



Research Insights

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# Executing intelligent workflows through automation

Enterprise-wide adaptability for chemicals, petroleum and industrial products

IBM Institute for Business Value



## How IBM can help

Progressive enterprises utilize automation and AI to augment their core strengths, mitigate 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 products 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](https://ibm.com/automation).

## 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 profitable growth, while reducing risks.

### **Enterprise-wide intelligent automation enables transformation**

Increasing use of automation, AI, and other technologies is changing the way humans and machines interact. Intelligent machines' tasks are expected to expand from administrative to include more departmental and cross-enterprise and expert work.

### **Adaptability and scale are paramount**

Deploying intelligent automation (IA) across an enterprise can build a more adaptable business, one that can rapidly respond, pivot, and scale up or down.

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## The intelligent automation opportunity

COVID-19, dwarfing previous disruptions, is making organizations rethink how to work, design, construct, source, operate, and maintain. The impact of COVID-19 varies from moderate to severe on different natural resources and industrial industries, depending on the downstream customer demand, workforce availability, supply-side shocks and regulatory environment.

Industrial original equipment manufacturers have experienced massive decline in new product demand and a slowdown in the services business. The metals and mining industry has been cautious.<sup>1</sup> The oil and gas industry's demand erosion occurring at the same time as its production disagreements has resulted in both the oversupply of resources and the subsequent oil price collapse. In chemicals, demand and supply fluctuations have driven the scale of manufacturing production down and in some cases, forced an alteration of product portfolio. Case in point: Demand by the medical community for personal protective equipment.

The pandemic has highlighted that operations can be severely affected by unexpected events, whether severe weather disruptions, political risks, or even the recent Russia-OPEC oil price war. This requires an operating environment that can execute fast, be innovative, and create more resilient operations across the enterprise. Businesses that apply intelligent automation to build end-to-end visibility, real-time insights and predictability into the value chain will likely weather supply chain challenges and customer service disruptions—and thrive in tomorrow's recovering market.

Automation has existed in chemicals, petroleum and industrial products since the 1990s in areas such as exploration and production, manufacturing, and refining. For example, drilling operations can use continuous diagnostics based on sensors on the drilling equipment to enhance uptime, improve safety and reduce costs.<sup>2</sup> In chemicals or equipment manufacturing, automation controls industrial machinery and processes, and helps optimize output.



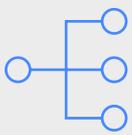
# 34%

of executives expect intelligent machines to perform departmental work in 3 years



# 63%

of respondents point to investment in robotic process automation today



# 86%

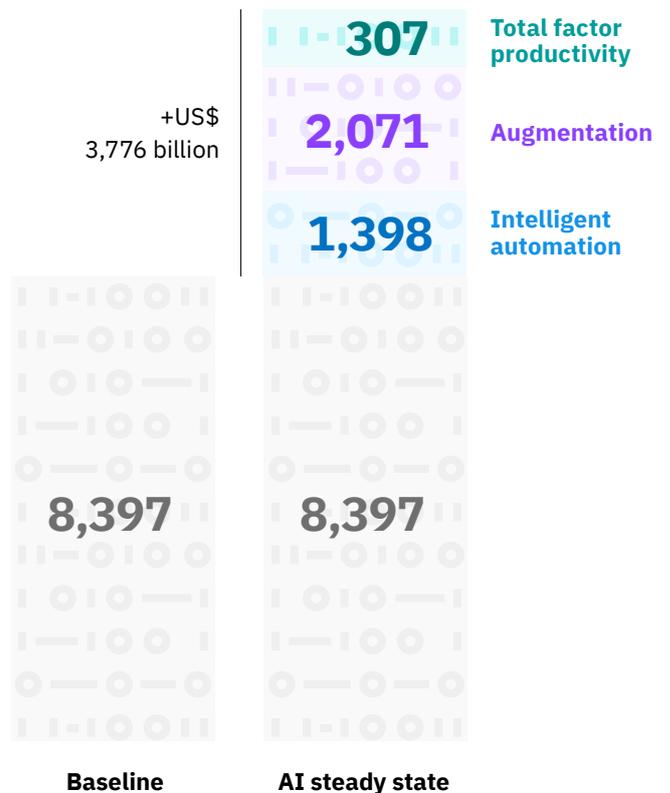
of executives say they are using automation to execute intelligent workflows

But intelligent automation (IA) enables step change. Artificial intelligence (AI) and automation—together they become intelligent automation—alter the way humans and machines interact. Intelligent automation changes how people analyze data, make decisions, and perform tasks and activities within a workflow or system. By applying intelligent automation, manufacturing companies can gain significant value (see Figure 1).

**Figure 1**

## The AI advantage

Value added (US\$ Billions) in manufacturing by 2035



Source: "The Future of Artificial Intelligence in Manufacturing Industries." Plant Automation Technology.

## With AI, organizations can integrate external data, identify prospects and understand customers individually—at scale.

Not only can intelligent automation provide costs savings, it can also dramatically enhance an enterprise’s decision-making capabilities. 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 combination of appropriate technologies for different processes and functions supports both intelligent workflow efficiencies and profitable growth (see Perspective: Automation evolution on page 4).

The IBM Institute for Business Value, in collaboration with Oxford Economics, conducted a comprehensive study to discover more about the effects of intelligent automation initiatives today and in the near future. 1,500 executives in 21 industries were asked a broad range of questions related to automation investments, priorities, benefits, and impact. In this report, we share the insights and strategies of the 90 chemicals, petroleum and industrial products respondents, representing 22 countries (for more details, see Methodology on page 14).

### The automation landscape

According to the executives surveyed, profitability enhancement, operational responsiveness and customer experience are driving technology expenditure decisions (see Figure 2). Investments in digital initiatives deliver value to their organizations, with the highest benefit in the areas of workforce management, customer experiences, and products and services.

Automation can enhance the customer experience by enabling more rapid and effective responses based on new data-driven insights. With AI, organizations can integrate external data so that marketers can identify prospects and understand customers individually—but all at scale.

In addition, automation improves productivity and allows employees more time to focus on critical customer priorities by shifting certain more mundane tasks away from humans. For example, AI-powered chatbots or agent assistants can manage routine customer requests and route the more difficult service items to customer service representatives.

With the right data, many activities—relating to both customers and routine business processes—can be automated. Predictive sales modeling and the provision of product or service data, descriptions, and use cases can help sales close deals.



### Figure 2 Tech expectations

The business objectives driving tech investment



Source: Q5. Which of the following objectives are most important when you make investment decisions about new and emerging technologies?

## Fluor: Using a data platform for efficiency and analysis<sup>3</sup>

Fluor Corporation is a global engineering, procurement, construction, and maintenance company.

The company has built a data platform that integrates its current and historical project data for benchmarking, and better project reporting and control. Enhanced project health and risk assessments, and scenario actions are now helping Fluor respond to the current challenges, using cognitive intelligence for process efficiency and real-time analysis.

## Perspective: Automation evolution

**Foundational automation** typically includes basic task and activity-based automation fueled by software algorithms. It reduces repetitive and rules-based tasks involving structured data. Business process management libraries and workflow software with select RPA 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 advanced 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 AI to analyze large bodies of operational information, recognize patterns from multiple sources, and execute accordingly.

**Enterprise-wide intelligent automation** is 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.

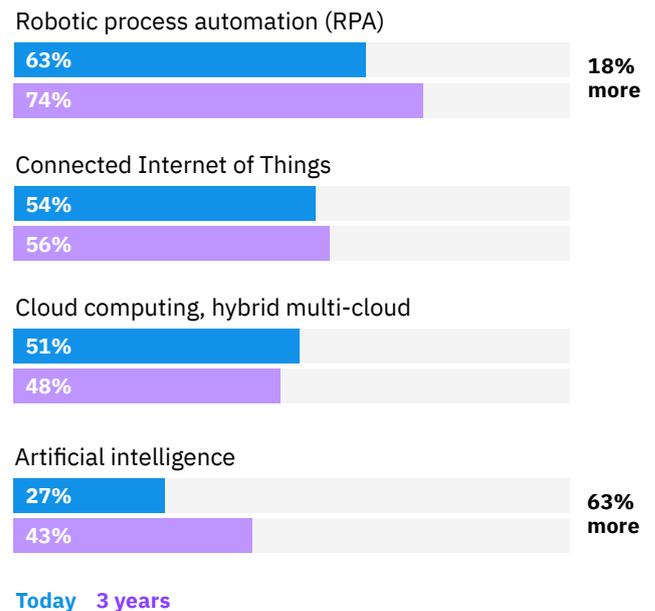
With automated workflows, bots can perform mundane, recurring activities, again liberating the workforce to focus on more complex decisions, higher value tasks, and new roles. In addition, automated workflows can link processes end-to-end, straddling silos and cutting across functions to enable new outcomes that differentiate an organization from its peers.

Applied in concert, technologies such as AI, automation, Internet of Things (IoT), and cloud computing help organizations discover, innovate, optimize, and customize workflows. And these technologies are maturing to a point where they can be deployed and exploited at scale (see Figure 3). Chemicals, petroleum and industrial products organizations plan to continue to expand the reach of robotic process automation (RPA), the top technology expenditure.

Figure 3

### Automation's sweet spot

Intelligent Automation attracts the most investment



Source: Q2. Which of the following technologies is your organization making substantive investments in Today, and in 3 years?

In parallel, AI is the investment required to take the benefits of automation to the next level. It is expected to grow rapidly in the next 3 years. Connected IoT and cloud computing remain strong investment areas since they are necessary to support generation, ingestion and integration of new and larger volumes of information from operations.

Our research also revealed that executives are currently investing an average of 34 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 increase revenue by 7.3 percent as they implement intelligent automation technologies and practices. Intelligent automation also helps improve efficiency—executives expect a 2.5 percent decrease in annual operating costs. Optimized workflows allow for profitable 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, adapt and scale with ease to create new value.

## Showa Denko (SDK): Improving spherical alumina production<sup>4</sup>

SDK is a Japanese-based chemical and technology business. The company has developed an AI-based image analysis system for spherical alumina production. In the production process, operators have to visually inspect the product using optical microscopes to see if there is a defect in sphericity. Production variables are adjusted based on these inspections. Since there are many types of defective shapes, operators have to make a judgement on particle conditions based on their experience.

SDK has developed this system to visualize the experience-based knowledge of skilled operators, which is not possible using conventional image-analysis software. The system provides rapid feedback of digitized data to the production process, with judgments at the same level as that of skilled operators in about 20 seconds. This system also enables accumulation of data for relearning processes and improves inspection accuracy. Thus, the product has the advantages of uniform sphericity and stable product quality.

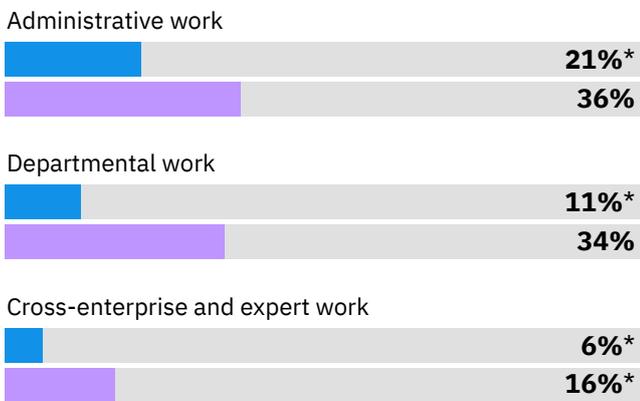
## Enterprise-wide intelligent automation

The landscape is shifting in the era of organizational enterprise automation, with intelligent machines' tasks expanding from administrative to include more departmental and cross-enterprise and expert work. In just 3 years, the nature of machine work will change (see Figure 4). The percentage of tasks overall—administrative, departmental, and cross-enterprise and expert—will continue to grow substantially.

**Figure 4**

### Beyond the factory floor

Enterprise-wide intelligent automation has arrived



Today 3 years

\* Results using low counts are statistically unreliable but can be considered directional

Source: Q9. Indicate the highest level of tasks your organization will allow intelligent machines to perform – today, in 2021, and in 2023.

## Henkel: Launching a smart factory<sup>5</sup>

Henkel operates worldwide with leading innovations, brands, and technologies in three business areas: Adhesive Technologies, Beauty Care, and Laundry & Home Care.

Henkel Adhesives Technologies in February 2020 officially opened its new production facility in Kurkkumbh, India, to serve the growing demand of Indian industries for high-performance adhesives, sealants, and surface treatment products.

The facility is designed as a smart factory with state-of-the-art technologies to ensure traceability and transparency, and to exceed the high industry standards for quality and safety. The factory has a high level of process automation, which enables both end-to-end digitalization of the plant operations and digitized workflows for high efficiency in manufacturing.

## EcoPlant: Cutting energy waste<sup>6</sup>

EcoPlant develops and markets an AI-powered, cloud-based monitoring and control system designed to reduce energy waste and optimize the maintenance of air compressors in industrial plants.

In the food and beverage sector, air compression systems are essential pieces of equipment, playing critical roles in operations. However, they are among the most expensive to operate due to energy consumption. These systems can account for 10 to 20 percent—and sometimes as much as 30 percent—of the electricity a plant consumes.

EcoPlant is a software-as-a-service solution that continually monitors and optimizes compressed air systems in real time to help companies significantly reduce energy waste, optimize maintenance, and save money. In addition to predicting equipment malfunctions before they escalate into real problems, the platform can also dynamically control the equipment, further boosting machine efficiency and minimizing downtime.

By using EcoPlant technology, a global food and beverage provider cut its energy consumption by roughly 25 percent, saving a total of \$85,000 in less than five months, and \$170,000 annually.

## Predictive analytics and machine learning enable an enterprise to adapt in a dynamic, and often disrupted, market.

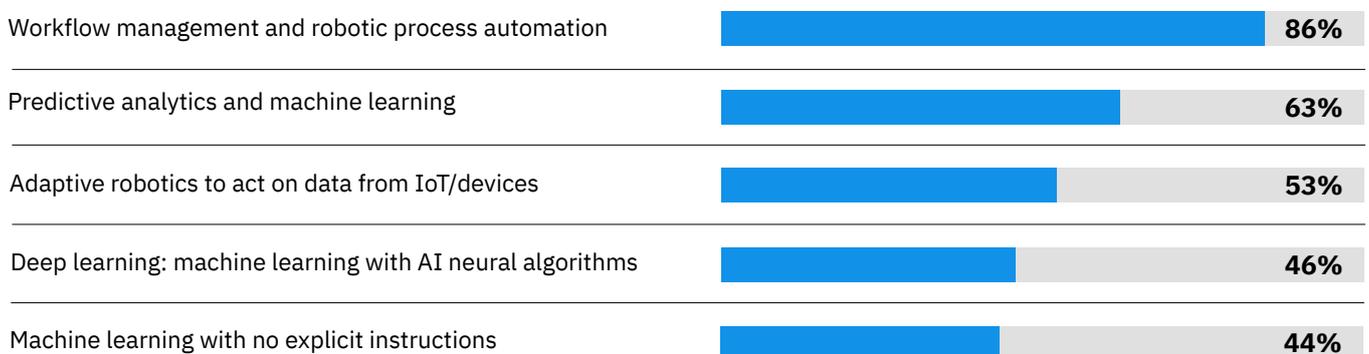
In addition to the level of tasks performed, we also asked respondents about the extent to which their organizations had implemented intelligent automation technologies. We found widespread use of automation to execute intelligent workflows (see Figure 5). Nearly two-thirds of organizations are also applying predictive analytics and machine learning. These capabilities enable an enterprise to be “always-on”— optimizing the delivery of products and services to provide continuity in a dynamic, and often disrupted, market.

With adaptive robotics to act on IoT data, companies can achieve real-time visibility into what’s happening on the plant floor, as well as across the supply chain. They can track products, raw materials, people, processes and assets. With this intelligence, organizations can optimize production operations and plant efficiency, improve worker safety and environmental compliance, and drive the shift to data-enabled services.

**Figure 5**

### Practice makes essential

Intelligent automation tech implementation grows



Source: Q11. To what extent has your organization implemented the following technologies? 3, 4, 5. pilot, full production, scaled across the enterprise.

# Chemicals, petroleum, and industrial production executives expect the impact of intelligent automation to increase over the next 3 years.

## Application of intelligent automation

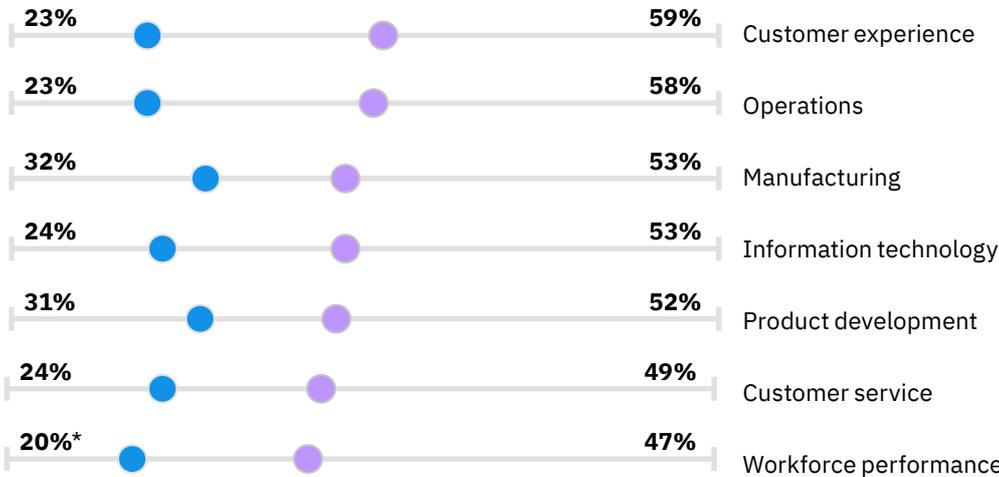
Chemicals, petroleum, and industrial production executives have high expectations for their intelligent automation initiatives that cross the value chain. Respondents expect the impact to increase over the next 3 years, particularly in areas that drive profitable growth and operational excellence (see Figure 6).

For example, increasing efforts to improve the customer experience and customer service reflects the expansion of the role of intelligent automation into systems of engagement. Operations and manufacturing are core activities where automation drives efficiency, reduced energy and better staff use. IT is an ingredient for intelligent automation success and workforce performance and associated training and skills set companies' differentiation.

**Figure 6**

### Where IA matters

Business areas where IA has the biggest impact



Today 3 years

\* Results using low counts are statistically unreliable but can be considered directional  
 Source: Q13. Extent intelligent automation has/will have an impact on these areas of your organization today and in 3 years. 1-5. No impact to major extent. Data represents those responding to a major extent 4/5.

In terms of use cases, chemicals, petroleum and industrial products companies are focused on five areas. Two really stand out: automating workflows and activity monitoring (see Figure 7).

Automated workflows can make efficient what are otherwise labor-intensive and wasteful processes. Typical areas of focus include maintenance, operations planning, customer interaction, invoice payments, order fulfilments, inventory management, and reporting. In the pulp and paper industry, preventive maintenance and other automation technologies have provided companies with a productivity gain among maintenance staff of up to 66 percent, and process efficiency gains of 20 to 30 percent.<sup>7</sup>

Rio Tinto uses robotic process automation software to manage maintenance order requests, scheduling, ordering, learning and development, finance and other core services for its iron ore business. The company saves around \$200 million a year in maintenance costs through RPA, predictive maintenance and other disruptive technologies.<sup>8</sup>

Activity monitoring applications range from back-office processes to predicting future responses and altering work tasks. Energy is one of the largest operating costs in manufacturing—as much as 40 percent in refining.<sup>9</sup> Proper monitoring of furnaces and gas-fired heaters to deliver stable, reliable power can reduce fuel consumption, waste and emissions, and maintenance costs.<sup>10</sup> Using AI capabilities, activity monitoring solutions can recognize patterns in unstructured data, make decisions, and even solicit services from other devices or systems.

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. Unplanned downtime costs industrial manufacturers an estimated \$50 billion annually, with equipment failure as the cause of 42 percent of this unplanned downtime.<sup>11</sup> The intelligent automation solutions can help companies optimize the quality and utilization of assets to increase production and reduce operations costs.

**Figure 7**

## Top use cases

Where chemicals, petroleum and industrial products companies will put IA to work

Automating workflows

62%

Activity monitoring

51%

Asset utilization

34%

Personalization of customer experiences

33%

Real-time inventory management

31%

Source: Q12. Which of the following intelligent automation use cases is your organization focusing on today?

## Sinopec: Promoting smart manufacturing<sup>12</sup>

Sinopec is one of the largest state-owned enterprises in China's petrochemical industry.

The company created smart factories at its Sinopec Zhenhai Refining and Chemical Company (ZRCC) and Sinopec Jiujiang Company. A comprehensive management system for equipment repairs and maintenance was established in Sinopec ZRCC, where equipment failures can be addressed in advance through data analysis and diagnosis. As a result, the reliability and utilization of equipment have improved, reducing maintenance costs by 20 percent and unscheduled shutdowns by 50 percent.

Solutions that bring intelligence and automation to workflows can help organizations improve the customer experience. For one steel company, AI is being used to better understand customer buying trends and needs, and predict the timeframes for purchases. This provides its sales team with the correct and up-to-date information they need when speaking with customers.

With digital assistants, the salesperson can ask for the latest information either before or while meeting with the customer. It helps make the salesperson more productive and improves customer satisfaction.<sup>13</sup>

Finally, real-time inventory insights help companies proactively respond to supply chain disturbances. AI can bring together both structured and unstructured data from a number of sources, including IoT devices, plant operations, and external partners, to identify patterns linking factors such as demand, location, socioeconomic, weather, and political status. These insights can enhance supply chain optimization spanning raw materials, logistics, inventory control, finished goods processing, and supplier performance, and help companies anticipate and react to market change.<sup>14</sup>

## ABB: Transforming customer support<sup>15</sup>

ABB is a global pioneering technology leader, producing power generation, distribution, automation and consumption equipment. The company had an enormous number of customer comments, in multiple languages, stored across numerous customer care systems.

ABB needed a solution that could not only collect, analyze and translate the comments into English to identify trends at scale, but also to understand how customers were feeling. If customer sentiment and emotions could be captured, the company could use the information to improve the manufacturing process and avoid future problems.

The company implemented a customer service solution. It includes Natural Language Processing (NLP) to understand customer comments and translate them into English, as well as Natural Language Understanding (NLU) to analyze text and extract metadata from its content: concepts, entities, keywords, categories, and relations and semantic roles. This helps the company learn about and understand sentiment, emotion and tone.

By linking this information with structured data, ABB can map an issue to its root cause, then build analytical models around the cause-and-effect analysis for better decision making and improved workplace productivity. Quality engineers have become more efficient while better understanding the root cause of problems.

## Cepsa: Optimizing chemical processes with AI<sup>16</sup>

Cepsa is a global, integrated company operating across the entire oil and gas value chain. The company has developed and implemented two real-time optimizers in the phenol production process at its Palos Chemical Plant in Huelva. These optimizers apply machine-learning techniques and predictive models and offer recommendations every 15 minutes to operators in the plant control rooms to maximize production.

To implement this project, it was necessary to mine and analyze over 3,000 process variables from different information sources (processes, climate conditions, lab data and more), build predictive behavior models based on the relationship of these variables, and program the optimizers to offer the best recommendations regarding optimal operating values. The optimizers have increased production by 2.5 percent, which help to produce over 5,500 tons of phenol per year.

## Action guide

### *Creating intelligent workflows through automation*

As intelligent automation makes its way across chemicals, petroleum and industrial products companies, here is a set of high-level actions to help guide your organization to the era of enterprise-wide automation.

#### **1. Digitize work, then infuse AI**

Map your data assets—your data, its sources, and platforms—to each of your business goals and processes. Embrace the integration of IT and operational technology (OT) domains, a necessity for AI-driven information and recommendation exchange. Use the full range of automation technologies to digitize work. Reengineer 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.

#### **2. Orchestrate new enterprise experiences**

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 executive sponsors.

#### **3. Prepare your people**

Attract employees with the right skills to embrace intelligent automation. Educate your teams about intelligent automation capabilities and benefits to engage them in shifting responsibilities to intelligent automation. Train staff on data management, visualization, analytical, and problem-solving skills. Equip employees with automated human-to-device and device-to-human understanding. Use connected mobility to empower supply chain and ecosystem workers in real time.

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## 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. This report focuses on the 90 respondents in the chemicals, petroleum and industrial products industries.

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.

## Related reports

### **Digital transformation at scale for industrial products**

AI, analytics, and other digital technologies are giving industrial products frontrunners a competitive edge. <https://www.ibm.com/thought-leadership/institute-business-value/report/transformation-industrial-products>

### **Optimizing the chemicals value chain with AI**

AI champions use AI to be more responsive and drive business performance with new approaches and ideas. <https://www.ibm.com/thought-leadership/institute-business-value/report/chemicals-value-chain-ai>

### **How AI can pump new life into oilfields**

AI can help fix costly downtime by monitoring and predicting equipment failures and highlighting the business impact of unprepared loss of production capacity. <https://www.ibm.com/thought-leadership/institute-business-value/report/oil-gas-production-optimization>

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