

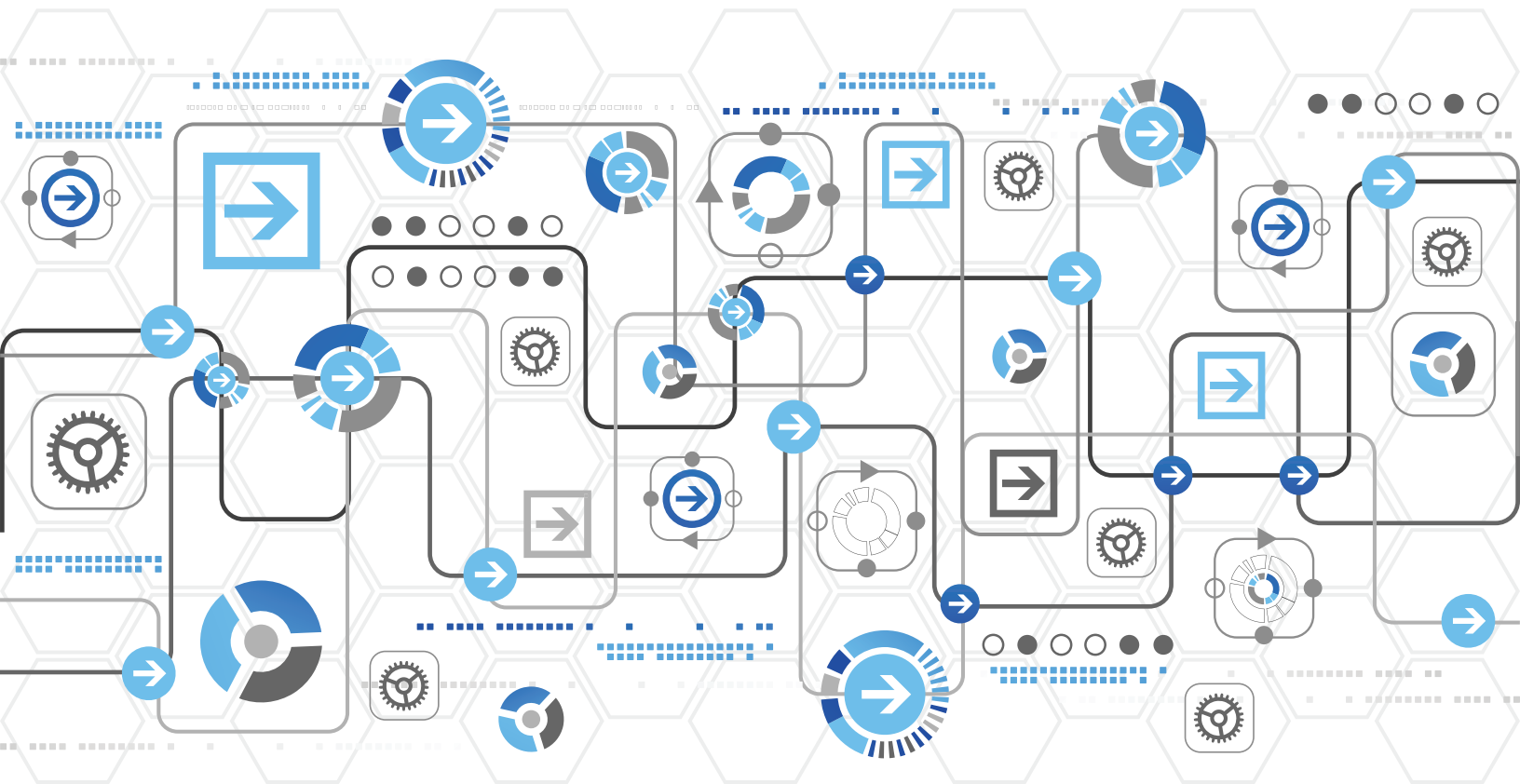
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2016 REALITY CHECK: TRANSFORMING INDUSTRIAL BUSINESSES WITH THE INTERNET OF THINGS

A significant majority of manufacturing leaders say that the Industrial Internet of Things will be critical to their future success. While some are already capturing the business benefits, most are unclear on the “what” and “how.”



A collaborative research effort between GE Digital, Industrial Internet Consortium, Genpact and IndustryWeek Custom Research

IndustryWeek



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MANUFACTURERS' TOP 5 IIOT CHALLENGES

1. Data security
2. Legacy systems
3. Insufficient skills of IT staff
4. Data quality
5. Data privacy and confidentiality

EXECUTIVE SUMMARY

This report highlights the findings of the 2016 *IndustryWeek/Genpact Current State of the Industrial Internet of Things* (IIoT) research study. Underwritten by the Genpact Research Institute, the study explores manufacturing leaders' expectations and application of IIoT technology.

Recognizing the business potential, four out of five manufacturing leaders (82%) say the adoption of IIoT technology will be critical to the future success of their organizations. But despite the recognition of IIoT's importance, only one out of four companies has a clear IIoT strategy, and slightly more than half (54%) have made budgeted IIoT capital investments.

When it comes to IIoT technology deployment, manufacturers are beginning to transition from the early adopters to the early majority. Half of companies report that they've been using IIoT sensors and related technology for a year or longer. By the end of the year, two-thirds of manufacturers say they will be actively using IIoT technology.

Data security, legacy systems, IT staff skills, data quality and data privacy are manufacturers' top five IIoT challenges. Half of our survey respondents believe that IIoT technology is increasing the probability of cyberattacks. In response to these threats, a similar proportion (48%) have developed cyberattack response plans.

IIoT technology is already having a high impact on operational performance for a majority of manufacturers. To drive revenue growth, manufacturers are leveraging IIoT technology to create new products and services, enhance the current customer experience, establish new revenue streams and open up new markets. While the leaders are clearly on track to reap the business benefits, many manufacturing executives remain unclear on how to adopt IIoT technology and which challenges need to be tackled first.

RESEARCH METHODOLOGY

The purpose of the study was to explore current adoption levels, challenges and the impact of IIoT technology among manufacturing companies. In March 2016 IW Custom Research e-mailed invitations to participate in the online survey to a selection of *IndustryWeek* subscribers. That invitation was followed by reminders to non-respondents. In addition, GE Digital, Industrial Internet Consortium and Genpact sent out invitations to participate to select partners. In total we received and tabulated 196 completed surveys. Of those, 173 met our specifications for leadership responsibilities and industry segment. This report and the analysis are based on those 173 respondents. Response percentages do not always add up to 100 percent due to rounding and the allowance for multiple responses on some questions.



I. INTRODUCTION **READY FOR PRIME TIME**

In the fall of 2015 representatives from the Industrial Internet Consortium (IIC) and Plattform Industrie 4.0 met in Zurich, Switzerland. Technical experts from the two organizations talked about how to integrate their independent and overlapping system architectures, and thereby smooth and speed the deployment of IIoT technology across all industries.

Breaking down these technical silos is a critical step in the evolution of the Industrial Internet. Such meetings and future collaboration will enable a vibrant and competitive marketplace while ensuring compatibility for emerging IIoT equipment, systems, devices and applications.

The frustration that prompted the meeting between IIC and Plattform Industrie 4.0 reflects a wider optimism, confusion and impatience within industry. Many business leaders are sold on the potential benefits of IIoT but aren't sure where to get started or where they need to invest. Some of those that have made investments are struggling with legacy systems and practices, and the question of near-term ROI.

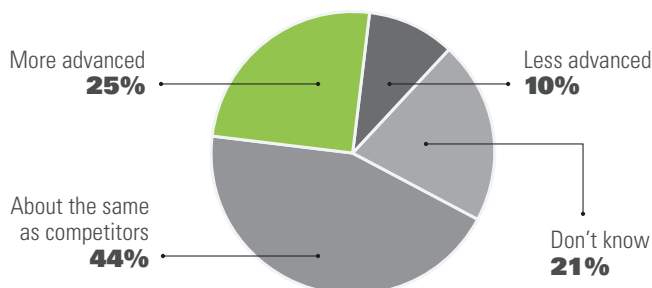
With these issues in mind, *IndustryWeek* and Genpact Research Institute initiated this research study with support from GE Digital and the Industrial Internet Consortium. We wanted to look at manufacturers' current perspectives and applications of IIoT technology as a key indicator of its immediate direction and potential.

Leading the IIoT Charge

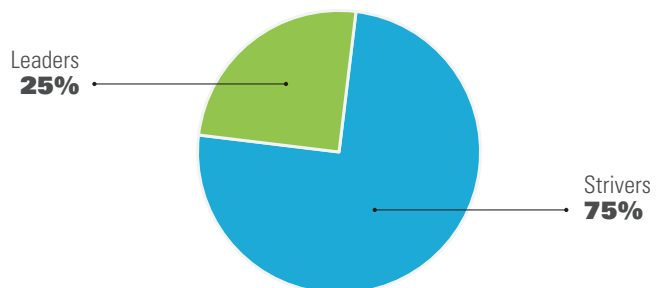
The challenges around IIoT evaluation and adoption are significant. Security, interoperability, connectivity and other issues have deterred many companies from making hard investments. As with any developmental technology, some business leaders are simply waiting for others to do the experiments (and incur the costs of mistakes) before making any investments themselves.

In contrast, first movers are looking to gain valuable knowledge and a competitive advantage that could make it difficult for followers to catch up. To look more closely at the opinions and practices of these early adopters, we compared manufacturers' assessment of their current use of IIoT technology. One out of four respondents believe they are more advanced in comparison to their key competitors. Their self-assessment of their progress is borne out in subsequent questions. We named these IIoT "Leaders" and labelled the remainder "Strivers." This second group consists of those companies reporting that they are less advanced or just keeping up with competitors, as well as those who honestly don't know how they compare.

IIoT USAGE COMPARED TO COMPETITORS



POINT OF COMPARISON: LEADERS VS. STRIVERS



To spotlight the perspective and practices of IIoT early adopters, we compare "leaders" and "strivers" throughout this research report.

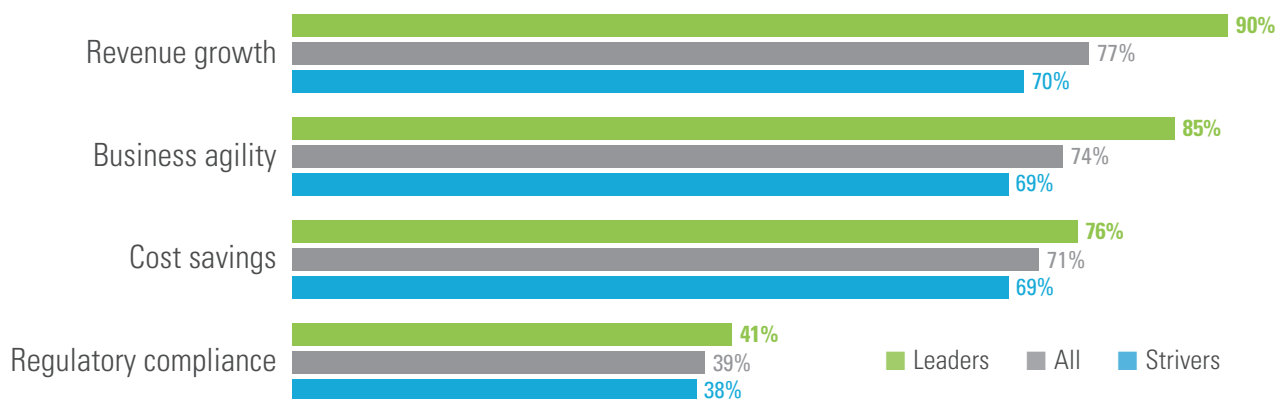
Source: 2016 *IndustryWeek*/Genpact Current State of the Industrial Internet of Things, n=173.

Knowing your company's competitive position with regard to IIoT is only the first step in knowing where the opportunities are, and where to invest. It doesn't help that every new technology is marketed as "revolutionary." Still, that characterization feels appropriate for IIoT given the span of potential applications and how it's already disrupting existing markets and creating new business models.

Underlying the formation and purpose of both the IIC and Industrie 4.0 is the fact that no one company will "win" or be able to address all of the emerging IIoT challenges on its own. Widespread collaboration is necessary to come up with optimum solutions that are both specific to a particular sector, and that cut across industries.

The solution providers who are leading the charge are taking some calculated risks and incurring costs to collaboratively design market-ready solutions. The manufacturers leading the charge are investing in innovative technology, workforce training and new hires, as well as the necessary infrastructure and system upgrades. Focused on the long-term, their ultimate goals mirror the top three objectives for any major, new business initiative: revenue growth, enhanced agility and cost savings.

IIoT PRIORITIES: LEADERS VS. STRIVERS



When considering their IIoT investments, all respondents place a strong emphasis on the big three business priorities: growth, agility and cost savings. Leaders place a somewhat stronger emphasis on growth.

Source: 2016 *IndustryWeek*/Genpact Current State of the Industrial Internet of Things, 4 or 5 (high impact) on a five-point scale, n=125.



II. IIoT STRATEGY LEADERS HAVE A GAME PLAN

IIoT connects machines and systems with sensors, intelligent data and analytics to increase visibility, provide better market and operational insights, and control operation of machines and other assets. There are potential applications in literally every industry.

Technology research firm Gartner forecasts that there will be 7.2 billion cross-industry and sector-specific Internet-connected devices by 2020 (not including mobile phones and other consumer devices). If that prediction comes to pass, it would represent a massive 288% increase over the 2.3 billion IIoT devices Gartner estimates will be in use by the end of 2016.

Recognizing the business potential, four out of five manufacturing leaders (82%) say the adoption of IIoT technology will be critical to the future success of their organizations. But despite the recognition of IIoT's importance, only one out of four report that their company has a clear IIoT strategy. While a substantial proportion of those who don't yet have an IIoT strategy (47%) report that they are developing one, 28% say that they still won't have such a strategy by the end of the year.

As you would expect, more than half (56%) of IIoT Leaders have a supporting strategy. Manufacturers with \$1 billion in revenue are also more likely (33%) to have an IIoT strategy compared to smaller companies (21%). The same is true for companies headquartered in North America (26%) vs. those headquartered elsewhere (18%).

As with any critical business initiative, having a strategy and an implementation plan are the first steps toward achieving the targeted objectives. Among manufacturers that have an IIoT strategy, most (82%) are happy with the current state of execution.

A WIDE MAJORITY OF MANUFACTURERS SAY IIoT ADOPTION IS CRITICAL TO THEIR FUTURE SUCCESS

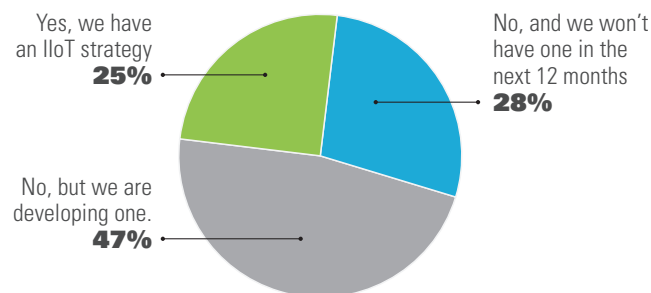
IIoT is critical to our future success



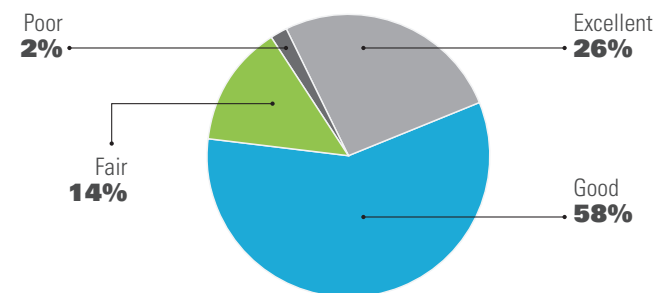
IIoT Leaders, high-tech and larger manufacturers rate the importance of IIoT higher.

Source: 2016 IndustryWeek/Genpact Current State of the Industrial Internet of Things; Yes, IIoT will be critical to the future success of our company; n=173.

ONLY ONE OUT OF FOUR MANUFACTURERS CURRENTLY HAS A CLEAR IIoT STRATEGY



AMONG MANUFACTURERS WITH AN IIoT STRATEGY, MOST ARE HAPPY WITH THEIR EXECUTION



Source: 2016 IndustryWeek/Genpact Current State of the Industrial Internet of Things, n=173.

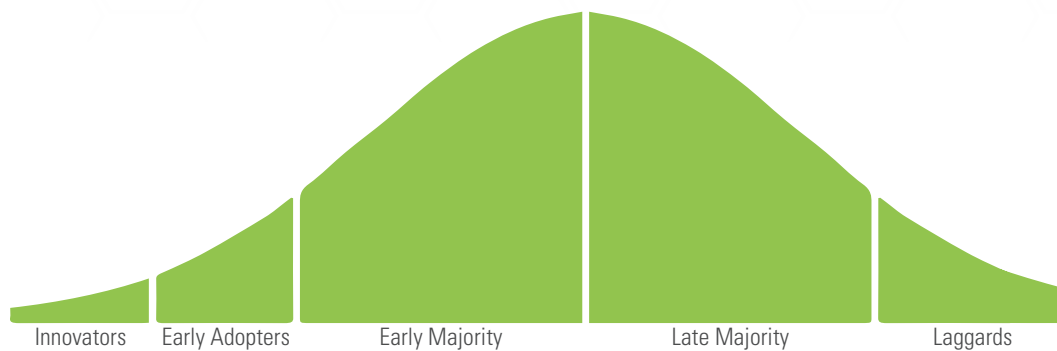


III. IIoT USAGE & MATURITY

MORE MANUFACTURERS ARE MAKING THE IIoT LEAP

Farmers' use of hybrid seed corn originally inspired the now well-known technology adoption lifecycle curve. The model has since evolved and been applied to a broad range of new product and technological innovations. Among the corollaries for the lifecycle is the observation that there's often a long gap between when innovators and early adopters test out a new technology and widespread uptake by the mainstream majority.

TECHNOLOGY ADOPTION LIFECYCLE



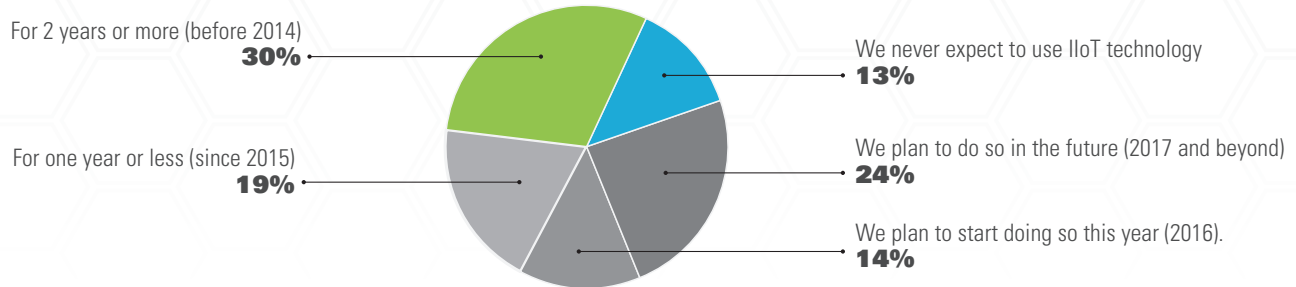
Source: The Technology Adoption Lifecycle was popularized in Everett Rogers' book *Diffusion of Innovations*, first published in 1962.

Before investing in any brand new technology, mainstream adopters tend to look for clear ROI examples from similar companies. This creates a catch-22 situation—and competitive opportunity—when the capabilities exist but the more practical applications haven't yet been fully developed. Depending upon their risk tolerance, company leaders can wait for these use cases to emerge or proactively experiment on their own.

To help everyone make the leap, testbeds organized by the IIC and other organizations have been helping manufacturers explore and resolve the technical, security and cross-organizational issues of new IIoT applications. These collaborative experiments pull together diverse stakeholders to determine the usefulness and financial viability of new IIoT systems, devices, products, services and processes. Testbeds are accelerating the development of IIoT applications for crop management, water management, security, power grids, factory visibility, medical devices, communication systems, asset efficiency and many other areas.

Based on our research, manufacturers are beginning to bridge the chasm between early adopters and market majority. Half report that they've been using IIoT sensors and related technology for at least a year. By the end of the year, two-thirds of manufactures say they will be using IIoT technology. Over half (54%) of manufacturing company leaders in our survey report that they have budgeted for IIoT capital investments. Of those spending on IIoT technology, more than half have increased their investments over the previous budget cycle.

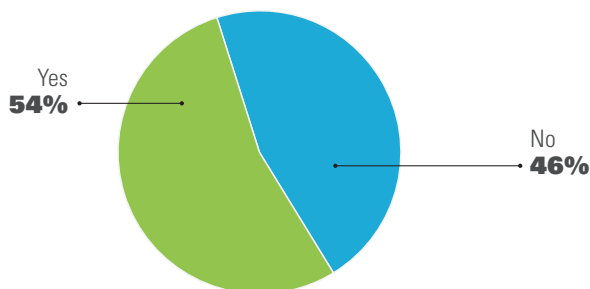
MANUFACTURERS' CURRENT AND PLANNED USE OF IIoT TECHNOLOGY



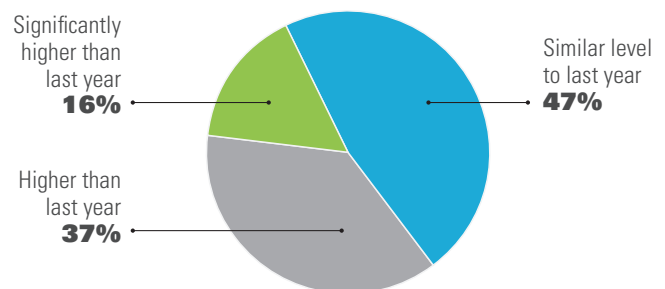
Almost a third of manufacturers have been using IIoT technology for 2 years or more. A significant portion still plan to make their initial IIoT investments in 2016 or sometime later in the future.

Source: 2016 IndustryWeek/Genpact Current State of the Industrial Internet of Things, n=173.

BUDGETED IIoT CAPITAL INVESTMENTS



IIoT CAPITAL INVESTMENTS ARE:



Of those manufacturers that have budgeted IIoT capital Investments, over half are investing more this year than they did last year.

Source: 2016 IndustryWeek/Genpact Current State of the Industrial Internet of Things, n=173.

Security Remains the Number One Concern

Despite growing applications and expanding investments in IIoT technology, many manufacturers are still wrestling with real and perceived challenges. Chief among them is security. Data breaches at financial institutions, hospitals, transportation systems, schools and police departments make headlines on an almost daily basis. Without more effective countermeasures, such breaches could increase as billions more devices come online and more and more data storage moves into the cloud.

Manufacturing leaders are well aware of these risks. Half of our survey respondents believe IIoT technology is increasing the probability of cyberattacks on their organizations. In response to these threats, a similar proportion (48%) have developed cyberattack response plans, which seems encouraging until you consider that this leaves a majority of firms without such plans.

MANUFACTURERS ASSESS IIoT CYBERSECURITY RISKS



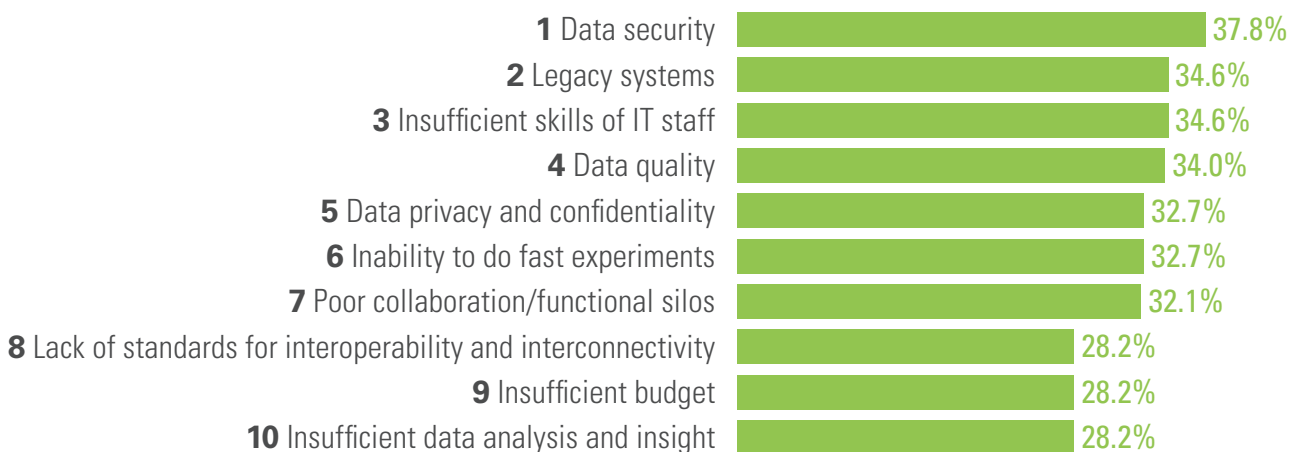
Source: 2016 *IndustryWeek*/Genpact Current State of the Industrial Internet of Things, agree or somewhat agree, n=136.

With the unresolved security issues it comes as no surprise that data-related issues dominate the list of IIoT challenges based on our research. Data security, data quality and data privacy all make the top five.

Interestingly, these concerns appear to become even more pressing with experience. Data security, privacy and quality are the top three concerns for IIoT Leaders, which also have a higher expectation of cyberattacks and are more likely to have created some form of response plan. Strivers are more focused on overcoming challenges related to legacy systems, insufficient skills of their IT staff and an inability to experiment with new technology.

There's less overlap in priorities when comparing manufacturers that have made dedicated IIoT investments to those that have not. Those that have not made such investments appear to be suffering from a crisis of both vision and capabilities; they're hindered by insufficient IT skills, failure to run experiments, lack of budget and an inability to build a business case for IIoT technology.

MANUFACTURERS' TOP 10 CHALLENGES IN LEVERAGING IIoT TECH



Source: 2016 *IndustryWeek*/Genpact Current State of the Industrial Internet of Things; ranking of those rating listed challenges 4 or 5 (very problematic) on a five-point scale, n=156.

TOP 5 CHALLENGES: LEADERS VS. STRIVERS (Common concerns are highlighted.)

Leaders

- 1 Data security
- 2 Data privacy and confidentiality concerns
- 3 Data quality
- 4 Insufficient skills of IT staff
- 5 Insufficient data analysis and insight

Strivers

- 1 Legacy systems
- 2 Insufficient skills of IT staff
- 3 Inability to do fast experiments
- 4 Data security
- 5 Data quality

TOP 5 CHALLENGES: MANUFACTURERS THAT HAVE MADE IIoT INVESTMENTS VS. THOSE THAT HAVE NOT (Common concerns are highlighted.)

Have Made IIoT investments

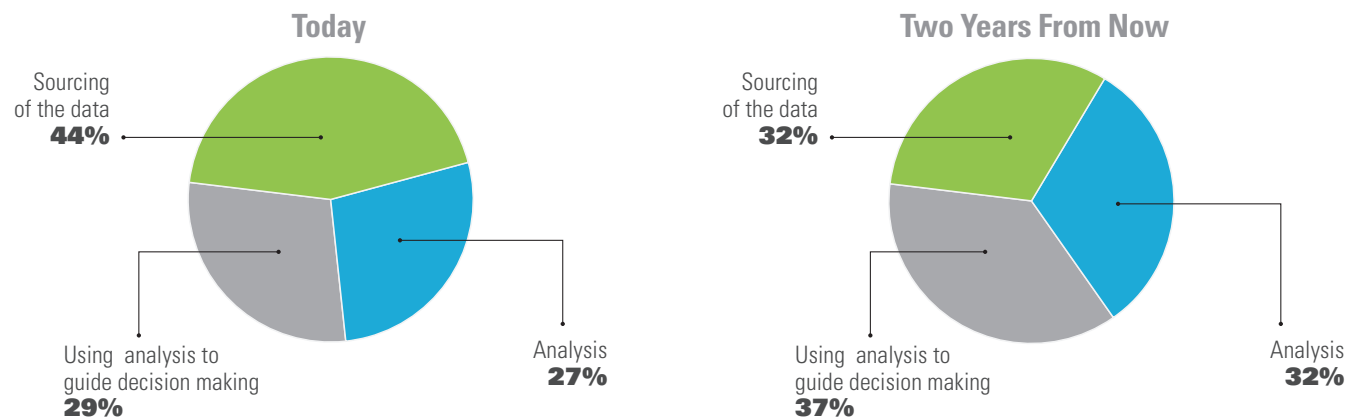
- 1 Data security
- 2 Legacy systems
- 3 Poor collaboration/functional silos
- 4 Data quality
- 5 Data privacy and confidentiality

Have Not Made IIoT investments

- 1 Insufficient skills of IT staff
- 2 Inability to do fast experiments
- 3 Insufficient budget
- 4 Unclear business case for IIoT
- 5 Data quality

Source: 2016 IndustryWeek/Genpact Current State of the Industrial Internet of Things; ranking of those rating listed challenges 4 or 5 (very problematic) on a five-point scale, n=156.

RESOURCES WILL SHIFT FROM DATA SOURCING TO DECISION MAKING



Over the next two years, manufacturers expect their IIoT resources and emphasis to shift from data sourcing (data capture, extraction, clean up, master-data management, etc.) toward more analysis (data reporting, mining and modeling) and leveraging that analysis to make better decisions.

Source: 2016 IndustryWeek/Genpact Current State of the Industrial Internet of Things, average time allocated, n=137.



IV. CURRENT IIoT IMPACT **WE HAVEN'T SEEN ANYTHING YET**

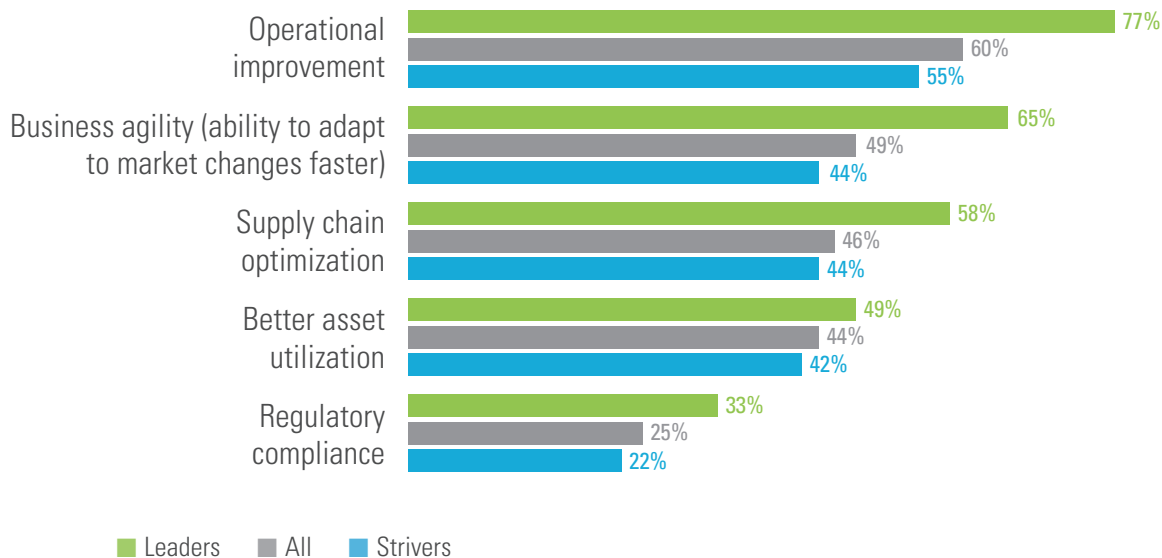
Voice-controlled agents, personal health monitors, self-driving cars, smart thermostats and other appliances. Internet-connected gadgets like these are capturing media attention and a rapidly growing share of consumer spending.

Meanwhile, hidden from public view, the Industrial Internet is beginning to transform business processes and business models in fundamental ways. Even conservative forecasts predict that IIoT technology will have a huge impact—counted in the billions of devices, and trillions of dollars—on how manufacturing companies operate, the products they make and the services they provide.

We asked research study participants to consider the current impact of IIoT technology on two critical areas to the future success of their business: operating efficiency and revenue growth. Operational applications of IIoT technology have been evolving since the popularization of the Internet. Today, embedded sensors and rapidly expanding analytical capabilities have helped reduce downtime and maximize asset utilization in a variety of industries from utilities to mining.

According to our research, IIoT technology is having a high impact on operational performance for a majority of manufacturers (60%). Interestingly, it's not having as significant of an impact on regulatory compliance, yet. One reason for this could be some of the unresolved challenges around tracking data provenance and lineage (this piece of data came from this specific sensor at this specific location at this specific time).

AREAS WHERE IIoT IS HAVING A HIGH IMPACT ON EFFICIENCY AND RESPONSIVENESS



Source: 2016 IndustryWeek/Genpact Current State of the Industrial Internet of Things, 4 or 5 (high impact) on a five-point scale, n=173.

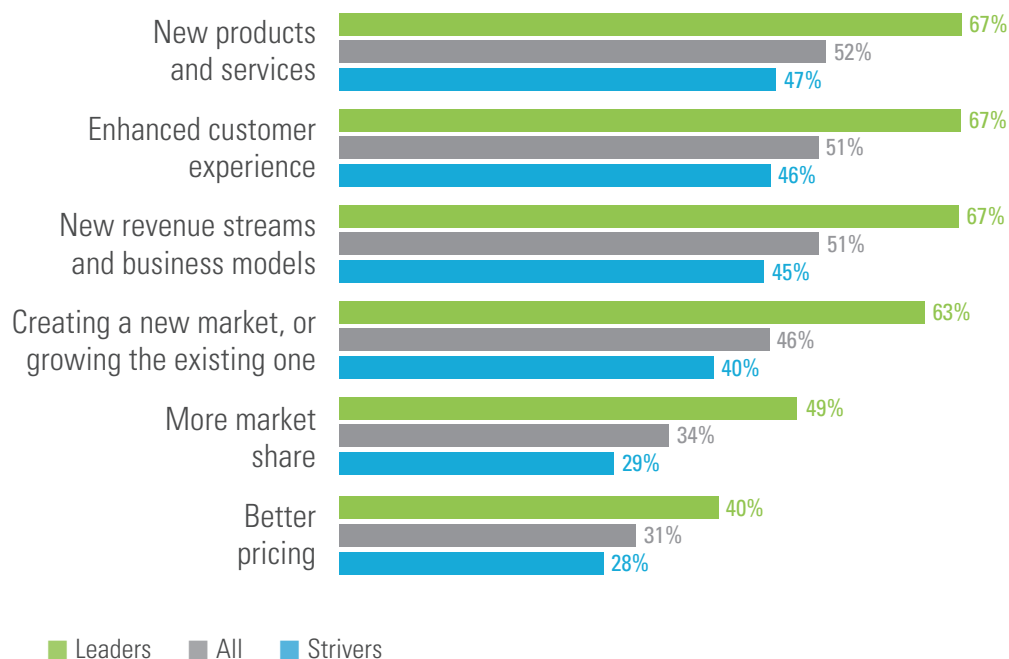
When it comes to revenue growth, IIoT capabilities build on performance-based business models as customers shift their purchasing attention away from buying and maintaining equipment toward outcome-based services and experiences. Accommodating this shift in mindset requires value-based business partnerships focused more on fulfilling core customer needs and less on selling discrete products or services.

To drive revenue growth, manufacturers are currently leveraging IIoT technology in four primary areas in almost equal measure:

- 1) Creating new products and services
- 2) Enhancing the current customer experience
- 3) Establishing new revenue streams and business models
- 4) Opening up new markets, and growing existing ones.

As you would expect, IIoT Leaders report significantly more progress in each of these areas. As a whole, manufacturers are struggling to leverage IIoT capabilities in ways that increase market share, through better pricing or other benefits.

AREAS WHERE IIoT IS HAVING A HIGH IMPACT ON REVENUE GROWTH



Source: 2016 IndustryWeek/Genpact Current State of the Industrial Internet of Things, 4 or 5 (high impact) on a five-point scale, n=173.



V. CONCLUSION

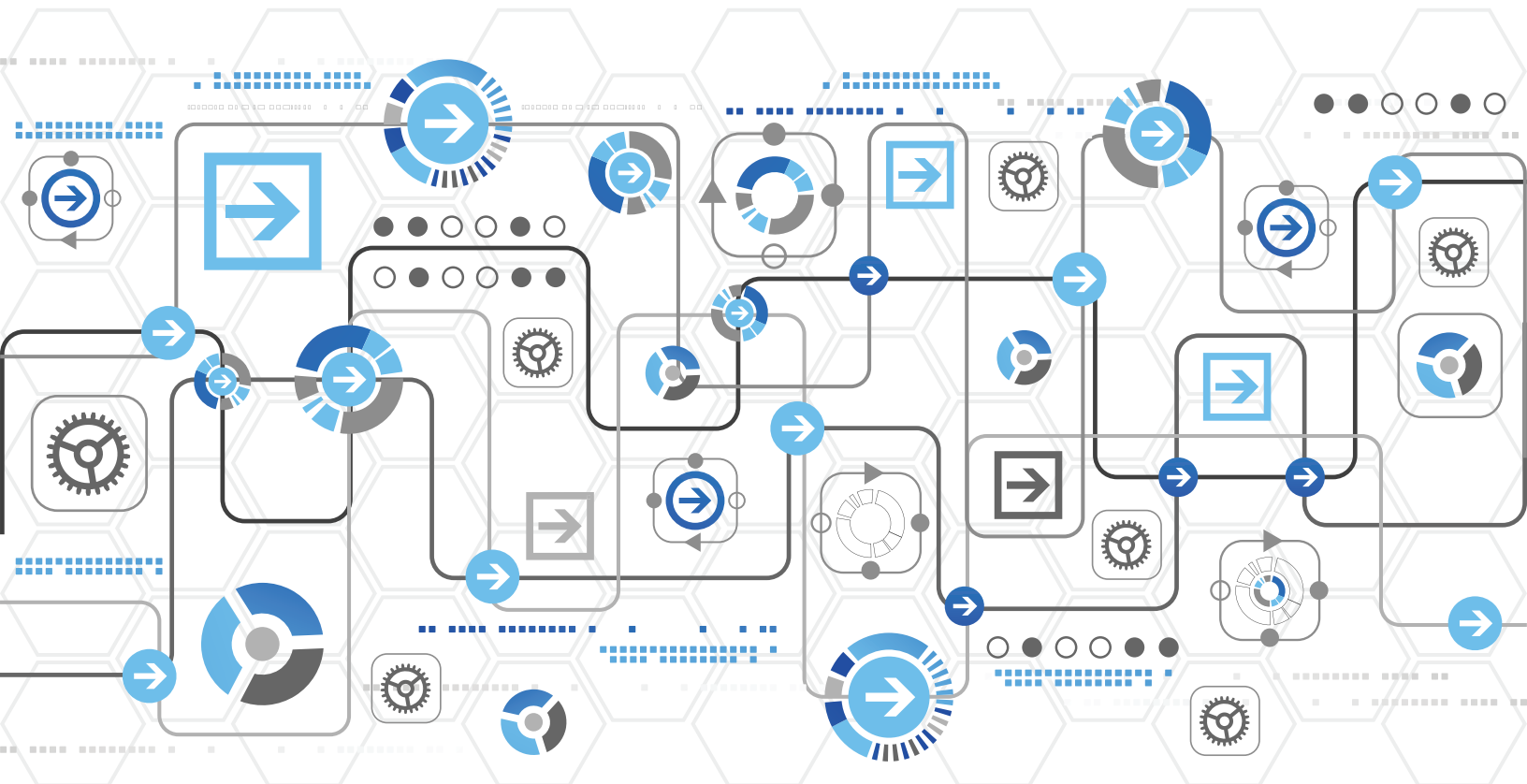
CHANGE HAPPENS SLOWLY, THEN ALL AT ONCE

One lesson that manufacturing leaders have learned repeatedly—largely through the botched rollout or upgrade of ERP systems and other software—is that adopting any new technology for technology’s sake is a surefire recipe for a poor or negative return on their investment. And that automating a broken or suboptimal process only makes it worse. Any major technology investment has to be supported by a thorough process analysis and redesign that takes full advantage of the new capabilities.

One of the unique characteristics of digital technologies like IIoT is that reaping all of the benefits requires coordination not just between value-chain partners—which can be immensely challenging on its own—but between departments within a company. Successful deployment also requires technical expertise and well-directed investments. Ultimately, companies may have to completely restructure business processes to align with new data transfer protocols, product handoffs, financial transactions and business relationships.

It’s no wonder why there’s some hesitancy among manufacturing leaders to consider changing what they do and how they do it in such fundamental ways. At the same time, there’s a great deal of excitement. IIoT is beginning to change interactions between people and machines—and transform the relationships between companies and their customers.

As this collaborative research study between *IndustryWeek* and Genpact makes clear, IIoT Leaders are deeply aware of the challenges around data security, IT skills, legacy systems, effective collaboration and technical standards. But they are also already reaping some of the benefits. As the Industrial Internet of Things continues to mature and the applications in the pipeline come online—joining those available and in use today—it will be thrilling to see how manufacturers harness these new opportunities to improve productivity and efficiency, adapt faster to market changes and create brand new revenue streams.



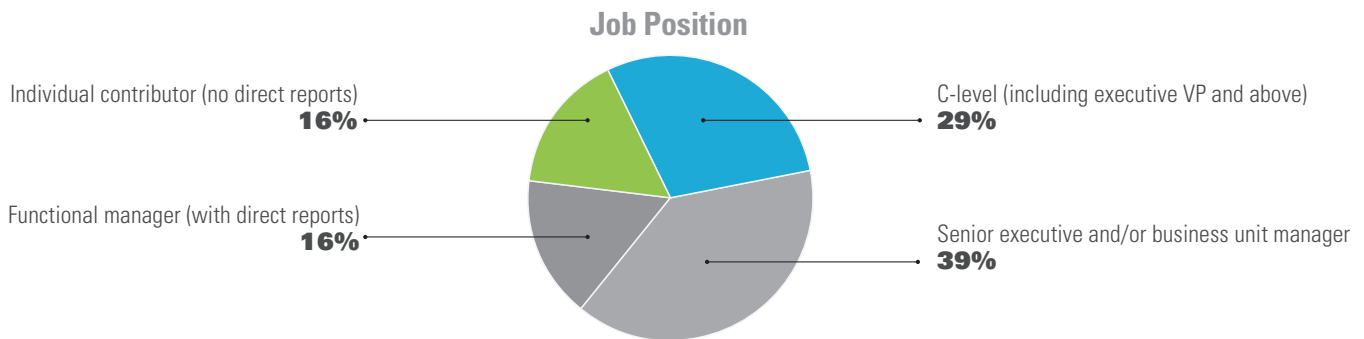
Respondent Demographics

The corporate headquarters for the vast majority of IIoT survey respondents are located in North America (84%), followed by Europe (12%) and Asia/Pacific (5%). Sixty-seven percent of respondents hold C-level, senior executive, or business unit manager positions. They are primarily responsible for operational management (27%) and sales and marketing (20%) activity.

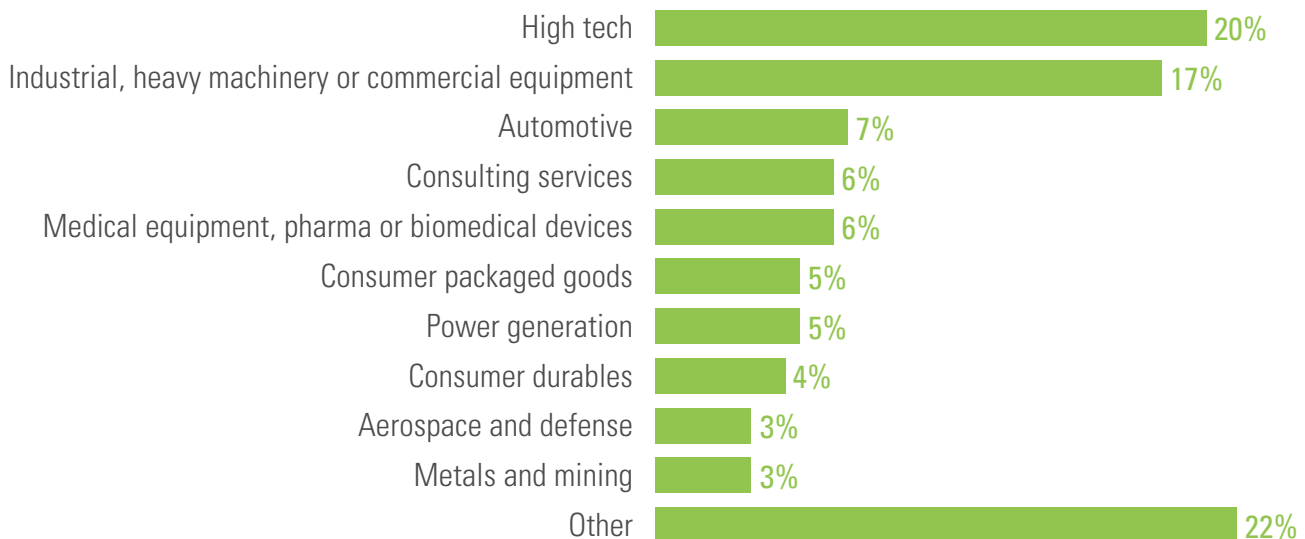
The top two industry categories are industrial equipment (24%) and high tech (23%). Those sectors include a wide variety of businesses from heavy equipment and commercial machinery to computers, semiconductors and electronics. Other industries include automotive (8%); consulting (8%); medical equipment, pharmaceuticals and biomedical devices (7%); consumer durables (6%); chemicals (6%); consumer packaged goods (5%) and power generation (5%).

Looking at annual sales, over one-quarter of respondents (27%) report annual revenues of \$1 billion or more. Roughly one out of five (19%) have annual revenues between \$100 - \$999 million.

RESPONDENT JOB RESPONSIBILITIES



INDUSTRIAL SECTORS



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For more information, visit www.genpact.com/internetofthings, or contact them at industrial.manufacturing@genpact.com.

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Industrial Internet Consortium

The Industrial Internet Consortium is the global, not-for-profit, public-private partnership of 250+ member organizations, joining together to accelerate the Industrial Internet. Our membership includes the world's most progressive and innovative companies, joining together to solve the tough challenges in interoperability, security and innovation. The Consortium brings together corporate leaders, entrepreneurs, researchers and governments into one community to advance innovation and share best practices.

Founded by AT&T, Cisco, GE, IBM and Intel in March 2014, the consortium's mission is to coordinate vast ecosystem initiatives to connect and integrate objects with people, processes and data using common architectures, interoperability and open standards. Visit www.iiconsortium.org or follow us at @iiconsortium, for more information.

IndustryWeek

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