

AIoT

How IoT Leaders Are Breaking Away

Together, AI and the IoT are having a bigger-than-expected impact - and leaders report that the Artificial Intelligence of Things (AIoT) is becoming the key to competing effectively.

Based on the results of a global study conducted by IDC and sponsored by SAS, with the support of Intel and Deloitte.



Deloitte.



IoT

AI

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While some business leaders are just starting to see the performance potential of the combination of artificial intelligence and the Internet of Things – the Artificial Intelligence of Things, or AIoT – others are already beginning to put it to use. According to a recent global study of 450 business leaders across major industries, AIoT is making a faster and greater impact than expected.

Study respondents report that not only is the AIoT already generating results, but for organizations that are pursuing an IoT strategy, they say they cannot compete effectively without using AI. This is a striking study finding considering that only a few years ago, the IoT was in its fledgling stages, and AI developments were unfolding on their own track. While combining the two was not unthinkable, it did not seem like a practical reality. But that appears to be changing quickly.

Organizations that are merely weighing the possibility of implementing an AIoT strategy may find themselves being left behind within only a year or two. “The benefits from AI and IoT are enhanced when we put them together,” says Melvin Greer, Intel’s Chief Data Scientist. “An AIoT approach provides visibility from edge to cloud and drives analytics to smart connected devices. Today, organizations are accelerating the convergence of AI and IoT in consumer wearables, industrial machines and health care. AIoT not only moves compute closer to where the data is, but adds the intelligence required to improve reliability, efficiency and productivity.”

Oliver Schabenberger, Chief Operating Officer and Chief Technology Officer at SAS, says the rapid emergence of the AIoT is a natural progression for both technologies. “Organizations across many industries are rapidly adopting IoT capabilities,” says Schabenberger. “And what do IoT users tell us about their experiences? Most start with the tremendous amount of data being produced by these systems. On their way to becoming data driven, they have to find a way to make sense of the data. In that context, it is natural to ask how we can use AI to act on the IoT-generated data to deliver the full potential of the IoT.”

Jay Cei, Chief Operating Officer of Ulbrich, a global leader in metal manufacturing, agrees. “Data, data, data – it’s all about the data,” says Cei. “You have to be able to get it up to the platform, and once it’s there, you can do all these great things with it. That’s where we’re spending a lot of time.”

If you are weighing the potential impact of the AIoT on your business strategy, or simply seeking more powerful ways to realize the full potential of the IoT in your organization, these study findings are worth serious consideration.





90%
of respondents
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for IoT operations
reported exceeding
expectations
for value.*

The true value of IoT data is only realized when combined with analytics and AI

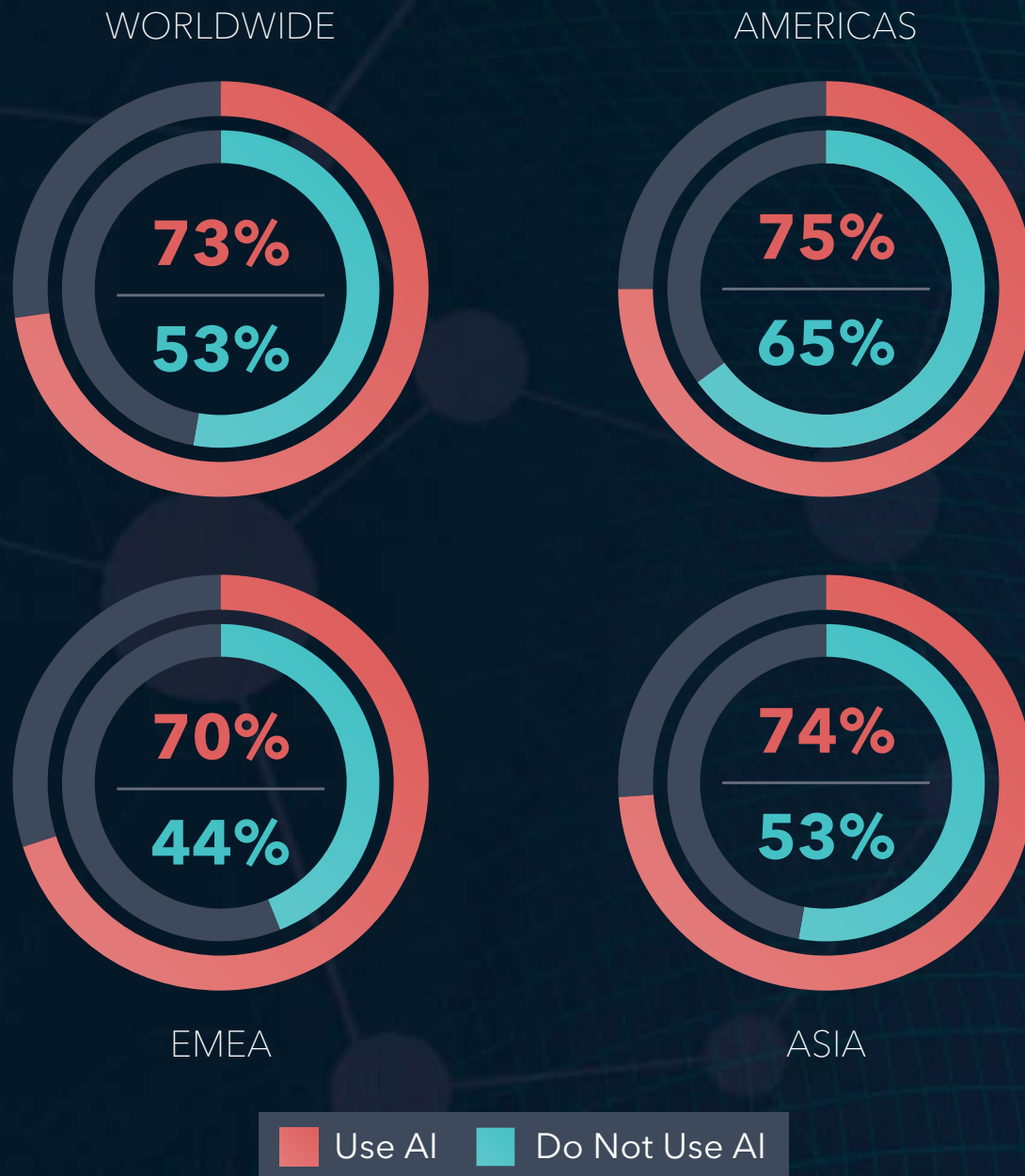
Our study showed that a significant predictor in an organization's ability to deliver value from the IoT across an enterprise is the heavy use of AI. Ninety percent of respondents heavily using AI for IoT operations reported exceeding expectations for value.*

Why does AI play such a significant role in the success of IoT initiatives? Most observers point to the challenge of using traditional methods when working with the tremendous amount of data generated by IoT systems. For Shak Parran, Partner at Deloitte Canada and Analytics leader for Omnia AI, this is no mere theoretical observation. "I was recently at a mining site where the company had more than 4,000 sensors, all feeding into their data processing systems," says Parran. "Over the course of a year, these sensors were generating a terabyte of numerical data. There's really no way for human beings to use all that IoT data without AI and analytics."

"In an IoT environment, AI closes the loop," says Chetan Gadgil, Director of IoT at Intel. "At that point you have the data, and you have AI capabilities learning from that data, and ultimately automating important choices and actions. Today most organizations using IoT capabilities are only at the first 'visibility' phase of the IoT, where they can start to see what's going on through IoT assets. But they're moving toward the reliability, efficiency and productivity phases, which are more sophisticated and will require significantly stronger AI capabilities."

According to Jason Mann, Vice President of IoT at SAS, companies are primarily focused on three core business objectives with their emerging AIoT capabilities. "We're seeing a lot of interest in using AIoT to achieve higher levels of operational efficiency, to improve top-line growth and to enhance customer engagement," says Mann. "For some, it's all of the above, although today we mostly see customers experimenting in one area, achieving success, and then expanding out from there."

FIG 1: WITH AI, IOT INITIATIVES EXCEED EXPECTATIONS*



Nearly 3 in 4 respondents said the combined value of AI and IoT capabilities exceeded their expectations*

Is the combination of AI capabilities with IoT implementations generating value? On this point, the study findings are clear. As seen in Figure 1, study respondents across geographies reported greater success for their IoT initiatives when using AI, with nearly three in four respondents saying that the value of combined AIoT capabilities exceeded their expectations.

For SAS' Oliver Schabenberger, the key to driving long-term, sustainable value lies in an organization's ability to operationalize AIoT capabilities. To operationalize, an organization must push beyond isolated implementations and proofs of concept to deliver AIoT capabilities at scale throughout the organization. "The only way to increase the scale of AIoT throughout the organization is to increase the level of automation," says Schabenberger. "So many CIOs I talk with say automation is a primary focus, to make IoT-related analytics insights consumable by business analysts and others, not just the data scientists."

What sort of expectations do business executives bring to their AIoT initiatives? The answer likely hinges on the maturity level of those initiatives. "Some people are just happy to achieve a new level of visibility into their business, because that's their job at this moment - and that's a good start," says Gadgil of Intel. "But once they achieve that visibility, they're going to start looking for other benefits like improved reliability. Most of the organizations I see applying AI to IoT efforts are currently at the availability/visibility of data phase, which is appropriate, but I expect that to continue changing as their efforts mature."

Senior leaders already believe the combination of AI and the IoT is strategically important

For business and technology leaders seeking support for their AIoT plans, this study included encouraging results. Specifically, not only are senior leaders overwhelmingly involved with IoT project decisions (79%), but 92% of those senior leaders say that AIoT value exceeds expectations. These decision makers see the value and potential of AI in combination with IoT investments and should be approached as advocates rather than skeptics.*

A closer reading of these results uncovers a number of interesting dynamics at work under the surface. For senior leaders, AIoT successes appear to be far more apparent than for those on the functional and technical teams implementing AIoT projects [Figure 2A]. For example, 25% of data scientists say that the use of AI along with IoT "significantly exceeded expectations," while 56% of senior leaders said the same.

For Deloitte Canada's Parran, this matches up with his day-to-day experiences working with clients. "When I talk to senior executives, they are certainly excited about the potential of AIoT initiatives," says Parran. "In my experience, senior executives tend to be a lot more optimistic than those at other levels in the organization - it's kind of a requirement for the job."

FIG 2A: AIoT PROJECTS SIGNIFICANTLY EXCEEDED EXPECTATIONS*

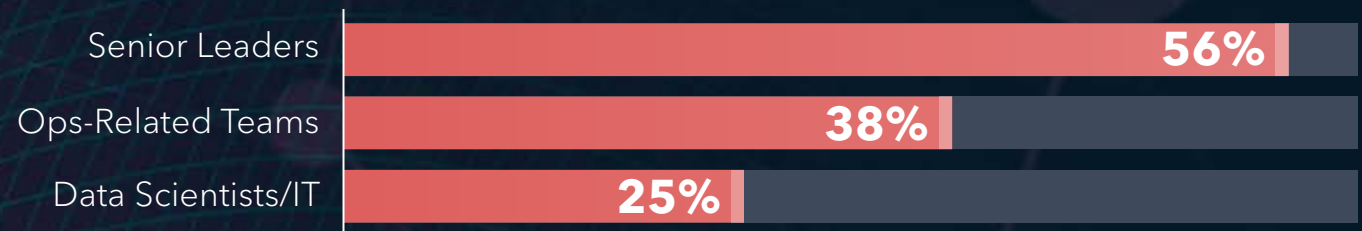
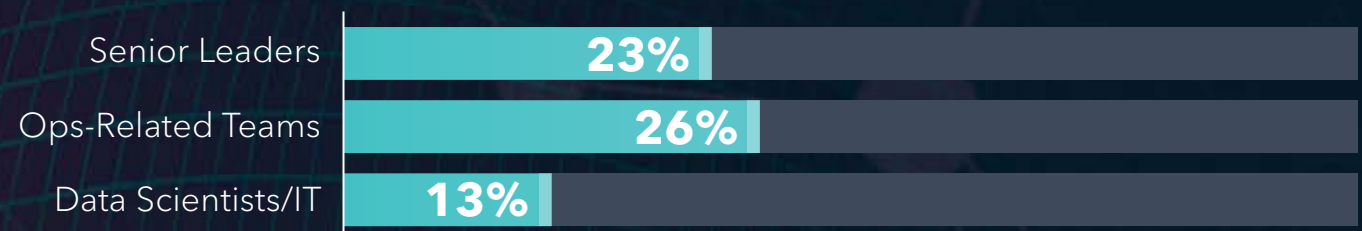


FIG 2B: IoT PROJECTS SIGNIFICANTLY EXCEEDED EXPECTATIONS*



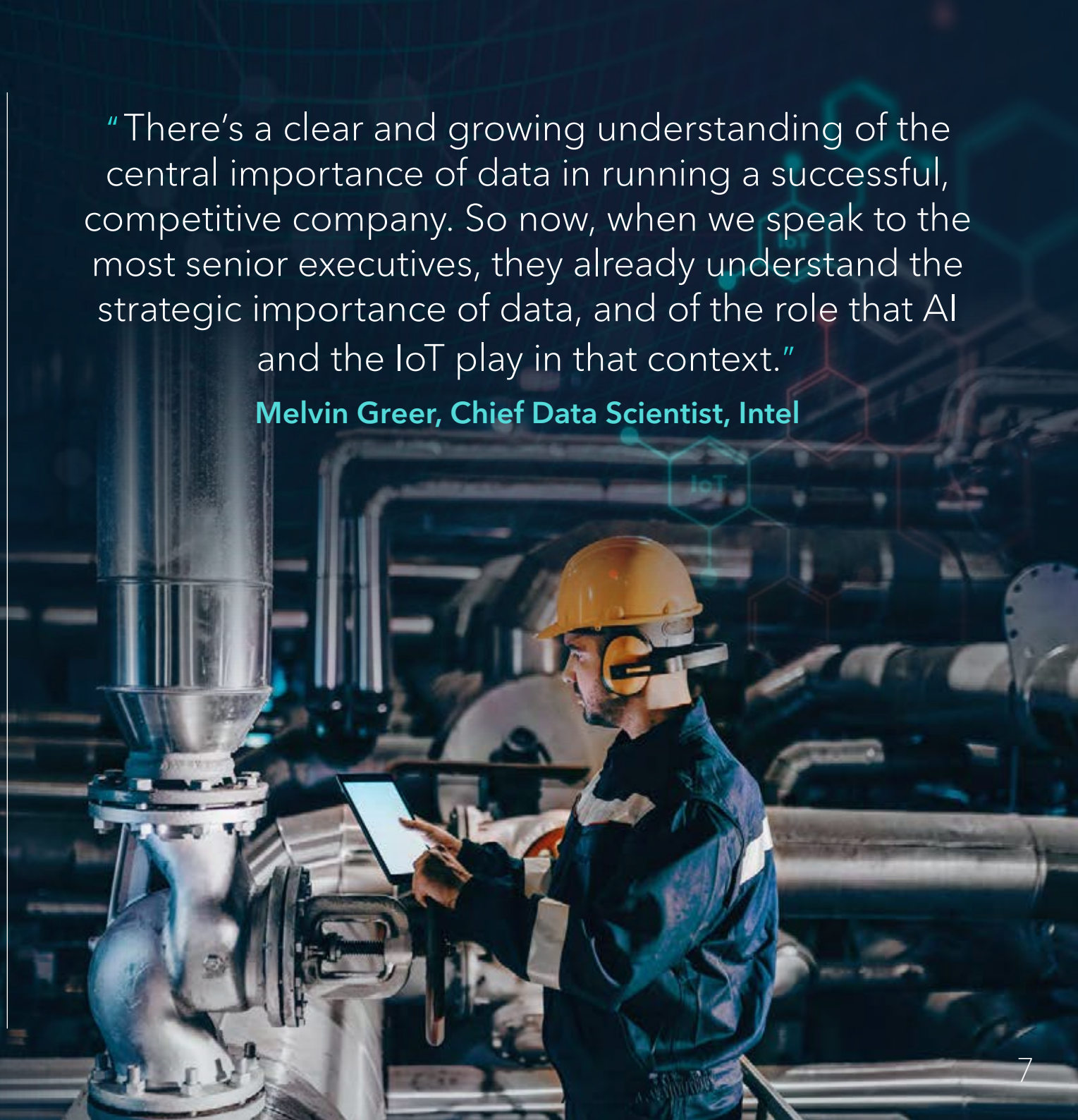
"But there's also the practical reality of putting these capabilities to work," says Parran, "and that's where data scientists may be a little more pessimistic. They know that their data has to be cleaned up, they have to teach machines to do the right things, their processes have to be optimized, and so on. They see the obstacles, because that's what they're responsible for navigating."

Similarly, executives are far more likely to see the enterprisewide positive impact that AIoT initiatives are driving - benefits that may be less visible for those who are more operationally focused. "Over the past 24-36 months, we've seen ample evidence of chief data officers moving into the CEO office," says Intel's Greer. "There's a clear and growing understanding of the central importance of data in running a successful, competitive company. So now, when we speak to the most senior executives, they already understand the strategic importance of data, and of the role that AI and the IoT play in that context."

Regardless of the reason, the takeaway is clear: Those looking to implement AIoT capabilities should start by seeking executive support. This will be important throughout the life of the initiative, according to Deloitte Canada's Parran. "These initiatives really have to be on the CEO's agenda," says Parran. "He or she needs to be repeatedly saying 'this needs to happen in our organization.' You can't have a successful AIoT initiative without the business initiating it, period. These are really business initiatives - not technology initiatives."

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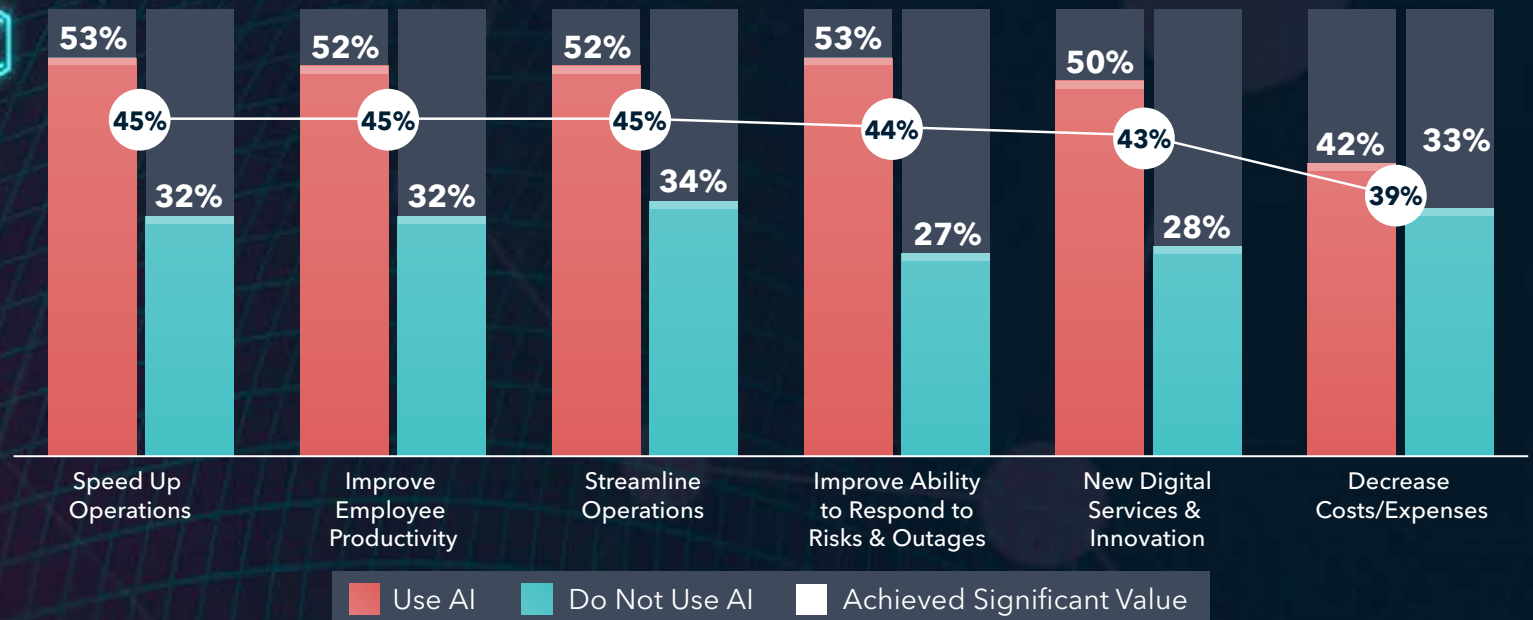
Companies that use AI and IoT together are more competitive than those using only IoT

One of the most striking findings from our study is the wide gap in competitiveness between those who are using AI in tandem with their IoT initiatives, and those who aren't.*

Those who have developed an AIoT capacity report much stronger results across a number of critical organizational goals - everything from their ability to speed up operations and introduce new digital services to improving employee productivity and decreasing costs. In every case, there are double-digit percentage differences between those who say they are achieving significant value and those who aren't - with AI making the difference.

As shown in Figure 3, respondents who use AI in combination with IoT reported a greater likelihood of achieving significant success across six major initiatives when compared with those who do not use AI. The difference between these two groups suggests a value gap: Enterprises that use AI across their IoT initiatives are more likely to achieve significant success than their non-AI counterparts. Seen another way, when two organizations using IoT compete with one another, the competitor using AI is more likely to achieve significant success. AIoT enterprises appear to be more competitive than IoT enterprises.

FIG 3: GAP IN COMPETITIVENESS BETWEEN AIoT AND IoT*



"In these results, we're seeing that organizations working with IoT data realize that if they want to get the real value out of it, they need AI and analytics," says SAS' Schabenberger. "They're using AI and analytics techniques to operate on their IoT data, as they should. I think it's fair to say that most successful IoT operations are actually AIoT operations."

Chris Donovan, Executive Director of Enterprise Analytics at the Cleveland Clinic, is actively bringing together all these threads in practice. "We think of it like a pyramid, where at the top there are some really advanced applications leveraging AI and machine learning techniques," he says. "But we're also driving analytics maturity across the entire organization, so that people who are never going to write code or understand the math can use the results of those kinds of techniques to make better decisions, become more efficient and achieve other goals."

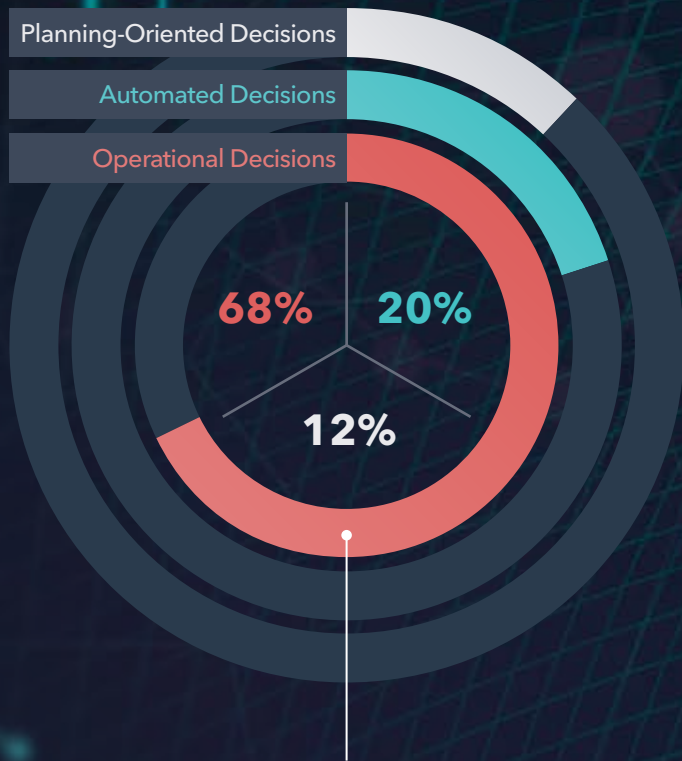
Andy Daecher, the leader of Deloitte Consulting LLP's U.S. IoT practice, sees the practical benefits of this approach. "It's difficult for me to separate AI and machine learning from IoT," says Daecher. "Every IoT project we're involved with has a heavy AI and analytics component. We're collecting and analyzing large data sets, which is not necessarily new. What's different is the need to do it all in real time at such large volumes."

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Oliver Schabenberger, COO and CTO, SAS



FIG 4: IoT DAY-TO-DAY DECISIONS*

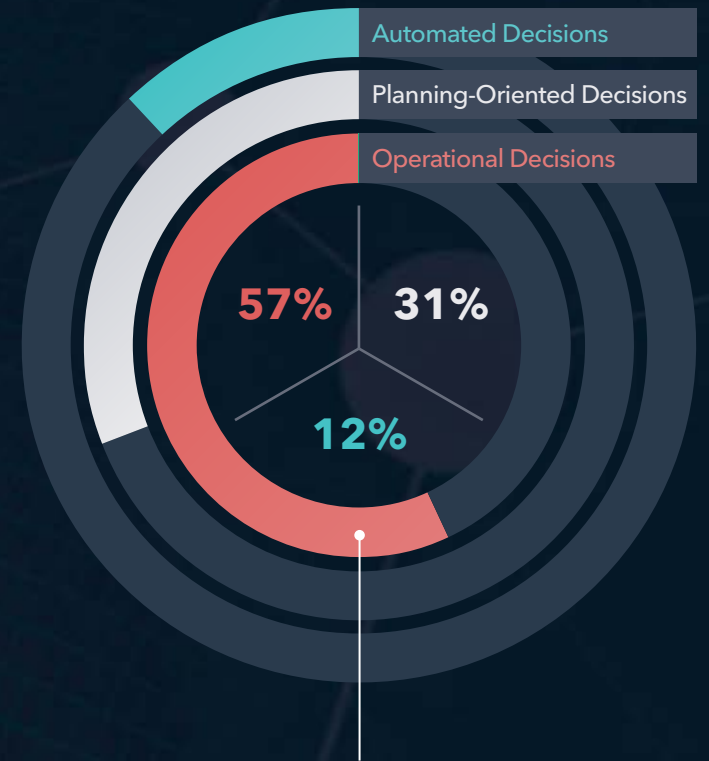


Spreadsheets and other non-AI technology dominate day-to-day decisions about operational problems.

AIoT capabilities play a bigger-than-expected role in rapid planning processes

As shown in Figure 4, companies that rely on IoT data to inform day-to-day decision making use it overwhelmingly for operational decisions (68%), using spreadsheets and other non-AI technology. Only 12% of respondents use such data to inform planning decisions. But when AI enters the picture, the number of respondents using this data for day-to-day planning nearly triples, increasing to 31% (see Figure 5).

FIG 5: AIoT DAY-TO-DAY DECISIONS*



Efforts to speed up planning primarily use AI.

This is an important leap, signaling that AI opens the door to more sophisticated and rapid decision making that affects results in a more expansive way. It shows that using AI broadens the focus from operational decisions ("Is it running or not?") to decisions about supply and demand, product quality, spread of illness in a hospital or health care facility, merchandising, etc. "Put yourself in the shoes of the CEO," says Intel's Gadgil. "They're focusing on issues like productivity, but they're also looking for the next opportunities for transformation in their business. To thrive in the future, they're going to need more from their technology investments, and they're pushing their organizations to connect the dots and see how some of these new technologies can contribute."

For Gautam Khera, Senior Director at Western Digital, a leading data storage company and manufacturer of hard disk drives, AI is already having a practical impact on the company's IoT strategy. "We're building these devices - how do we build them and learn fast?," says Khera. "How do we ensure the quality, the yield, how do we get a faster time to market, time to cost? Now we're really using AI schemes to help us do that internally in our development processes, in our R&D, and in our factories."

IDC researcher Maureen Fleming, Program Vice President for Intelligent Process Automation, agrees. "Improving the speed of data refresh in collecting sensor data combined with AI expands an organization's ability to focus on immediate planning, while also quickly identifying and resolving operational problems," says Fleming. "The combination produces greater agility and more efficiency."

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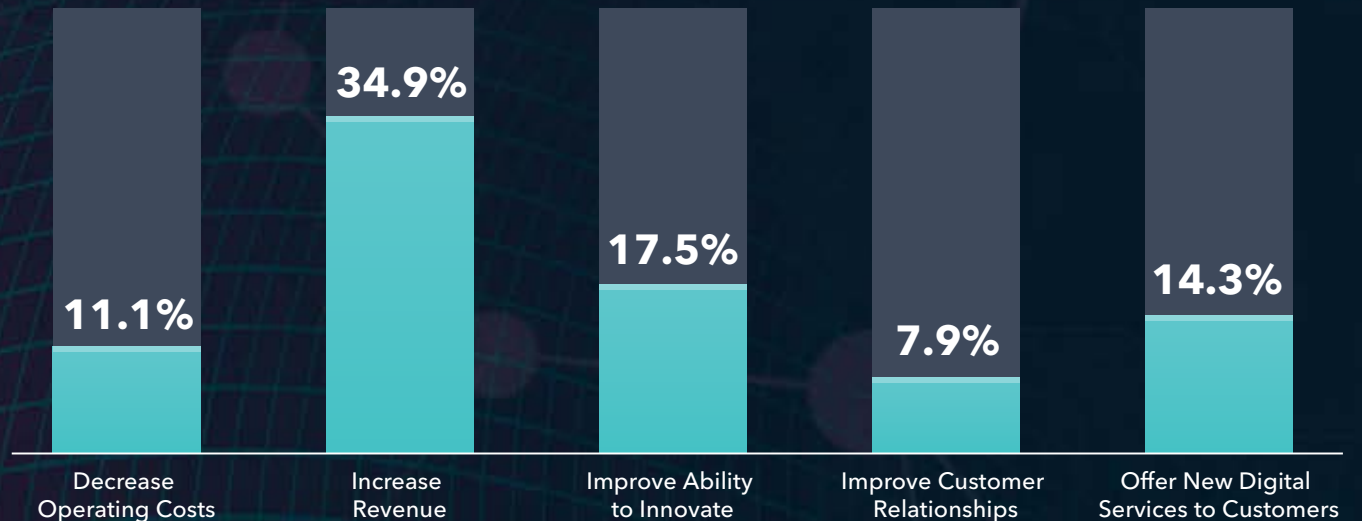
IoT IN CONTEXT

The emergence of AI as a major force in IoT efforts arrives against the backdrop of several important IoT-related trends that must be considered in any conversation about AI and the IoT. On everything from the benefits they hope to achieve with IoT to the analytics techniques they're already using, here are some critical pieces of context for understanding the broader business environment in which these technologies are being deployed.

Increased revenue is the top goal for IoT efforts*

While there are a wide range of goals for IoT initiatives, ranging from decreased operating costs to an improved ability to innovate and offer new digital services to customers, increased revenue tops the list for senior leaders across geographies, industries and companies of all sizes (see Figure 6). For SAS' Jason Mann, this is not so surprising. "We see huge implications for efficiency with the IoT," says Mann. "But at the same time we are very aware that company leaders are facing huge pressure to deliver top-line revenue growth. IoT adopters are certainly not going to abandon their pursuit of efficiency benefits and other categories of benefits, but within the executive ranks, it's all about revenue. Those who are responsible for combining AI and IoT capabilities for their organizations would do well to remember this as they develop their long-term strategies and continue down the path to implementation."

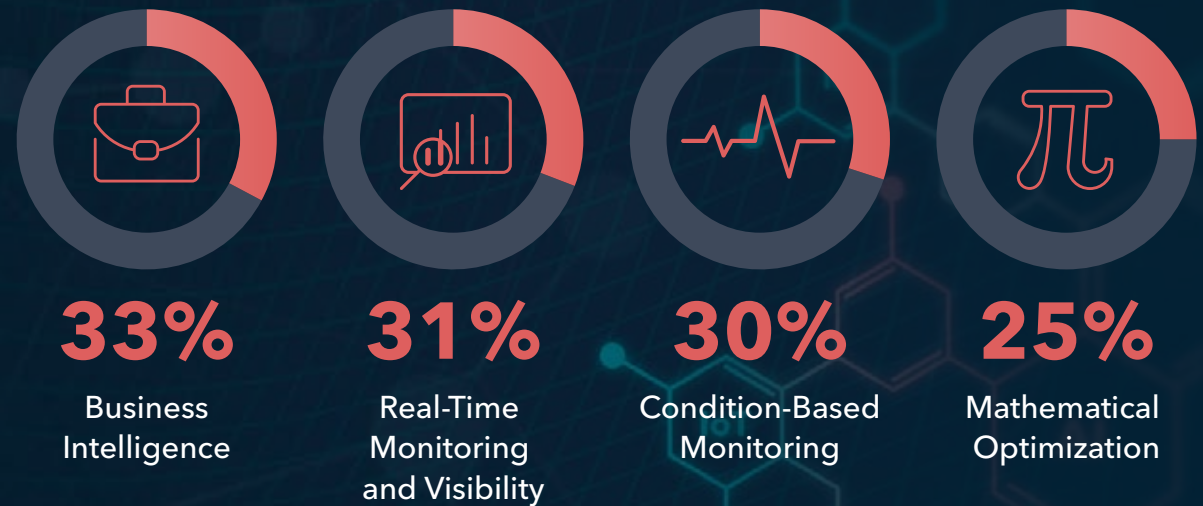
FIG 6: WHAT IS THE SINGLE MOST IMPORTANT AREA OF IMPROVEMENT YOUR ORGANIZATION EXPECTS TO ACHIEVE COMPANYWIDE FROM ITS IoT EFFORTS?*



Analysis techniques used with IoT data are in flux*

When asked which analysis techniques they used with their IoT projects, respondents were all over the map. Business intelligence (33%), near real-time monitoring and visibility (31%) and condition-based monitoring (30%), topped the list, with other capabilities such as mathematical optimization (25%) close behind. For Deloitte Consulting's Daecher, this fits a predictable pattern. "The first step is connecting the machines and starting to gather data," says Daecher. "For many of the companies we work with, just the ability to see and monitor all that data is a big first step. But as you start to see those signals coming in, in real time, you begin to develop the ability to filter them, correlate them, to understand and even anticipate when certain conditions are occurring repeatedly - to see patterns. So today I would expect to see near real-time monitoring and visibility, along with condition-based monitoring, figuring prominently in these responses. But as we look ahead, I expect we'll see more sophisticated analysis techniques being used more widely by these companies."

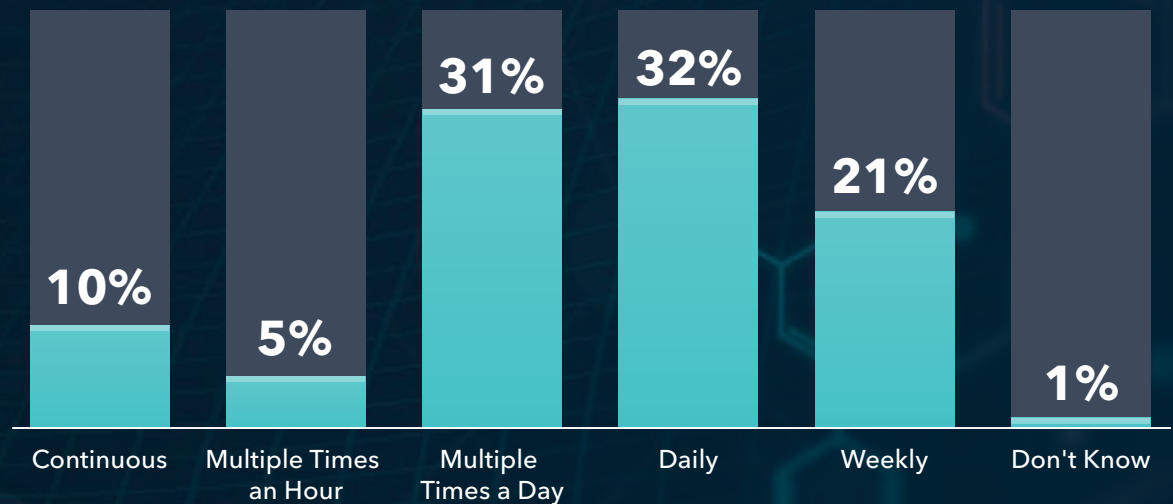
FIG 7: MOST COMMON ANALYSIS TECHNIQUES USED WITH IoT DATA*



Most are receiving refreshed data at least daily*

When asked how often their organizations are receiving sensor data in their analytics environments, 78% of respondents indicated that their data refresh cycles were either daily, multiple times a day, multiple times an hour, or continuous. For Deloitte Consulting's Daecher, attaining the robust levels of frequent data updates desired in an IoT/AI/ analytics environment takes time. "Every company has a mix of newer, more digitally oriented assets, alongside older assets that aren't necessarily connected. For an easy example, consider the automobile manufacturer that is releasing a line of connected vehicles today, but also contending with older models that aren't connected. It's difficult to retrofit many of these older assets - and it can take a while."

FIG 8: DATA REFRESH CYCLE*



What's next: Large-scale operationalization

These study results paint the picture of a quickly emerging, powerful combined capability – one that has been tested in the labs as pilots or proofs of concept and is already in the process of being rolled out more broadly within organizations.

This is a view shared by Deloitte Consulting's Daecher. "Among our clients, we've seen a lot of leaders who have already proven what they set out to prove with AI and their IoT investments, and are committing to more implementations," says Daecher. "In the last 18 months, we've seen many more clear, measurable commitments to these initiatives – more investments and more organizations rolling these capabilities out to multiple product lines, plants and locations. That's the big shift that's underway."

To be sure, many challenges await. Jason Mann at SAS says, "It's one thing to show that you can apply an AI concept to a data set and generate results. But full deployment has to happen in the context of an operational infrastructure. For example, maybe your infrastructure is comprised of a cloud, distributed into an on-site gateway device using prebuilt umbrella security procedures. As a practical matter, that's the infrastructure your AIoT efforts need to operate within. That's operationalization, and it's where too many AIoT efforts have lost momentum to date."

As companies move ahead with the goal of operationalizing their AIoT strategies, there are **five** areas that warrant special focus:

Commercialization

As with any new or swiftly advancing technology, adoption tends to pick up speed when proven commercial solutions become more widely available – particularly those that target repeatable, known problems or opportunities. While combined AIoT solutions targeting specific, clearly defined challenges are not yet broadly available, they're likely on the way – and will accelerate the pace of AIoT adoption across industries.

Cross-industry adoption

AIoT models, tools and approaches developed for one use case tend to be highly adaptable to others. "Think about an oil and gas practice that has built a great model for anticipating problems in operations," says Intel's Gadgil. "That same model could be highly applicable to health care companies trying to better manage their MRI machines, or to utilities facing similar problems." Companies and entire industries will be looking for ways to borrow and adapt ideas from one another, so they can quickly adopt and scale practical solutions, accelerating innovation and risk reduction activities.



C-suite led

As with any important technology initiatives, AIoT projects that target clear business goals, in alignment with overarching business strategies, are those most likely to be successful in the long run. "I have yet to see an AIoT initiative succeed without it starting as a business initiative sponsored by an executive," says Deloitte Canada's Parran. These projects tend to receive sufficient funding from the start and successfully make the leap from test case to implementation, which is where many AIoT initiatives stall. As awareness of the potential of both AI and IoT capabilities grows within the C-suite, business and technology leaders should plan on working together to identify compelling use cases and pursue initiatives with clear business cases. Revenue targets are expected to figure heavily in these cases.

Recruitment and training

The challenge of finding talented professionals capable of delivering on the promise of advanced AI, analytics and IoT technologies is already widely understood and will continue to be relevant in the context of AIoT initiatives. "You need people who not only have a deep understanding of data science and analytics, but who know how to move a data center capability for analytics to the edge," says Intel's Greer. "Finding those people is not easy - we don't even have a curriculum focused on AIoT in any major university today." This means that in order to realize the benefits of AIoT capabilities, companies need to be actively recruiting for the talent they will need - and growing the skills of those already in their organizations with the capacity to develop these skills.

As the results of this global study show, some companies are well on their way to large-scale operationalization of AIoT capabilities. As these companies realize their first broad AIoT victories and gain a competitive edge as a result, pressure will only grow among those who have taken a wait-and-see approach. This race to operationalize AIoT capabilities may be one of the defining trends in business and IT over the next decade. If your organization is still watching, waiting and plotting its first moves, the findings of this study suggest that it is time act as these capabilities mature and enjoy more widespread adoption.

Ethics

The ethical implications of AI are already being examined and challenged in a society becoming more attuned to the growing role that these technologies play in our lives today. Model bias, privacy and security issues are only the starting points of this conversation. If anything, combining AI with far-flung IoT capabilities only raises the stakes. Organizations that are already developing ethical standards to guide their technology usage in these areas must also be working to address the combination of AI and IoT; those that are not yet considering the ethical implications should be actively planning to do so.



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