing business processes across the value chain. Because of this widespread potential, industry analysts estimate that the IoT market will have a significant economic impact.

Figure 1: **Projected IoT Market Growth**

Market Size
$ Billions

$227 (2021)
$196 (2020)
$154 (2019)
$116 (2018)
$92 (2017)
$75 (2016)

25%

$200
$150
$100
$50
$0

2016 2017 2018 2019 2020 2021

The projections for the growth of the overall IoT market vary, however. For instance, reports from ABI Research[1], the Boston Consulting Group[2], International Data Corporation[3], and Gartner[4] have estimated the market will reach anywhere from $155 billion to $1.2 trillion by 2020.

PTC has taken these estimates into consideration, along with our own research, an analysis of available market reports, and insights garnered from our conversations with thousands of companies piloting and deploying IoT solutions. Based on this collective base of intelligence, we believe that the IoT market reached a revenue total of $74 billion in 2016 (inclusive of applications, analytics, connectivity, and services & implementation revenue) and it shows no sign of stopping. We predict sustained growth over the next several years, and based on an expected CAGR of 25%, we expect the market could reach over $227 billion by 2021.

The largest driver of this staggering growth is the sheer volume IoT-enabled devices, which is fueling the development of countless new smart applications and value-added services. These applications and services are becoming especially critical for industrial companies as they create new revenue opportunities, product and service differentiations, and business models that threaten the traditional way of doing business.

Based on PTC research, through 2018, half the spend on implementing IoT solutions will be spent on integration. Therefore, enterprises are increasingly leveraging IoT platforms to connect IoT endpoints to enterprise systems.

Who is Adopting the IoT?

Organizations around the world are realizing the power of the IoT as they develop initiatives that utilize this technology to compete in the global economy. Products embedded with smart software and sensors can be found throughout cities, hospitals, factories, and homes across the globe.

While the IoT is having major and widespread effects across all industries, it is having a significant impact on industrial industries. This is particularly true in the Americas, which is currently leading the way with 45% of the industrial IoT activity. This is followed by EMEA at 33% and Asia Pacific at 22% (Figure 2).

Several regional initiatives are underway which are accelerating Industrial IoT adoption. For instance, in Germany, there is "Industrie 4.0" which is focused around hardware and the smart machines required to enable digital manufacturing. In the United States, there is the "Manufacturing USA" initiative which employs a more balanced approach of creating public-private partnerships aimed at overcoming technical IoT challenges. Regardless of their different approaches, these initiatives represent a worldwide push for standards and a continued adoption of industrial IoT.
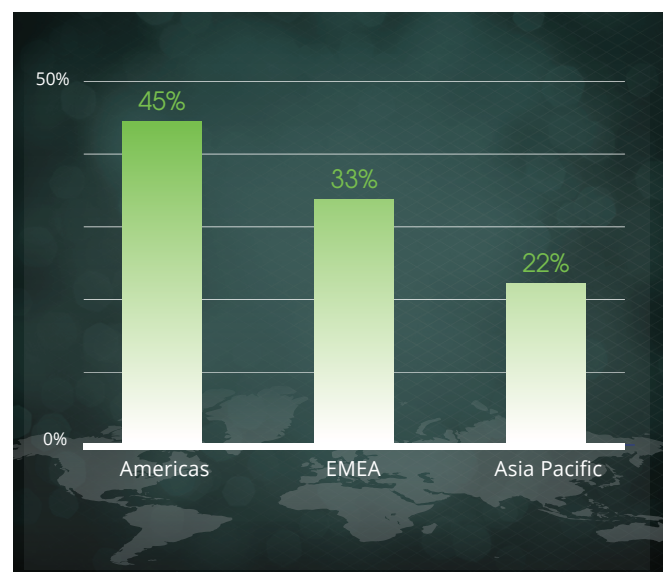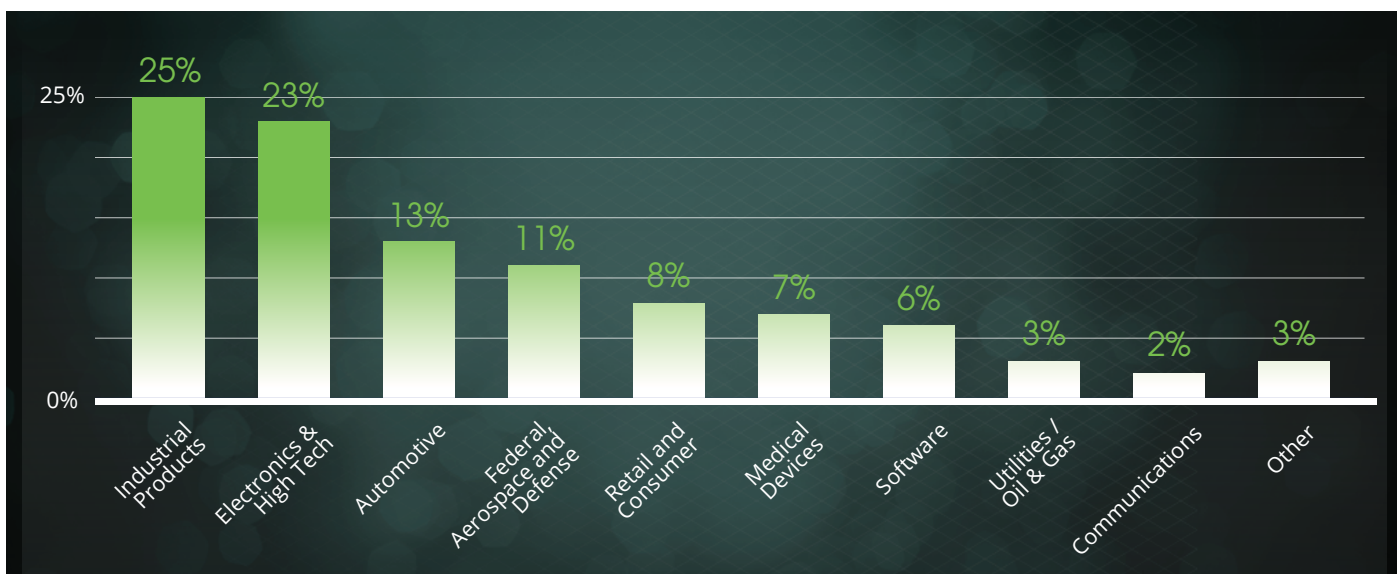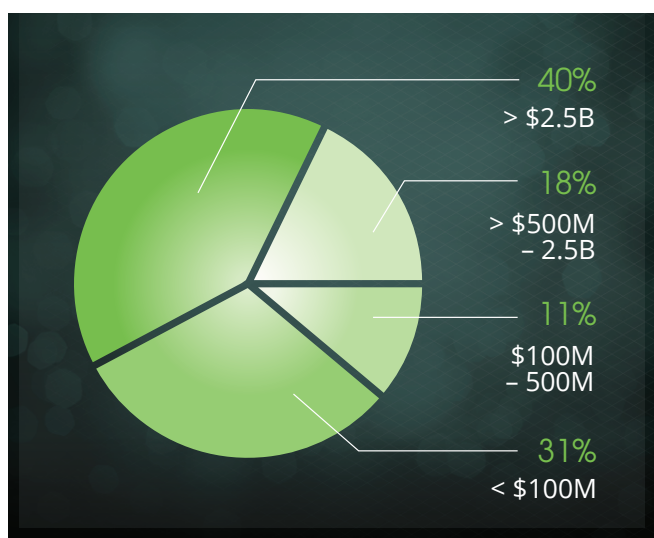
Figure 2: **Industrial IoT Adoption by Region**

External Sources:

[1] https://www.abiresearch.com/press/professional-services-driving-iot-revenues-today-w/

[2] https://www.forbes.com/sites/louiscolumbus/2017/01/29/internet-of-things-market-to-reach-267b-by-2020/#20be47cc609b

[3] http://www.idc.com/getdoc.jsp?containerId=prUS42209117

Figure 3: **Industrial IoT Adoption by Industry**

Today, the most robust adoption of industrial IoT technology can be found in these industries: industrial products, automotive, electronics and high tech, life sciences, and aerospace and defense (Figure 3). These industries lead the IoT charge because they have complex manufacturing and operational processes, along with high-capital equipment, that can benefit greatly from IoT solutions and data-driven insights that drive more sustainable, resilient, and efficient processes.

Figure 4: **Industrial IoT Adoption by Company Size**

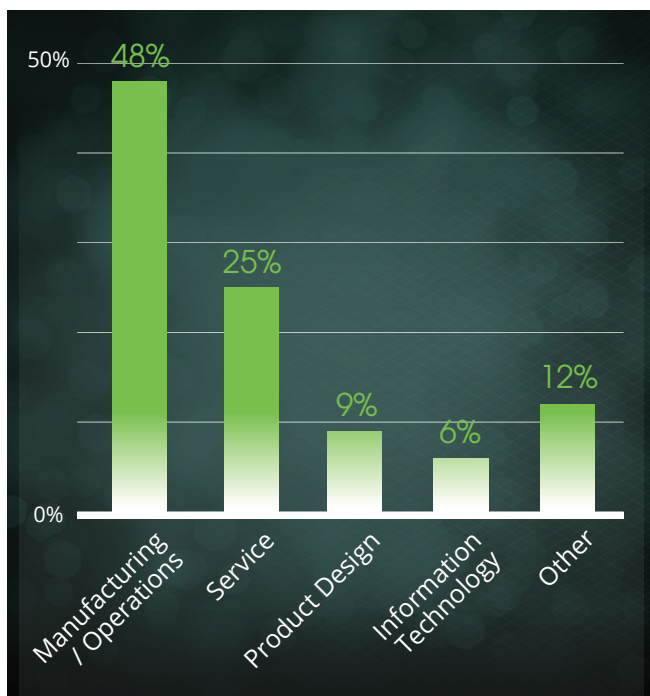
To date, industrial companies generating revenue greater than $500 million have largely dominated the space, representing 58% of the current IoT adoption (Figure 4). This is not surprising, as these organizations typically have robust manufacturing footprints where smart connected devices can produce intelligence that drives significant operational efficiencies.

However, the IoT is not reserved for large players. As the cost of sensors and retrofitting equipment continue to dramatically decrease, companies with relatively fewer resources can compete across the new capabilities IoT enables with their larger competitors. Furthermore, small companies can benefit from speed, and move to rapidly adopt IoT as a means for evening the playing field with their larger competitors.

What IoT Use Cases Are Currently Gaining Traction?

As to how the IoT is used across the enterprise, PTC research shows there is a split between use cases for improving efficiency in internal operations and creating differentiating products and services. The majority of early adopters are currently pursuing use cases aimed at improving manufacturing operations, field service and support, and product design innovation (Figure 5).

Figure 5: **Use Case Adoption**

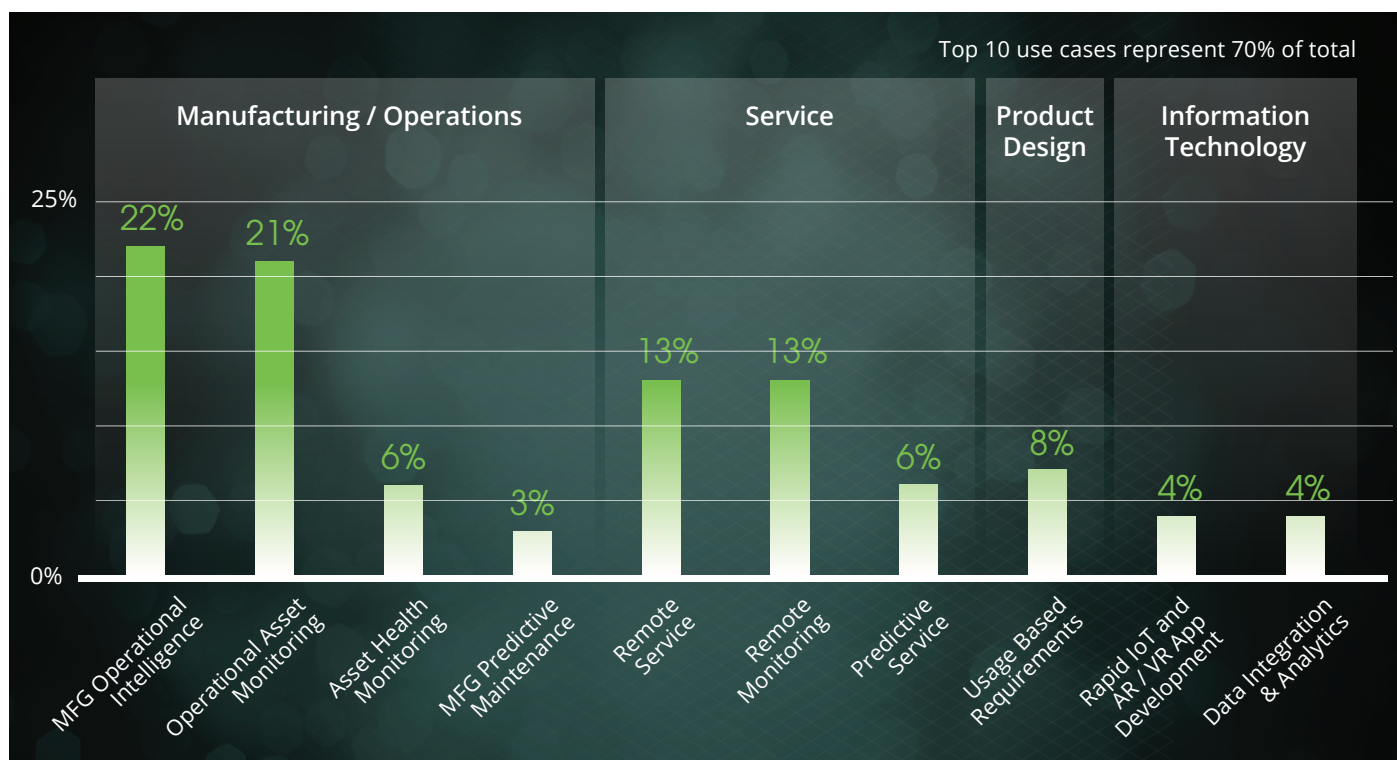
Operational Performance in Manufacturing

When analyzing trends in the types of use cases, our data indicates the focus of IoT deployments has varied over time. While service-oriented use cases are prevalent today, there is greater adoption in manufacturing and operations as organizations realize the value IoT technologies can deliver in these areas. Industrial organizations can gain unprecedented visibility and control over their operational processes, which can lead to increased consistency and productivity, and ultimately, a stronger competitive advantage.

Operational-oriented use cases have become an easy IoT entry point for the following reasons:

- Internal manufacturing environments are well-defined with less friction to add or leverage existing connectivity.

- IoT provides manufacturers with unprecedented levels of real-time visibility into their operations enabling them to quickly root out process inefficiencies and reduce waste associated with their manufacturing operations.

- IoT on the plant floor is directly aligned with many of the existing "lean" style initiatives such as improving uptime, and increased output. So, the outcomes are well established.

- Many existing plant floor technologies segregated point solutions. IoT offers an opportunity to integrate the systems and enhance the operational visibility across functions/lines and across plants, helping to fix an age old problem.

- In many developed countries, aging workforce is a trend within manufacturing. As critical knowledge is starting to retire, many companies are using IoT solutions as a way to capture knowledge and enhance practices.

- As consumer technologies are advancing (e.g. Amazon Alexa, Google Home, etc.), the expectation around the user experience of plant floor technology is also advancing. Many companies are using their IoT implementations as a way to improve the user experience of their employees.

The most predominant use cases employ the IoT for manufacturing operational intelligence and operational asset monitoring. These smart, connected capabilities help product manufacturers increase throughput, improve production quality, and reduce manufacturing costs. By leveraging the IoT, manufacturers can now analyze and deliver insights from disparate and diverse silos of assets, operators, and enterprise systems. The IoT delivers unified real-time visibility into key performance indicators (KPIs) that can help increase operational efficiency and improve decision making.

Figure 6: **Top 10 Use Cases**

For example, GE Transportation, a leader in the rail industry, provides freight and passenger locomotives, signaling, and communications systems as well as rail services. The company's Grove City manufacturing facility connected its locomotive manufacturing plant to gain real-time visibility of the plant's condition in areas such as labor efficiency, machine health, and production and schedule attainment. By gaining real-time visibility into its operations, GE Transportation optimized its work-order scheduling and avoided unnecessary downtime while realizing a 10-20% increase in overall efficiency.

The Optimization of Field Service and Support

Service and support use cases are now the second most highly adopted use cases. IoT technology helps companies improve equipment uptime by optimizing their field service operations with predictive monitoring and remote service capabilities.

For example, Caterpillar is a global leading manufacturer of construction and mining equipment, diesel and natural gas engines, industrial gas turbines, and diesel-electric locomotives. The company is combining service documentation with real-time sensor data to deliver contextualized instructions to its field service technicians.

Varian Medical Systems, a global-leading manufacturer of integrated cancer therapy systems, used the IoT to improve system uptime through faster service and resolution. By making its instruments smart and connected, Varian can now monitor performance, predict and prevent product failures, enable remote service, and ensure visiting technicians deliver service faster. Ultimately, Varian reduced resource time for repairs by 50%.

Product Development Innovation

Product design use cases are now the third most highly adopted ones. Companies are looking to analyze real-world product usage and condition data across products and customers with product lifecycle management, application lifecycle management, and quality systems. This helps inform design requirements, support product portfolio optimization, enable data-driven closed-loop lifecycle management, reduce development costs, and accelerate product innovation.

Flowserve is a manufacturer of fluid motion control solutions for the world's toughest, most critical applications in industries such as power, oil, gas, and chemical. By leveraging IoT feedback, Flowserve can gather and analyze sensor data which informs the company on the use of its industrial pumps and equipment. With this real-world data, Flowserve can analyze performance of specific portions of its products to improve overall design and effectiveness.

New Business Models

IoT technologies are not only impacting operational processes, service, and product innovation. They are also altering the very nature of an enterprise's strategic differentiation by enabling new, innovative business models.

For example, All Traffic Solutions, an industry leader in traffic management solutions, differentiated itself by using the IoT and smart connected products to change its offerings from merely selling hardware to selling new data-driven business services. In doing so, All Traffic Solutions has expanded its potential market, increased productivity of customer workforces, and transformed its relationship with customers.

How Are Companies Deploying the IoT?

The emergence of the IoT has spurred a prodigious amount of new data. Consequently, a number of new choices around how data will be captured and utilized has also emerged. This includes options for hosting environments and how data is stored.

IoT applications and data stored on premise allow for a high level of control and confidence in data security, and provides for the ability to take action in near real time. On the other hand, many companies are choosing to use public or private clouds for hosting their IoT applications and storing their data. By employing a cloud approach, companies can take advantage of greater flexibility and scalability, with access to their data from anywhere in the world.

A key factor influencing a company's strategy is the environment in which the application will be deployed. Consider the factory or hospital setting, which are environments where security is a paramount concern. In cases like this, a scenario that includes asset health monitoring, for instance, would require sub-second to milisecond response times that are best delivered by on-premise deployments. In applications used for smart cities, transportation, or oil and gas, where the variety and geographical distribution of assets is generally higher, cloud-hosted deployments provide the necessary scalability.

Today, 62% of IoT deployments are leveraging an on-premise data strategy, while 38% are moving hosting to the cloud (Figure 7). It is likely that barriers such as security concerns and the application environments (Figure 8) are why on-premise deployments are still the preferred choice.
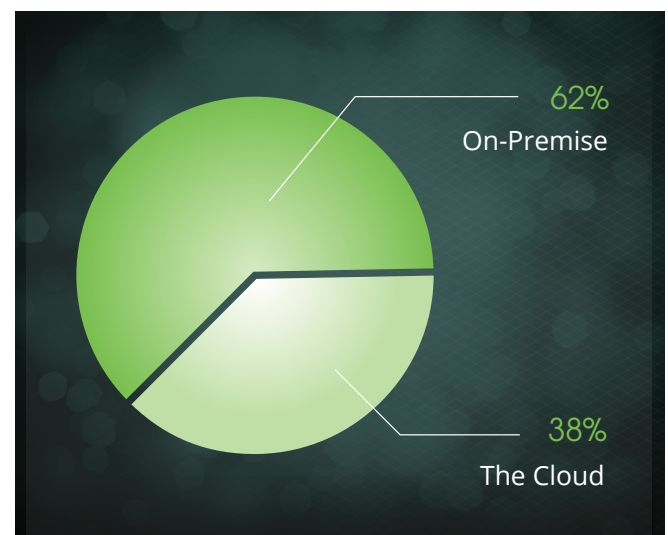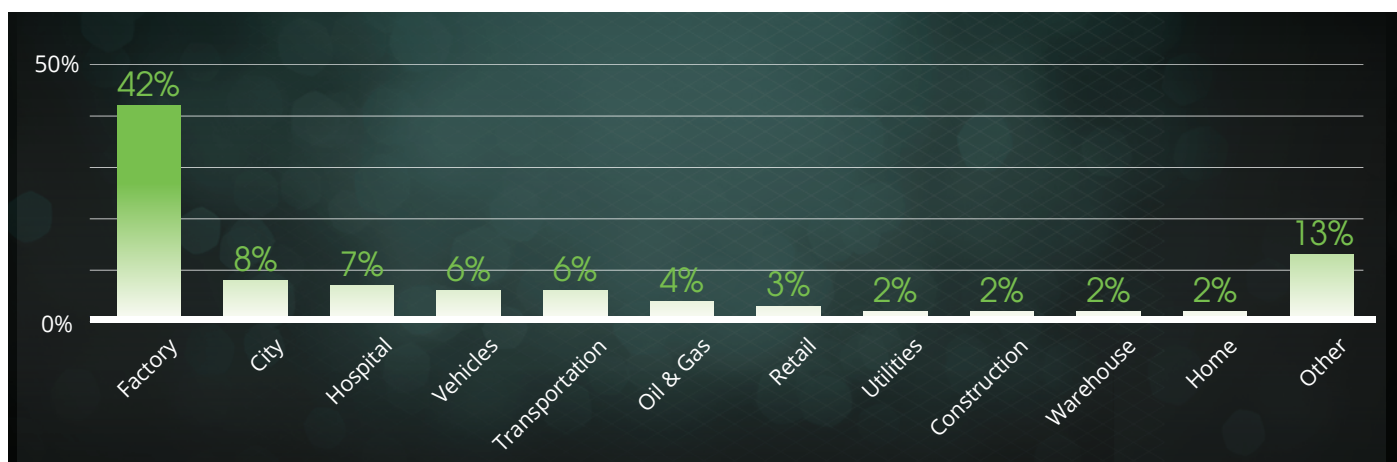
Figure 7: **Desired Deployment Strategy**

62%
On-Premise

38%
The Cloud
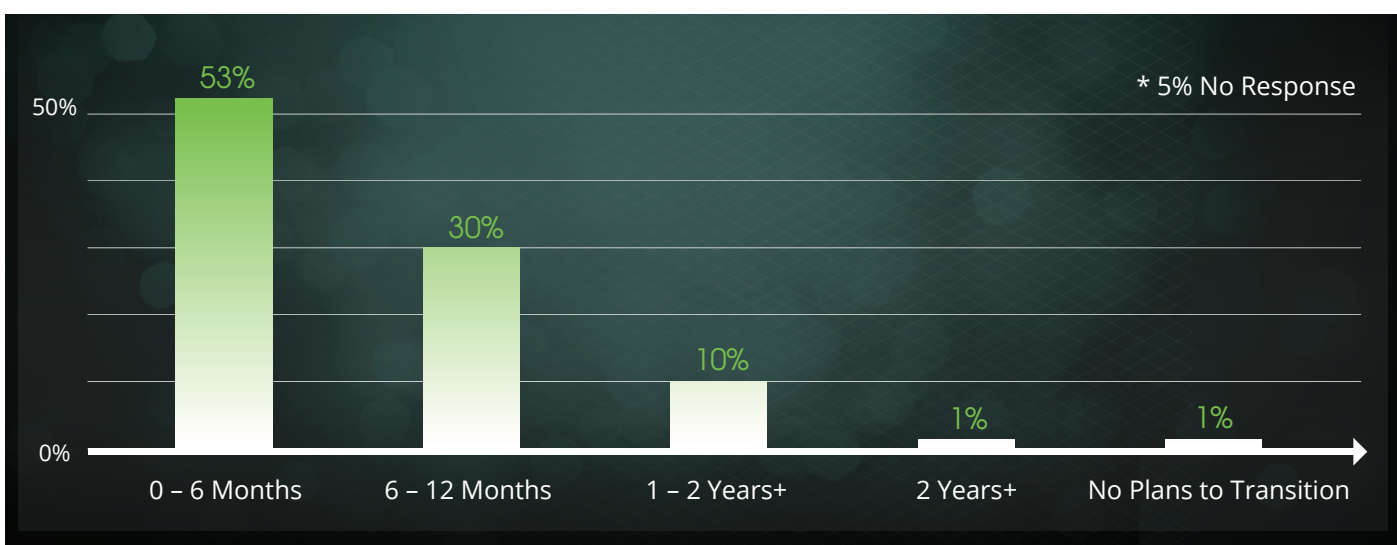
Figure 8: **Application Environments**

When Are Companies Transitioning to Production?

Gartner estimates that by 2020, more than 20 billion objects will be connected via the IoT[4]. As this report shows, the IoT will reshape industries, products, and services and most companies are already advanced in their deployment plans. Today, many IoT deployments are already in the proof-of-concept stage, and PTC data indicates that within 12 months, 83% of adopters plan to transition their IoT deployments to full-scale production environments (Figure 9).

These transition plans represent a significant increase in the adoption of IoT, and an indication the value of IoT technology has become real. Industrial adopters will quickly begin to separate from their laggard competitors, reaping material increases in operational performance via efficiency gains and cost savings. IoT adopters will also benefit from increased differentiation over their competitors by providing new and improved user experiences, as well as innovative product and service offerings to their customers.

IoT is no longer a wait and see technology; companies must act now or risk being left behind.

Figure 9: **Transition to Production**

External Sources: [4] http://www.gartner.com/newsroom/id/3598917

Conclusion

As the technologies, business models, and value for IoT technologies continues to mature, there is sure to be additional changes in the adoption of IoT use cases.

The market is growing at a rapid pace, and we believe IoT is quickly becoming the new reality for industrial manufacturers.

Our research indicates:

- IoT adoption is currently dominated by large product manufacturers in industries such as industrial products, automotive, and aerospace and defense.

- The economic potential of the IoT has garnered the attention of the international communities and led to global policy initiatives aimed at fostering the growth of IoT across the globe.

- A majority of applications in use today apply to manufacturing and operations, where the amount of data collected that can be used to refine processes, predict maintenance requirements, an increase overall operational effectiveness.

- The emergence of a vast new stream of data created by IoT are emphasizing the importance of selecting an appropriate deployment strategy.

- The IoT is no longer an emerging technology – it has arrived. IoT deployments are driving value today, across the value chain from product development through manufacturing and service. Organizations must act now or risk being left behind.

Explore the possibilities.

Industrial IoT is already transforming how companies engineer, manufacture, operate, and service new and innovative products and services.

ThingWorx industrial innovation platform can jumpstart your team's IoT success by enabling:

- Connectivity for any device, any cloud to your IoT infrastructure.

- Discovery of the true value of your IoT data.

- Deployment and management of new, innovative end-user industrial IoT solutions.

- Delivery of new types of user experiences.

- Ability to deploy on a scalable, secure architecture.

For more information, contact an expert to learn more about the ThingWorx industrial innovation platform.

About PTC

PTC recognizes the potential of the IoT to transform the nature of the things in our surroundings. For more information on how PTC helps customers achieve the most out of their IoT and augmented reality (AR) strategies, you can explore the following:

Learn how PTC is uniquely positioned, with our extensive investment in AR and IoT, to help customers truly unlock the value of the Physical and Digital Convergence.

Find out why industry analysts have named PTC a leader in IoT platforms:

Forrester Wave

IDC MarketScape

For more information about this research report, contact PTC today.