



→ Smarter, faster, better: Intelligent automation at work in the government

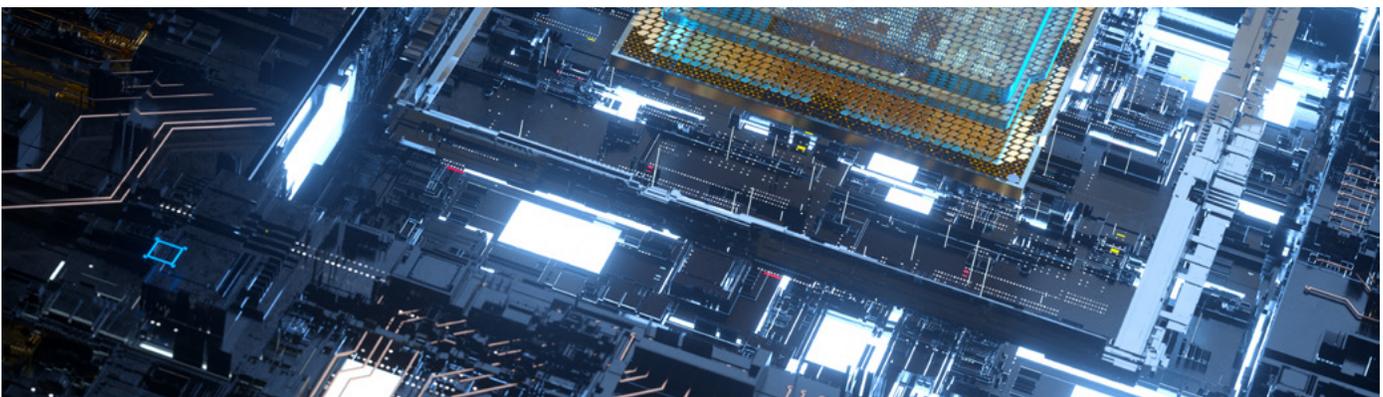
How automation tools and technologies are revolutionizing process workflows and helping agencies meet their missions.

By Kyle Tuberson, ICF

Introduction

Now is an exciting time to be a mission leader. For the first time in history, a collection of technologies has emerged with the power to solve the talent, speed, and data quality problems that have challenged federal agencies for decades. Through the artful application of artificial intelligence (AI), machine learning (ML), data and analytics, automation tools, and low-code platforms, agencies can augment their human capabilities and provide better and more timely services—at scale.

What does this mean in practice? Think of any business process workflow. A contact center. An institutional knowledge base. A public health surveillance system. In all of these cases—and thousands of others—we can leverage technology to automate the tedious, low-level aspects of the work, freeing up the human workforce to do more specialized and nuanced tasks that are strategically aligned to the mission.



We can write the business rules into digital decisioning platforms, allowing domain experts to own and author them through low-code and orchestration-oriented tools. And we can take it even further, using AI and ML to create a virtuous cycle of continuous learning where the automated aspects of the process get smarter over time.

The need for this transformation is urgent. Federal agencies are facing a talent gap unlike any we've seen in decades, along with a workforce that's retiring and taking its institutional knowledge with it.¹ Many struggle under the weight of ad hoc and siloed legacy systems that are slow, clunky, and rapidly approaching obsolescence. And they have data quality issues that result in a disjointed and incomplete internal information landscape.

By combining tools and tactics to automate as many IT and business processes as possible—moving toward “hyperautomation” (Gartner term²) and “intelligent automation” (Forrester term³)—we can solve the key challenges that agencies face today, while setting them up for a successful tomorrow.

But while artificial intelligence applications have moved from science fiction fantasy to 9-5 reality, already streamlining and even transforming operations in certain programs, they are far from a plug-and-play solution. Determining where to have real human oversight, design, and review of business processes that involve automation is a capability that many agencies will need to develop over time; it's a process that requires collaboration between business and IT leaders to get it right. But the results—nimble, data-driven operations and improved digital experience and mission outcomes—are well worth the effort.

In this paper, I will:

- outline the key architectural problems that intelligent automation addresses.

- profile some of the workflows within many federal programs that have these attributes and are therefore good candidates for intelligent automation.
- discuss some of the foundational capabilities that federal agencies will need to evolve to support AI applications.

Key architectural challenges that agencies face—and how intelligent automation addresses them

As outlined in our [hyperautomation primer](#), the act of automating as many IT and business processes as possible requires a firm grounding in your organizational context. Each agency has its own hyper-specific business processes and IT ecosystem to consider—and the details make all the difference when it comes to knowing which processes to prioritize in service of the mission.

But while each agency context is unique, there are a set of architectural problems that we commonly see across agencies that intelligent automation can help solve:

Inconsistent service delivery

In 2020, citizen satisfaction with federal government services fell for the third year in a row, dropping 4.4% to 65.1% overall, according to the American Customer Satisfaction Index.⁴ Why the downward trend? Much of the problem stems from legacy systems that were designed without current citizen needs in mind—and that lack the flexibility to adapt to the needs of the day.

Take a contact center, for example. As noted in the Digital.gov guidelines, today's digital citizens want to speak to government agencies via multiple channels—web, social media, mobile technologies, *and* phone⁵—but many contact center systems were designed

¹ Brian Roach, “What’s Causing the Federal Talent Crisis?” Forbes, accessed March 8, 2021, <https://www.forbes.com/sites/sap/2019/10/18/whats-causing-the-federal-talent-crisis/?sh=89252d4e2099>.

² “Gartner Top 10 Strategic Technology ...” Gartner Research, accessed February 12, 2021, <https://www.gartner.com/smarterwithgartner/gartner-top-10-strategic-technology-trends-for-2020/>.

³ Craig Le Clair, “Predictions 2021: Automation Becomes a Business Imperative,” Forrester, accessed March 3, 2021, <https://go.forrester.com/blogs/predictions-2021-automation-becomes-a-business-imperative/>.

⁴ “ACSI Federal Government Report 2020,” American Customer Satisfaction Index, accessed March 8, 2021, <https://www.theacsi.org/news-and-resources/customer-satisfaction-reports/reports-2020/acsi-federal-government-report-2020>.

⁵ “Contact Center Guidelines,” Digital.gov, accessed February 23, 2021, <https://digital.gov/resources/contact-center-guidelines/?dg>.

primarily for phone intake and fall short of the omnichannel support that citizens expect. To improve service delivery across all channels, agencies need to design information flows and knowledge resources that match common customer journeys⁶, a process that leverages human-centered design principles and results in a more empathetic and effective contact center experience.

From a systems perspective, agencies need to reimagine their front-end digital experience and orchestrate the systems and dataflow in the back-end to activate artificial intelligence and machine learning capabilities. The **conversational AI** elements of intelligent automation (which can include chatbots, smart speakers, and virtual assistants) help agencies deliver a consistent service experience across channels.

Data access, fragmentation, and volume issues

Data issues also abound in the federal government. Agencies currently collect more data than they know what to do with thanks to the proliferation of web tracking, sensors, markers, and devices that power our modern lives. Discrepancies in the quality of that data are a serious problem for federal agencies ill-equipped to manage, catalog, and sift through the incoming flood of raw information. And unfortunately, the legacy systems through which the data is supposed to flow are too outdated, slow, clunky, and siloed to properly manage its collection in an easily-indexable or communicable way from an IT perspective.

The intelligence layer of an intelligent automation solution—which includes the predictive analytics and machine learning elements—addresses data quality challenges by pulling speech, image, video, and unstructured text into a single repository. From here, AI and machine learning can be applied to the data to deliver predictive analytics scoring and services to the application layer. As its name implies, the intelligence layer uses data to help the process continually learn and improve.

Rigid business rules that are hard to monitor and change

It's a challenge to optimize and improve when the business rules that fuel your processes are outdated and hard-coded into the system. Many agencies face this problem due to legacy applications that were custom-built for the program as it was in the past. As technology and customer expectations evolve, as they always do, these rigid business rules begin to hinder progress and can have a negative impact on the mission.

With the introduction of **low/no-code platforms**, business and domain leaders can own their own destiny when it comes to business processes. These flexible platforms power **process automation** and allow agencies to compose and execute business processes across the organization—and change them as needed to optimize performance.

Skills turnover that inhibits key systems maintenance

One of the biggest pain points we see across agencies is the inability to maintain systems that contain key insights due to skills turnover. The knowledge is trapped in legacy systems, and in the minds of a retiring workforce. And the talent is not plentiful and available enough to evolve, maintain, and modernize that knowledge.

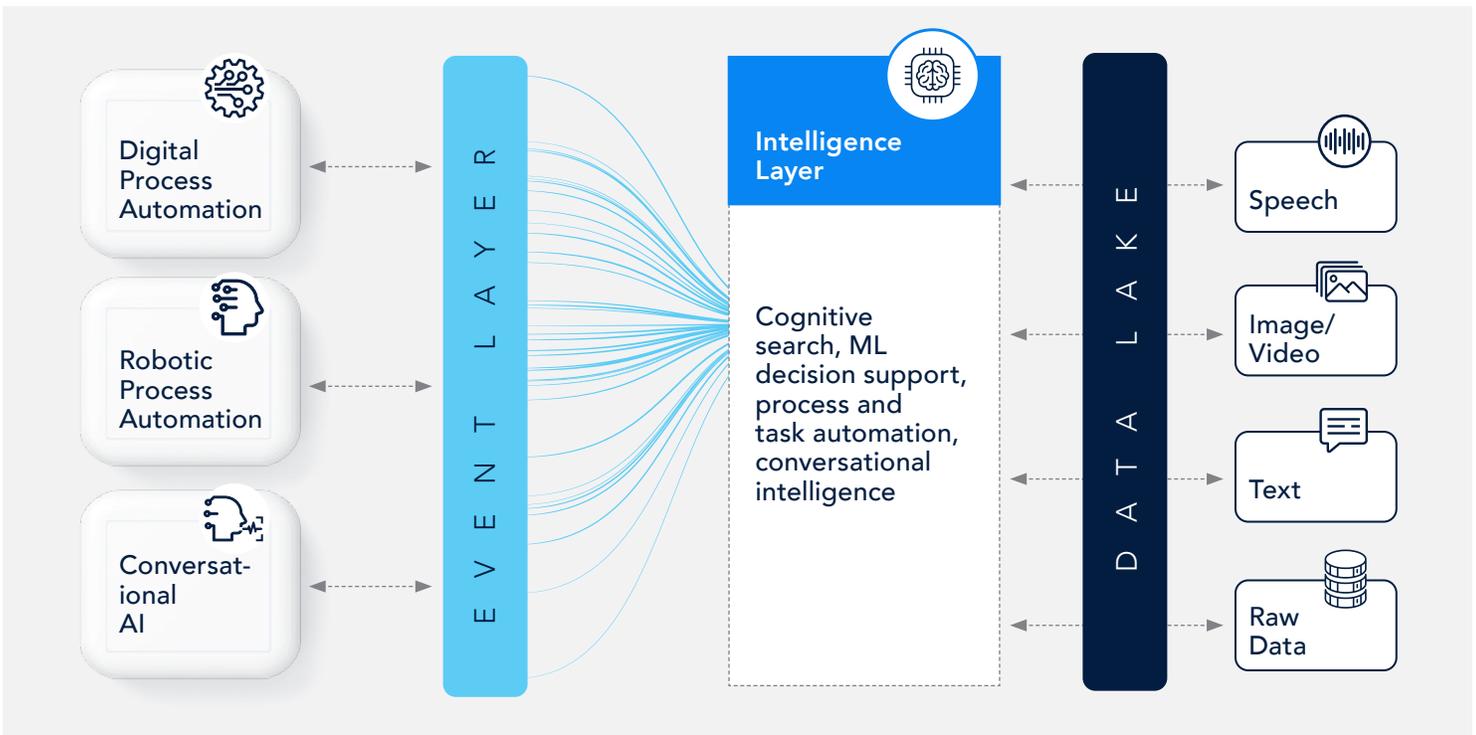
Robotic process automation (RPA)—the automation of labor-intensive, repetitive tasks across multiple systems and presentation layers—is especially helpful at solving this challenge. RPA uses physical or virtual robots to support human-led functions and introduce efficiencies without the need for reengineering. It can be plugged in to support the places in the IT ecosystem where (1) the knowledge has dried up or retired; and (2) the costs of system replacement are prohibitive. RPA automates essential tasks run on legacy systems while allowing program leaders to focus rebuilding and replacement efforts in the right places.

⁶ Wendy Harman, "Setting up citizens for success: A framework for federal contact centers designed to serve," ICF, accessed March 2, 2021, <https://www.icf.com/insights/technology/federal-contact-center-framework>.

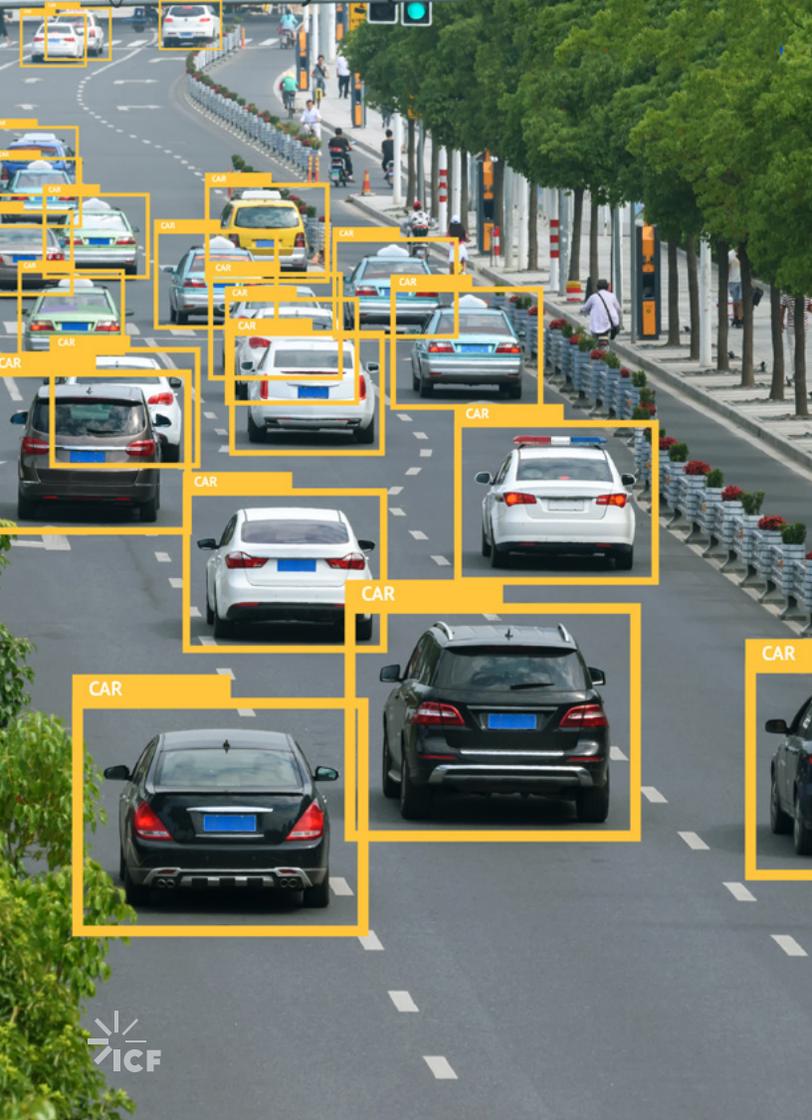
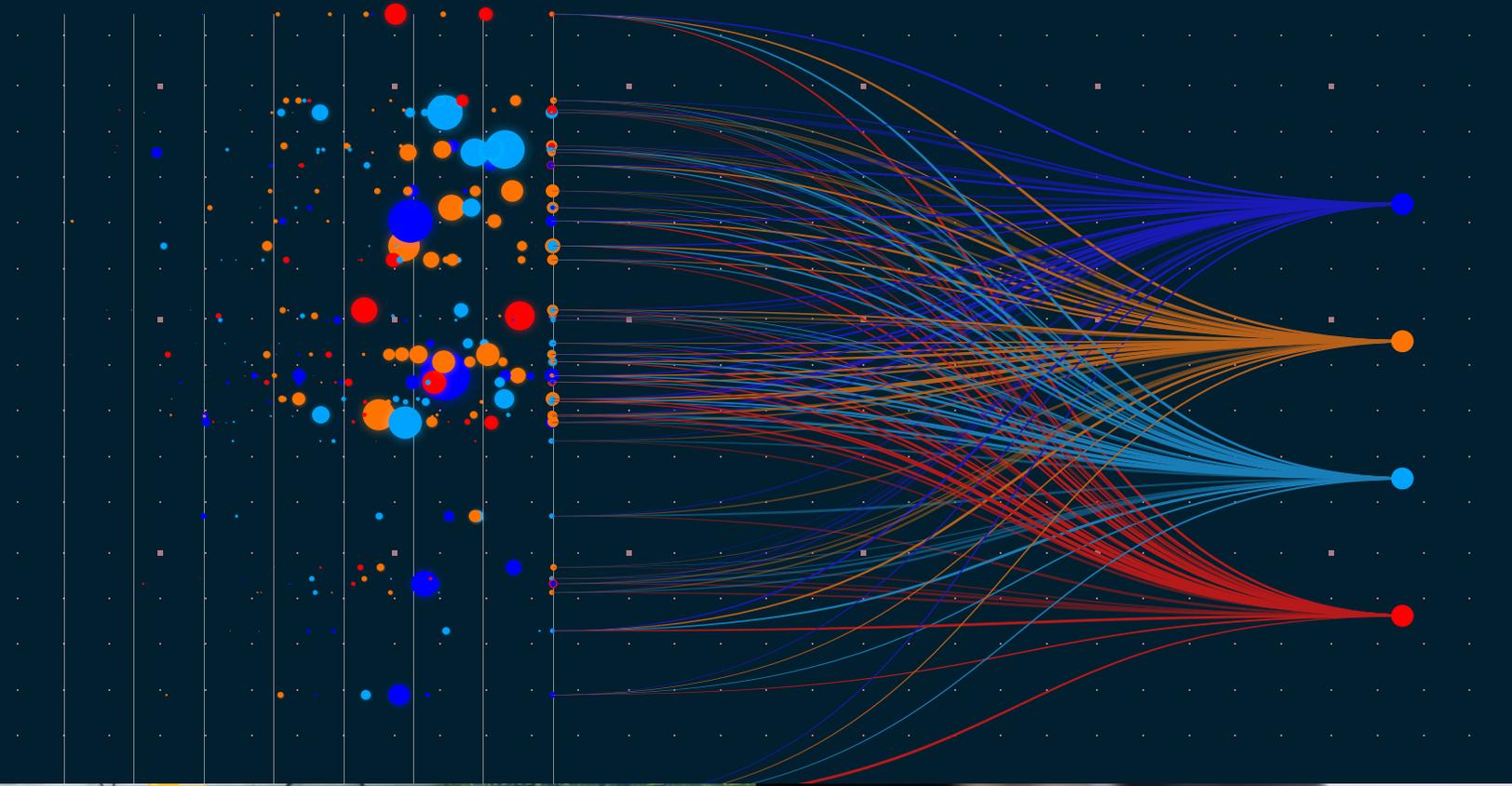
Orchestrating intelligent automation capabilities to achieve mission outcomes

While the individual capabilities called out above highlight elegant solves to common architectural issues, the individual tools and technologies need to be combined in highly specific ways to achieve mission outcomes. The real art to intelligent automation lies in the orchestration—the ability to architect a solution that combines Platform-as-a-Service (PaaS), open source technologies, and best-of-breed capabilities to solve the unique mission objectives and concerns that agencies face.

This diagram offers a high-level look at an intelligent automation solution and shows how the elements work together.



- **Conversational AI** – Synthetic brain power that gives machines the ability to understand, process, and respond to human language with the help of natural language-based technology.
- **Data lake** – A foundational piece you must have in place before you can leverage AI/ML, a data lake is a centralized repository to capture, curate, and store both structured and unstructured data for further analysis.
- **Intelligence layer with predictive analytics and machine learning (ML)** – AI and ML are applied to the data to deliver predictive analytics scoring and services to the application layer. As its name implies, the intelligence layer uses data to help the process continually learn and improve.
- **Low/no-code platforms and digital process automation** – The composition and execution of business processes across the organization, digital process automation is orchestrated by low/no-code platforms such as ServiceNow and Appian.
- **Robotic process automation (RPA)** – RPA looks for manual tasks to automate. Tasks that are repetitive, labor-intensive, and occur across multiple systems are prime candidates for RPA, allowing organizations to create further efficiencies through physical or virtual “robots” that can support human-led functions.
- **Event layer processing** – The glue that holds everything together, event processing is how you get systems to talk to each other based on events that occur within them.



Applying intelligent automation to common federal agency workflows

Given the many different government divisions and activities that have highly-specific business processes, the applications of intelligent automation range far and wide. It is already making a positive impact in the areas of disaster management, energy efficiency, public healthcare, and a myriad of social-interest programs—and we are still in the early days of adoption.

In the examples below, I will illustrate how agencies can apply intelligent automation to transform operations and improve service delivery in three program areas: a contact center, a knowledge base, and a health surveillance system. But because every digital transformation journey involves a complex combination of tools and technologies—many of which apply across all scenarios—I will focus on one or two key technologies for each example to highlight the promise they offer.

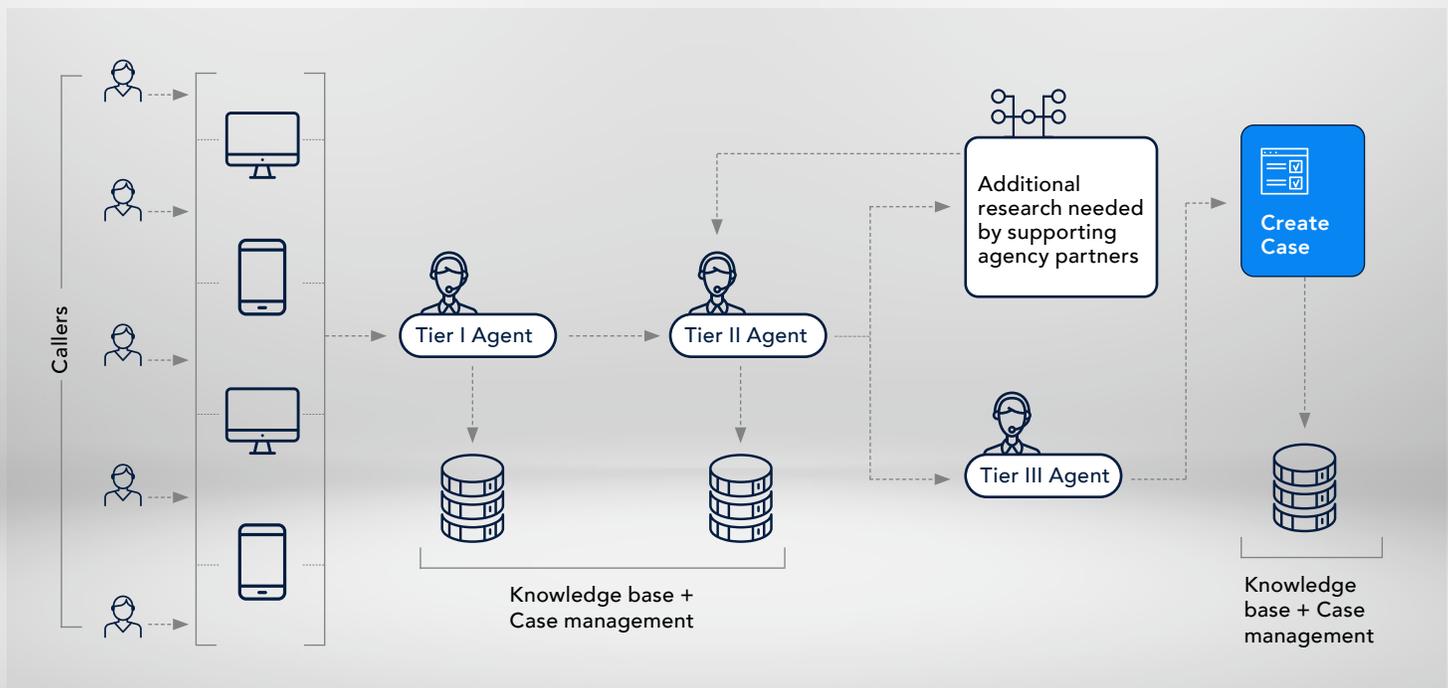


Applying intelligent automation to a contact center: A conversational AI example

Imagine a contact center that is failing to achieve business objectives due to legacy technology and operational constraints. The program struggles with inconsistent service delivery. Tier 1 cubicle workers field calls and enter data manually, which introduces errors and inconsistencies. The Tier 2 agents who are then tasked with analyzing and processing the collected data are often faced with the prospect of wading through a jumble of duplicated, incorrect, or inconsistent data.

How can intelligent automation help? To answer this question, we would start by mapping out the present-day call center workflow to identify existing issues and areas for potential improvement.

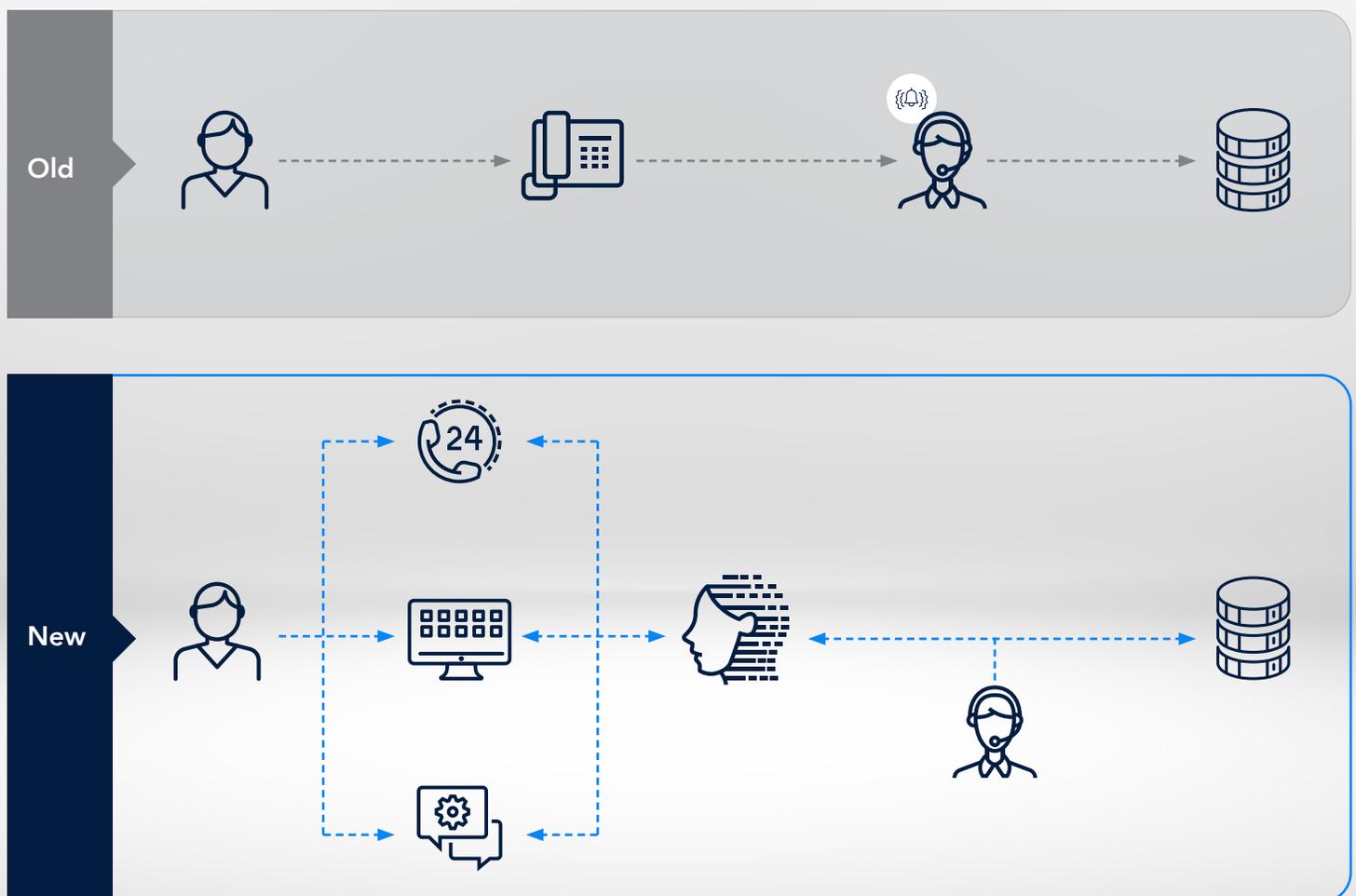
The present-day workflow might look something like this:



When we analyze this business process flow, we see how conversational AI can be applied to create efficiencies right away. Through the introduction of chatbots, we are able to offload manual call volume and improve the quality and consistency of Tier 1 data collection and service delivery. These lower-value data entry tasks are ideal for chatbots and bring about immediate process improvements such as reducing the dependency on manual labor and allowing experts to do their jobs more quickly and efficiently.

But intelligent automation allows us to do more than just handle basic data entry. Behind the scenes, the video, images, and unstructured text data collected by the chatbots can be curated and stored in a data lake environment, which will allow us to build machine learning and AI models that assist with identity and entity resolution while training the bots to get smarter and improve service delivery over time. For example, someone calling in about a failed HVAC system can take a picture and upload it using the chatbot. The bot would then run the image through an AI/ML model to advise the caller in real time.

With the application of conversational AI and an intelligence layer, the contact center workflow is streamlined and transformed:



AI applications and intelligent automation allow the agency to deliver better digital experiences and meet mission objectives—outcomes that were out of reach before.

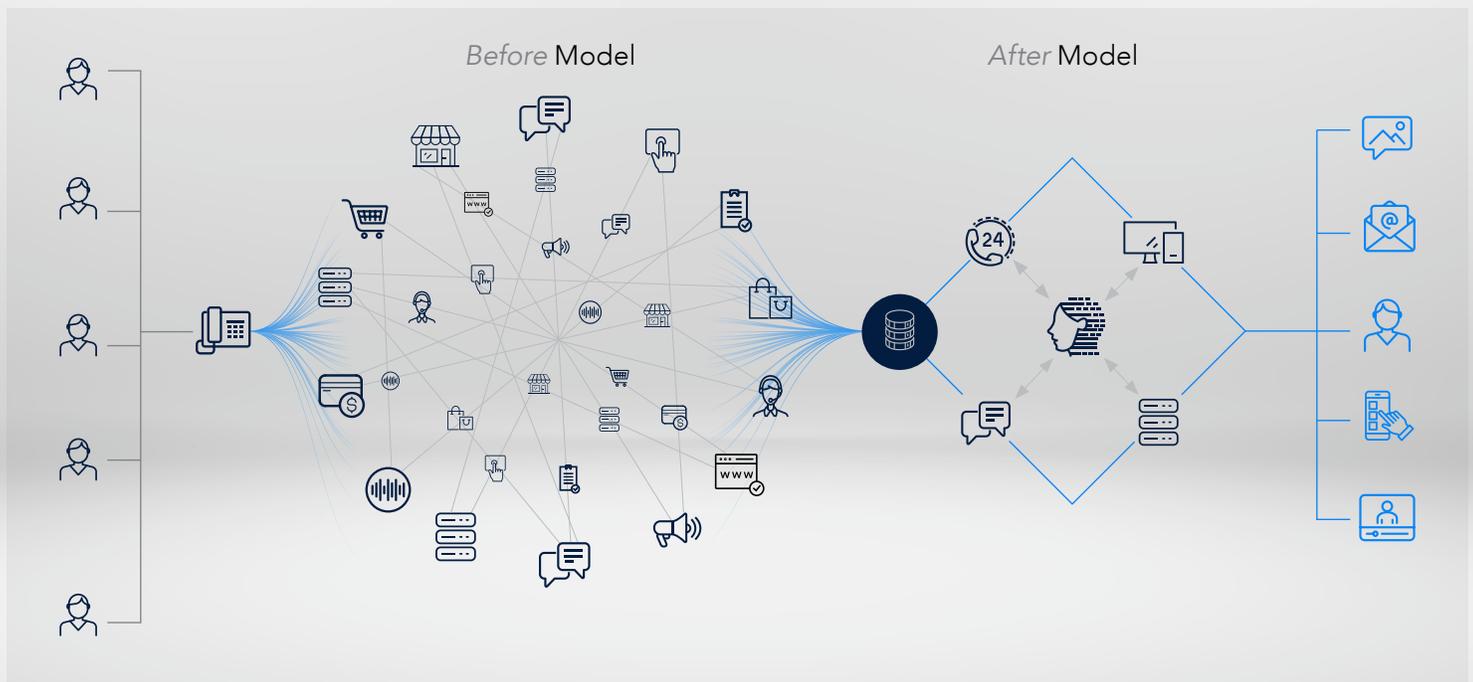


Applying intelligent automation to a knowledge base: A cognitive insights example

Now imagine a large resource center that distributes materials to 100,000+ social welfare professionals. These experts need to be able to conduct advanced searches to retrieve important resources for people in need—in real time. But the legacy technology and siloed systems that comprise the knowledge base hamper their ability to access and deliver essential materials and services.

How might we apply intelligent automation tools and technologies to provide a better digital experience to these professionals each time they access this important clearinghouse? We would start by mapping the present-day IT ecosystem, which consists of 30 siloed systems, websites, and databases.

We see the need to modernize, integrate, and consolidate these systems to address delays, data transparency issues, and search functionality limitations. As we devise a digital transformation roadmap for the agency, we would focus on (1) using **AI** to index the information, which will make it more accessible to the experts; (2) applying **machine learning** behind the scenes to the huge corpus of data that then enables us to serve up answers in a way that's fast, easy, and accurate; (3) implementing a **hybrid cloud solution** with a low-code platform to consolidate and standardize the multiple functions that those redundant programs/platforms deliver; and (4) extending it with **Amazon Web Services** to provide more advanced analytics capabilities.



By moving all data under one platform, we encourage a centralized data strategy, which will dramatically improve the digital experience while providing real-time insights to practitioners. The centralized data and new architecture produce powerful cognitive insights that supplement the social welfare case workers and help the agency make a giant leap forward in its mission delivery.





Applying intelligent automation to a public health surveillance system: A data harmonization example

Syndromic surveillance informs health professionals of growing public health threats, but its success relies on the input and harmonization of a large volume of field data.

How many people are testing positive for COVID-19 in Tennessee? Is there an HIV or tuberculosis outbreak brewing in a certain region? Are gunshot wounds on the rise in particular cities? Public health agencies collect data on a wide range of critical issues and use that information to inform investments in PPE, education and awareness campaigns, and other measures.

But America's fragmented public health enterprise presents serious challenges to agencies tasked with preventing outbreaks and monitoring public health. With more than 200 disparate legacy information systems that lack interconnection and interoperability—combined with massive discrepancies in data collection approaches across these systems⁷—agencies struggle to collect, process, and deliver timely public health surveillance data in a way that's affordable and effective.

Health surveillance data presents additional challenges, since patient-generated sensor and marker data is extremely high volume. Given the proliferation of incoming data, public health agencies need to build IT ecosystems that can handle the volume—both today, and in the future as the program scales.

How can machine learning and intelligent automation help agencies produce timely public health insights that can be used

to prioritize investments and get ahead of disease outbreaks? And what is the best way to integrate the systems, harmonize the data, and make sure an increasing number of producers and consumers of the data can access it quickly?

To answer these questions, we would first need to understand the present-day dataflows, sources, and systems. Once we had fully mapped out the existing data infrastructure and workflow logic, we would be ready to make the following recommendations:

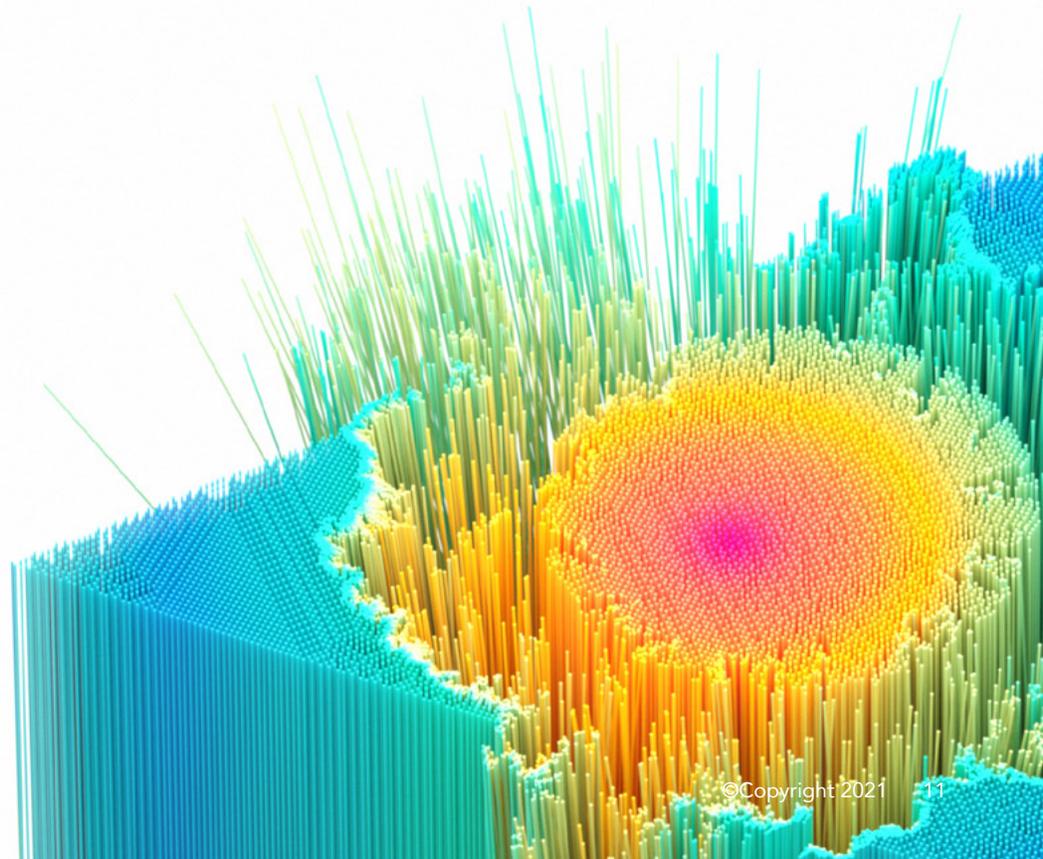
- (1) **Expand the AWS platform servers and software** to unlock more advanced analytics capabilities; (2) **re-architect the data processing workflow** to pull the data into a centralized repository, which will allow the agency to use machine learning to build predictive models that can classify data; (3) **introduce streaming analytics** functionality to enable the agency to process and analyze field data continuously instead of in batches; and (4) **develop text mining methods** to transform unstructured text into a structured format, which will allow the agency to analyze emergency department data as a complement to case reporting.

By implementing these technologies, we would be able to make dramatic improvements to the platform—helping the agency unlock timely public health insights that it can use to improve mission outcomes.

⁷ David Speiser, "The urgent need to reinvent America's public health enterprise," ICF, accessed March 8, 2021, <https://www.icf.com/insights/health/reinvent-americas-public-health-enterprise>.



The real art to intelligent automation lies in the orchestration—the ability to architect a solution that combines Platform-as-a-Service (PaaS), open source technologies, and best-of-breed capabilities to solve the unique mission objectives and concerns that agencies face.



Solving the talent gap—and building the workforce of the future

The automation tools and technologies available to agencies today provide a helping hand across all types of work: repetitive work benefits from conversational AI and RPA; administrative work benefits from process automation and RPA; and expert work benefits from cognitive search and machine learning decision support.

But although there are numerous upsides to intelligent automation from a business and mission perspective, these technologies can trigger anxiety in a workforce that feels threatened by displacement and wary of change. Technology, after all, closes some doors while opening many others. To ensure a smooth shift, agencies should involve the workforce in the innovation from the beginning. When mission leaders communicate changes early and often—while showcasing the efficiencies the new technologies will bring about—they will obtain the buy-in and investment they need from the workforce. And having that mission-focus and goodwill in place is crucial, as the workforce of the future must evolve in

significant ways, including:

- Cubicle workers will need to move up the value chain.
- The workforce will need to become workflow experts, understanding how the various actors (human and technology) contribute to the execution of business processes across the agency—and know how to communicate these details to others.
- Roles will require less programming knowledge, as off-the-shelf and open source technologies remove the need for heavy coding and customization.

The bottom line? The human workforce will be focused on orchestrating and integrating a number of automation tools and technologies to optimize tasks and workflows, while spending their time on higher value tasks that contribute to mission outcomes.

Robust workforce and human capital strategies that are grounded in digital transformation expertise can help agencies build their future-ready workforce successfully. Agencies need strong change management⁸ capabilities to identify and fill talent gaps while evolving their workforce to meet the needs of the modern mission.

Conclusion

Business processes that live in digital decision platforms. Data that's collected, curated, and leveraged to streamline operations and deliver faster service. Systems that are consolidated, integrated, and nimble enough to flex as your business needs evolve. And business experts who are empowered to focus on the higher value work that adds strategic value to the mission.

There are many areas throughout federal programs that can benefit from AI approaches. When applied carefully, modernizations such as intelligent automation and AI-driven decision making can help solve the

talent, speed, and data quality problems that plague agencies today.

But implementing these changes correctly can be a complex, costly, and time-intensive endeavor if you don't have the right experts at your side. It's imperative to choose digital transformation and IT modernization consultants who understand the federal agency context and have a demonstrated record of success. Effective intelligent automation results from an artful blend of domain and technology expertise—and is powered by a vision for both short-term wins and long-term transformation.

⁸ "Workforce and human capital," ICF, accessed March 3, 2021, <https://www.icf.com/work/human-capital>.

About the author



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Kyle Tuberson is ICF's public sector chief technology officer. He has over 20 years of technology consulting experience in the areas of data visualization, geospatial analytics, data management, and data science. In his role, Kyle builds teams that use data to create innovative solutions to difficult business challenges. His teams have applied data science and data visualization techniques to help ICF's clients reduce greenhouse gas emissions, prevent fraud with government immigration and entitlement programs, and improve access to healthcare in emerging markets.

Currently, Kyle leads initiatives that focus on providing IT modernization services to the government and to industries such as healthcare and energy. Services include IT modernization, cloud computing, machine learning, internet of things (IoT), geospatial analytics, data visualization, and more.

Kyle holds a master's in technology management from George Mason University and a bachelor's in management information systems from George Mason University. He was awarded the CIO University Certificate in Federal Executive Competencies by the Federal CIO Council. He is also a 2018 Federal 100 award winner.



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