Forbes insights

ARTIFICIALLY INTELLIGENT DATA CENTERS:

How the C-Suite Is Embracing Continuous Change to Drive Value

TABLE OF CONTENTS

INTRODUCTION

Now that digital transformation (DX) is well underway at large and midsize organizations around the world, progressive companies are taking the next logical step: forging IT transformation (ITX) strategies to create artificially intelligent data centers. These data-driven IT infrastructures gather large amounts of business and operational information and then leverage artificial intelligence (AI), machine learning (ML) and predictive analytics for automation and continuous-learning capabilities that support DX in powerful new ways.

"As part of our transformation process, IT is forming closer relationships with our businesspeople and product development groups to enable P&G's ability to win," says Alan Boehme, global chief technology officer and chief of innovation information technology at the consumer products giant Procter & Gamble. "It's a recognition by the company that IT is the business and the business is IT. These areas are merging into one."

Unfortunately, too few executives understand this reality and, as a result, aren't addressing the parallel need for ITX and DX, as indicated by a new survey of 512 global executives conducted by Forbes Insights, Dell EMC and Intel. Yet there is a select group that sees the need for artificially intelligent data centers to advance DX goals.

Who are these leading companies, and what benefits are they seeing as a result of their efforts? In the Forbes Insights, Dell EMC and Intel survey, leaders are those who consider themselves DX innovators or first movers in their markets and say their transformation efforts exceed expectations. These DX front-runners were two times more likely than laggards to have seen revenue gains of 7% or more in the past year thanks to the application of disruptive technologies, such as artificial intelligence, the Internet of Things and blockchain, within their IT infrastructures. Note, laggards are defined as those who

rate their DX efforts on par, or behind, their peers and say their strategies deliver disappointing results or only meet expectations at best.

This gap between leaders and laggards could quickly widen. A third of the C-suite executives surveyed say they aren't confident they're doing enough to fully capitalize on AI and analytics. Yet there are steps organizations can take to strengthen their competitive positions and create IT environments engineered for continuous change and improvement. In this report, we'll outline these steps and demonstrate why now's the time to act. **In an era of technology innovation, new business models and evolving customer demands, falling behind in ITX is not an option.**

DEFINING KEY CONCEPTS

Digital Transformation (DX)
Leveraging new digital technology to promote fundamental changes in business processes and systems and enhance business outcomes, such as improved customer experience; real-time, data-driven insights; and increased competitive advantage.

IT Transformation (ITX)
The shift from traditional IT to IT-as-a-Service cloud models to deliver agility and scalability for internal and external IT consumers. This may include modernizing the IT infrastructure, automating the delivery and consumption of IT services, and transforming IT operating models to free up resources for strategic initiatives, speed up product development and reduce costs.

> DX leaders were two times more likely than laggards to have seen revenue gains of 7% or more in the past year thanks to the application of disruptive technologies within their IT infrastructures.

KEY FINDINGS

- **DIGITAL TRANSFORMATION (DX) LEADERS WERE TWO TIMES MORE LIKELY** than laggards to have seen revenue gains of 7% or more in the past year due to the application of disruptive technologies within their IT infrastructures

- **DX LEADERS ARE MORE THAN 1.5 TIMES MORE LIKELY** than laggards to rate their IT organization's ability to support DX more highly than their peers

- **DX LEADERS ARE 3.5 TIMES MORE LIKELY** than laggards to already have AI and machine learning in place to support IT transformation

- **34% OF C-SUITE EXECUTIVES OVERALL** say outdated infrastructures represent the top technical challenge to achieving IT transformation

- **34% OF C-SUITE EXECUTIVES OVERALL** cite change management and cultural change as the top, non-technical challenges to IT transformation

- **70% OF LEADERS** say data and analytics will become integral to running IT infrastructures more efficiently and effectively over the next two to five years

- **DX LEADERS ARE 3 TIMES MORE LIKELY** than laggards to implement additional foundational technologies for analytics, such as business intelligence systems, data warehouses and executive dashboards, by 2023

- **DX LEADERS REVEAL 3 KEY STEPS FOR ITX:** infrastructure modernization, IT automation and cultural change

METHODOLOGY

This report is based on a survey of 512 global executives. Thirty-one percent of respondents are from North American companies, 30% from Europe and the Middle East, 29% from Asia-Pacific and 10% from South America. The executives work in a variety of sectors, including energy, healthcare, technology and education. All are C-suite executives, representing CIOs (43%), CEOs (29%) and chief data officers (28%).

Leaders in digital and IT transformation, which represent 13% of the survey sample, are defined as those who describe themselves as digital transformation innovators or first movers in their markets and say their transformation efforts exceed expectations.

DIGITAL TRANSFORMATION TAKES HOLD FOR SOME, WHILE OTHERS STRUGGLE

The Forbes Insights, Dell EMC and Intel survey confirms that DX is the new normal. More than half of C-suite executives describe their DX initiatives as significant or their business operations as being fully transformed (Figure 1). What's more, DX strategies are succeeding—53% of respondents say their DX initiatives are meeting or exceeding expectations (Figure 2).

ITX and DX aren't unique to any industry, but some segments are achieving results faster than others. The highest percentages of leaders in the Forbes Insights, Dell EMC and Intel survey come from telecommunications and media companies, with financial services and technology firms tied for third. Regionally, the highest share of leaders comes from North America and Europe/the Middle East.

While it's good news that more than half of the organizations surveyed are pleased with their DX results, it leaves almost as many companies disappointed. Universal success isn't to be expected, of course, but such a large group having to play catch-up is surprising given the time and resources many firms devote to DX. The question is, what are leaders doing that separates them from the laggards?

Leaders understand that IT infrastructures play a critical role in DX success. They're acting on this realization by enabling ready access to high-quality business data and leveraging advanced analytics and AI to capitalize on this growing amount of information. Specifically, leaders are already capitalizing on ITX to derive more value from internal and external data to improve data center operations. In fact, leaders are 3.5 times more likely than laggards to already have AI and machine learning in place to support ITX (Figure 3—see next page).

"As automation and deep learning improve, there is the potential to move to a more proactive state in all areas of IT operations," says Procter & Gamble's Boehme. For example, with analytics, IT organizations will be better able to predict impending incidents and find correlations in data that can help avert problems before they arise. "The knowledge within machine learning and AI can take automation beyond routine tasks to more sophisticated activities for creating business value and supporting operations," he says.

Figure 1. Which best describes the state of your organization's digital transformation?
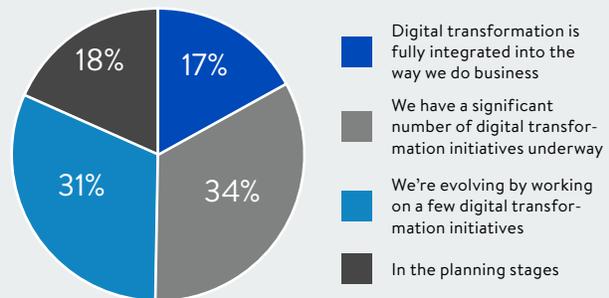

- 17% — Digital transformation is fully integrated into the way we do business
- 34% — We have a significant number of digital transformation initiatives underway
- 31% — We're evolving by working on a few digital transformation initiatives
- 18% — In the planning stages

Figure 2. Please assess how well your company's digital transformation initiatives are meeting expectations of success.

- 21% — 5-Exceeding expectations
- 32% — 4
- 29% — 3- Neutral
- 16% — 2
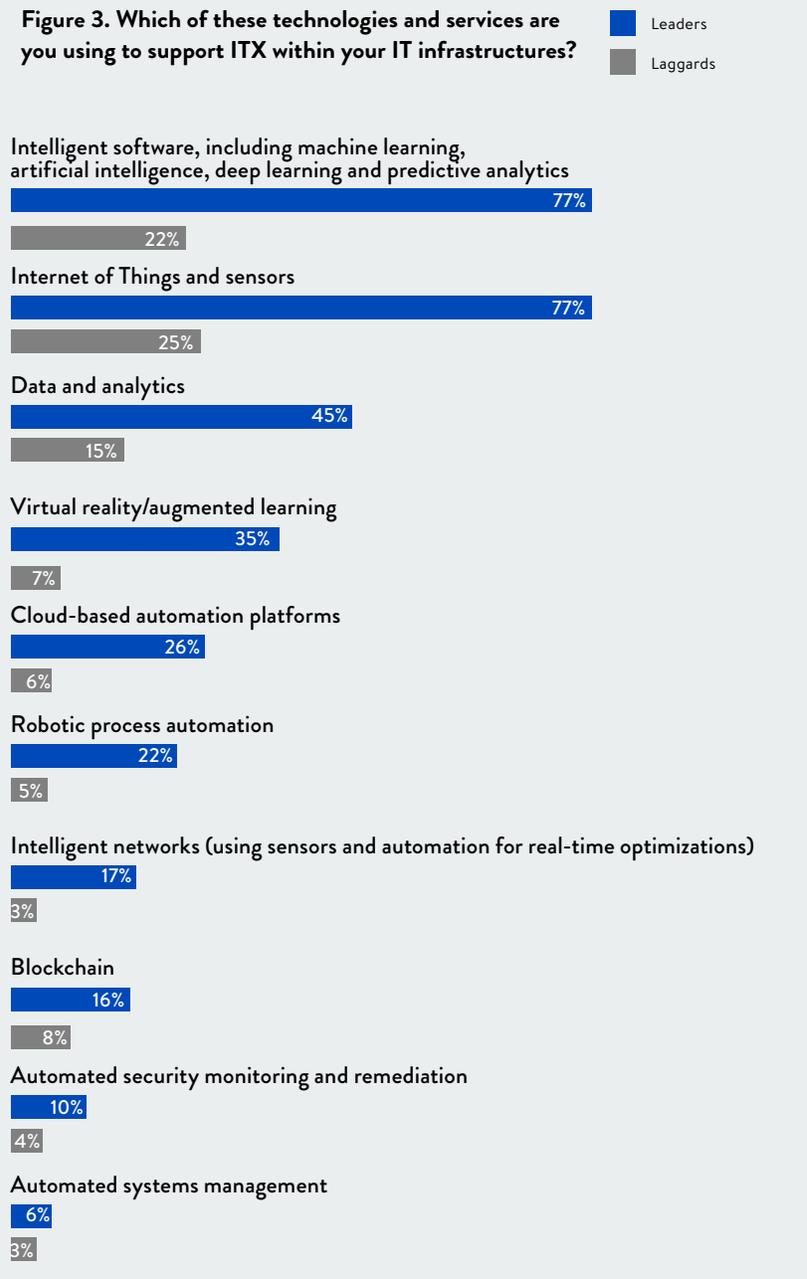- 2% — 1- Not meeting expectations
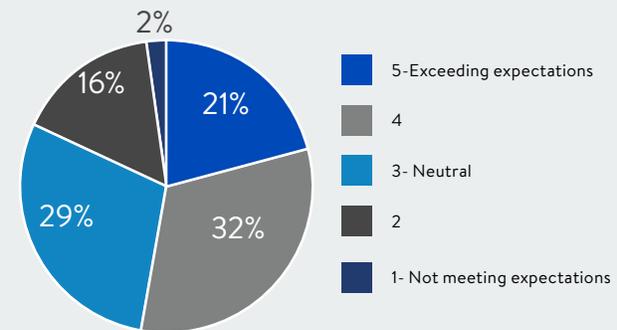
Commercial companies aren't the only ones that can benefit from establishing artificially intelligent data centers. TGen is a nonprofit biomedical research institute that performs genome sequencing to develop more effective medical treatments. "For me, IT transformation is a way to take non-value-added work out of humans' hands so people can focus on solving problems and figuring out how we can advance our research," says CIO James Lowey.

To do that, Lowey and his team are engineering their IT environment to be dynamic and support constantly changing research demands and technology innovation. For help, his team is turning to AI, machine learning and IoT to better manage and optimize IT. "We have to be on the leading edge of IT technology to keep up with the latest generation of sequencing technology that drives research at the institute," Lowey says.

That means systems that support large volumes of data. Sequencing an entire genome for one patient produces about 4 terabytes of data, or the equivalent of 250 16-gigabyte thumb drives. In total, the Institute manages 8 petabytes of genomic information in its storage systems (enough to fill 500,000 16-gigabyte thumb drives) and uses high-performance computing systems to crunch the data.

"We use machine learning algorithms and predictive analytics to determine the right place and the right time to run each workload, and we do that without a huge amount of human intervention," Lowey says. "The more we can automate, the more we can fully utilize the resources that are available to us."

Figure 3. Which of these technologies and services are you using to support ITX within your IT infrastructures?

Leaders (Blue) / Laggards (Gray)

Intelligent software, including machine learning, artificial intelligence, deep learning and predictive analytics
- Leaders: 77%
- Laggards: 22%

Internet of Things and sensors
- Leaders: 77%
- Laggards: 25%

Data and analytics
- Leaders: 45%
- Laggards: 15%

Virtual reality/augmented learning
- Leaders: 35%
- Laggards: 7%

Cloud-based automation platforms
- Leaders: 26%
- Laggards: 6%

Robotic process automation
- Leaders: 22%
- Laggards: 5%

Intelligent networks (using sensors and automation for real-time optimizations)
- Leaders: 17%
- Laggards: 3%

Blockchain
- Leaders: 16%
- Laggards: 8%

Automated security monitoring and remediation
- Leaders: 10%
- Laggards: 4%

Automated systems management
- Leaders: 6%
- Laggards: 3%

BUILDING ON BUSINESS BENEFITS
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As mentioned earlier, being a DX leader correlates to positive business results. In addition to higher revenue growth, 32% of leaders also saw significant improvement in their competitive advantage and risk profiles (Figure 4). This puts leaders in the enviable position of building on these advantages to further widen the competitive gap with peers, who must focus investments on playing catch-up.

Executives at Ericsson, the global telecommunications company based in Stockholm, understand how adding innovative technologies to the data center yields a competitive edge. As the company is rolling out new cloud-based networking services and working with partners to use IoT to support data-driven manufacturing plants and smart city initiatives, a similar strategy is

Figure 4. What business results has your organization achieved in the past year due, at least in part, to the application of disruptive technology within your IT infrastructures?

■ Leaders
■ Laggards

Significant improvement in competitive advantage
32%
23%

Significant improvement in risk profile
30%
22%

creating an automated, data-driven IT organization within Ericsson. "We're making IT 'smarter' by using data, machine learning and predictive analytics to automate more of IT," says Johan Torstensson, Ericsson's CIO. "This is helping to drive down costs while also increasing quality."

But Torstensson and his staff aren't just layering advanced tools onto old operating models. "We are sharply focused on strengthening our digital foundation and on driving cultural change by making everybody responsible for ensuring the product and customer data we have becomes digital."

For Ericsson, becoming a more data-driven IT organization is already delivering a payoff in the form of greater stability and reliability. "Our factories are working three shifts throughout the world so there's no time for any downtime," Torstensson says. "We started by making the data high quality, then we added analytics tools to help us understand where to focus our attention." The end result? In the five years leading up to 2016, the company reduced downtime by 95%. In 2017, Ericsson cut downtime by another 40%.

CHALLENGES FOR ITX LAGGARDS
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Unfortunately, the ITX initiatives at many companies aren't as advanced as Ericsson's, for a number of reasons. When considering the biggest obstacles to ITX, respondents in the survey say they struggle most with outdated organizational and cultural obstacles as well as outdated IT infrastructure (Figure 5). These results are supported by an underlined earlier study by Forbes Insights and Dell EMC that identified the need for

Figure 5. What are the top challenges you face when trying to achieve ITX?
Select up to 3 responses

Outdated organizational structures	34%
Change management, cultural roadblocks	34%
Our foundational IT infrastructure is outdated and must be upgraded before we can implement transformational technologies	33%
The push for digital transformation (DX) puts IT transformation (ITX) on the "back burner"	33%
Lack of C-suite commitment/support	32%
Lack of vision or full understanding of what IT transformation (ITX) is	32%
Inadequate funding	31%
The business case is hard to quantify to senior decision makers	31%

updating reporting structures and the cultivation of change agents, especially among CIOs and CFOs.

But just as significant is how highly ranked outdated IT infrastructure is on the list of top concerns. Together, these results reinforce the fact that ITX requires a comprehensive plan for modernizing IT infrastructures, company cultures and organizational structures. While these challenges are significant and worth mentioning, they're not insurmountable, as leaders are demonstrating through their own success.

A ROAD MAP FOR ITX SUCCESS

Progressive companies are seeing impressive results from their transformation efforts. Yet the fact still remains that only a small segment of companies is excelling at ITX. Luckily, the measures these front-runners have taken can point the way for other companies. The emerging best practices also show how executives can ensure their data centers stand the test of time and enable their business to meet the challenges and opportunities of tomorrow.
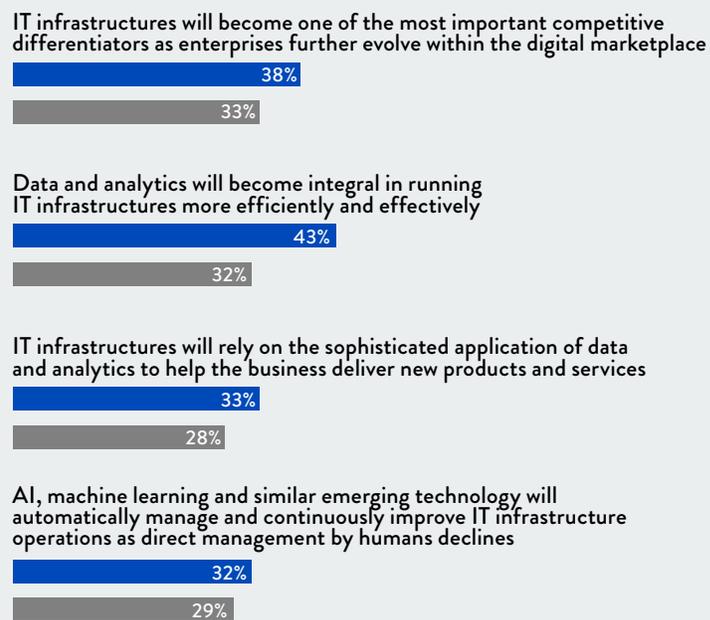
Here are three steps you can take now to enhance your odds for ITX success.

1) Modernize Your IT Environment
As the research by Forbes Insights, Dell EMC and Intel shows, a modern IT infrastructure is a primary characteristic of leaders, who are far more likely than laggards to rate their IT operations' support of DX ahead of their peers'. Laggards appear to understand this. By a roughly similar percentage, they agree with leaders that IT infrastructures will be a key competitive differentiator over the next five years (Figure 6).

The question is, how will innovative technology impact data centers in the near and long term? The answer is important because it shows how laggards should target new IT investments to best close the technology gap with leaders. Leaders see data and analytics as having a greater impact on successfully running tomorrow's IT infrastructures, and are also more likely to see analytical insights as integral to achieving higher-performance IT operations. Laggards, on the other hand, do not feel as strongly on either of these fronts. This shows the two-pronged power of data and analytics—the same advanced technologies, such as AI, that are helping to drive DX can also help modernize IT infrastructures and pave the way to artificially intelligent data centers.

Figure 6. To what extent do you completely agree with the following statements about IT infrastructure trends over the next two to five years?

■ Leaders
■ Laggards

IT infrastructures will become one of the most important competitive differentiators as enterprises further evolve within the digital marketplace
- Leaders: 38%
- Laggards: 33%

Data and analytics will become integral in running IT infrastructures more efficiently and effectively
- Leaders: 43%
- Laggards: 32%

IT infrastructures will rely on the sophisticated application of data and analytics to help the business deliver new products and services
- Leaders: 33%
- Laggards: 28%

AI, machine learning and similar emerging technology will automatically manage and continuously improve IT infrastructure operations as direct management by humans declines
- Leaders: 32%
- Laggards: 29%

Leaders at OTTO Motors recognize how big data supports both DX and ITX. "The data assets we accumulate are becoming the most valuable resource we can provide to our customers," says CEO Matthew Rendall. OTTO Motors designs and builds self-driving vehicles for manufacturing and warehousing operations to streamline the flow of products and raw materials within facilities. In addition to moving materials, each vehicle continuously collects data that can be analyzed to identify inefficiencies in shop floor designs and uncover ways to boost productivity.

Rendall sees even more opportunities on the horizon for OTTO Motors as a big data company. "The data and insights we're creating are delivering tremendous value, but we're only scratching the surface of what's possible in this area," he says. "In the near future, when we invest in machine learning and related areas, we expect to really move the needle forward."

Nevertheless, he considers the underlying IT infrastructure as a competitive advantage in his market. Having a skilled technical staff, a vehicle simulation lab for research and development, and proprietary data analysis software are all vital to the company's success. "It's a unique combination that translates into our ability to design, iterate, test, harden and deploy cutting-edge, autonomous vehicle technology faster than anyone else in our market," Rendall says. "That's an absolutely critical competitive advantage for us."
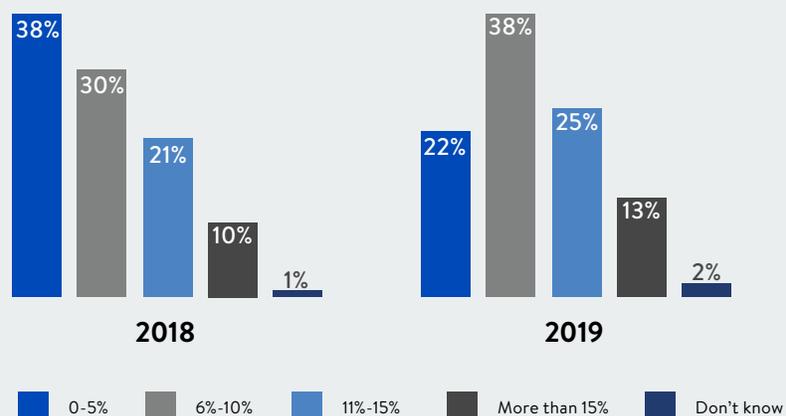
Funding apparently won't be a stumbling block for survey respondents who will be joining OTTO Motors on the path to becoming data-driven organizations. Nearly a third (31%) of IT departments are expecting to devote more than 11% of their total budget to ITX this year, with 10% of that group earmarking more than 15% for this area. This spending is expected to continue through 2019, with 85% eyeing increases for ITX initiatives up to 15% and another 13% planning increases above 15% (Figure 7). Based on these estimates, it's clear that while senior executives may have once seen ITX as a back-burner item compared to DX, IT departments are becoming more adept at convincing the C-suite that infrastructure investments will be good investments for DX.

While this is reason for optimism, differences between leaders and laggards emerge in their spending plans for achieving ITX. Leaders will use ITX investments to expand resources for helping business units analyze large volumes of data in near real time. When asked specifically how they'll do that, leaders say they are three times more likely than laggards to implement additional foundational technologies for analytics, such as business intelligence applications, data warehouses and executive dashboards.

This offers an important lesson for laggards: Emerging analytics require a solid foundation of traditional number-crunching resources that must be maintained over time to ensure decision makers have a full array of reliable tools. With those core capabilities in place, leaders can then aggressively build out these foundations.

Leaders are also 3.5 times more likely than laggards to implement advanced analytics technologies, such as AI, machine learning and predictive analytics, for optimizing their technology environments.

Figure 7. What percentage of your entire organization's annual budget will be used for ITX initiatives in 2018? What about the following year?

2018: 0-5% = 38%, 6%-10% = 30%, 11%-15% = 21%, More than 15% = 10%, Don't know = 1%

2019: 0-5% = 22%, 6%-10% = 38%, 11%-15% = 25%, More than 15% = 13%, Don't know = 2%

Legend: 0-5% | 6%-10% | 11%-15% | More than 15% | Don't know

The C-suite may be willing to approve expanded budgets for ITX, but justifying investments for specific projects can be challenging. The ultimate value of emerging technologies may come from enabling new business models or work processes, innovations that are ultimately hard to quantify with traditional business cases. As a result, organizations need strong executive leadership. "While we carefully consider the business case for each proposed investment, at a certain point we need to take a leap of faith with new technology," says OTTO Motors' Rendall. "The moment we see the potential for sustainable competitive advantage—whether it's from data analytics, blockchain or something else—we invest in order to build a world-class IT infrastructure."

2) Automate IT Operations

While traditional and new advancements in analytics will significantly factor into investment plans, leaders are also looking beyond this area. They plan to adopt technology that will enable continuous improvement within data centers. The complexity of today's on-premise and multi-cloud IT environments and the fast pace of technological change are making manual management and maintenance processes obsolete. As a result, leaders will be nearly four times more likely than laggards to automate IT management and maintenance resources to ensure their IT infrastructures keep pace with ongoing change (Figure 8).

By another wide margin, leaders will be 3.5 times more likely than laggards to incorporate technologies for adaptive learning, specifically for IT operations. By a similar margin, more leaders than laggards plan to incorporate technologies for predictive analytics for IT. This demonstrates that leaders understand the complexities of dynamic, multi-cloud environments and the long-term advantage of artificially intelligent data centers. Until laggards come to the same realizations, they risk being saddled with unreliable, underperforming data centers that can't support modern business needs.

One company that is following a path toward artificially intelligent data centers is Rio Grande Pacific Corp., which owns and operates four railroads and manages a dozen others. Rio Grande Pacific's IT department recently installed new, solid-state storage systems, which provide faster performance and other advantages over traditional spinning-disk drives. Management software that came with this storage upgrade monitors temperature levels, processor utilization

Figure 8. What steps will your IT organization take to ensure your IT infrastructure stays current with the ongoing pace of change?

Leaders
Laggards

Expand resources to help business units analyze large volumes of data in near real time
- Leaders: 75%
- Laggards: 19%

Automate IT management and maintenance activities as much as possible
- Leaders: 67%
- Laggards: 17%

Provide resources for predictive analyses
- Leaders: 58%
- Laggards: 14%

Incorporate technologies for adaptive learning
- Leaders: 58%
- Laggards: 16%

Collaborate closely with business units to identify and act on new opportunities and challenges
- Leaders: 67%
- Laggards: 15%

Proactively provide recommendations to business units for ongoing digital transformation (DX) initiatives
- Leaders: 72%
- Laggards: 19%

rates and other factors within the storage units, and sends alerts when results surpass preset thresholds. This helps the IT staff allocate storage resources more effectively and head off potential bottlenecks.

Over time, CIO Jason Brown plans to enhance performance analytics with AI and machine learning so IT systems automatically adjust to current conditions based on rules established by the Rio Grande Pacific staff. Not only will that improve overall performance, but it will also keep the company from becoming overwhelmed by the rising tide of data. "There is so much data we can collect throughout the data center, so we need a way to pare it back to what's essential for making decisions," he says. "Otherwise, we'll face analysis paralysis."

The IT changes dovetail with the rise of analytics to enhance business operations. The company recently upgraded a section of its rail system with new IT networking technology, along with video cameras for collecting data and predictive analytics software. "Much of what we're doing for railroad transformation centers on capturing and analyzing data," Brown says. "The bottom line is higher availability, greater reliability and better overall performance."

One Rio Grande Pacific initiative combines current traffic and weather data with historical information to predict impending traffic slowdowns or safety concerns, and then acts before problems materialize. The railroad is also examining important performance indicators, such as on-time performance levels for commuter rails and the revenue value of all the freight cars it moves each month.

Brown says Rio Grande Pacific is the only hauler in its market that uses analytics programs to make better operating decisions. "Within a couple of years, our operating decisions will rely almost exclusively on this type of data," he predicts.

3) Transform Cultures and Organizations

While technologies' role cannot be overstated, ITX isn't only about implementing the latest and greatest tools and platforms. Digital innovations will deliver only when combined with modernizations to company cultures and organizational structures, something leaders are already prioritizing.

In following suit with ITX leaders, there are three steps IT managers need to take to transform their cultures. First, as IT automation takes hold, CIOs must revise how people work. Again, leaders already know how to do this. In fact, they will be 2.5 times more likely than laggards to promote cultural change with agile principles borrowed from DevOps initiatives, which at a fundamental level break down large projects into a series of shorter steps and opportunities for continuous improvement (Figure 9).

Figure 9. What are some of the specific steps your IT organization is likely to take in the next two to three years to promote cultural change?

Leaders | Laggards

Require agile processes beyond the testing and development departments
Leaders: 67%
Laggards: 25%

Revise incentives and performance criteria
Leaders: 61%
Laggards: 22%

Implement new types of collaboration technology
Leaders: 58%
Laggards: 28%

Explore new organizational reporting structures
Leaders: 42%
Laggards: 26%
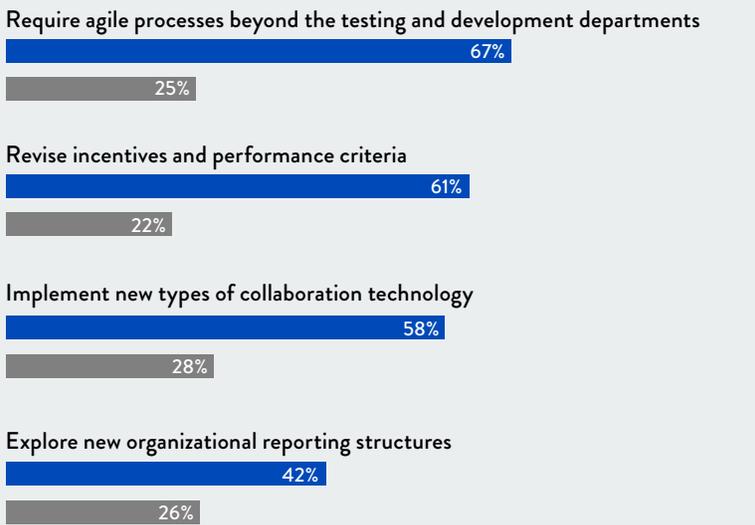
Second, as roles and responsibilities evolve, senior managers will need to adjust how talent is rewarded for successful performance. Accordingly, leaders will be nearly three times more likely to revise incentives to further cultural change, and also twice as likely to implement new collaboration technology and be more open to exploring new reporting structures. Presumably, these efforts will be carried out to break down communication barriers between departments and create cross-functional teams to more effectively advance ITX plans.

Third, organizations will need to cultivate forward-thinking talent. "In addition to implementing blockchain or AI, ITX takes vision and a combination of investments coming online at different times," says OTTO Motors' Rendall. "That's why we require a visionary CIO, and a skilled team, who can push us forward."

A FUTURE OF CONTINUOUS CHANGE

It's clear that ITX will be table stakes for business success in the years ahead. An overwhelming majority of C-suite executives agree that the pace of technology innovation and market disruption will continue or grow over the next 10 years, and executives are already dealing with this new reality.

"Producing a three-year IT road map is virtually impossible today," says TGen's Lowey. "In that amount of time, the whole landscape may completely change."

With change happening so quickly, organizations can't afford to be laggards. Letting leaders widen gaps in IT modernization, automation capabilities and cultural evolution may soon put many companies too far behind to recover. To stay current, organizations need to understand the essential role data centers play in business transformation, and invest in continuously transforming their data centers by following a comprehensive ITX strategy.

> "
> ITX isn't about just implementing blockchain or AI; it takes vision and a combination of investments coming online at different times. That's why we require a visionary CIO, and a skilled team, who can push us forward."
>
> **MATTHEW RENDALL,**
> CEO,
> OTTO MOTORS

Fortunately, the core element of this strategy has emerged among leaders who are creating artificially intelligent data centers to support IT operations that continuously adapt to changing technologies and markets. "As an IT professional, I'm constantly looking for new ways to improve our company, our environment for employees and our relationships with customers and consumers," says Proctor & Gamble's Boehme. "We're focused on harnessing technology to better serve consumers, customers and employees. Information technology has never been more important to our company than it is today. The new currency of consumers is time and relevance, which are driven by technology."

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