

# Public Sector Innovation:

The Art of the Possible



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# Foreword

Dear Innovators,

2020 and 2021 were filled with tremendous change for public sector organizations around the world. COVID-19 brought to light the need for governments, educational establishments, and nonprofits to accelerate their digital transformation, invest in innovation, and improve accessibility, while also creating infrastructure to support digital equity in the broader community.

Forbes magazine stated, “It’s never been more important for government agencies to embrace innovation than over the past 18 months. Citizens are relying on our governments more than ever to provide critical services during the global pandemic—from developing COVID-19 vaccines at warp speed to extending benefits to the record number of unemployed Americans.” Even during the pandemic, many public sector organizations encountered limitations in embracing innovation because they do not have the internal mechanisms and/or resources to innovate, they are concerned about digital/data sovereignty, and they have stakeholders who are resistant to change.

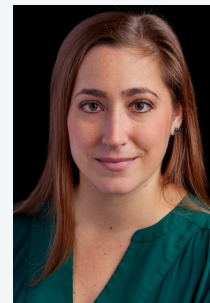
Amazon Web Services (AWS) has a suite of programs to inspire, enable, and proliferate innovation within the public sector globally. These programs include the AWS Cloud Innovation Centers (CICs), AWS Digital Innovation Program (DI), AWS Innovation Studio (Studio), and AWS Joint Innovation Centers (JICs).

To help public sector organizations understand these programs and how they accelerate innovation in the community, we are sharing this showcase: AWS Public Sector Innovation: The Art of the Possible. This piece shares customer testimonials and showcases projects that were built as a result of these programs. Through these stories, you will learn how:

- 1 Working Backwards from the customers’ needs** helps build better solutions
- 2 Quality mechanisms** are critical for implementing social programs
- 3 Technology** positively impacting education and healthcare
- 4 Data** is the building block for greater insights and rapid innovation

AWS’s innovation programs are here to help public sector organization succeed, from ideation through establishment. I am inspired every day by our customers’ relentless pursuit of mission-critical solutions for their customers and how they are striving to make the world a better place for future generations. This showcase includes real-life examples of how technology is enabling innovation and making the world a better place.

I look forward to supporting your innovation journey.



Sincerely,

Katie Herritage  
Global Leader, Worldwide Customer  
Innovation and Acceleration Programs

# AWS Innovation Programs

## AWS Cloud Innovation Centers

AWS Cloud Innovation Centers (CICs) provide an opportunity for nonprofits, education institutions, and government agencies to collaborate with other public sector organizations on their most pressing challenges, test new ideas with Amazon's innovation process, and access the technology expertise of AWS. Any nonprofit, education, or government organization can apply to work on a challenge with our global network of public sector-led innovation centers. Organizations bring their expertise and work through a challenge engagement, uncover new ways to solve complex problems, and publish their lessons learned to further drive public sector innovation.

In short, CICs are public-private sector collaborations around the world—powered by AWS—that identify digital transformation challenges and real problems that matter most to communities, and provide subject matter expertise to help create innovative new answers.

## AWS Digital Innovation Program

The AWS Worldwide Public Sector Digital Innovation team (DI) helps customers solve mission-critical challenges. Through hands-on workshops, AWS Digital Innovation Specialists collaborate side by side with public sector executives, and their teams, using Amazon's innovation approach—Working Backwards from their “customer” (residents, members, students, constituents, etc.) to define a new solution, product, or service to solve their customer's challenge. Together, the teams create a mock press release (PR), a set of Frequently Asked Questions (FAQs), and a visual storyboard, which become inputs to bring the idea to life quickly on AWS. The AWS specialists then work with customers, AWS Professional Services, or an AWS Partner to build a first version of the idea on AWS. After an initial release, AWS helps customers to continuously experiment and enhance the solution, iterating like Amazon.

## AWS Innovation Studio

The AWS Innovation Studio (Studio) serves as a center for scaling the impact our customers can have on improving the communities in which we live, work, and learn. Together, public sector organizations, policy makers, citizens, industry leaders, and academia collaborate with Amazon experts at the AWS Innovation Studio to find new ways to address some of the world's most pressing societal issues, such as housing insecurity, climate change, sustainability, and education inequality. Organizations work with the AWS Innovation Studio to imagine, build, and share forward-thinking solutions with national and global impact, leveraging Amazon's wide range of technologies, including artificial intelligence (AI), data science, and machine learning (ML). Amazon experts will begin collaborating with organizations starting this year, both virtually and at our Arlington HQ2 offices.

## AWS Joint Innovation Centers

AWS Joint Innovation Centers (JICs) are a customer-centric program that helps early-stage companies and enterprises from different industries and backgrounds experience, learn, adopt, and expand on AWS through joint offerings from AWS, local government, and partners. The JIC Program is designed and built with four major business pillars, which include incubator for startups, accelerator for enterprise digital transformation, international startup program, and cloud talent development base. AWS Joint Innovation Centers collaborate with local governments to develop local startup ecosystems and transform traditional industries utilizing AWS technology. Similar to the CICs, the JICs operate as a physical space that incubates and accelerates customers' innovation and growth by providing a suite of offerings based on Amazon's unique culture of innovation.

# 1 • Working Backwards from the customer's needs

The customer is at the heart of everything we do. AWS Innovation Programs start with the customer and work backwards. This section has examples spanning geographic locations from California and Arizona to Bahrain. Amazon's Working Backwards methodology supports focused and rapid innovation by keeping the focus for innovation firmly on the desired outcome. Amazon uses this approach to come up with its own products and services, focusing on customer needs first, rather than technical solutions.





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## How students use AI to help transform digital sign language translation with the Ministry of Information Affairs

On the other side of the globe, the University of Bahrain Cloud Innovation Center focused on the customer when they tackled AI-powered digital sign language translation with the Ministry of Information Affairs (MIA). Together, they designed VoiceMate, a solution to help people with hearing impairments watch the news.

Audio input captured from a user is sent to Amazon Transcribe which converts the speech to text. AWS Lambda formats the text to sync with ASL grammar before utilizing Amazon Sumerian to display it onto a 3D avatar. The students used about 117 animations and motion capture to train the model that would be a virtual ASL interpreter. The prototype is published on GitHub as an open-sourced solution, and available for public use.

Today, the students have a functional prototype, and they want to take it one step further. The plan is to turn VoiceMate into a two-way solution available as a mobile application and plug-in for websites and video conferencing platforms, like Zoom. They are working with AWS to turn VoiceMate into a company, which will then have the opportunity to become part of the AWS Partner Network (APN). The students hope that their application will help thousands of people with a hearing impairment communicate more effectively in their daily lives, whether they are at a work conference or a drive-thru window. The students also plan to market the tool for educators and parents who can use the software to teach kids who are deaf or mute how to sign.

***“After working on this project for years, we decided we want to bring this to the whole world with the help of AWS. Right now, we are building the app for Arabic sign language. We are going to start locally and then expand globally.”***

- Shehroz Salim, team leader and developer, VoiceMate



## How students help modernize rocket launches at the Western Range with the AWS Cloud

The California Polytechnic State University (Cal Poly) Digital Transformation Hub (DxHub) powered by AWS utilized Amazon's Working Backwards process to help Vandenberg Space Force Base (VSFB) prototype a solution. VSFB, also known as the Western Launch and Test Range, is one of only two U.S. Space Force launch ranges.

There are more than 200 instruments collecting data at the Western Range to support their rocket launches. Currently, meteorologists and other experts access the information from those instruments through a website called XUI (external user interface). But because XUI was outdated and difficult to use, VSFB had to develop web crawlers to scrape the application and compile reports. When the VSFB team spoke to the DxHub on the Cal Poly campus, improving user experience in XUI was their top priority.

Prioritizing the user experience aligned with the DxHub's approach to developing AWS Cloud solutions. "We focus on understanding the customer in a deep way and solutioning from there. It's not about coming up with a reason to try out new AI [artificial intelligence] or cutting-edge tools. It's about understanding the user's needs first," said Nick Osterbur, AWS digital innovation lead at the DxHub.

The DxHub team used Amazon Simple Storage Service (Amazon S3) to store raw data from the instruments and host the application's front-end. They then wrote code for an AWS Lambda trigger that would determine the appropriate parsing procedure for a given dataset. This code allows the Western Range team to simply add new instruments to the database. After the data is parsed, it is stored in an Amazon Aurora instance managed by Amazon Relational Database Service (Amazon RDS). A mature API that uses Amazon API Gateway pulls the structured data out programmatically.

After only three months, the DxHub delivered a reliable prototype with a simple-to-use interface that allows meteorologists to see a snapshot of weather data in real-time. Western Range meteorologists can save about 50 hours of work a month—weeks of work every year—and this prototype shows that cloud technology and student ingenuity can help transform even the highest levels of government.

***"The DxHub has been, and continues to be, a tremendous catalyst for change at the Western Range. The DxHub engagements have shown folks across the base new ways of approaching a multitude of challenges we face."***

- Steve Rogers, technical director, Western Range





## How an app connects Phoenix youth with life-changing jobs through St. Joseph the Worker

Focus on the customer remains a central theme of AWS Innovation Programs. The Arizona State University Smart City Cloud Innovation Center (ASU CIC) powered by AWS kept this in mind while collaborating with St. Joseph the Worker, an Arizona based nonprofit, on reimagining how it operated when the COVID-19 pandemic struck.

In Arizona, about 9% of 16 to 24-year-olds are unemployed or not attending school. The best way to engage young people and inform them of St. Joseph the Worker's Teen Workforce Initiative resources—which range from resume support and job coaching to interview preparation and transportation assistance—had been to hold in-person workshops at schools. But the pandemic upended that approach. "It was hard to reach youth because we couldn't get into schools," said Rae Herrera, director of youth services at St. Joseph the Worker.

To help address this need, Herrera and her colleagues came up with a new idea about how to reach and engage those it was dedicated to support—a mobile app. The process involved with developing the app followed Amazon's Working Backwards process, which begins by deeply understanding human (i.e. customer) needs and works backwards from

those to create the right solution to address those challenges. In this case, it involved bringing together ASU, St. Joseph the Worker, a range of other community stakeholders, and AWS in a workshop to develop a vision for what the app should achieve.

Once the app wireframe was developed and given to St. Joseph the Worker by the ASU Smart City CIC, St. Joseph's hired AWS Consulting Partner Patagonian to build the app for implementation. The app is available to anyone who has a smart phone in the US, as of April 2022. The team hopes to reach at least a minimum of 4,000 youth who are 16+ years old in the first year and help them not only enter jobs, but also build job skills like creating a resume.

***"The ability to reach thousands of youth is exciting, as our whole focus is to reach and prepare them for the workforce. We are currently serving Maricopa County. Our ideal goal is to serve all youth in Arizona, eventually all of the United States, and then the world. We want to reach as many youth as possible, and we know that is feasible with this app as a result of our collaboration with the ASU Smart City CIC and AWS."***

- Rae Herrera, director of youth services, St. Joseph the Worker





# 2 • Building mechanisms to support community

Mechanisms are complete processes that help turn inputs into the right outputs to address a recurring business challenge. In a complete process, you build a tool, drive adoption of the tool, and inspect the results in order to make course corrections. A complete process or mechanism as we like to say, is a “virtuous cycle” that reinforces and improves itself as it operates. They allow organizations of all types—from small nonprofits to large government agencies—to scale, to help leaders operate beyond their direct line of sight, and to facilitate innovative thinking. We use mechanisms around the world—whether we’re in Arizona, Rhode Island, or France—to serve our customers.



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## Rhode Island's unemployment insurance team delivers data transparency to claimants using AWS

The State of Rhode Island Department of Labor and Training (Rhode Island DLT) delivers temporary income support in the form of unemployment insurance (UI) and reemployment assistance to residents. During the COVID-19 pandemic, state unemployment agencies were challenged to deliver unemployment benefits at the speed and scale required. The Rhode Island DLT received more than 140,000 initial claims for the UI program in the first 45 days after the governor declared a state of emergency. By comparison, the state—with a population of slightly over one million people—received 107,000 initial claims during the peak of the Great Recession.

To better serve residents during the COVID-19 pandemic and beyond, the Rhode Island DLT decided to use AWS to make the unemployment process more transparent for UI claimants. By engaging the AWS Digital Innovation team on multiple occasions, the Rhode Island DLT created several innovative solutions to solve its customers' most pressing needs. These include UI Online, which provides residents with 24/7 online access to information about their unemployment claims, and two new chatbots—Hope and Skipper—to help claimants navigate the UI process and find reemployment. Through these efforts, the Rhode Island DLT is providing a streamlined, transparent, and more holistic experience for workers seeking unemployment assistance.

***“Using AWS, we can use technology to do the simple tasks so that our employees can use their time to work on complex problems.”***

- **Abby McQuade**, senior advisor and chief innovation officer, Rhode Island DLT





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## A streamlined, mobile-first approach to service delivery for counties and states

Before the pandemic hit, Wildfire, a state association for community action agencies, was working with Prefix Health Technologies (Prefix), an AWS Technology Partner, to develop a cloud-based solution for utility and rental assistance. When the city of Phoenix requested they support the distribution of \$20 million in Coronavirus Aid, Relief, and Economic Security (CARES) Act funds, they shifted their resources and existing infrastructure and, in a matter of weeks, stood up a repeatable public-facing solution with the help of AWS and the ASU CIC.

Previously, the process of applying for utility and rental assistance was fragmented and challenging to access. Applicants often spent hours on the phone, were required to take time off work to meet with a caseworker, and then found they did not bring the right documents to qualify for assistance. To simplify this workflow and be able to deliver services to people in need on a timely basis, the Arizona benefits portal was created.

The Arizona benefits portal allows COVID-19 impacted households to pre-screen and apply for assistance with rent, mortgage, gas, electric, and water. Applicants can attach document images to the benefit applications using their mobile phone camera. Amazon Textract captures the data from the images and populates or verifies the data entered, which eliminates the need for manual verification and speeds up the processing time. In many cases, eligibility is determined at the point of entry and funds are credited to the customer's account with little or no delay. For additional details on the solution developed read, "A streamlined, mobile-first approach to service delivery for counties and states." The solution they developed for Arizona resulted in 49% of the applications being automatically approved, therefore reducing the time required to verify and distribute funds.



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## Sciences Po students form startup to address digital divide in France's rural territories

At Sciences Po, an international research university with seven universities across France, students at the Sciences Po Public Innovation Lab powered by AWS formed a citizen project in January 2020 to help tackle France Services' challenges.

Even though 75% of French citizens believe public services play an important role in quality of life in French territories, only 52% report that they have access to the services they need, and 26% expect a more personalized approach to these services. The need to improve communication channels between the government and the citizens was reinforced in 2018 with the yellow vest movement. Following these protests, the government introduced France Services, a host of public services provided by public servants who understand the needs of delivering to local citizens in rural areas.

With the collaborative environment where students develop expertise in solving public problems at the Sciences Po Public Innovation Lab, the team launched the France Services challenge and established a startup company called Public + in September 2020. Public + built a web-based solution to bridge the digital divide in France's rural territories and improve relationships between citizens, public servants, and France Services, by offering a more personalized approach to service delivery.

Harnessing the power of digital technology and a cost-effective, serverless application framework, Public + developed a web portal called Mon Espace France Services (My France Services Space) designed to meet the needs of both citizen users and public servants. The portal centralizes tools to help citizens minimize paperwork, understand government policies, navigate complex administrative procedures, access nearby public services, schedule appointments, and provide feedback to improve the France Services experience.

Initial survey responses and user tests from more than 260 public servants have been positive. The Public + digital platform is extensible and scalable, and can be implemented to enhance public services throughout France, as well as in other countries facing public policy and service delivery challenges, such as the United States.

# 3 • AWS in healthcare and education

The use of technology in both healthcare and education has been increasing for years and more recently accelerated exponentially during the COVID-19 pandemic. Today, educators are embracing technology to improve their ability to connect and share resources with students while counties are leveraging technology to help save lives.



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## Innovating the nursing school experience through video in Melbourne, Australia

In nursing school, there is a steep learning curve. One of the most significant hurdles in this journey is the differences between theoretical education and practical application of learning. This has been a cause for anxiety in many prospective nurses who attend classes solely online due to COVID-19 lockdowns.

The Swinburne Data for Social Good Cloud Innovation Centre in Melbourne, Australia developed Know Before You Go (KBYG), a learning tool that provides students with a preliminary understanding of their working environment by displaying a 360-degree view of the Swinburne Simulation Lab. This solution helps to reduce anxiety in online nursing students before embarking on their on-site practical learning. KBYG is accessible to students over a web browser, which makes it available to every student and does not require the utilization of equipment such as virtual reality headsets.

***“This is an application that was created by students for students, which is really fantastic. The prototype development is now complete and the full virtual learning experience is expected to be deployed and piloted with our nursing students in 2022.”***

- **Veronica Moran**, technology innovation manager, Swinburne Online





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## Helping prevent opioid overdoses: Cal Poly student developers build web app on AWS

During the first 12 months of the pandemic, fatal opioid overdoses increased over 30% nationally, and more than doubled in San Luis Obispo (SLO) County in California. Facing the sharp rise of preventable deaths in their community, the SLO Opioid Safety Coalition (SLO OSC) needed to find a way to increase the community's access to Naloxone—a life-saving treatment for opioid overdoses.

Currently, the drug is available at certain pharmacies, substance abuse clinics, and the local syringe exchange. However, since SLO County is relatively rural with limited public transportation, it is difficult for community members without cars to access the drug in an emergency. The county decided to build a web application, Naloxone Now, in collaboration with the Cal Poly DxHub powered by AWS, which would help connect those in need to the life-saving drug.

After months of training, researching, developing, and designing, the students at the DxHub created the prototype: a web application that's accessible on any browser or device. "The mission of the DxHub, to use software to help make an impact on the community, was a huge draw for

***"Thanks to the DxHub, our community members will be able to access Naloxone and learn how to administer it without fear of stigma or judgment. We'll be able to get Naloxone in the hands of anyone who needs it, whether they are struggling with addiction themselves or trying to protect a friend, family member, or neighbor."***

- Jenn Rhoads, coordinator, SLO OSC

me. With open source, developers can build on each other's technology to make the world a better place," said Reilly Salkowski, student developer at the Cal Poly DxHub.

The Naloxone Now app includes life-saving resources on how to prevent an overdose, including video tutorials. It also uses location information to show users the nearest pharmacy or clinic where they can find Naloxone. But perhaps the most innovative part of this application is its delivery feature—community members can fill out a short order form and have doses of Naloxone delivered to their door at no cost.

To learn more and use the Naloxone Now app today, visit [naloxonenowslo.org](http://naloxonenowslo.org).





A photograph of a woman with dark curly hair and glasses, wearing a light-colored striped shirt, and a man with a beard wearing a light blue button-down shirt. They are sitting at a table in an office, looking at each other and talking. A large green plant is visible in the background. The image is partially obscured by a large magenta diagonal shape that contains the text.

## 4 • Leveraging data for better insights

Data is the fuel that powers business intelligence, engagement, personalization, analytics, AI and ML. By working backwards to identify a compelling customer-focused solution, building skills, and leveraging agile cloud technologies, valuable data-driven insights are discovered to address public sector challenges around the globe—from South Africa and South Korea to the United States and Canada.

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## Becoming data-driven: Lessons from tackling Durban's water crisis

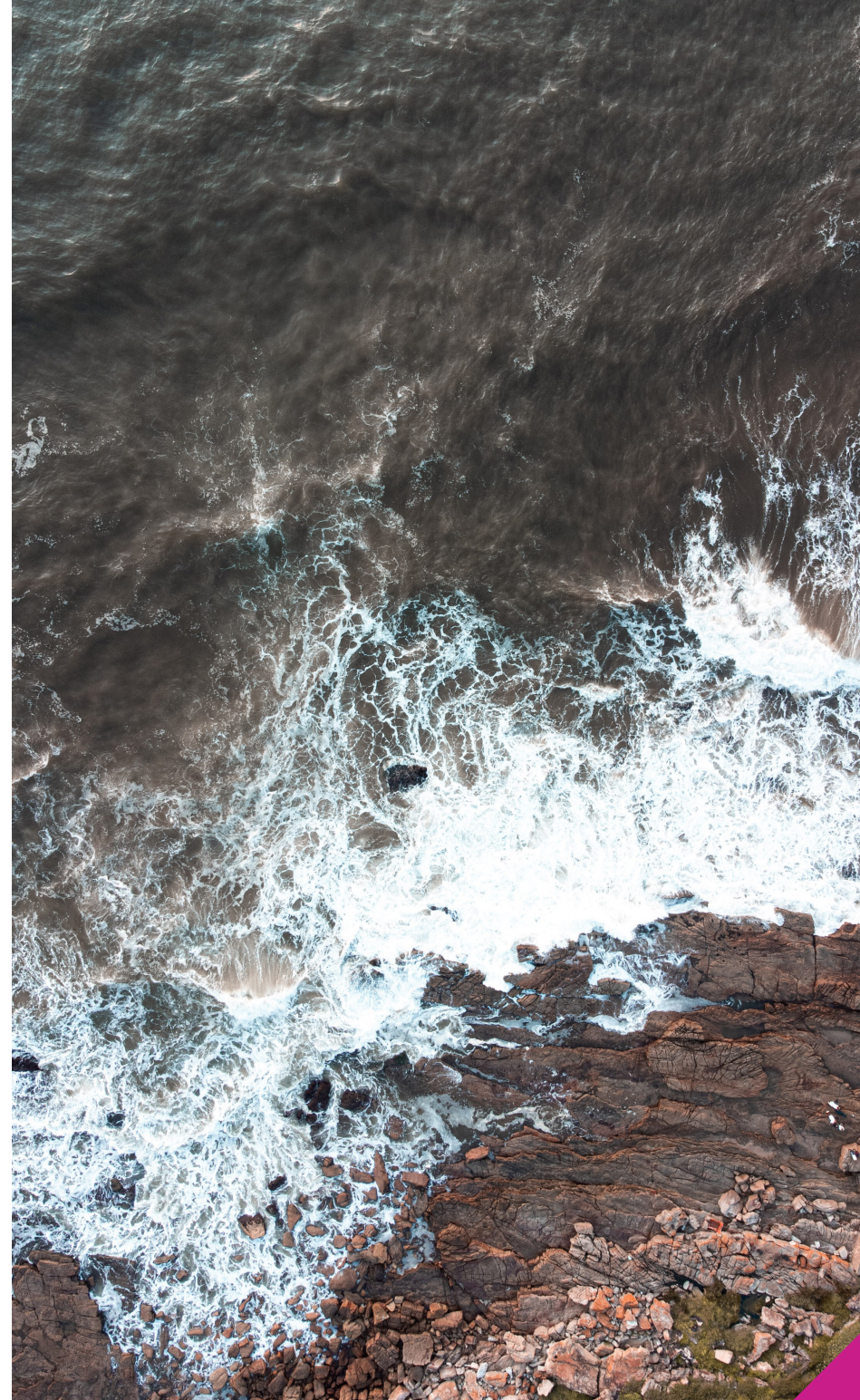
According to recent research, 99% of blue-chip companies are currently spending money to apply data to derive better insights from their customers and businesses. And leveraging data is not simply a matter of buying hardware and software. 92% of these organizations cite people, business processes, and culture as their greatest challenges; only 8% say it's technology. Unfortunately, only 24% have successfully created a data-driven organization even though there is many a reason to try: research shows companies that leverage data perform much better than their peers. Massachusetts Institute of Technology (MIT) professor Erik Brynjolfsson found companies that embrace data-driven decision-making enjoy 5-6% higher output and productivity. Forrester also estimates data-driven businesses are growing at an average of more than 30% annually.


Like many places, Durban, the third-largest city in South Africa and within the eThekweni Municipality, wrestles with aging water infrastructure, a growing population as more people migrate to big cities, and the threat of not having enough water to support this growth.

Durban loses 50% of its municipal water supply to leaks from its aging pipes, poor metering, and theft. Many of the Municipality's 500,000 meters aren't reading water volumes correctly because they are broken or out of calibration. Plus, they must be read manually, so readings are always dated. Without good data, officials don't know where water has gone, can't charge for it, and can't be sure they have enough to meet the future demands of the rising population.

eThekweni's water unit, like many organizations, kept its data in spreadsheets. It was incomplete and in a format that made it difficult for anyone who wasn't a data analyst to understand. Management knew there was a better way of doing things, but they had never seen it, so the staff couldn't imagine what it might look like.

Dr. Sandile Mbatha, senior manager of research and policy advocacy at eThekweni's Office of Strategic Management, explored the idea of improving





the Municipality's data capabilities, with the Arizona State University Smart City Cloud Innovation Center powered by AWS. The ASU CIC spent a few months working backwards and interacting with eThekwini's water sector partners, data custodians, and data users to understand the data they had and identify the problem they wanted to solve through the SHANA project, short for "ukushintshana," which means "exchange."

***"The Working Backwards process [and workshop] created a ripple effect among my colleagues, to start thinking more about the data and innovating with data as a strategic tool. It had a huge impetus on the data journey that we've taken as a city."***

- Dr. Sandile Mbatha, senior manager of research and policy advocacy, eThekwini's Office of Strategic Management

The goal of the SHANA project was to centralize data from three sources: the municipal staff that buys the water (revenue management), those that sell the water (suppliers), and those responsible for maintaining the system (fault management). Amazon QuickSight's ability to integrate various data sources allowed the ASU CIC team to create visualizations of the Municipality's disparate data sets. Specifically, data scientists were able to create valuable graphs such as: suburb usage trends; water levels at different dams based on season, month, drought, and other factors; monthly billed volumes; cumulative monthly sales; correlation between population and water utilization; and water purchases vs. sales. These visualizations accelerated decision-making and information sharing across stakeholders within the Municipality. In addition, ASU CIC data scientists leveraged Amazon Elastic Compute Cloud (Amazon EC2) and Amazon Simple Storage Service (Amazon S3) with Amazon QuickSight for easy data integration and interpretation.

Because of SHANA, eThekwini officials now better understand the Municipality's water losses and can take action to reduce them. Additionally, SHANA has become a springboard for other smart city initiatives. The water unit is now beginning to scale the data platform and extend it beyond water to multiple city functions such as understanding workforce productivity, electricity consumption, and traffic patterns.





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## South Korean farmers grow more perilla leaf with machine learning

Like the eThekweni Municipality, Digilog, an agriculture startup, wanted to apply digital technology to the “analog domain” of agriculture for the benefit of farmers in South Korea and beyond. Local farmers in Geumsan County manually monitored weather conditions to adjust greenhouse climate for their crops. This process was unreliable. By counting on experience, advice from others, and the weather forecasts, farmers sometimes got it wrong, and would return the next morning to find a greenhouse full of wilted plants.

To address these challenges, Digilog developed the G-Smart solution following a Smart Farm Challenge workshop at the Cloud Innovation Center in Busan. The smart greenhouse system, built on AWS, is changing the way farmers are running family businesses. Now, they receive recommendations from an app on their smartphone that can be used to adjust ventilation in the greenhouses automatically.

The program aims to reach almost 2,000 farms in the future, save farmers valuable hours every day, and increase productivity by 5%. Through these efforts, Geumsan County is encouraging widespread adoption of smart farm and intelligent control systems.

***“We want to bring value to the thousands of small-scale farmers who are currently excluded from the digital advancement taking place in our cities. With the development of G-Smart, we’re showing how machine learning can have real, tangible impacts on people’s livelihoods. In the long term, we’d like to take this concept to as many farmers, in as many different countries, as possible.”***

- HyunKwon Suh, chief executive officer (CEO), Digilog



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## Civix reimagines the voter experience and modernizes its voter solution using AWS

When public sector technology company Civix decided to modernize its voter management software, which helps users find election information and view near real-time voting results, it saw an opportunity to simplify its architecture and improve the voter experience. To achieve that goal, Civix decided to start by improving voters' accessibility to information using AWS.

Using the AWS Digital Innovation Program, Civix worked backwards from the voter to gain a better understanding of their needs and devise a solution to solve their most pressing challenges. The company used AWS GovCloud (US)—which gives government customers and their partners the flexibility to architect secure cloud solutions—to optimize its internal development process and create the Intelligent Voter Information System (IVIS). IVIS is a software solution and mobile application that makes important election

information, such as voter registration status and candidates' details, readily accessible from computers, smartphones, and smart speakers. Now voters have access to all the election resources they need from one trusted source that also delivers automatic notifications about upcoming deadlines and other information. And as a result of building IVIS on AWS GovCloud (US), Civix has a library of reusable backend cloud services—including automatic notification features—that are highly configurable and simple to implement across other solutions in its portfolio.

Civix plans to start by rolling out IVIS to a handful of state and local governments and is excited about sharing the value of IVIS with more customers in 2022.

***“The technology we developed during our engagement with the AWS DI team has set us up for the future success of our company. IVIS brings game-changing functionality to voters’ election experiences.”***

- Mike Wons, president of government business, Civix

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## Preventing the next pandemic: How researchers analyze millions of genomic datasets with AWS


Effective data management and analysis also plays a role in healthcare research. In the months after the pandemic began, scientists realized that if genomics researchers had seen COVID-19 coming, the world might be a fundamentally different place today. In response, the University of British Columbia Cloud Innovation Centre (UBC CIC) launched the Open Virome project, a collaborative, global initiative that seeks to avoid future pandemics by identifying hundreds of thousands of previously undiscovered viruses.

For researchers working with the UBC CIC, the answer lies in a massive library of genetic sequencing data called the Sequence Read Archive (SRA). Via the SRA, researchers have access to millions of gigabytes of genetic sequencing data, including the DNA and RNA of hundreds of thousands of unknown viruses. But the data library is so massive that traditional computing can't comprehensively analyze or process it. Driven by the urgent need to prevent another global pandemic, the team at the UBC CIC collaborated with computational virologists to create Serratus, an open-science viral discovery platform to transform the field of genomics—built on the massive computational power of the AWS Cloud. With Serratus, the researchers believe they can both identify potentially harmful new viruses and alert scientists to potential mutations in SARS-CoV-2 that could nullify herd immunity.

Once the solution was optimized and ready for action, the team put it to the test. In only 11 days, Serratus processed a staggering 5.7 million sequencing datasets—for only \$24,000 USD. From that data, the team discovered 130,000 new RNA viruses. Previously, scientists discovered only 15,000 viruses after decades of data analysis, and it was common to spend hundreds of millions of dollars on studies to find a few thousand

new viruses. Using bare-bones AWS architecture, the Open Virome team saves the scientific community millions of dollars and years of time in discovering new viruses.

With the tools in place to rapidly process and analyze sequencing data, the Open Virome project is now turning its attention toward real-time pandemic prevention.



***“We are now looking into automating annotation of the datasets, so we can give meaning to these unknown viruses. Our goal is to create a quick analysis tool that can link a patient with an unknown virus to its epidemiology using SRA data. We want the epidemiology to write itself.”***

- Artem Babaian, computational biologist and head, Open Virome project





# Next Steps

It's an exciting time to be part of the public sector and an excellent time to explore innovation opportunities. As a proponent of innovation, AWS is here to help you. Here are a few additional resources to get started.

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## 1 | **AWS Training and Certification**

AWS provides training that is fast, scalable, and cost-effective, either in a classroom or online, making it flexible for your workforce to learn at their own pace. We can help bring wider cloud skills to your business that continue to unlock the full potential of the cloud once you're ready for the next steps.

## 2 | **AWS Partner Network (APN)**

Get help from our comprehensive network of AWS Partners, from consulting to technology. We have experienced delivery partners that can help your business get the most out of the AWS Cloud, and deliver on your specific cloud objectives.

## 3 | **AWS Marketplace**

The AWS Marketplace is a digital catalog that has thousands of software listings from independent software vendors that makes it simple to find, test, buy, and deploy innovative software that runs on AWS.

## 4 | **AWS Events and Webinars**

AWS has an active learning community where you can attend upcoming events, training, networking conferences, demos, and more. Register for our upcoming events.

## 5 | **Digital AWS Public Sector Innovation: The Art of the Possible**

The digital version of this contains additional links and resources that provide a comprehensive overview of the projects showcased.

# Visit our CICs and JICs



**CAL POLY**



**SciencesPo**

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**NITI Aayog**



**UC DAVIS  
HEALTH**



**LEARN MORE ABOUT INNOVATION IN THE PUBLIC SECTOR TODAY**

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