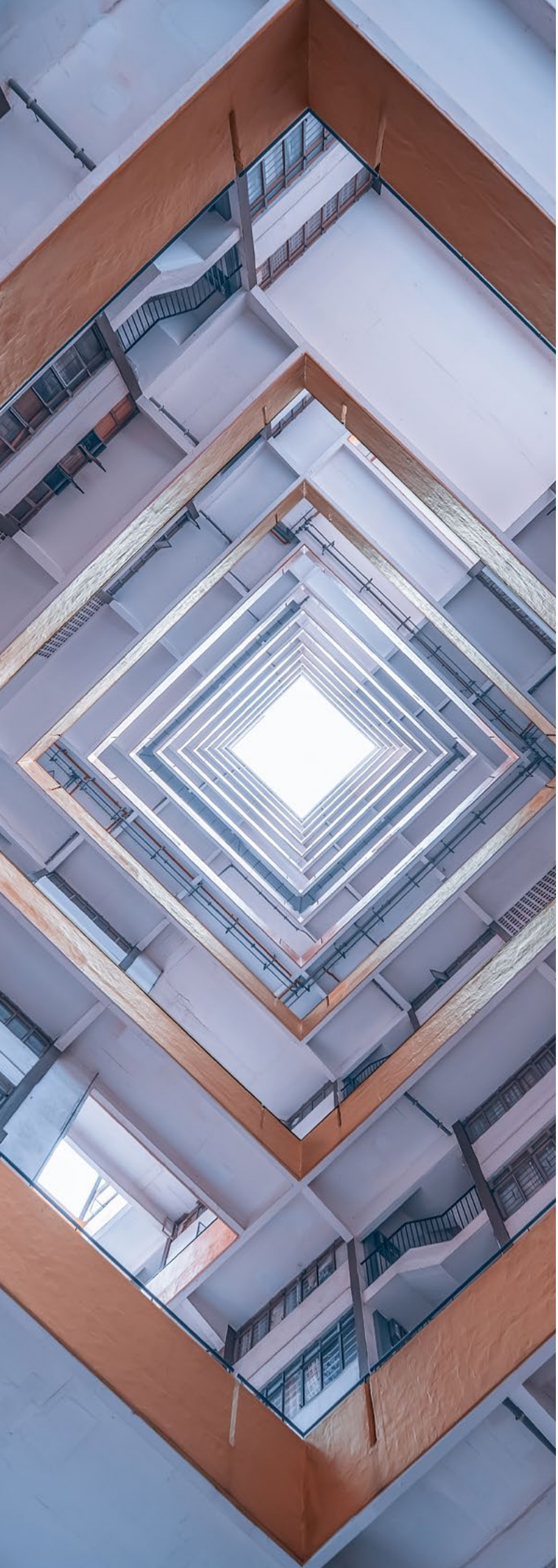

Research Insights

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Automation and the future of work

Creating intelligent workflows across the enterprise

IBM **Institute for Business Value**

IBM

How IBM can help

Forward-looking enterprises utilize automation and AI to augment their core strengths, supplement their weaknesses, and empower their people to focus on what's important. Intelligent automation enables your entire organization to be "always-on," optimizing the delivery of goods and services to provide seamless continuity in dynamic markets. With a diverse set of intelligent workflow solutions, IBM can guide your digitization journey to automate more types of work at greater speed and lower cost. We'll meet you at any stage, helping you adapt and thrive by turning momentary challenges into long-term opportunities. Find out more at ibm.com/automation.

By Karen Butner,
Tom Ivory,
Marco Albertoni,
and Katie Sotheran

Key takeaways

Disruption compels progress

Operational disruptions associated with COVID-19 signal a critical need to fast-track intelligent workflow initiatives. Intelligent automation helps drive improved efficiency and performance: 80 percent of organizations scaling intelligent automation expect to outperform the competition in profitability within three years.

Human-machine partnership

Increasing use of automation, AI, and other technologies is changing the way humans and machines interact. Almost 80 percent of organizations scaling intelligent automation indicate they will permit intelligent machines to render complex or mission-critical decisions within three years.

Adaptability and scale

Deploying intelligent automation across an enterprise and ecosystem can build a more adaptable business, one that can rapidly respond, pivot, scale up or down, and adopt new operating models. It is not necessarily the fittest, fastest, or strongest that will survive future disruptions—but the most adaptable.

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The intelligent automation opportunity

As evidenced by COVID-19, operations can be devastated by unexpected events, whether pandemic, foodborne illness, severe weather disruptions, geopolitical change, or even international trade policy changes. Executives know this all too well and continue their efforts to create more resilient operations across enterprise functions.

Today's operations must be dynamic, responsive, and interconnected to an organization's ecosystem and workflows. This requires end-to-end enterprise visibility, real-time insights, and decisive actions—particularly in escalating situations. Businesses that leverage intelligent automation to build these capabilities are poised to address today's workforce dislocation, supply chain challenges, and customer service disruptions—and to thrive in tomorrow's recovering market.

Over the decades, automation has touched most industries—from the factory floor to banking transactions and oil refineries. *But intelligent automation enables change at a whole new level.* Artificial intelligence (AI) and automation—together they become intelligent automation—alter the way humans and machines interact, in terms of how data is analyzed, decisions are made, and tasks and activities within a workflow or system are performed (see *Insight: Automation evolution* on page 3).

In addition to potential costs savings, intelligent automation can dramatically enhance an enterprise's ability to respond, adapt, and thrive in a challenging market. Organizations that build a robust automation program combine a broad set of technologies, including robotics, bots, and devices, with AI capabilities such as machine learning, natural language processing, augmented intelligence, and computer vision and hearing. A blend of the appropriate technologies for the task at hand supports intelligent workflow efficiencies but can also help drive revenue and profit.

79%

of executives whose organizations are scaling intelligent automation expect their organization to outperform the competition in revenue growth within the next three years

75%

of respondents point to customer experience as the area where their digital initiatives deliver the greatest value

90%

of executives whose organizations are scaling intelligent automation tell us it creates higher-value work for their employees

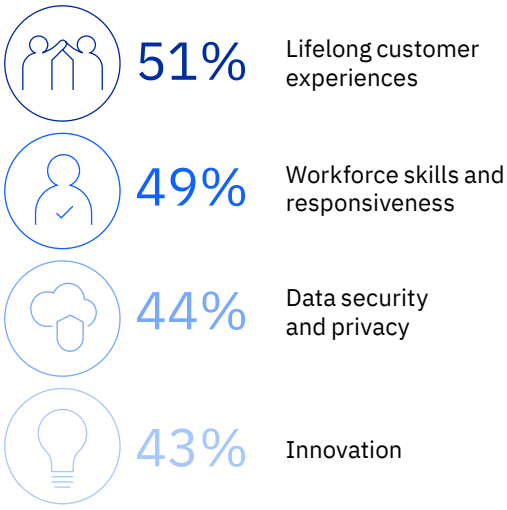
The IBM Institute for Business Value, in collaboration with Oxford Economics, conducted a comprehensive study to discover more about the impacts of intelligent automation initiatives today and in the near future. We posed a broad range of questions related to automation investments, priorities, benefits, and impact to 1,500 executives around the world, representing 21 industries in 26 countries. In this report, we share their insights, strategies, and future plans.

The automation landscape

Executives surveyed tell us that in three years, the two most important elements in defining competitive advantage will be the customer experience and workforce skills (see Figure 1). They also tell us that digital initiatives can greatly influence those elements: When asked where their digital initiatives deliver the highest value to their organization, 75 percent of respondents point to customer experiences, while 64 percent say workforce management.

Figure 1

Customer experience and workforce skills are key drivers for competitive advantage



Q: Which of the following will be the most important in defining your competitive advantage in the next 3 years? (Figure depicts top 4 of 12 choices.)

"AI is the future. Algorithms and bots will make intelligent decisions."

Chief Technology Officer, Healthcare, United States

Automation can enhance the customer experience by enabling more rapid and effective responses based on new data-driven insights. In addition, by shifting certain tasks away from humans, automation allows employees more time to focus on customer-related priorities.

With the right data, many decisions—relating to both customers and routine business processes—can be automated. And with automated workflows, bots can perform mundane, recurring activities, again liberating the workforce to focus on more complex decisions, higher-value tasks, and new roles. In addition, automated workflows can link processes end-to-end, straddling siloes and cutting across functions to expose new outcomes that differentiate an organization from its peers.

Applied in concert, technologies such as AI, automation, IoT, blockchain, and 5G enable organizations to optimize and customize workflows. And these technologies are maturing to a point where they can be deployed and exploited at scale. For example, AI implementations are on the rise, with 55 percent of respondents planning to increase AI investments in the next three years. Forty-four percent of respondents say their organizations will increase robotics investments. Edge computing and 5G investments are also expected to increase, while augmented/virtual reality investments will remain steady.

Our research also revealed that executives are investing an average of 59 percent of their information technology (IT) budget on technologies related to intelligent automation, including AI, cloud computing, connected IoT, and robotics. And executives expect those investments to pay off: 72 percent expect revenue to increase as they implement intelligent automation technologies and practices. Intelligent automation helps improve efficiency and reduce costs—and enables creation of new business models. Optimized workflows allow for cost control in tandem with growth.

It is the convergence of automation technologies that enables transformation. Deploying them in concert, not discretely, amplifies their effects. Implementing intelligent automation across an enterprise establishes a human-technology partnership that can improve and scale over time at a rate that exceeds traditional technological progress. These intelligent workflows aren't just automated, optimized, and personalized; they're dynamic and can flex and scale with ease to create new value.

Insight: Automation evolution

Foundational automation typically includes basic task and activity-based automation, fueled by software algorithms. It removes the need to manually perform repetitive and rules-based tasks involving structured data. Business process management libraries and workflow software with select robotic process automation capabilities can eliminate errors, reduce biases, and accelerate the pace of transactional work.

Advanced automation brings together humans and machines to integrate multiple systems and executive functions across an enterprise. Supporting more complex processes, advanced automation relies on unstructured data coupled with machine learning, natural language processing, and analysis. It promotes knowledge management and decision support for work requiring greater levels of expertise.

Intelligent automation is guided by AI capabilities and performs actions that require minimal routine interventions by humans—including monitoring, alerts, scheduled events, and data/analytical tasks. It encompasses the reasoning and learning abilities of cognitive computing to analyze large bodies of operational information, recognize patterns from multiple sources, and execute accordingly.

Enterprise-wide intelligent automation refers to the pervasive use of intelligent automation across the enterprise. This capability looks beyond the technologies in use, to the breadth of their application and the extent to which the use of intelligent automation is transforming the way work gets done.

Almost three-quarters of executives expect revenue to increase as they implement intelligent automation technologies and practices.

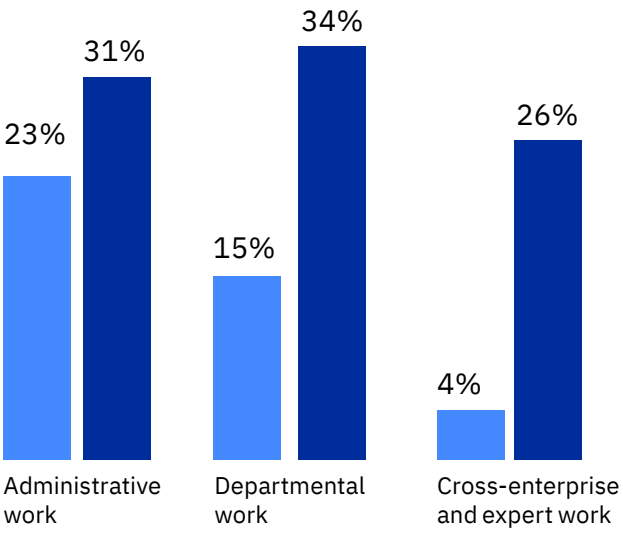
Enterprise-wide intelligent automation

This is the era of organizational enterprise automation: intelligent automation scaled and applied across the enterprise. As organizations deploy intelligent automation for more advanced work, the landscape is shifting, with intelligent machines' tasks expanding from administrative to include more cross-enterprise and expert work.

In just three years, the nature of machine work will change (see Figure 2). The percentage of tasks overall—administrative, departmental, and cross-enterprise and expert—will continue to grow substantially, with the largest percentage increase in cross-enterprise and expert work. Breaking that down further, one in five respondents report that machines will perform cross-enterprise transactions across multiple departments, and 5 percent say machines will perform expert work—problem solving based on real-time information or multiple inputs.

Figure 2

Enterprise-wide intelligent automation has arrived

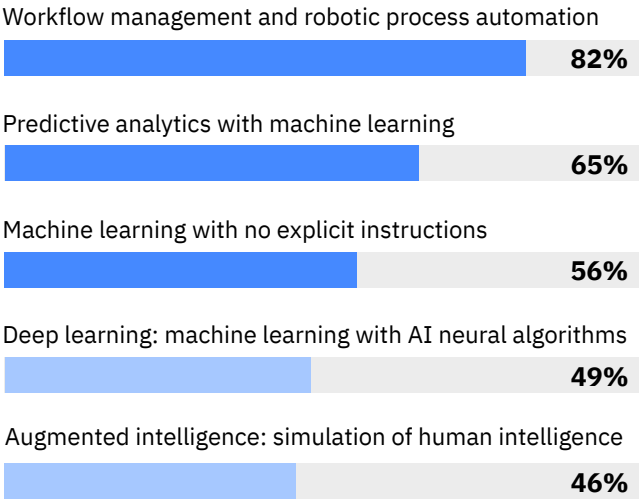


Q: Indicate the highest level of tasks your organization will allow intelligent machines to perform.

In addition to the level of tasks performed, we also asked respondents about technologies implemented. We found widespread use of automation to execute intelligent workflows (see Figure 3). The majority of organizations are also leveraging predictive analytics and machine learning. These capabilities enable an enterprise to be "always-on"—optimizing the delivery of goods and services to provide continuity in a dynamic, and oftentimes disrupted, market.

Figure 3

Implementation of intelligent automation technologies: from emerging to essential



Q: To what extent has your organization implemented the following technologies? (Percentages represent respondents who selected 3, 4, or 5 on a 5-point scale: 3 = We are piloting programs around this technology, 4 = We already have this technology in production, and 5 = We have scaled this technology across the enterprise.)

Automation Achievers are scaling for impact

As part of our research, we singled out organizations that plan to allow intelligent machines to perform *cross-enterprise* or *expert work* for their organizations in the next three years. Representing 26 percent of respondents (nearly 400 organizations), these Automation Achievers are positioning themselves to embrace the full potential of intelligent automation.

Not only are Automation Achievers leading the way in automation programs, they are also successful in the wider business arena. They rate themselves higher in responsiveness and productivity, and they outperform peers in profitability, revenue growth, and efficiency. They expect continued success in the next three years, predicting improvements that only widen the gaps (see Figure 4).

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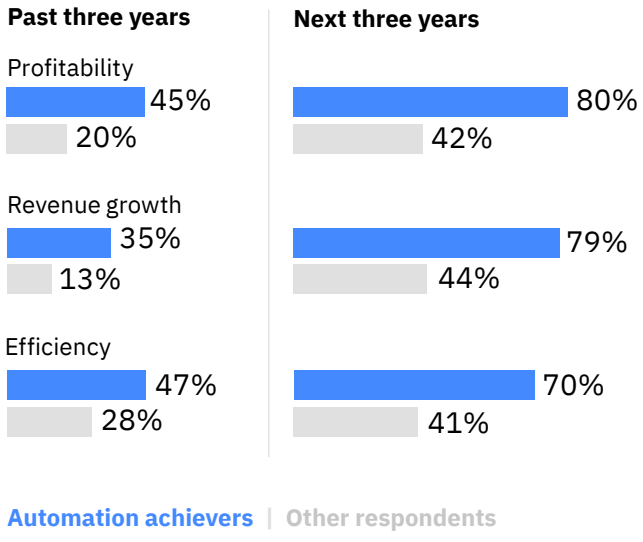
Figure 4

Automation Achievers outshine peers in profitability and revenue growth



Q: Please rate your expected success in each area compared with similar organizations a) in the past three years b) in the next three years. (Percentages represent respondents who selected 4 or 5 on a 5-point scale.)

German auto dealer: Automating workflows across the organization

An automotive dealer in Germany is applying intelligent automation to perform cross-enterprise work using a central robotic process automation and AI platform. Implemented in a virtual environment, the solution helps automate workflows across functions.

The company currently uses more than 60 bots to support processes in various departments, including production, sales, logistics, and finance, and plans to deploy more than 180 bots over the next few years. The company also relies on robotic automation for warranty management of certain parts using unstructured data such as images. The solution copies and validates dealer data and then recognizes and interprets auto damage based on the images provided. This solution helped the company cut the time needed to determine spare parts replacements by more than 99 percent.

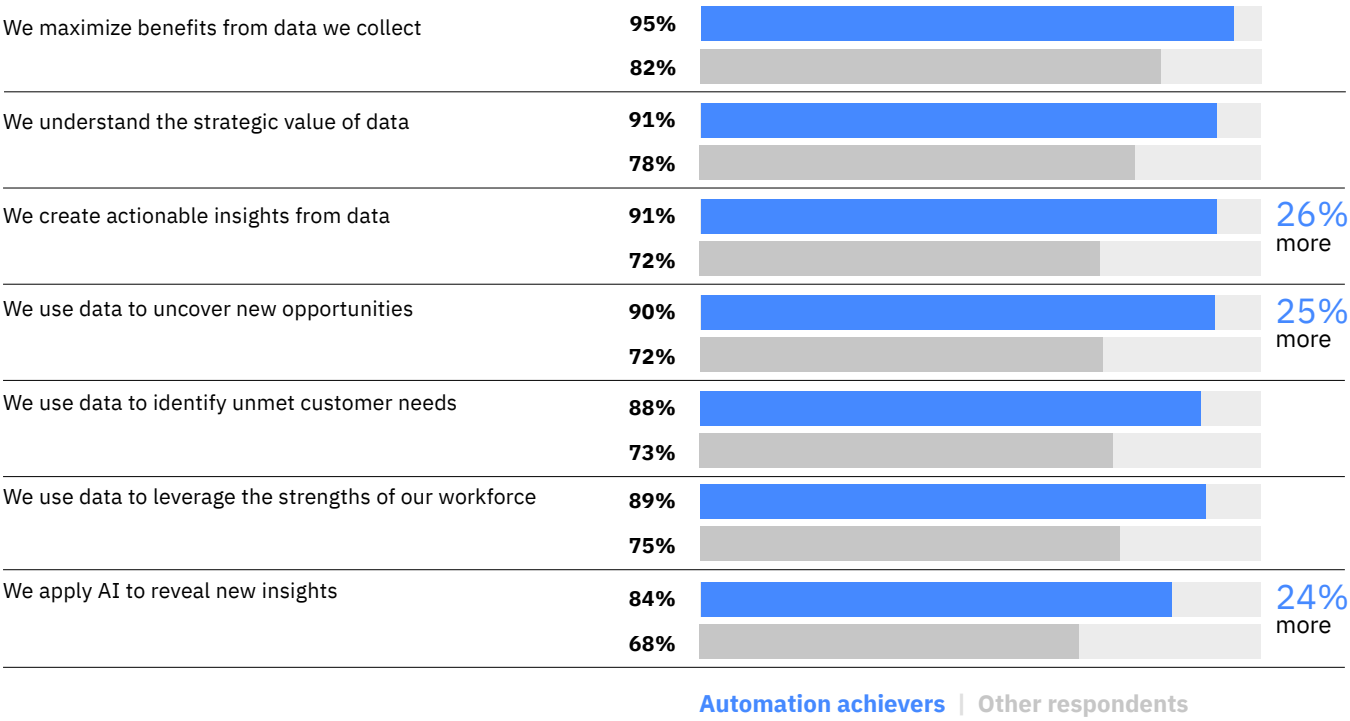
In just three years, the nature of machine work will change dramatically, with both the percentage of tasks and the level of their complexity growing.

We also discovered that Automation Achievers are using data to their advantage (see Figure 5). They understand data's power to reveal new opportunities, uncover insights, and facilitate decisions. Algorithms, for instance, can be used to make product recommendations, personalize the prices of big-ticket items, and nudge customers' purchasing choices.

Intelligent workflows help deliver the right data to the right place for effective, timely decisions—regardless of whether the decisions are made by humans or digital workers. Enterprise automation extends beyond technologies—it is pervasive and human-centric with continuous and advanced use of data.

Figure 5

Data leads to new insights, new opportunities



Q: How would you describe your organization today in terms of usefulness of data?
(Percentages represent respondents who selected 3, 4, or 5 on a 5-point scale.)

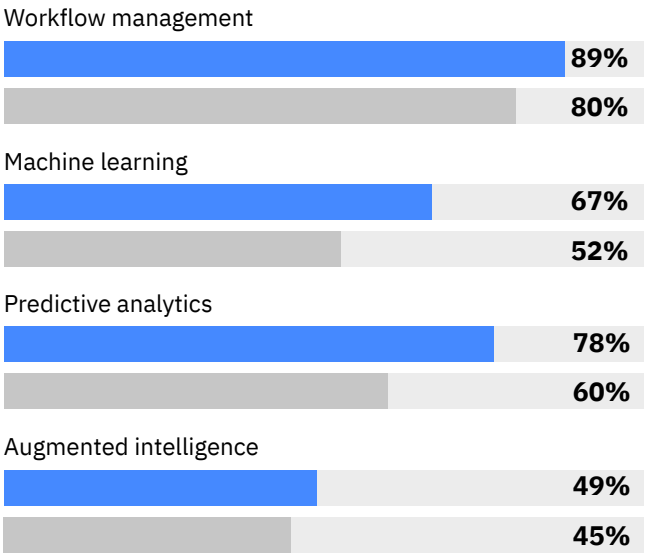
Technology shift, workforce shift

With more and more machines making complex decisions, the nature of work is changing rapidly. Automation Achievers are embracing the shift, with 78 percent telling us they will allow intelligent machines to make complex decisions (solving problems based on real-time information or multiple inputs) and mission critical decisions (decisions in the moment that may alter essential outcomes) within three years. Just 19 percent of other respondents say the same.

While the majority of all respondents are employing workflow management, machine learning, and predictive analytics, the Automation Achievers are leading the pack with higher percentages in each category. In addition, just under half of the Achievers have moved beyond predictive analytics to augmented intelligence (see Figure 6).

Figure 6

Leaders use more advanced tools to scale intelligent automation with AI-enabled technologies



Q: To what extent has your organization implemented the following technologies? (Percentages represent respondents who selected 3, 4, or 5 on a 5-point scale.)

Latin American telco: Intelligent workflows for increased efficiency

Due to growth, a telecommunications company in Latin America suffered redundancies and inefficiencies in its production, testing, and development environments. Seeking a workflow step change, the company employed a cloud-based robotic automation solution to establish an execution control tower for robots and robot execution environments.

The project was so successful that the company applied robotic automation capabilities to the response process for communication network queries from customers and other service providers. Automating and standardizing several workflows—with intelligence—helped the company increase the number of queries answered each month from 450 to 3,800. In addition, the use of robotic automation with AI algorithms helped accelerate the average process response time from three days to only three minutes.

Organizations can build a more flexible workforce by striking the right balance between human and digital labor.

Intelligent automation systems understand signals from data in a way similar to humans but can consume data with far greater speed. They can also learn from interactions and respond accordingly.

Not only are Automation Achievers using more advanced tools, they also have higher expectations for their intelligent automation initiatives. While all respondents expect impact to increase over the next three years, the Automation Achievers' expectations start higher and end higher, particularly in areas that drive growth like customer experience and innovation. For example, the percentage that expects intelligent automation to greatly impact the customer experience is 57 percent today. In three years, it grows to 84 percent—a 47 percent increase. And the percentage expecting high impact on innovation increases 150 percent, going from 22 percent today to 55 percent in three years.

We also asked respondents about success factors in implementing intelligent automation. More than half of Automation Achievers realize that using design thinking for automation workflow design is critical (compared to 36 percent of other respondents). Automating old processes won't suffice; intelligent automation requires redesigned processes and workflows—intelligent workflows with AI. This point is well understood by Automation Achievers. As they redesign, they are securing the appropriate data platforms, apps, and tools, as well as equipping employees with the necessary knowledge and skills.

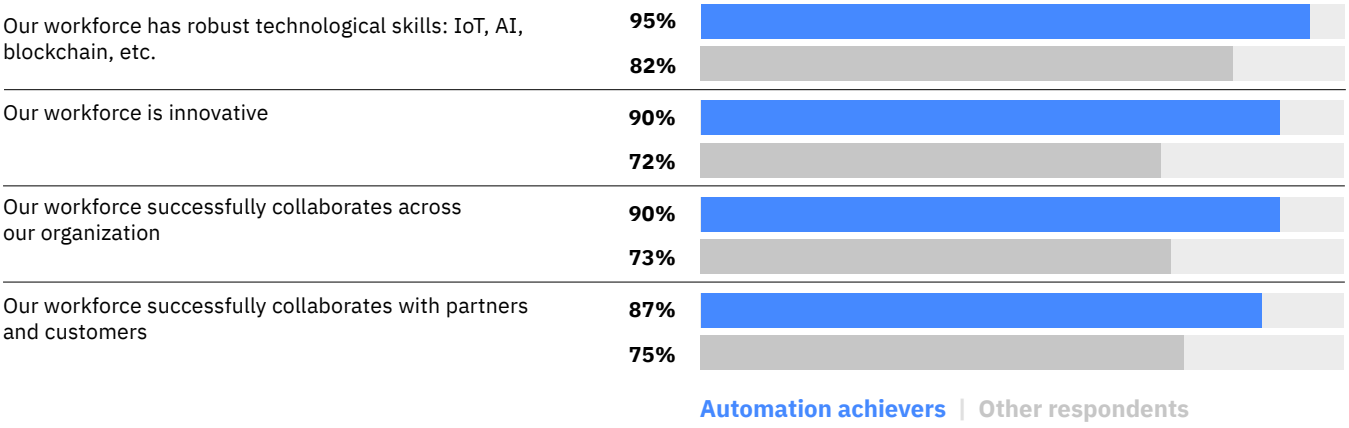
Preparing for the future of work

While intelligent automation offers significant opportunity for organizations, the implications for and impact on the future of work are substantial. Eighty-nine percent of Achievers realize they must transform their culture and processes, as well as reskill and retrain employees, to receive the full value from intelligent automation.

These trail blazers are focusing on innovation and a collaborative, inclusive culture—recognizing the need to address the future of work (see Figure 7). While technological skills will remain necessary, those required today could be obsolete tomorrow. Enterprises with innovative and collaborative workforces are better equipped to respond to a changing landscape. They are also better equipped, therefore, to continue adopting intelligent automation, as it involves an ongoing and evolving transformation rather than a single shift.

Figure 7

Grooming the workforce for the future



Q: To what extent do you agree with the following statements?
(Percentages represent respondents who selected 3, 4, or 5 on a 5-point scale.)

Executives know that they must retool, reskill, and retrain employees to augment—not reduce—their workforce. In fact, Automation Achievers expect headcount will only change by about 1 percent in the next three years. And as part of that 1 percent, many employees will be redeployed into newly defined roles and responsibilities.

By striking the right balance between human and digital labor, Automation Achievers can build a more flexible workforce. Intelligent automation—in the form of digital workers—allows an organization to augment the workforce to handle spikes in demand or troughs in capacity, as well as shift workers within and between industries in a dynamic market.

Saving costs, growing revenue

Intelligent automation can transform virtually all types of workflows and processes for improved efficiency and performance. Ninety-one percent of Automation Achievers agree that these transformations help their organizations meet strategic challenges and improve business results. They tell us that reducing operational costs and risks are key benefits of intelligent automation initiatives. They also realize the longer-term and continued benefits of increased output volume (71 percent more than other respondents) and improved inventory productivity (42 percent more than other respondents).

Woodside: Intelligent workflows for improved workforce management[1]

Woodside Energy, an Australian energy company, is at the forefront of adopting AI in its industry. Along with its investments in AI, the company is rethinking the way it will innovate, accelerate, and collaborate through the adoption of a garage approach. For its first initiative, Woodside has embraced design thinking to reimagine the employee onboarding process.

The company is transforming the experience for new employees using an AI-powered assistant to yield a more intelligent workflow. By streamlining processes, the company aims to better connect employees with their managers, their teams, and human resources—and make sure they have the resources necessary to hit the ground running.

"Intelligent automation will optimize business process workflows. We will be able to generate higher revenues while controlling costs."

Chief Operations Officer, Chemicals, Mexico

To better understand the impact of intelligent automation on revenue growth and operating cost reduction, we used data from the leading organizations—the Automation Achievers—and examined 12 intelligent automation use cases. (For more on our research and analysis, as well as a list of the 12 use cases, see the *Research methodology* section on page 14.) Of the 12 use cases, 5 had a dramatic influence on increasing revenue and a different 5 had a dramatic influence on decreasing operating cost (see Figure 8).

Increasing revenue

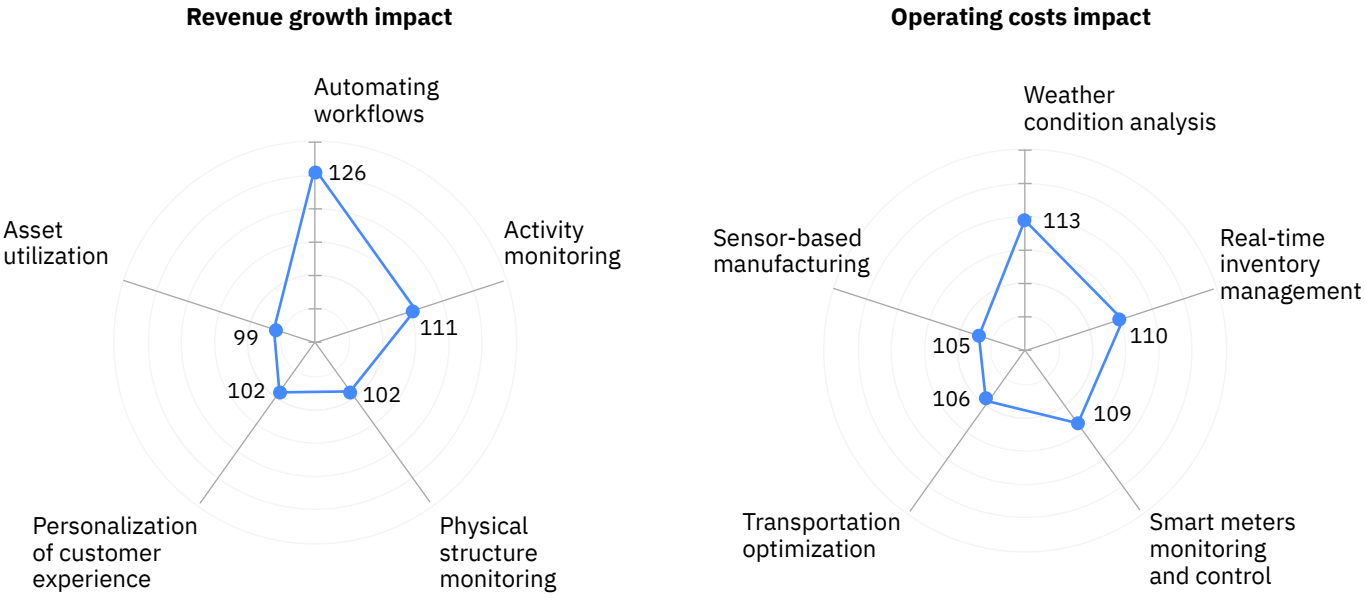
Automated workflows can impact revenue by enabling businesses to meet customer needs seamlessly and consistently, particularly during periods of uncertainty. In fact, 65 percent of Automation Achievers report automating workflows among their most important use cases.

Also impacting revenue growth, activity monitoring applications range from back-office processes to predicting future responses and altering work tasks. Using machine learning and AI capabilities, activity monitoring solutions can recognize patterns in unstructured data, make decisions, and even solicit services from other devices or systems.

Another automation use case, physical structure monitoring can apply to any type of real estate or asset, enabling it to operate in new and automated ways through AI and IoT technology. For example, a building that adjusts temperatures or lighting based on conditions can improve occupant experience, operational efficiency, and asset utilization.

Figure 8

Top use cases with positive impact on revenue and cost



Note: Regression analysis impact scores for: 1) Q: How would your organization's annual revenue and annual operating costs (separate analysis) be affected by implementing intelligent automation? Dependent variables. 2) Q: Which of the following intelligent automation use cases is your organization prioritizing in 3 years? Independent variables.

Particularly useful in asset-intensive industries like manufacturing and heavy equipment, asset utilization solutions employ automation, machine learning, and other intelligent capabilities to help organizations understand when and how assets are being used—or not being used. This information can help companies optimize the quality and utilization of assets to increase production and reduce operations costs.

Finally, solutions that bring intelligence and automation to workflows can help organizations improve the customer experience—which respondents tell us is one of the most important factors in determining competitive advantage. Eighty-four percent of the Automation Achievers say that intelligent automation will have a major impact on their organization's customer experiences in the next three years.

Decreasing operating costs

On the flip side of the coin—cost reduction—efficient end-to-end operational performance across functions is indispensable. Weather condition analysis solutions can combine data about weather conditions and predicted weather events with real-time inventory insights to help companies proactively respond to supply chain disturbances. Industry-specific weather insights integrated directly into operational dashboards, such as inventory visibility, can provide a clear view for exception management.

Industrial automation typically employs a network of smart meters and sensors to collect critical production data. AI systems can turn this data into valuable insights about the efficiency of manufacturing operations, which companies can use for preventative maintenance and production utilization to reduce downtime. In addition, smart meters monitoring and control with edge-enabled devices can enhance operational responsiveness, efficiency, and productivity.

Also impacting cost, the use of intelligent automation for transportation optimization is growing and includes optimization of loads, modes, routes, and equipment. Smarter transportation and logistics planning solutions use real-time data with machine learning capabilities to create event-driven alerts. Based on these alerts, companies can dynamically allocate inventory and make in-transit corrections.

Yara: Open collaboration for more efficient, sustainable food production[2]

Yara International, one of the world's leading fertilizer companies and a provider of environmental solutions, created an industry-wide collaborative platform to empower independent farmers and facilitate collaboration regarding farm and field data. The platform collects vast amounts of data from IoT sensors planted in fields and employs AI algorithms to analyze crop and field condition data, along with weather data. Participating farmers receive automated alerts and information on their mobile devices, including hyperlocal weather forecasts, crop damage predictions, and real-time recommendations for crop yield and care. This platform is transforming Yara's existing supplier relationship and helping create a more holistic approach to food production.

Action guide

Automation and the future of work

Intelligent automation is making its way across the enterprise and the broader ecosystem of collaborative partnerships. We offer a set of high-level actions to help guide your organization to the era of enterprise-wide automation.

1. Digitize work, then infuse AI

Leverage the full range of automation technologies to digitize work. This goes beyond automating tasks and requires reengineering processes to create new intelligent workflows. Use AI technologies and cognitive solutions to reveal patterns that might otherwise go undetected, and use the insights to enable responsiveness, particularly in times of uncertainty and rapid change. AI systems not only consume data much faster than humans, they also can learn from interactions and respond accordingly. Intelligent automation leverages these capabilities to enable a new class of intelligent products, services, and workflows that can reason and learn with the support of AI in real time.

2. Orchestrate new operating models

Look for ways enhanced intelligent automation can improve customer, employee, and partner experiences to create competitive value and differentiation. Create differentiation through agile workflows and in-the-moment processing. Improve responsiveness through actions based on timely customer, employee, and partner insights. Establish enhanced measurement and reporting tools to communicate business impact to support executive sponsorship.

3. Prepare your people

Intelligent workflows allow you to leverage digital workers to augment your workforce. Intelligent automation can help support your organization's core strengths, supplement additional resources to balance any weaknesses, and empower employees to focus on higher-level work. Educate your teams about intelligent automation capabilities and benefits to engage them in shifting responsibilities to intelligent automation. Remember that this is not a "once-and-done," but an ongoing effort to keep skills and engagement programs in pace with advancing technology.

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Research methodology

In collaboration with Oxford Economics, the IBM Institute for Business Value surveyed 1,500 executives with direct knowledge of their organizations' strategies, investments, and operations concerning intelligent automation. This group encompassed 21 industries with corporate headquarters spanning 26 countries around the world.

Respondent roles include CEO/head of strategy, CFO/head of finance, CMO/head of marketing, COO/CSCO/head of operations, CIO/head of IT/head of technology, chief technology officer, and executive responsible for strategic alliances or partnerships. We explored their organizations' planned investments, expected benefits and impacts, and applicability of intelligent automation across the enterprise and ecosystem. We also sought input regarding their adoption and investments in various emerging technologies and the impact on their workforce.

We used classification analysis to segment the survey population, identifying a distinct group representing successful and enterprise-wide implementation of intelligent automation. Representing 26 percent of respondents, the Automation Achievers were selected based on their expectation that intelligent machines will perform cross-enterprise or expert work within three years. In other words, these organizations are rapidly scaling and accelerating automation.

We also employed an econometric model and performed regression analysis, scrutinizing this group of achievers on the dependent variables of annual revenue and cost impact. We analyzed these dependent variables based on the 12 use cases listed below (independent variables) to determine which use cases yield the greatest impact on revenue and cost:

- Personalization of customer experience
- Automating workflows
- Activity monitoring
- Real-time inventory management
- Asset utilization
- Smart meters monitoring and control
- Autonomous vehicles/drones
- Physical structure monitoring
- Transportation optimization
- Sensor-based manufacturing
- Weather condition analysis
- Wearables for training and site maintenance.

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Notes and sources

1 Bennett, Tess. “Woodside Steps into The IBM Garage to Reimagine Employee Onboarding.” Which-50. October 21, 2019. https://which-50.com/woodside-steps-into-the-ibm-garage-to-reimagine-employee-onboarding/

2 “Yara and IBM launch an open collaboration for farm and field data to advance sustainable food production.” IBM press release. January 23, 2020. https://newsroom.ibm.com/2020-01-23-Yara-and-IBM-launch-an-open-collaboration-for-farm-and-field-data-to-advance-sustainable-food-production; “Yara and IBM join forces to transform the future of farming.” IBM press release. April 26, 2019. https://newsroom.ibm.com/2019-04-26-Yara-and-IBM-join-forces-to-transform-the-future-of-farming

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