2017 IOT BUSINESS INTEGRATION INDEX

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ABOUT FUTURUM RESEARCH

Futurum Research provides research, insights and analysis to the market that help tie leading and emerging technology solutions to strategic business needs. The purpose behind each of our reports is to help business executives and decision-makers gain a better understanding of the technologies driving digital transformation, connect the dots between the practical business requirements of digital transformation and the forces that impact employees, customers, markets and experiences, and take appropriate action regarding critical digital transformation opportunities.

INTRODUCTION

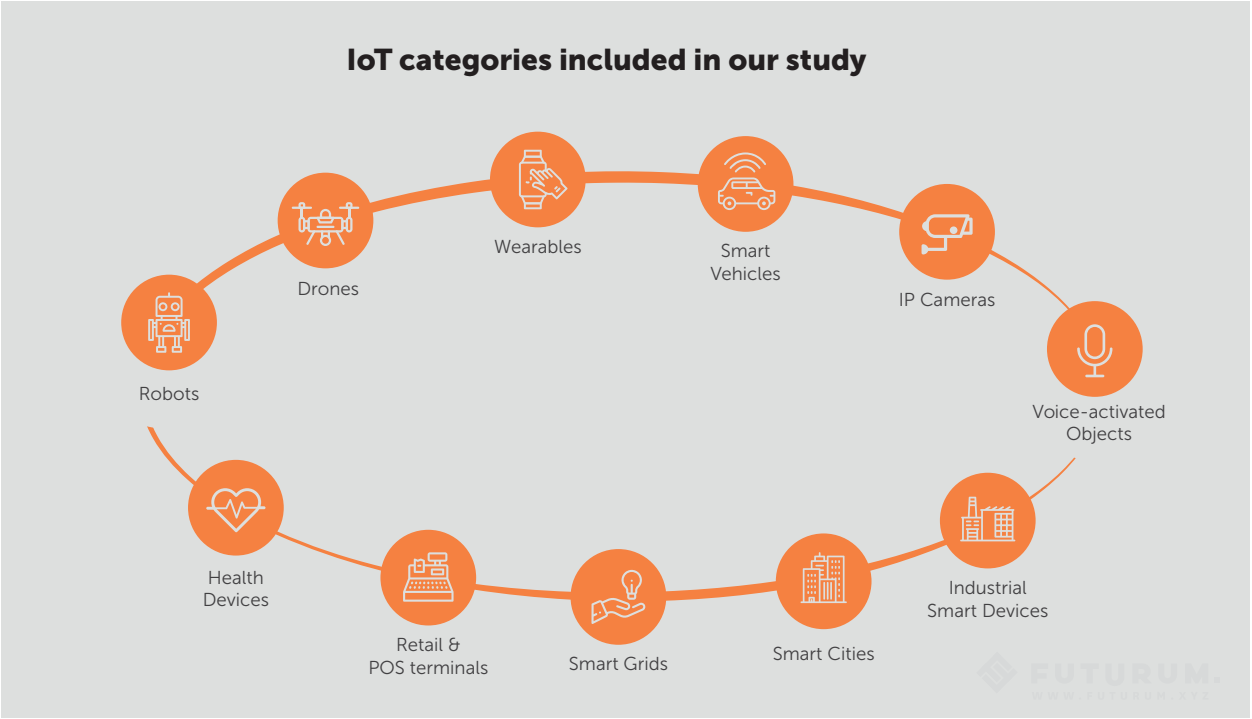
Welcome to Futurum's 2017 IoT Business Integration index.

In Q2 2017, Futurum surveyed 255 executives and decision-makers from key industry and innovation hubs across the United States, and asked them to share their thoughts on the near-future of the IoT. These industry and innovation hubs are located in California, New York, Texas, North Carolina, Illinois, Wisconsin, Georgia, Washington D.C., Alabama, Washington State, and Virginia. We were interested primarily in identifying common IoT adoption trends and friction points, as well as gauging 2017-2022 investment intent relative to specific IoT categories. All respondents occupy decision-making roles with budgetary authority. This report outlines our study's findings.

For a detailed breakdown of our respondents' professional roles, see Appendix A.

IOT FACTS AND FIGURES

The Internet of Things (IoT) refers to both the network of end devices that feature internet connectivity (usually excluding general-purpose compute devices like PCs and phones), and the communication that occurs between these objects and other Internet-enabled devices and systems. While macro IoT categories tend to focus on consumer-centric applications (like smart thermostats, smart speakers, and smart TVs), Business-centric applications (like connected healthcare and retail devices), and Industrial-centric applications (like manufacturing robots and self-managing utility grids), dozens of sub-categories (ranging from wearables and voice-activated devices to smart homes and smart cities), make up the IoT ecosystem as a whole.



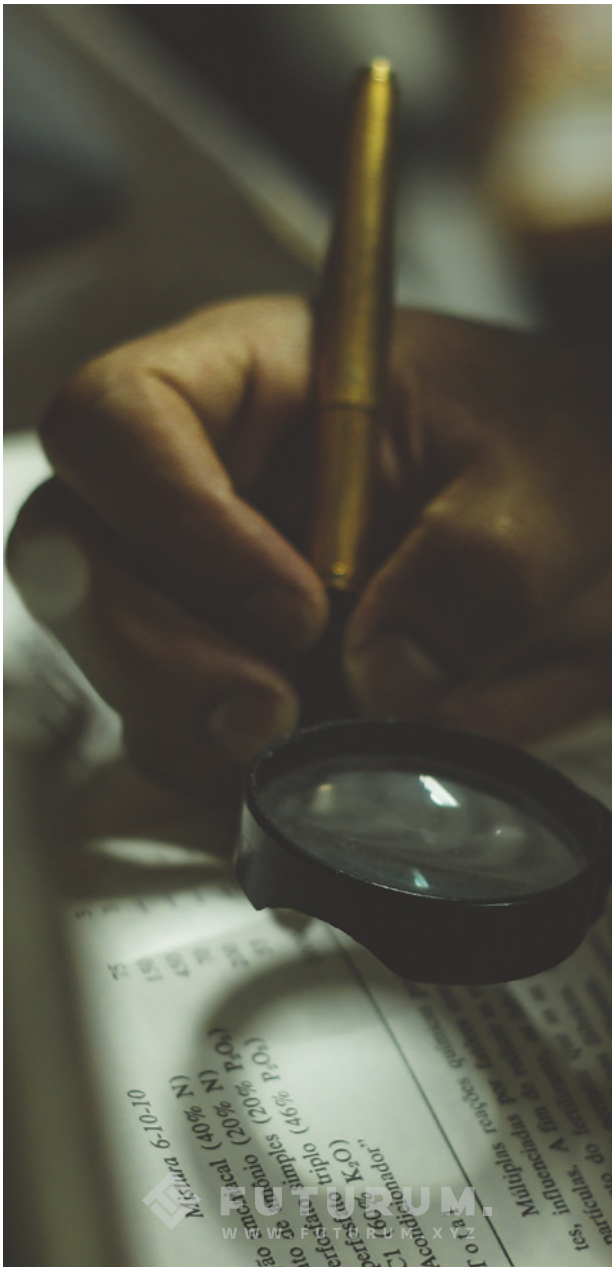
While estimating with any precision how large the IoT will be by 2020 can be challenging, given current growth trajectories, we put the global number of connected devices and objects in operation in 2020 in the neighborhood of 40-50 billion. As a point of reference, Qualcomm (a key global provider of IoT chipsets and IP) alone now ships roughly 1 million chips for IoT every single day.

> The Internet of Things (IoT) refers to the network of end devices that feature internet connectivity, excluding general-purpose compute devices like PCs and phones.

Our estimates put global spend on the IoT on track to reach $250 billion in 2020, with 40-45% of that amount going to products, and 55-60% going to services.

KEY FINDINGS

- Areas of greatest interest for IoT integration were operational efficiency, resource optimization, revenue increase, and corporate image/reputation.
- Areas of greatest concern were cost, security, complexity, and compatibility/ interoperability
- IoT categories generating the most interest from businesses are connected IP cameras, Virtual and Augmented Reality, wearables, retail and point-of-sale terminals, voice-activated speakers and objects, and manufacturing and industrial devices (IIoT)
- 54.2% of respondents report having already incorporated some IoT into their business operations, while only 13.8% report having a more mature IoT practice.
- 32% of respondents report no IoT integration whatsoever.
- 67.2% of businesses report having expertise equal to that of their competition while 22% consider their IoT expertise to be far ahead of their competition. Only 10.8% admit to their IoT expertise being far behind their competition.
- 92.9% of surveyed businesses are interested in the IoT. Only 7.1% reported not being interested in the IoT at all.
- 68.5% of surveyed businesses intend to see their investment in the IoT increase in the next 3-5 years.

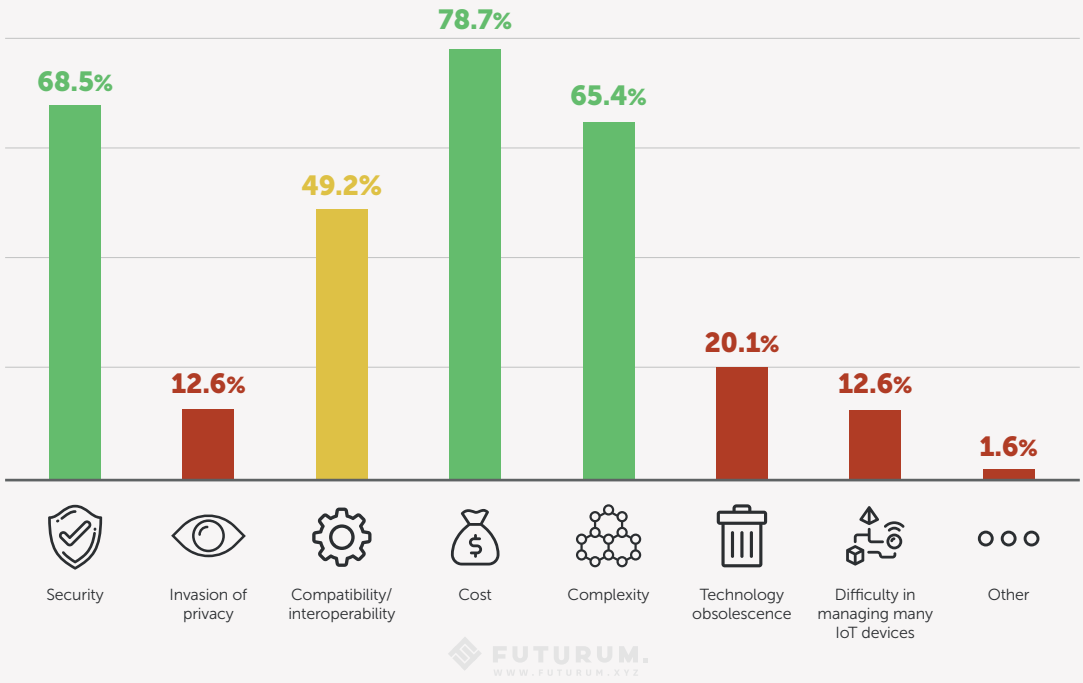


UNDERSTANDING THE SECURITY, COST, AND COMPLEXITY EQUATION

Unsurprisingly, concerns about security came up during our survey: 68.6% of respondents identified security as a major concern about the IoT in their organizations – second only to cost (78.4%) and only slightly ahead of complexity (65.1%).

What was unexpected, however, was that only 35.7% of respondents prioritized expertise in security from potential IoT vendors – well behind cost effective solutions (73.7%), easy-to-use solutions (63.1%), optimized and compatible platforms across devices (54.5%), and expertise in related spaces like connectivity (53.3%).

What concerns do you have about the IoT in your organization?

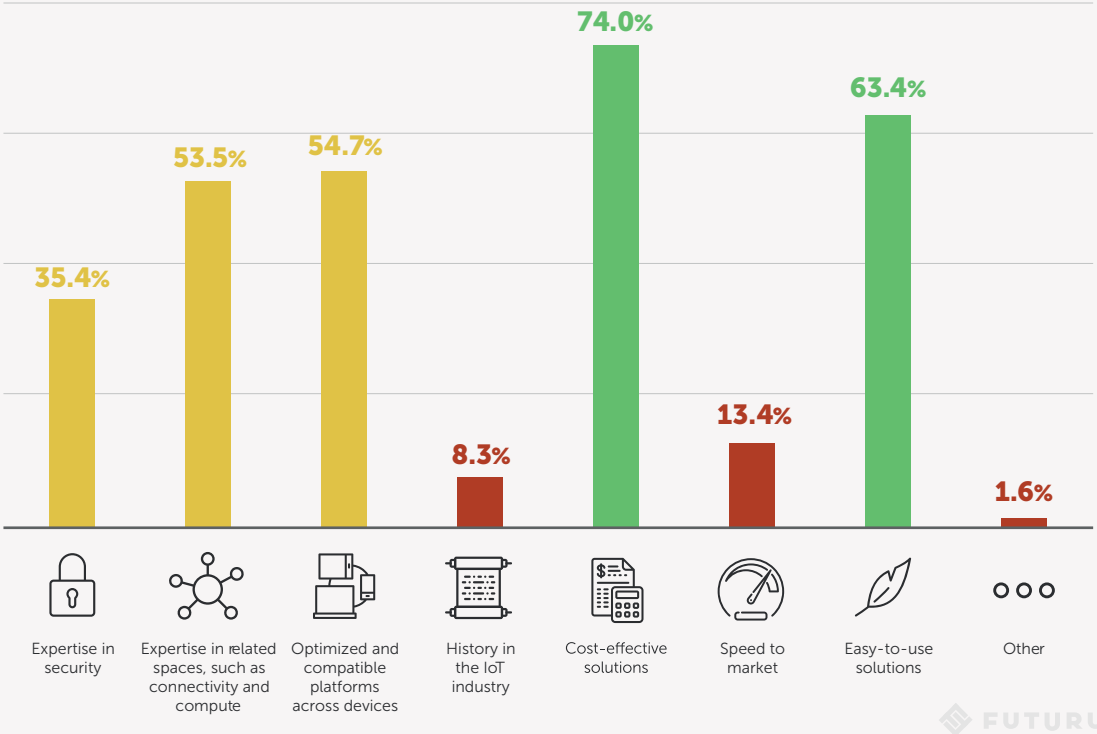


We believe that the disconnect between the 68.6% figure and the 35.7% figure denotes a gap between theory and execution when it comes to the subject of security and the IoT. In theory, survey respondents are aware that cybersecurity is a major concern for businesses, and that the IoT brings its own set of challenges and threats. They know that an IoT ecosystem must be protected top to bottom from hackers and other cyberthreats from the cloud down to individual devices. This is why 68.6% of respondents declared security as a top concern about the IoT. When it comes to execution, however, - where theory becomes a practical consideration that calls for specific action - we see that number cut almost in half, and our respondents' focus on security shifts from second to fifth place. We caution not to attribute this attrition of focus to the perception that cybersecurity is not critical to the IoT, but rather to the belief that IoT security can be adapted to devices and systems independent of IoT vendors – as a separate layer to be implemented

and managed either internally or by way of separate security solutions vendors. This approach is not ideal, as software-only security models remain vulnerable. A truly effective IoT security approach requires a combination of software and hardware, with hardware-based security features hardwired down to the silicon that powers IoT devices: Security features must be tightly integrated with the operating system, communication protocols, applications, and the Cloud.

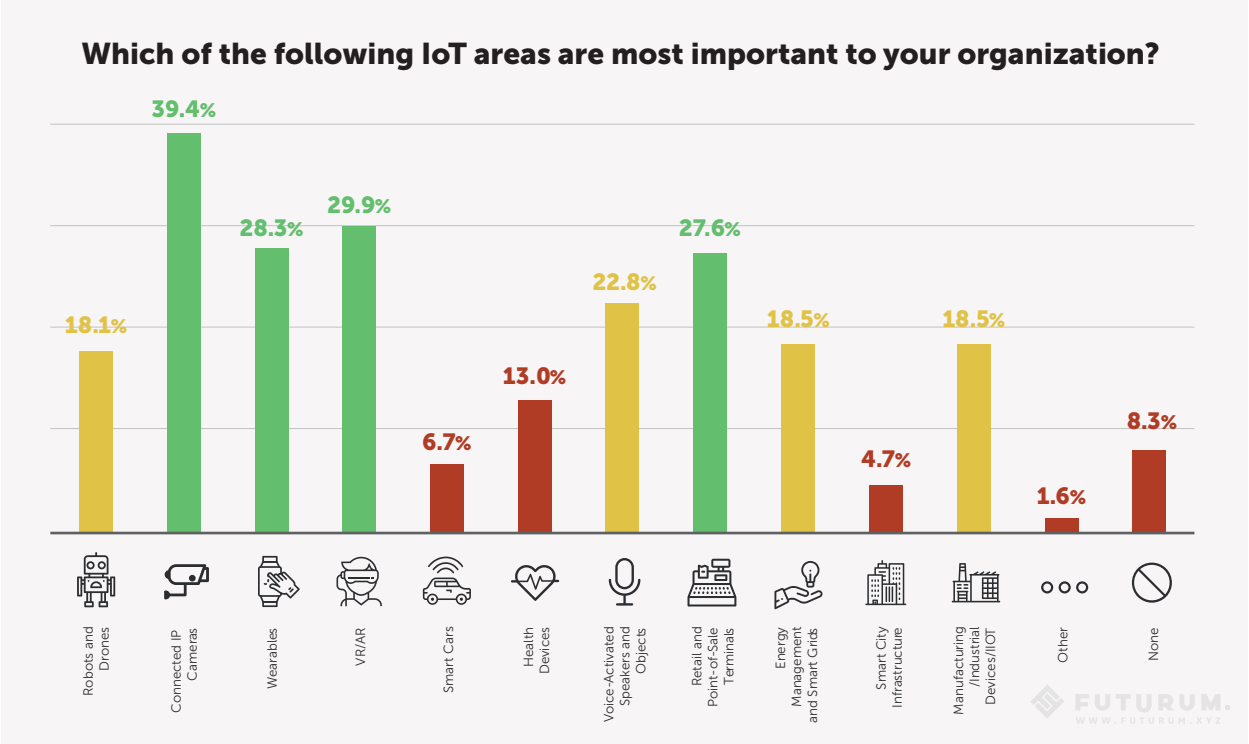
Cost and complexity seemed to cause more concern than security among the majority of respondents. As we already noted, 78.7% cited cost as their primary concern, and complexity came in less than three points behind security. Additionally, when asked which criteria they prioritized in IoT vendors, cost-effective solutions, easy-to-use solutions, compatibility across devices, and expertise in other areas (such as connectivity and compute), topped the list. This indicates that while most businesses surveyed are concerned about IoT security within the broad scope of cybersecurity, they will tend to favor IoT vendors with cost-effective price-points and low-friction IoT solutions.

Which of the following criteria do your organization use to select an IoT technology provider?



AR/VR'S IMPACT ON SPEED TO MARKET

We noted a strong correlation between organizations whose focus was AR/VR, and speed to market as a primary objective. While most organization's focused on operational efficiency, the AR/VR focused orgs appeared to be using (or planned to soon use) AR/VR as a means of accelerating their design process. Digging through the data, we noticed that the vast majority of AR/VR-focused respondents self-identified as Engineering rather than IT. This signals that the integration of AR/VR capabilities in design engineering, particularly as it relates to 3D modeling, is reaching an inflection point.



Note that as of yet, AR/VR technology vendors, from Oculus to Meta and Microsoft HoloLens to HTC, do not offer solutions that allow design engineers to migrate from screen-based 3D design-build interfaces to headsets and goggles. Currently, AR/VR headsets and accessories are used to proof, validate, and test three-dimensional designs rather than actively create them. We expect this to change in the next 12 to 18 months, as showcased by the partnership between AR pioneer Meta and 3D-modeling giant Dassault Systemes, but for now, AR/VR technologies don't support the entire virtual design-build lifecycle.

Having said that, the use of AR/VR technologies in the proofing and testing phases of product design and system design should considerably accelerate speed to market and consequently reduce operational costs. Although this specific use of (or approach to) IoT integration generally falls into the realm of operational efficiency, it stands in stark contrast to the broader trend towards leveraging the IoT to reduce operational costs by way of smart automation. In this specific context, speed to market is an active, dynamic, even aggressive approach to operational efficiency, while investments in smart automation tend to be more static and endemic to repetitive, predictable use cases (ranging from manufacturing and logistics to customer support and sales).

THE IOT AS A COST SAVINGS VEHICLE FOR IT LEADERS

One data point from our study reminded us of the ongoing global trend towards reducing IT costs: IT leaders, rather than being tasked with accelerating and scaling innovation for their organizations, are still being tasked with delivering cost reductions. While we believe that treating IT departments as cost centers rather than as innovation engines and business growth accelerators is myopic, we find that the results of our study reflect the pervasiveness of the "IT as a cost center" mindset.

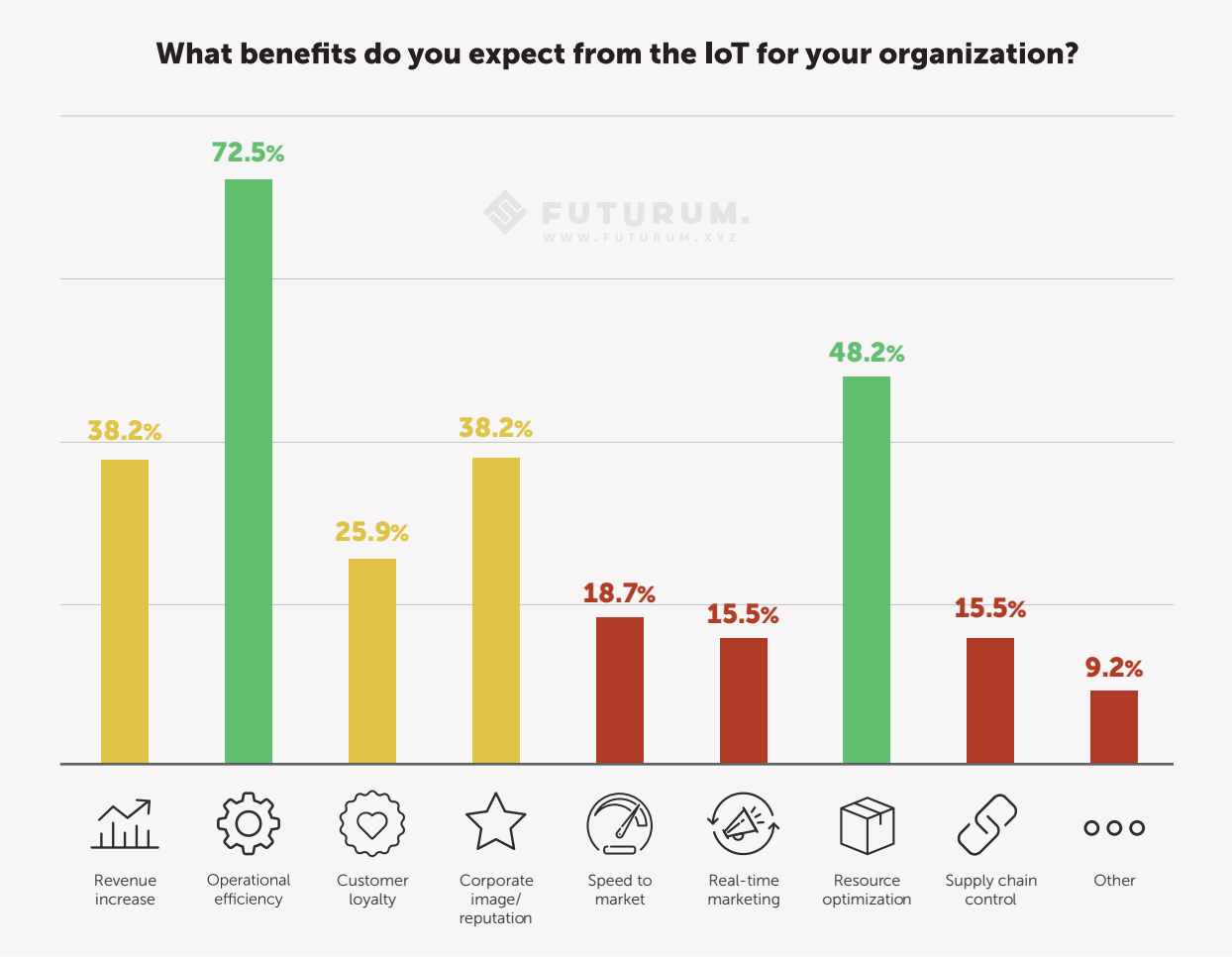
That data point is that the number-one concern among respondents was cost. Even if we set aside the "IT as a cost center" mindset, the focus on cost as a primary concern points to a key hurdle for organizations: the IoT's value relative to the perception of its overall cost to the business has not yet been effectively articulated.

How much has your organization already incorporated the IoT into its business operations?

We caution that no concrete numbers or figures appear to back this concern. When respondents were asked to elaborate on their answer, none could point to any specific reason why they expected IoT investments to outweigh potential benefits, financial or otherwise. We attribute this caution to a combination of two factors: The first is the emphasis on cost reduction prevalent in the IT world that we just brought up. The second is a lack of hands-on experience with IoT adoption and integration projects (across most industries). We note that 32% of respondents – nearly 1/3 – had not yet incorporated any IoT solutions into their business operations. Among the rest, 54.2% had only somewhat incorporated IoT solutions into their business operations. Only 13.8% of surveyed organizations reported strong or maturing IoT integration. What we derive from this is that uncertainty pertaining to the IoT's hidden costs is likely to be driving this bubble of risk aversion.

On the other hand, when asked what benefits to

their organization could be expected from the IoT, 72.6% of respondents pointed to operational efficiency, and 48% pointed to resource optimization. (Cost savings in various forms also came up as the leading answer in the "other" category.) As both operational efficiency and resource optimization fall under the umbrella of cost reduction, we find that concerns about the ROI of investing in IoT solutions may ultimately find a balance in a general expectation that the IoT will, at some point in the future, become a primary vehicle for IT-related cost reductions.



The cost-reduction theme comes up again when respondents are asked which criteria in selecting an IoT solutions provider is most important to their organization: Cost was the number-one answer with 73.7% of responses. Ease of use took second place with 63.1%, supporting our earlier observation regarding the general lack of hands-on experience – or fluency – with IoT integration.

In short, most organizations expect the IoT to eventually result in beneficial cost efficiencies, but aren't entirely certain that investments in IoT will yield positive ROI just yet. We believe that this confidence gap will be bridged by most organizations that currently fall into the "somewhat integrated" category over the next 12-24 months.

For both IT and line of business leaders, the challenge now is to determine when the ROI of investments in IoT capabilities will deliver a net positive outcome, and calculate – to the best of their ability – to what degree incorporating IoT solutions in their business will help them produce the kinds of cost reductions they have been tasked with delivering.

RETAILERS TURNING TO THE IOT TO INCREASE REVENUE

Retailers also stood out in the way they answered the survey. While small retailers focused mostly on investments into point of sale technologies (like tablets and card readers), larger retailers tended to also be focused on IP cameras. Further discussions revealed that the cameras were not intended solely as security and theft prevention tools, but, by leveraging machine learning and computer vision, also as analytics tools and real-time marketing vehicles.

Focusing on analytics, digitally-savvy retail-focused IT managers and sales leaders pointed to the cameras capturing customer traffic patterns in their stores, patterns in customer density per section over time, the amount of time customers lingered in high-value sections of the stores, and even facial expressions to gauge purchase intent. Though the survey did not specifically mention beacons and in-store sensors, several large retailers volunteered that they were already using sensors and beacons in their stores in order to track inventory, better understand customer behaviors, and create more personalized, friction-free shopping experiences.

WEARABLES, HEALTHCARE DEVICES, AND IOT-ENHANCED MEDICINE

We noted some overlap between wearables and healthcare devices, signaling that the market may have trouble separating the two categories. Follow-ups with respondents confirmed that while wearables are not necessarily healthcare devices, most thought of IoT healthcare devices mostly as wearables. We concluded that the majority of our study's respondents think of healthcare devices are a subset of wearables.

This is important because while wearables as a whole form a booming and promising IoT category for the consumer market, interest in wearables from the survey's business-focused respondents was at best lukewarm. When presented with wearables with specific uses, however, attitudes among them improved: The more specific the wearable's use, the more concrete the value proposition.

Healthcare devices in particular drew quite a bit of interest from healthcare-focused businesses, notably eldercare and outpatient care service providers. We identified two critical areas of focus among that group: Providers of assisted-living solutions working to integrate the IoT in the monitoring and machine-assisted living of elderly and disabled patients, and providers of health monitoring and remote care solutions for patients in recovery or managing chronic illnesses. The opportunities offered by the IoT to design safe, customizable, always-connected, self-managed environments for patients dealing with a broad range of health challenges were clear as day to those service providers. Of all the industries and verticals represented, they showed interest in the greatest number of IoT technologies.

Respondents also expressed a marked interest in fitness wearables and GPS trackers (for use with children and pets).

MARKET MATURITY, PERCEPTION, AND KNOWLEDGE GAPS: WHAT WE'VE LEARNED SO FAR

The final portion of our study asked respondents to select IoT industry leaders from a short list and connect them to specific IoT technology categories. This is what we learned:

1. The more familiar people are with an IoT category, the more confident they are in making judgments about its viability

We noticed that the amount of consumer-facing media coverage an IoT category received had an impact on how well respondents paired that IoT category to specific companies (versus leaving the question blank and skipping ahead). The more media-established an IoT category, the higher the degree of confidence from survey takers that they would be able to answer the question.

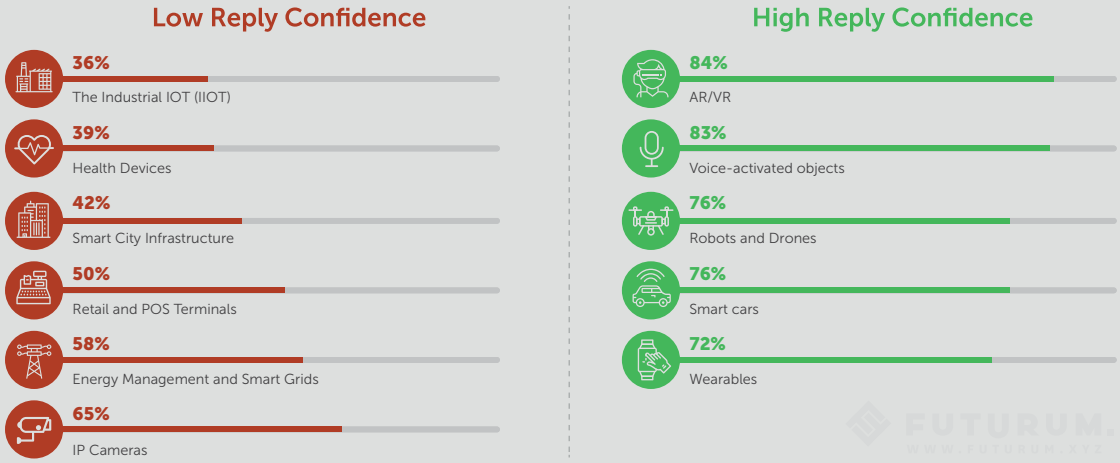
IoT categories with the weakest reply confidence were:

- The Industrial IoT (IIoT)
- Health devices
- Smart City infrastructure
- Retail and Point-of-Sale terminals
- Energy management and smart grids
- IP Cameras

IoT categories with the greatest degree of reply confidence were:

- AR/VR
- Voice-activated speakers and objects
- Robots and drones
- Smart cars
- Wearables

IoT Categories with strongest reply confidence vs IoT Categories with lowest reply confidence



High reply confidence denotes higher response rates. *Low reply confidence* denotes low response rates.

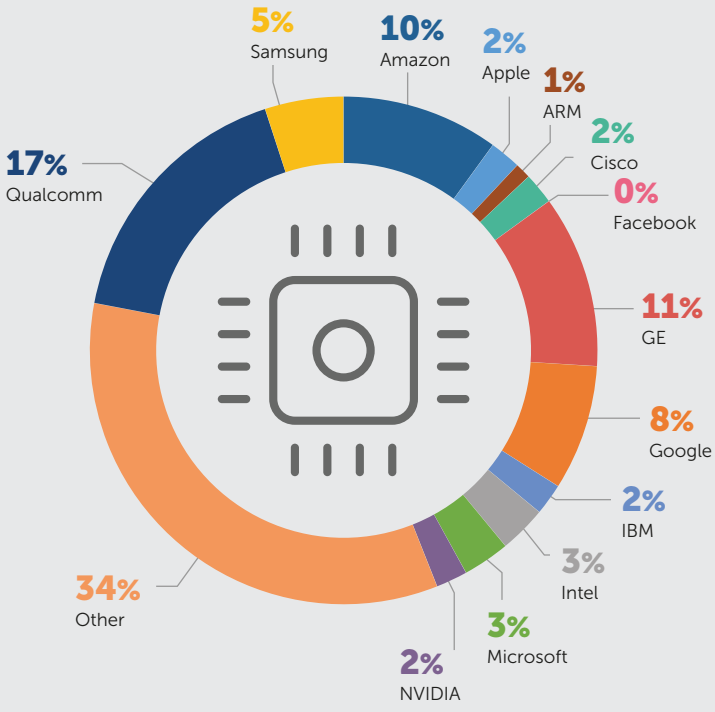
Not surprisingly, the more consumer-facing the IoT category, the more confidently survey respondents connected them to a specific industry leader, and the least consumer-facing, the more hesitation found its way into their replies. The more familiar respondents were with an IoT technology, the more likely they were to be able to point to an industry leader for that particular category.

2. Different roles = different perceptions of the IoT

We noted that different categories of professional roles tended to yield different degrees of knowledge regarding IoT-focused companies. For instance, technical roles like IT, Manufacturing, and Engineering were far more likely to identify chip makers like Qualcomm, Intel and NVIDIA as leaders in certain IoT fields, while less technical roles tended to point to consumer-facing companies like Amazon, Apple and Samsung.

For instance, among respondents whose jobs fall outside of technical fields, we discovered a strong affinity response linking market leadership in the Drone technology category to Amazon. When asked about this, respondents mentioned having read about Amazon delivery drones, and based their answer on the connection they perceived between Amazon and advances in drone technology. Another example also involves Amazon's perceived leadership, this time in the smart speaker space, because of its successful rollout of Amazon Echo. Among more technical respondents, however – IT and engineers – we found that their responses tended to focus more on the technology itself than media-driven associations, with respondents leaning towards chip makers.

Perceived Leadership in the IoT space



TOP PERCEIVED LEADERS AMONG CONSUMER BRANDS:

1. Amazon
2. GE
3. Google
4. Samsung
5. Microsoft

TOP PERCEIVED LEADERS AMONG IOT SEMICONDUCTOR AND IP COMPANIES:

1. Qualcomm
2. *Samsung
3. Intel
4. Nvidia
5. ARM

Note that respondents answered "Other" 34% of the time, suggesting that a significant number of other IoT companies are already seen as leaders in the industry. From the feedback we received, these companies include Tesla, Bosch, Dell, Fujitsu, Honeywell, Freescale, and Helium, among others.

** Samsung is both a semiconductor/IP company and a consumer brand.*

What this suggests is that a practical understanding of the IoT space can vary significantly depending on the type of role you occupy in an organization. A sales VP, a CEO, an engineer, and an IT manager may have entirely diferent frames of reference not only regarding the IoT, but individual IoT technologies and companies. This means that articulating the value of an investment in the IoT, or in a particular category of IoT technologies, must be approached as a multi-layered effort that must cater to individual spheres of understanding.

Rather than build separate pitch decks for each type of role that may want to learn more about an IoT technology, we recommend using a more holistic approach to the process, and breaking down the pitch or education into three parts: First, the technology itself must be explained. Second, specific use cases must be outlined to create context and concrete value. Third, relevant IoT vendors must be both identified and rated to help stakeholders gain a practical understanding of the vendor ecosystem.

Reframing Effective IoT Education

Explain the IoT technology.

Show use cases. Create context and value.

Identify and evaluate relevant IoT/Solutions vendors.

CATEGORY LEADERSHIP: THE IMPORTANCE OF PR IN ESTABLISHING MARKET PERCEPTIONS

We noted a strong relationship between perceptions of technology leadership in the IoT by certain companies and the amount of media coverage regarding that IoT category that focused on those companies. Note that these perceptions don't necessarily reflect market share or the full value of any company's contributions to the IoT space.

For instance, many of our respondents selected Google from our list of companies as the leader in smart car technologies. Most of the responses, however, indicated "other." When we went back and asked what "other" company our respondents had in mind when they participated in our study, respondents almost unanimously answered Tesla, which was not included on our multiple choice list.IT, engineering, and manufacturing professionals were more likely to identify chipmakers like Qualcomm, Nvidia, and Intel than automakers as leaders in the smart car space, but they were the exception rather than the rule. Most responses seemed informed more by media coverage of certain brands than by purely technical analysis or market penetration.

> Amazon's visibility relative to IoT technologies, first with the success of Echo and Fire TV stick, and with the volume of news stories reporting that the online retail giant is considering launching a drone delivery service, has created a strong perception of leadership in the IoT market.

A second example is the preponderance of respondents identifying Amazon as the market leader in the drones and robots category (although presumably more because of the drones than the robots). Again, the sheer volume of media attention being given to Amazon delivery drones appears to have informed most of those answers.

A third example involves smart speakers. While most respondents identified Qualcomm as the leader in smart speaker technology (Qualcomm chips are found in many smart speakers today), a significant number of respondents identified Amazon as the leader in smart speakers, largely because of the success of Alexa, Fire TV Stick, and Echo.

> Qualcomm was 3.6x more likely to be named as an IoT leader than the other chipmakers named in this study.

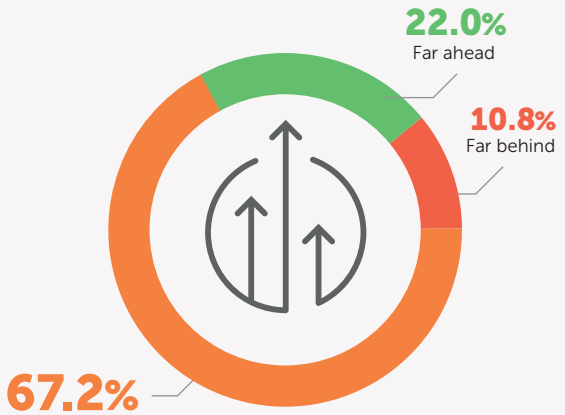
Our fourth and last example brings us to smart grids. Most of survey respondents selected GE as the leader in smart grid technology, not because of any particular product or solution, but because GE, a company heavily invested in energy products and infrastructure, seemed like the most logical choice in that category.

INVESTMENT INTENT AND COMPETITIVENESS

67.2% of respondents consider their IoT expertise to be more or less equal to that of their competition. This two-thirds proportion is consistent across the board, with similar responses whether companies have aggressively implemented the IoT into their business operations, only somewhat implemented the IoT, or not implemented the IoT at all. Note that this response does not constitute an objective and empirical evaluation of IoT expertise but, rather, a statement of perception.

We note that the 22% of respondents who firmly believe their IoT expertise to be superior to their competition were nearly three times (3x) as likely to intend to increase their investment in the IoT over the next 3-5 years than the rest of the respondents. Only 10.8% of respondents admitted to being behind their competition relative to their own IoT expertise.

How is your organization's IoT expertise compared to your competition?



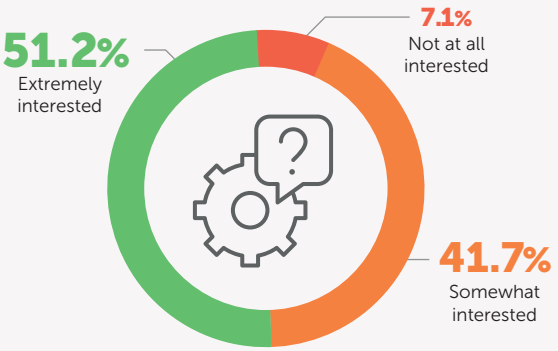
When asked about their interest in the IoT over the course of the next 3-5 years, an overwhelming majority of respondents (92.9%) acknowledged some degree of interest in the space. 51.2% expressed a strong interest, while 41.7% were somewhat interested. Only 7.1% of respondents were not at all interested in the IoT in the next 3-5 years.

When asked about investment intent, 68.5% of respondents signaled that their organizations were planning to increase IoT spending in the next 3-5 years, 28.7% replied that their spending would remain the same, and only 2.8% indicated that their IoT spending was likely to decrease. Among the organizations planning to increase IoT spending, 16.5% were planning to significantly increase their IoT budgets, while 52% expected those budgets to only somewhat increase.

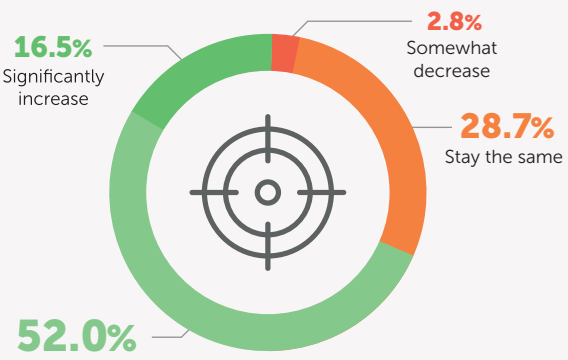
Note that investment intent was not necessarily indicative of high levels of expertise or interest in the IoT. For instance, many of the companies we spoke with that were at the forefront of IoT adoption in their respective industries, didn't expect their IoT spending to significantly increase due to the fact that their programs were already starting to mature. Conversely, companies that had until recently been reluctant to experiment with IoT solutions, and still showed merely marginal interest in the space, expected to have to significantly increase their IoT budgets over the next 3-5 years in order to either catch up or not find themselves left behind by their industry.

The most important insight we derived from this data is that 92.9% of companies acknowledge the IoT's potential, and 68.5% of them are already planning to increase their IoT budgets between now and 2022.

How interested is your organization in the IoT in the next 3-5 years?



How do you expect your organization's investment in the IoT to evolve in the next 3-5 years?



TAKEAWAYS

- 92.9% of surveyed businesses are interested in the value that the IoT might bring to their organizations over the next 3-5 years. Only 7.1% of businesses reported not being interested in the IoT at all.

- 68.5% of surveyed businesses intend to increase their investment in the IoT over the next 3-5 years.

- Areas of greatest interest for IoT integration are operational efficiency, resource optimization, revenue increase, and corporate image/reputation.

- Areas of greatest concern for organizations are cost, security, complexity, and compatibility/interoperability

- The 3-5 year window of opportunity for IoT vendors involves establishing a clear leadership in key IoT categories ("Company ABC is the leader in IoT categories X, Y, and Z"), addressing the complexity and interoperability objection (easy-to-integrate solutions will prevail, at least initially), articulating their solutions' net positive cost-to-value propositions (ROI), and appeasing concerns about cybersecurity relative to the IoT.

- IoT categories currently generating the most interest from businesses are connected IP cameras, VR/AR, wearables, retail and point-of-sale terminals, voice-activated speakers and objects, and manufacturing and industrial devices (IIoT).

- Over two thirds (68%) of surveyed organizations report having already incorporated IoT solutions into their business operations. Only one third (32%) of respondents report no IoT integration whatsoever.

- 67.2% of businesses report having expertise equal to that of their competition while 21.9% consider their IoT expertise to be far ahead of their competition. Only 10.8% admit to their IoT expertise being far behind their competition.

- While respondents were most confident identifying technology giants like Qualcomm, GE, Amazon, Google, Samsung, Microsoft and Intel as IoT category leaders, 34% of responses in our survey indicated "other." This suggests both a rich ecosystem of large, medium, and small IoT companies already establishing leadership positions in the space, and a healthy mix of category specialization across these companies.

APPENDIX A: BREAKDOWN OF SURVEY RESPONDENTS BY PROFESSIONAL ROLES

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