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Executive Summary

With the support of SAS, the Internet of Things Institute (IoTi) developed the **2017 Internet of Things ROI Research Study** to gather real-world insights, lessons learned and future guidance from current users of IoT technology and advanced analytics. This selective sample of IoT users offers valuable insights to both IoT innovators and organizations still waiting to see how the technology evolves before investing.

Multiple business layers and functions have input into IoT decision making. In the early stages, the IT department is most involved in IoT decision making. As experience grows, functional engagement increases, particularly by the marketing and sales teams. Among IoT Leaders — those organizations that have achieved the highest percentage of their targeted ROI — executives are much more likely to be involved in IoT decision-making.

Longer term IoT users — five years or more — report that IoT technology has had a bigger impact across the

board. For these organizations IoT has had a significant impact on equipment uptime, operational dashboards and better quality/yields compared to those with less experience. For these less experienced users — less than two years — IoT has had the most impact on remote diagnostics and trouble-shooting of machinery.

When it comes to analytics, longer term IoT users focus more on analyzing stored data. IoT Leaders report a generally higher usage of advanced analytics techniques, and they seem to be focusing their efforts on predictive analytics.

For IoT users that have achieved higher returns the use of analytics for decision making, collaboration with customers and suppliers, and having a formal strategy are the main drivers of IoT success. When considering the issues that can undermine an IoT initiative, Leaders singled out six primary factors: Lack of leadership support, poor collaboration, inability to scale, poor connection to the business strategy, and insufficient technical knowledge.

Research Methodology

This report highlights the findings of the **2017 IoT ROI Research Study**, underwritten by SAS. The purpose of this research project was to investigate the current use and application of Internet of Things technology among experienced users. During November and early December 2016, Penton Custom Research e-mailed invitations to participate in the online survey to 200,338 members of Penton's IoTi audience. That invitation was followed by reminders to non-respondents. In total, we received 1,959 responses. Of those responses, 158 experienced IoT users qualified for inclusion in the research. This analysis and report are based on the views of these 158 mostly senior-level executives and managers. Response percentages do not always add up to 100% due to rounding and the allowance for multiple responses on some questions.

Introduction: Leaders of the IoT Revolution

The “first-mover advantage” is notoriously difficult for technology innovators and early adopters to capture and sustain. The inherent technical and market uncertainties inevitably lead to wasted investments and misplaced capability development.[†]

Fast followers benefit from the technical and market experiments of the early adopters. They’re able to leverage technology maturity and existing customer relationships to build real-world applications — often by acquiring the innovators — and direct their resources where it will deliver the highest returns. Today, a generation of data-savvy business leaders — first movers and fast followers alike — is intent on extracting a competitive advantage and market growth from the Internet of Things (IoT).

There are few technology areas in recent decades that have been so anticipated — and the market potential so wildly extrapolated — than the Internet of Things. The confluence of Internet connectivity, cloud-based data storage and advanced analytical capabilities has created many new businesses and revenue streams, and more than a few false starts. The IoT “revolution” has been emerging and evolving for more than a decade, and some companies have much more experience than the others.

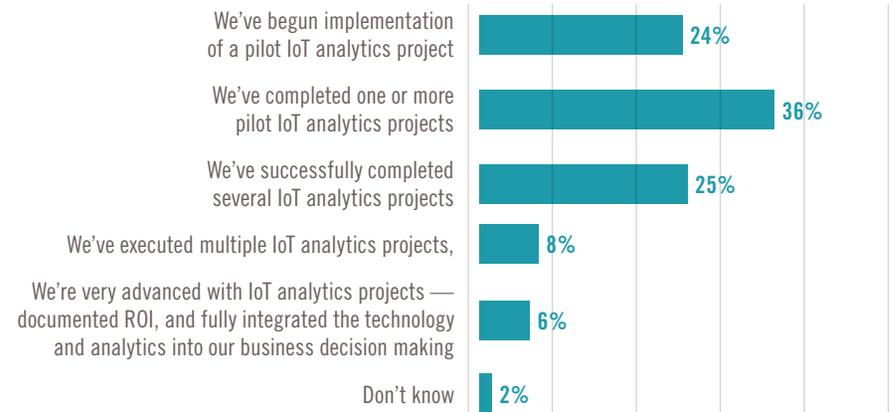
With these issues in mind, the Internet of Things Institute (IoTi) developed the **The Key Factors Driving IoT Success**. Our goal was to gather real-world insights, lessons learned and future guidance from current users of IoT technology.

All participants in this research study reported that they are using IoT technology and advanced analytics. To some degree they are also all involved in the review, approval and use of IoT technology and related analytics solutions. We believe this selective sample of IoT users offers some valuable insights to both IoT innovators and those organizations that are still waiting to see how the technology evolves before making any investments.

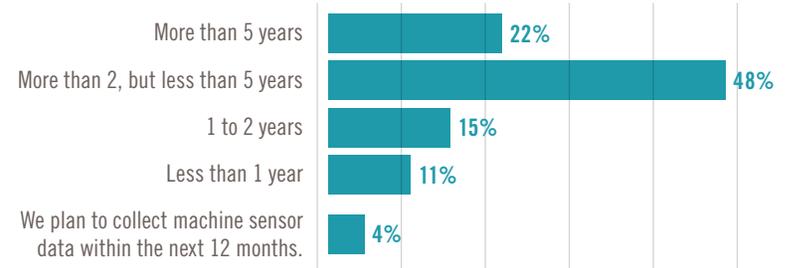
Within this unique cohort of IoT users there is a wide range of experience. Well over half (60%) are still in the pilot phase, having begun to implement or having completed several pilot IoT projects (**Figure 1**). That puts them several steps further along the learning curve than companies that have not yet launched a pilot project.

FIGURE 1: IoT Experience

Most Research Participants Are Still in the Experimentation Phase



Almost Half of Research Participants Have 3-5 Years of IoT Experience



Source: 2017 Internet of Things ROI Research Study, March 2017, n=158.

Similarly, while one out of five (22%) research participants reports that they've been using the technology for more than five years, almost half (48%) have been experimenting with IoT for two to five years (Figure 2). And one out of four (26%) has been using IoT technology for less than two years.

Measuring the ROI of IoT (Or Not)

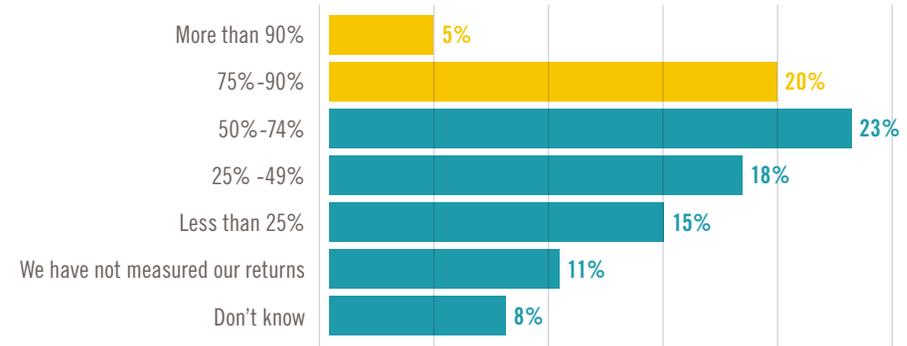
Early stage Internet of Things investments have largely been about gaining technical knowledge as viable applications and market opportunities emerge over time. It's not surprising therefore that one in five IoT users (19%) don't know or have not measured their return, and an additional 15% have realized less than 25% of the targeted financial and performance returns from such investments to date (Figure 2).

Comparing the reported returns on IoT investments, we found no differences based on company size (annual revenues), respondent job level (senior executives vs. others), or primary focus (cost savings vs. revenue growth). There was no difference in ROI by maturity (pilot phase vs. more mature) either. The only differentiator for return on IoT investments was years of experience, which was fairly striking (Figure 3). IoT users with more than five years of experience reported an estimated median return of 83% of their targeted ROI, compared to 62% for all respondents.

This is why, for purposes of comparison in this study, we look primarily at the differences in priorities and results between companies by years of experience. We also compare those that have achieved 75% or more of the targeted performance and financial gains (which we call "Leaders") to all others ("Strivers"). We use strivers to describe those that haven't been as successful rather than "laggards" — the more typical classification for research of this type — because the real IoT laggards are those companies that haven't yet started to experiment with IoT technology.

FIGURE 2: IoT Returns

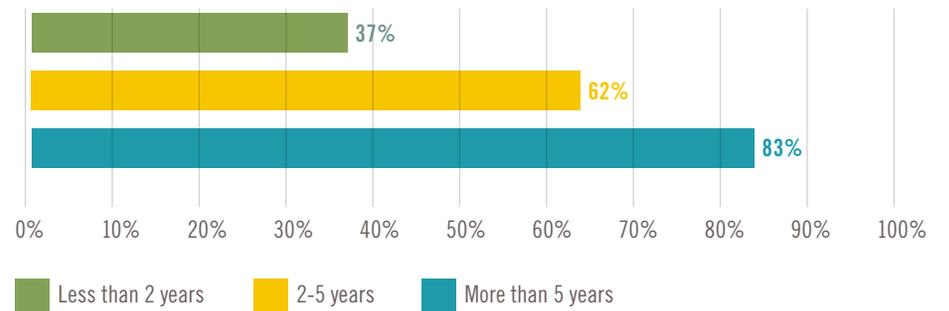
One in Four IoT Users Achieve Close to Targeted Returns



In this study we compare the differences in IoT priorities and results by years of experience and percentage of targeted returns achieved. "Leaders" are companies that have realized 75% or more of their targeted performance and financial gains (yellow). "Strivers" (blue) have achieved less than 75% of their anticipated returns.

FIGURE 3: IoT Returns by Years of Experience, Estimated Median

Returns from IoT Investments Increase with Experience



Source: 2017 Internet of Things ROI Research Study, March 2017, n=158.

IOT FOCUS AND OWNERSHIP: Who's in Charge of IoT?

Early Internet of Things use cases focused on efficiency savings and cost reductions. Businesses in a wide range of sectors from mining to aviation and electronics have applied IoT technology internally to improve machine utilization and reduce downtime (Figure 4). There are still plenty of potential performance improvements in such applications still waiting to be captured.

In recent years more externally oriented applications that gather customer data and contribute to the development of new products and services are emerging. These applications are expected to deliver significantly higher long-term business value and growth.

As organizations balance their attention between internal and external IoT applications, between efficiency gains and customer focus, success requires different teams, different levels of functional involvement, and different leadership. It requires different expertise, capabilities and cross-functional engagement. We looked at this issue from two angles: 1) the departments involved in IoT decision making, and 2) those that own IoT-related activity.

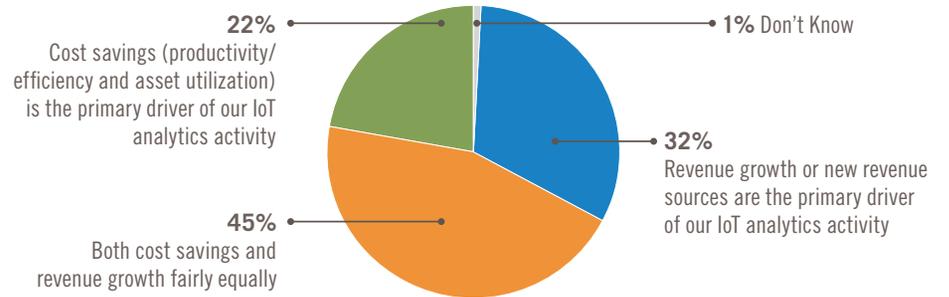
IoT Decision Making, Involvement and Ownership

Multiple business layers and functions have input into IoT decision making. In the early stage, when an organization is most focused on understanding the technical requirements, representatives from the IT department appear to be most involved in IoT decision making (Figure 5). Their efforts are closely guided by the company's leadership team and engineering.

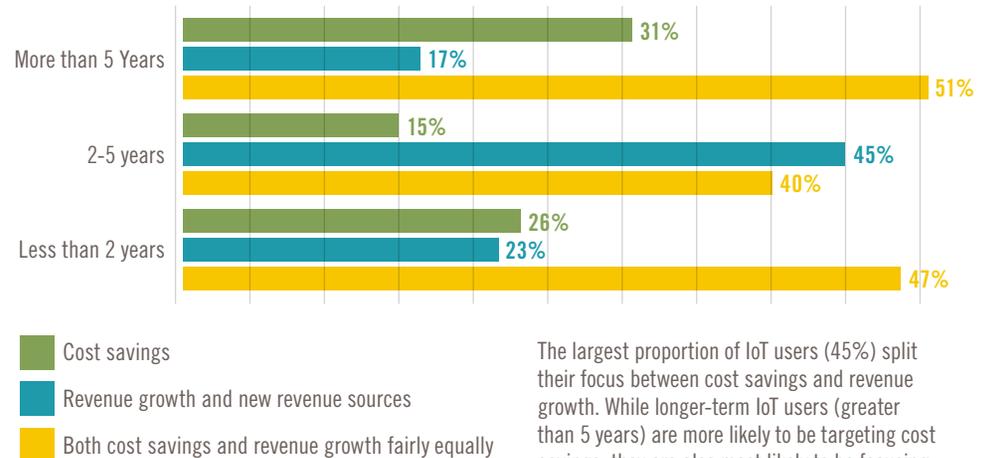
As IoT experience increases, functional engagement IoT decision making expands, particularly in marketing and sales. Among the IoT Leaders, executives as well as the sales and marketing department are much more likely to be involved in IoT decision-making. This would appear to reflect a deeper focus on customer intelligence and new service applications.

FIGURE 4: IoT Focus

IoT Users Are Focused on Cost Savings and Revenue Growth



IoT User Priorities Vary Based on Years of Experience

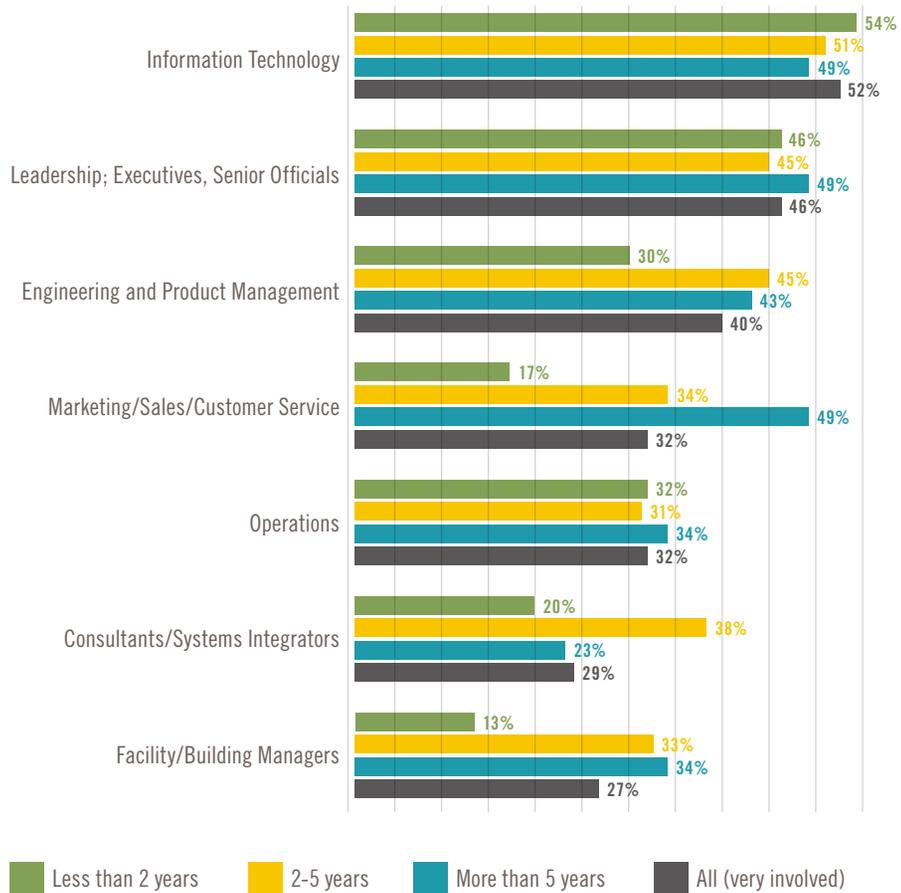


The largest proportion of IoT users (45%) split their focus between cost savings and revenue growth. While longer-term IoT users (greater than 5 years) are more likely to be targeting cost savings, they are also most likely to be focusing on both costs and new revenue streams.

Source: 2017 Internet of Things ROI Research Study, March 2017, n=158.

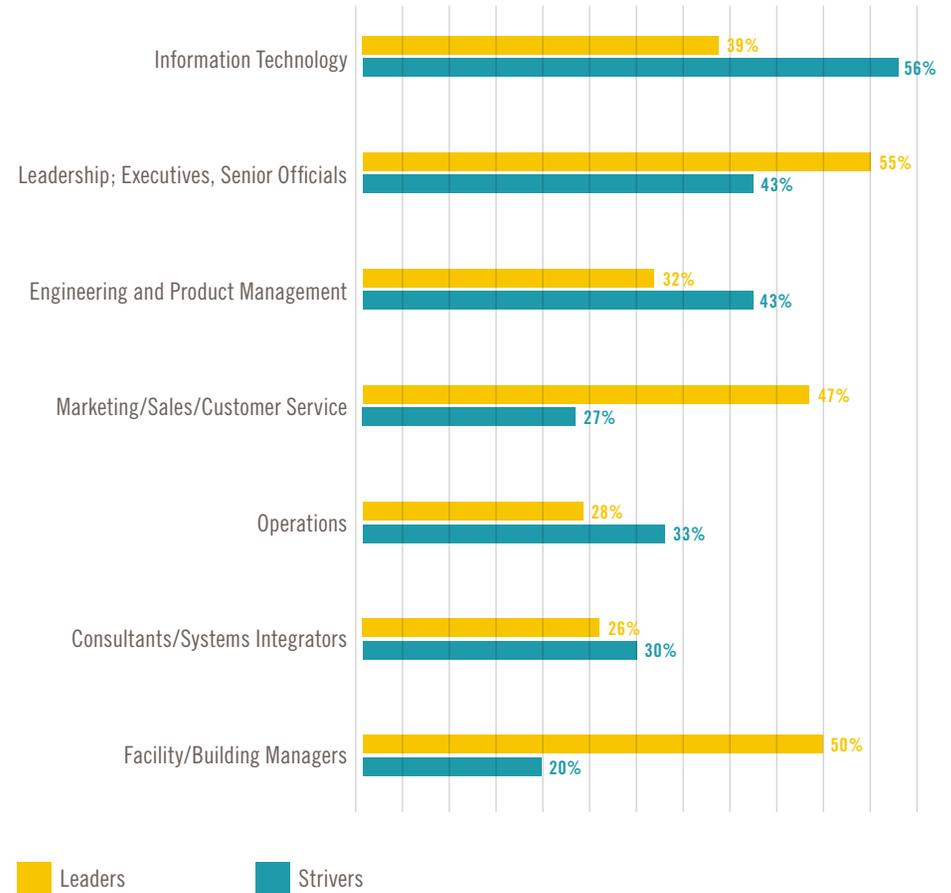
FIGURE 5: Involvement in IoT Decision Making

IT, Executives and Engineering Lead IoT Decision Making



This bar chart shows areas where management is very involved in IoT decision making (5s on a 5-point scale from (5) very involved to (1) not involved), and how that involvement varies based on IoT experience.

Executives and Sales & Marketing Are More Engaged at IoT Leaders

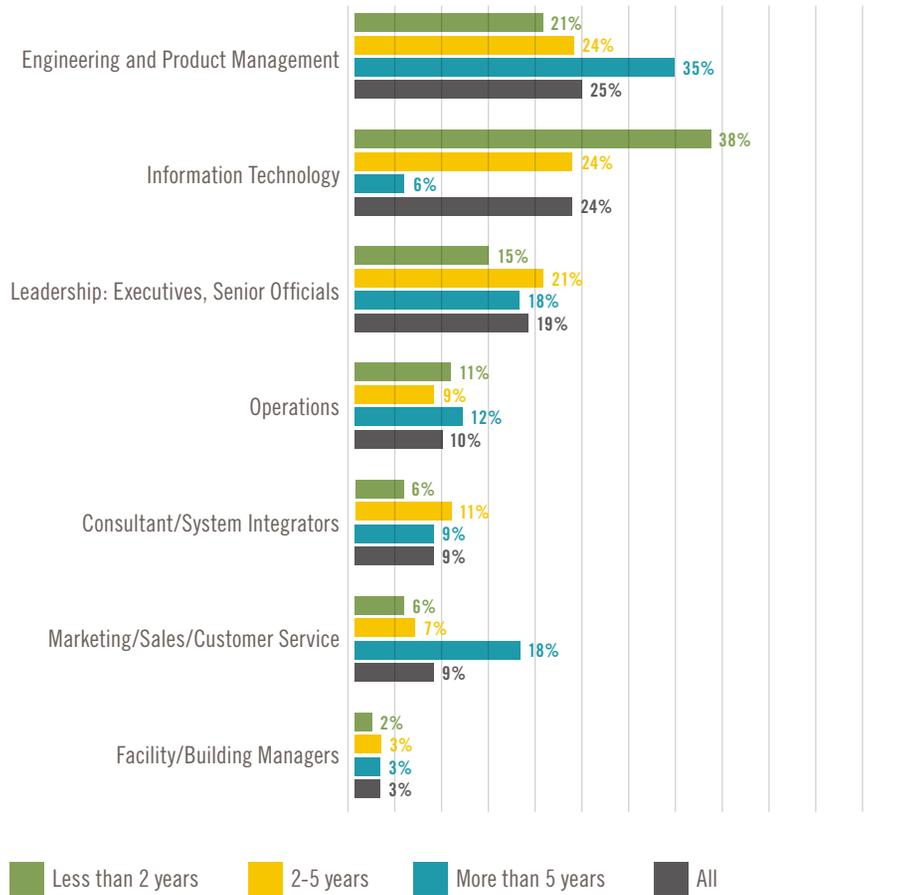


For IoT Leaders, executives and the sales and marketing department are more likely to be involved in IoT decision-making.

Source: 2017 Internet of Things ROI Research Study, March 2017, n=158.

FIGURE 6: IoT Ownership

Engineering and IT Tend to “Own” IoT Initiatives

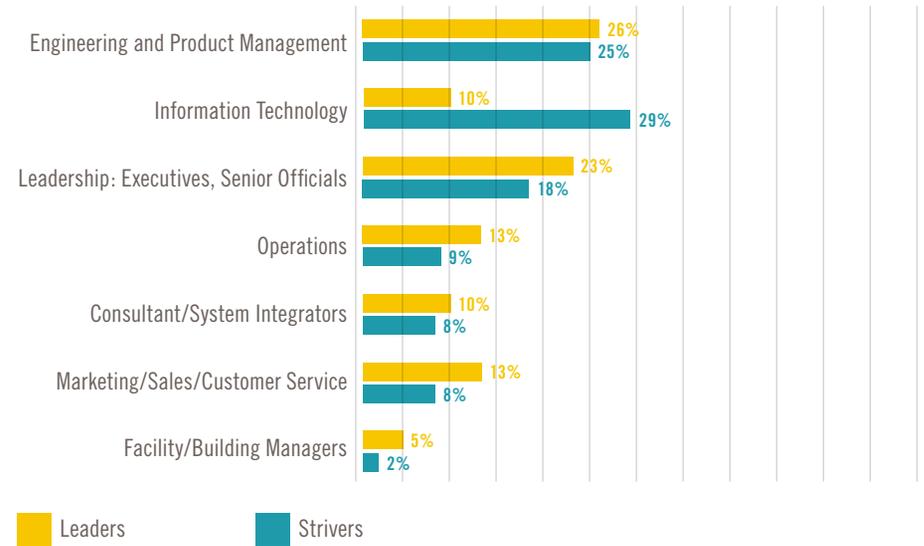


Engineering is more likely to own IoT initiatives at companies that have been using the technology longer. The IT department leads deployment at newer users.

So, who is in charge of the rollout of IoT technology? IT clearly owns the initiative in the early stages (**Figure 6**). Among research participants who have been using IoT longer, the engineering department has taken on greater responsibilities. However, company executives and managers in other functional areas are more likely to be in charge among IoT leaders, and IT is much less likely to be leading efforts.

“For IoT Leaders, executives as well as the sales and marketing department are much more likely to be involved in IoT decision-making.”

Executives Are More Likely to Own IoT at Leaders



The IT department is less likely, and leadership is more likely, to own IoT initiatives at the most successful technology users.

Source: 2017 Internet of Things ROI Research Study, March 2017, n=158.

IOT IMPACT ON MARKET POSITION AND PERFORMANCE: Leading the Pack or Just Keeping Up

Business leaders might not like to admit it, but there is a certain “herd mentality” when it comes to investing in new technologies and new markets. If our competition is doing it, the thinking goes, and they’re finding some value, we better do it too. That’s why any competitive advantage in operating efficiency, or even new product or service innovations, tends to be short lived.

It should therefore come as no surprise that most users don’t feel they have an advantage over their competitors when it comes to Internet of Things applications. Only 4 out of 10 (38%) say they are ahead of their competitors (**Figure 7**). This does not mean that those who don’t have an edge regard these investments as wasted.

Interestingly, IoT users that have more than five years of experience and those that have achieved a greater percentage of their investment target (our Leaders), are both more likely than Strivers to report that they are either behind or that they are ahead of their competition. As much as anything, this dual perspective may reflect a deeper understanding of what their competitors are up to and how their own efforts compare.

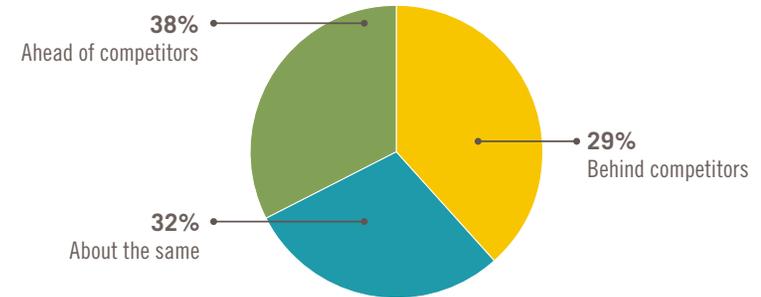
Current Impact of IoT

IoT and advanced analytics users can benchmark their performance against competitors on an internal and external basis. The application of IoT technology has had a fairly broad impact on both areas.

Internally, IoT technology has helped users create operational dashboards, boost equipment uptime and improve quality and yield rates (**Figure 8**). It has also enabled remote trouble shooting and reduced operational costs. IoT has had less of an impact on facility security, energy usage, and utilization.

FIGURE 7: Competitive Advantage

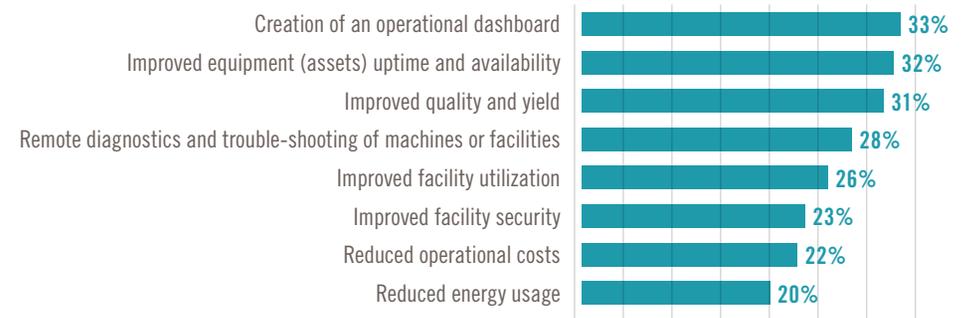
How IoT Adoption Compares to Competitors’ Efforts



When asked how their organization’s experience and application of IoT and advanced analytics compares to competitors, nearly four in ten IoT users (38%) claim to have an edge.

FIGURE 8: IoT Impact on Internal Operations

Areas Where IoT Technology Has Had a Major Impact on Internal Operations



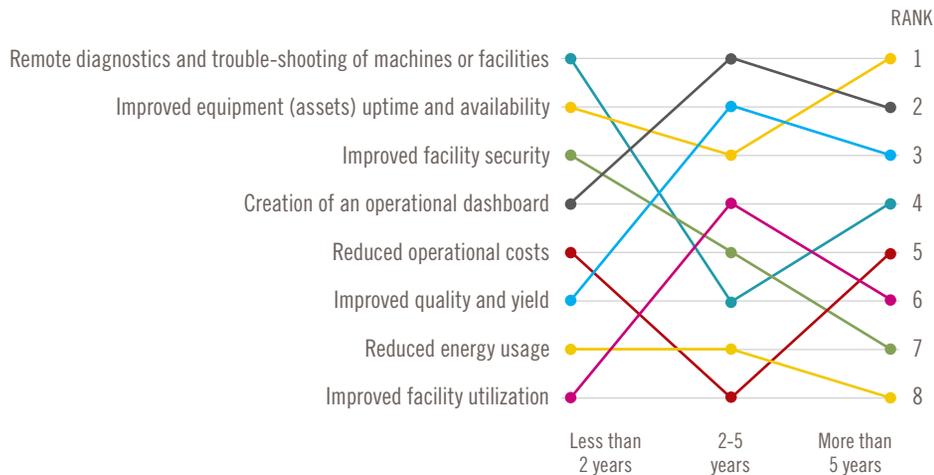
The Internet of Things has had a major impact on current users ability to create operational dashboards, improve uptime and increase yields (5s on a 5-point scale from 5 -Major impact to 1 - no impact).

Source: 2017 Internet of Things ROI Research Study, March 2017, n=158.

As one would expect, longer term users report that IoT technology has had a bigger impact across the board. But the areas where it has had the most impact vary based on years of usage (Figure 9). For example, IoT has had a more significant impact on remote diagnostics and trouble-shooting of machinery for users who have been using IoT for less than 2 years. IoT has had a more significant impact on equipment uptime, operational dashboards and better quality/yields for longer term users. This may reflect priority differences for the industries that have been using IoT for longer — like mining, utilities and other asset-intensive sectors — not necessarily how those priorities evolve over time.

FIGURE 9: Internal Impact by Years of Experience

Internal Impact of IoT Technology Varies by Experience



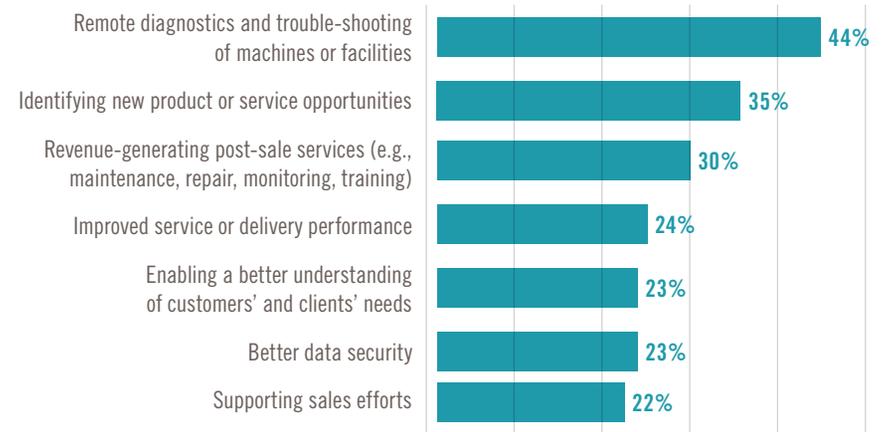
IoT technology has had a bigger impact across the board based on years of experience. This chart shows rank changes in the areas of internal impact.

Externally, IoT has also had a major impact on remote diagnostics of products (Figure 10). Research participants report that the technology has had the least impact on revenue-generating, post-sale services, data security and sales support.

While all survey respondents report a high impact from remote-diagnostics of products and the identification of new products or services. Long-term users singled out the impact of IoT on data security, and more recent adopters cited revenue-generating, post-sale services.

FIGURE 10: Impact on External Initiatives

Areas Where IoT Technology Has Had a Major Impact on External Operations



IoT has had a major impact on users' ability to perform remote diagnostics and identify potential new products and services (5s on a 5-point scale from 5 - Major impact to 1 - No impact).

Source: 2017 Internet of Things ROI Research Study, March 2017, n=158.

IOT INFLUENCE ON DECISION MAKING AND BEST PRACTICES: Cultural Attributes that Drive IoT Success

IoT initiatives tend to thrive or not depending upon how strongly such efforts are focused on the new and unique value that the technology can bring to a particular business. As we will explore in this section, IoT initiatives achieve their targeted objectives in organizations that have developed a culture and attendant business practices that value analytics and data-driven decision making, and which proactively address some of the pitfalls to achieving the anticipated returns. These practices include:

- Executive/leadership engagement and support
- Collaboration with customers and suppliers
- Having a formal IoT strategy connected to the business strategy
- Ability to collaborate across departments
- Finding analytical talent
- Developing the ability to scale and manage IoT data.

Current users are deploying a range of descriptive, predictive and prescriptive analytical approaches for processing IoT data (**Figure 11**). Descriptive analytics extracts insights from the past to explain “what has happened.” Predictive analysis uses statistical models and forecasting techniques to predict “what could happen.” And prescriptive analytics uses optimization and simulation algorithms to plot possible outcomes and offer advice on “what you should do.”

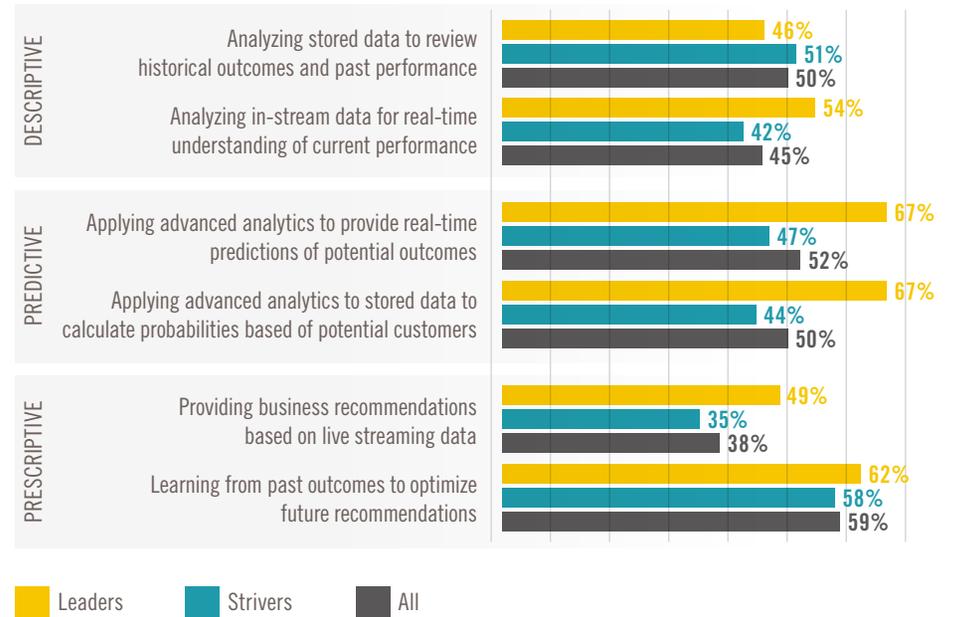
Longer term IoT users appear to focus more on analyzing stored data. There’s less analysis of in-stream and live streaming data by current IoT users, which makes sense since this includes relatively new but rapidly growing capabilities. IoT Leaders report a higher usage of advanced analytics techniques, and they seem to be focusing their efforts on predictive analytics.

IoT Users’ Strengths and Weaknesses

Current IoT users take pride in their ability to effectively use IoT data and analytics for decision making, leadership support, collaboration with customers and suppliers, having an IoT strategy, and managing the tidal wave of IoT data (**Figure 12**). Areas of weakness include connecting IoT to a wider business strategy, speed of project rollout and having the appropriate level of analytics talent.

FIGURE 11: Current Analysis and Application of IoT Data

IoT Technology Users Leverage a Range of Analytical Approaches



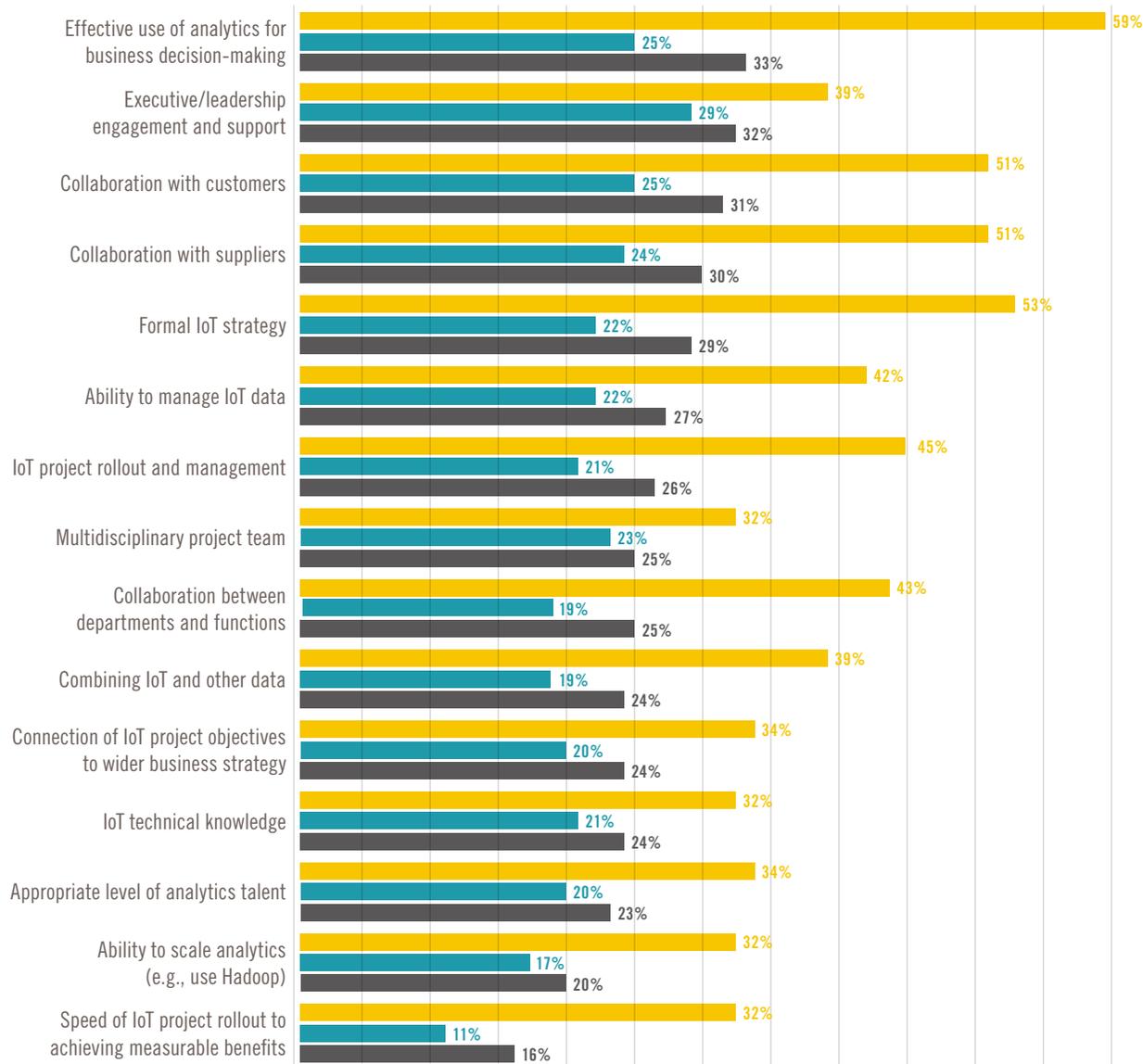
IoT Leaders report a higher usage of predictive analytics compared to Strivers.

Source: 2017 Internet of Things ROI Research Study, March 2017, n=158.

These observations align with users’ opinions about the factors that cause IoT initiatives to fall short of achieving their full potential. In addition to the failure to connect to the business strategy and insufficient technical knowledge, they point to the absence of leadership support and poor collaboration (**Figure 13**).

FIGURE 12: IoT Success Factors

Organizational Strengths of IoT Users



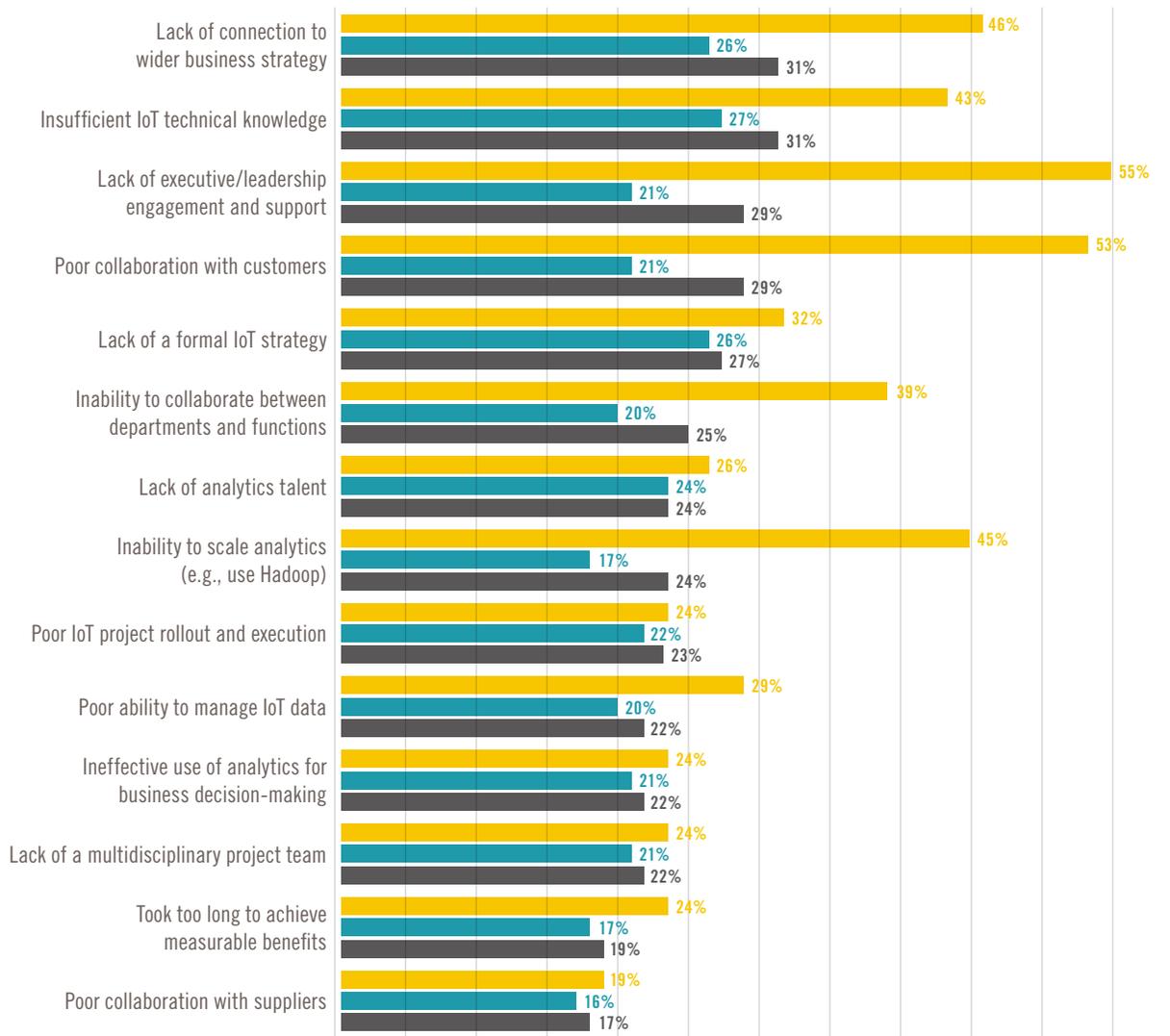
Leaders Strivers All

This chart ranks the self-identified strengths (and weaknesses) of current IoT users (5s on a 5-point scale from 5 - Strong to 1 - Weak). Leaders report that they are much better at using analytics for business decision making, having an IoT strategy, and collaboration with suppliers, with customers and between internal departments.

Source: 2017 Internet of Things ROI Research Study, March 2017, n=158.

FIGURE 13: Top Reasons for IoT Project Failure

Top Reasons for IoT Project Failure



Leaders Strivers All

Lack of connection to business strategy, insufficient technical knowledge and lack of leadership support, are the leading factors that IoT users say cause projects to fail to achieve their full potential (5s on a 5-point scale from 5 - Significant factor to 1 - Not a factor).

Source: 2017 Internet of Things ROI Research Study, March 2017, n=158.

Based on IoT experience, effective use of analytics for making decisions, internal and external collaboration, and analytics talent are greater strengths for longer term IoT users. On the flip side of this observation, more recent IoT adopters single out lack of technical knowledge, ineffective use of analytics, lack of an IoT strategy, and poor IoT project execution as key factors that contribute to IoT project failure.

Looking at IoT users that have achieved higher returns, Leaders view use of analytics for decision making, collaboration with customers and suppliers, and having a formal strategy (Figure 14) as the main drivers of IoT success. Interestingly, multidisciplinary project teams (a key tactic for encouraging collaboration) and IoT technical knowledge did not rate much higher among the top performers.

Among the issues that can undermine an IoT initiative, Leaders singled out six factors (Figure 15). These factors mirror the primary weaknesses presented above. They are: Lack of leadership support, poor collaboration, inability to scale, poor connection to the business strategy, and insufficient technical knowledge.

CONCLUSION: Follow the IoT Leaders

The number of Internet-connected sensors and devices is expected to exceed 20 billion by 2020 (or 30 billion or 40 billion, depending upon which projections you want to believe). They could exceed the number of people on the planet by a factor of up to 4X. It's impossible to truly comprehend or appreciate such numbers, or predict with any certainty the future impact that these billions of things will have on markets or how business operates.

The Internet of Things is not a single type of device, or technology, or solution, or application. It encompasses many interconnected technologies to which businesses and people are applying their technical, process and market knowledge. Fleet management and asset tracking. Smart lighting and waste management. Thermostats and consumer wearables. Current IoT leaders offer our best clue to how the technology can be successfully (i.e., profitably) developed and deployed.

FIGURE 14: Selective Sample: IoT Decision Making Influence

All Research Participants Influence or Make IoT Technology Decisions

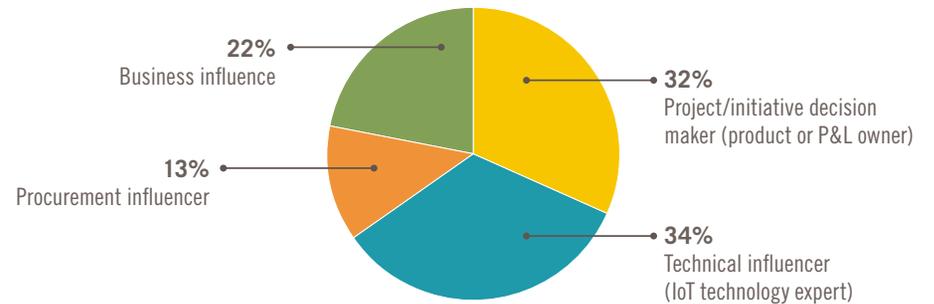
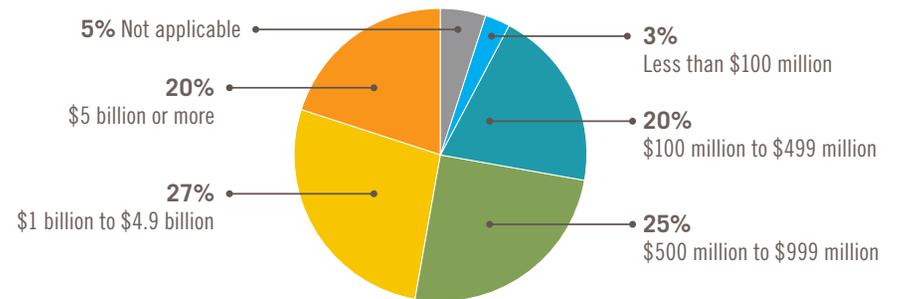


FIGURE 15: Selective Sample: Respondents' Annual Revenues or Budget

Most Respondents Report Revenues >\$100 million



Source: 2017 Internet of Things ROI Research Study, March 2017, n=158.

These early users have made investments in IoT without knowing what the ROI will be. As we suspected and discovered, the organizations most familiar with the technology, which have been using IoT for the longest period of time, are much more likely to be achieving their targeted returns. With experience responsibility for IoT flows from the technical experts in IT to more customer facing leaders in the corporate office, engineering and sales.

IoT has improved visibility internally through operational dashboards, and boosted uptime and quality by monitoring and reporting machine performance. On the customer side, of IoT has had the most impact on remote diagnostics of products and services. IoT has also supported the development of an analytical culture by expanding the ability of business managers to make smarter decisions using available data and advanced analytics.

In conclusion, IoT Leaders point to some of the factors that drive superior performance. Success starts with having a formal IoT strategy that's connected to the wider business strategy. Superior results come from effectively collaborating with customers and suppliers, and between internal functions. Success requires competent and timely project management. And it requires the ability to handle more data and analytical challenges by finding and developing the right talent. All of which is impossible to manage without senior leadership engagement and support.

Respondent Demographics

As noted in the Research Methodology, all participants in the **The Key Factors Driving IoT Success** (underwritten by SAS) are current users of IoT technology. They are also involved in the review and approval of IoT technology and analytics solutions as project decision makers, or as technical or business influencers.



The industries represented are diverse. They include non-automotive manufacturing (35%); automotive manufacturing, distribution and service (11%); R&D (9%); energy and utilities (8%); healthcare or health insurance (6%); Banking (6%); business services (5%); government/public administration (4%); and other sectors. Functional representation includes engineering, operations, corporate, marketing, business finance, purchasing, sales, and elected or appointed government officials.

Primary located in the United States or Canada, almost half (47%) of research participants' companies reported \$1 billion or more in annual revenues. A sizeable group (45%) reported sales from \$100 to \$999 million. And a small proportion reported sales of less than \$100 million (3%), or that they worked for non-revenue based government entities (5%).

[†] "First-Mover Disadvantage," *HBR*, Oct. 2001; "The Half-Truth of First-Mover Advantage," *HBR*, April 2005; "First-Mover Disadvantage," *Forbes*, June 2007.



This Research was Underwritten by SAS®

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