Governments leading through change

How analytics and AI are helping
agencies face unprecedented challenges

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About this e-book

Even before the coronavirus disruption, the government landscape was changing. Public sector agencies were evaluating and implementing vital digital transformation and analytics initiatives to help them make better, faster and more cost-effective public sector decisions. Then 2020 brought a once-in-a-lifetime disruption across all areas of our lives. And most governments weren't prepared to address the turmoil and support the individuals, families and communities under their care.

In this e-book, SAS has collected the wisdom and stories of the government agencies that are rising to the challenges of our times and applying analytics to drive evidence-based decision making. These stories are pulled from every sector of government and are relevant across all sectors because they each share innovative new ways to respond to a changing landscape.

If you're ready to learn about technology and best practices to help you meet unprecedented challenges, keep reading. You'll be glad you did.
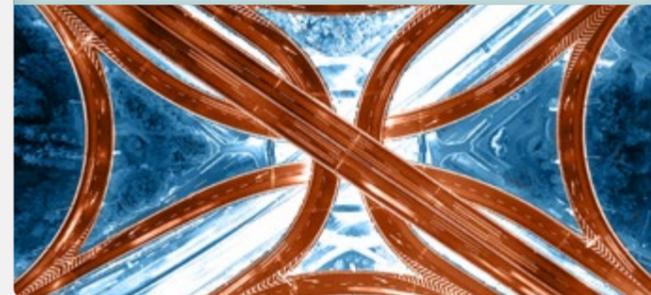
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**Economic disruption:
3 ways analytics can help governments adapt**

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Barring natural disasters, pandemics or economic downturns, the mechanics of government finance and operations are fairly constant, and most organizations capably manage revenue collections and spending under normal circumstances. But when crisis strikes, many cannot quickly adjust and respond to rapidly changing economic conditions.

In times of extreme economic disruption, when normal revenue streams are drying up and economic needs for new programs are expanding, government must have the ability to adapt and act quickly, especially in these three areas:

• Revenue impact.
• Economic development.
• Financial transparency.

Each area has a specific mission, but with overlapping impacts and dependencies. Revenue streams affect economic development decisions, and economic development activities often have financial transparency requirements. Let's look at the unique challenges in these three areas – and how analytics can help.

Revenue impact

When disruption occurs, inherent latencies in revenue collection often delay a full understanding of the magnitude of revenue drops. Policymakers are stretched to provide economic relief and development activities without a clear picture of the revenue decreases, or which populations and businesses need the most help. With so many people affected by an economic downturn, conflicting ideas on appropriate levels of aid and multiple levels of government providing relief, leaders must be confident in their plans and able to provide transparency on their spending – while also ensuring that the right people are getting the right relief.

The challenge: *Declining revenue*

The COVID-19 pandemic disrupted normal economic activity, reducing fuel consumption as people worked from home and canceled or postponed travel and vacation plans. Tourism and restaurants have suffered, along with retail sales, all of which can greatly reduce government revenue.

How analytics can help: *Accurate forecasting with nontraditional data sources*

The variable revenue streams of governments can be difficult to forecast at the best of times due to complex factors and multiple data sources (employment rates, production and movement of goods, real estate sales, commodity prices, etc.). To achieve accurate forecasting for good decision making during times of crisis, governments must:

• Incorporate data more frequently from the usual data sources.

• Incorporate new data sources that are not normal revenue predictors.

Being able to quickly incorporate and test the applicability of nontraditional data sources becomes a crucial capability, and must be easily repeatable to understand the rapidly changing impacts on revenue.

How analytics can help: *Vital what-if scenarios*

Disruptive events often mean government relief efforts and quickly changing policy decisions. When those policy decisions introduce changes to revenues, especially taxes, policymakers must be able to run a variety of what-if scenarios to simulate the impacts of proposed policy changes. This requires assessing the impact of changes at very detailed levels of tax filings, or transaction-level information to accurately reflect many of the complex rules, thresholds and conditional logic present in current policies. With analytics, agencies can effectively manage their revenue streams by evaluating the current revenue-generating environment, accurately forecasting revenue and understanding the impacts of policy decisions.

Economic development

The COVID-19 pandemic and resulting government and private sector actions have transformed the economy, leading to significant changes in many industries and unprecedented job losses. Loss of income, business closures (temporary and permanent) and heightened uncertainty will lead people to spend less, which will continue to shock supply and demand in ways we haven't seen before.

The challenge: *Minimizing permanent harm from a temporary crisis*

To counteract the economic and workforce disruption caused by COVID-19, governments and central banks worldwide have enacted sweeping fiscal stimulus measures. In addition to stimulus funding, substantial targeted policies are needed to support the economy through the pandemic, keeping intact the web of economic and financial relationships between workers and businesses, lenders and borrowers, and suppliers and consumers to ensure recovery once the outbreaks can be brought under control. The goal is to minimize, wherever possible, any permanent harm a temporary crisis may cause through job losses and business bankruptcies.

How analytics can help: *Data-informed decisions*

Government leaders are expected to make difficult decisions to minimize the economic impact of COVID-19 and reinvigorate the economies and businesses in their jurisdictions. With mixed opinions on the magnitude and duration of the disruption, targeted and effective interventions based on the most accurate revenue forecasts are essential.

Organizations must be able to incorporate as much data as possible to understand the most affected citizens and businesses. Understanding the impact of policies enacted during previous periods of economic disruption will provide critical data points as we assess new policies. Recovery will depend heavily on data-informed policies and effective application.

Financial transparency

During times of crisis, governments worldwide are compelled to help their citizens, businesses and economies by providing monetary assistance in the form of stimulus payments, additional benefits and relaxed tax policies. As with all government spending, the public expects funds to be used in the best possible way, with the ability to understand what was paid out, who was paid for what services and who it benefited. Many of the funds may come down from higher levels of government – national to provincial, for instance – and there is an expectation, or even requirement, to report back to the higher levels on the use of those funds.

The challenge:
Tracking high-velocity spending for a multitude of programs

Two of the complicating factors associated with providing financial transparency are the velocity at which governments deploy funds and the multitude of programs, as well as the underlying systems that track those programs.

How analytics can help:
A financial platform provides transparency

To counteract the complicating factors, governments must leverage platforms that enable timely access to the systems that accept and disburse funds. This facilitates scrutiny of spending details and the ability to identify and address anomalies. A financial transparency platform provides the spending reports and dashboards required for oversight requirements, as well as public examination.
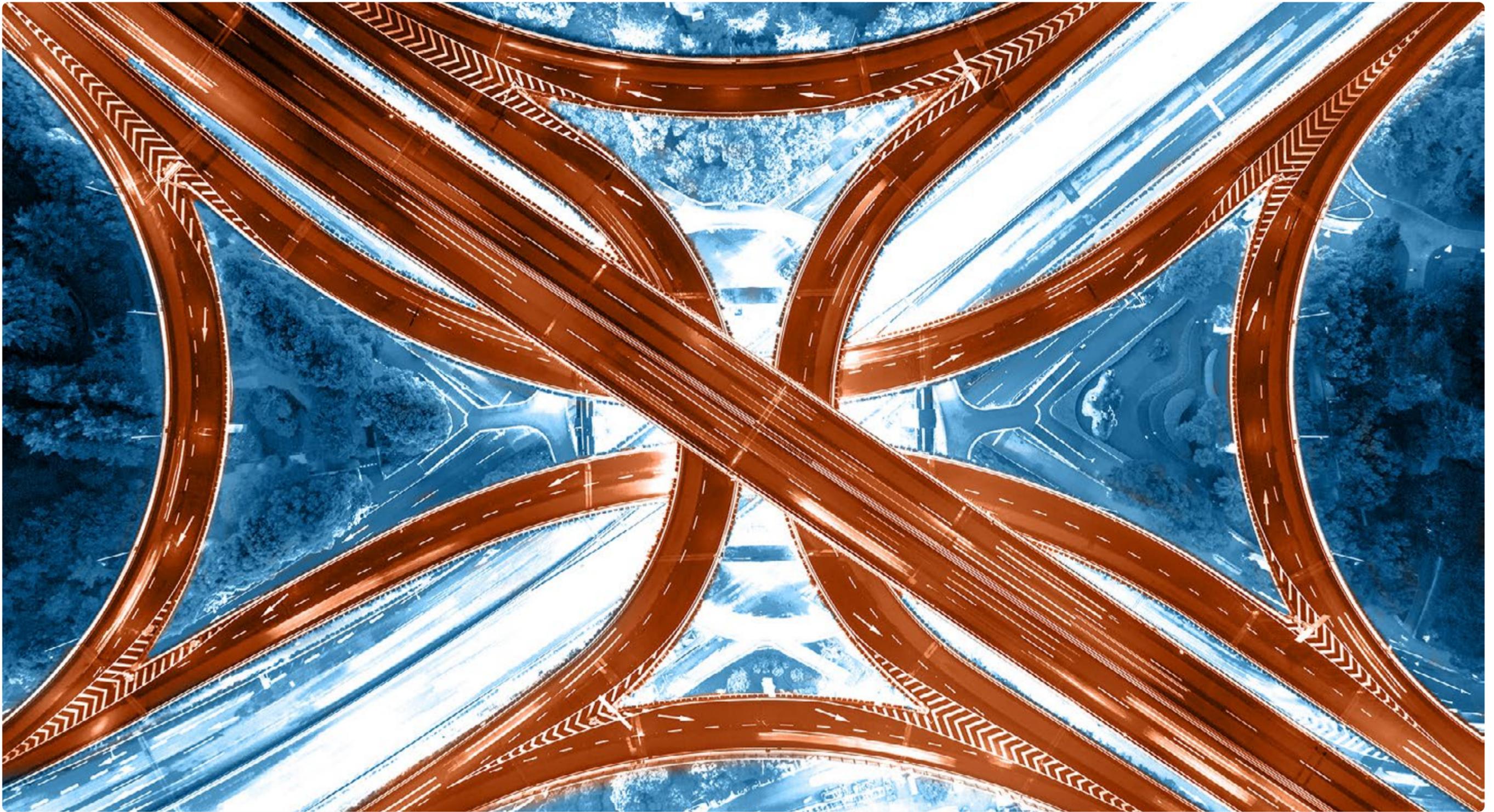
Governments taking action during COVID-19

Her Majesty's Revenue and Customs (HMRC) in the UK has long relied on analytics to derive key insights from data for better decision making and improved revenue collections. A global leader in the use of analytics in government, HMRC collects more than GBP 630 billion (US$812 billion) each year, serving almost 70 million Britons.

When COVID-19 struck the United Kingdom, HMRC had to quickly deliver economic recovery resources to British citizens who lost their jobs. HMRC was able to swiftly adjust its systems to allow payments to employees, providing economic relief to the right people at the right time while allowing businesses to quickly ramp back up once the economy reopened and employees were called back to work.

Moving forward

As many governments incur budget deficits to alleviate the negative economic impacts of COVID-19, the expectation of sound fiscal policy, execution and transparency will only increase. Decisions being made to address the short-term impact will have long-lasting implications. Now more than ever, it's important that organizations employ an infrastructure of data and advanced analytics to fully understand current challenges related to revenue impacts, economic development and financial transparency. Organizations should take the opportunity presented by the pandemic to address long-standing data issues. Improving the way that data is shared between government agencies will profoundly improve their ability to generate data driven insights. This greater data infrastructure will not only provide a basis for sound decisions and actions, but also create an organization that can quickly respond to the continuing effects of COVID-19 – as well as any future emergencies.

Transportation agencies in the age of COVID-19 and beyond

The outbreak of COVID-19 has affected every transportation agency, forcing many to make unprecedented changes to the way they operate. The pandemic has caused the demand-related revenue streams that many transportation agencies depend on (motor fuel taxes, fees associated with ownership or operation of motor vehicles, user fees, etc.) to drop significantly. Some agencies are reporting a reduction in demand as high as 50%. Urban areas that rely heavily on public transportation are seeing severe impacts on fare revenue as more people work from home and limit travel.

With the uncertainty of how long the pandemic and its impacts will continue, agencies are taking steps to reduce spending. They need analytics solutions that can show revenue impacts as they happen and accurately forecast what will occur over the next 18-24 months.

The landscape was changing – even before the virus

Before the COVID-19 pandemic, many transportation agencies were already fiscally constrained and struggling to fully fund capital projects and maintain existing infrastructure.

Aging bridges, pavement and other assets – and the increase in maintenance and construction costs – were already outpacing budget increases, requiring agencies to do more with less. Disruptive technologies were already rapidly changing how people access, use and pay for transportation infrastructure and services, fundamentally reshaping how transportation agencies operate.

In addition, revenue was already suffering from an increase in fuel-efficient gasoline and diesel vehicles, the popularity of hybrid and electric vehicles, and growing ride-hailing services. This all made standard forecasting tools and methodologies obsolete.

What technology challenges are transportation agencies facing?

Many agencies have disparate and siloed data sources coming from desktops or legacy systems that serve specific business functions. Data and analytics can provide critical insights to help agencies stretch their budgets and provide a safe and reliable transportation system. Agencies need technology that efficiently integrates multiple data sources and automates the data management process without the burden and delay of replacing existing systems.

A strong analytics platform can empower each role within a transportation agency, and every discipline – including planning, engineering, operations and finance – to better meet the challenges presented by fiscal constraints, aging infrastructure, changing government policies and stakeholder demands for data-driven decision making and increased efficiency.

With advanced analytics, transportation agencies can improve decision making and find cost-effective solutions that:

• **Maximize resources** with improved forecasting and predictive models.

• **Implement a systematic approach** to managing infrastructure while lowering life cycle costs.

• **Consolidate new and existing data sources** to identify and mitigate potential safety risks.

• **Better plan and prepare** for disruptive technologies.

4 examples of analytics in action

We're going to take a look at how transportation agencies are using advanced analytics to improve a wide range of vital tasks, including:

Revenue and expenditure forecasting

Forecasting solutions are critical to planning and executing transportation programs, particularly now, given the impacts of COVID-19. A state transportation department uses vehicle registration information, driver license records and social, political and economic indicators to forecast multiple revenue sources. Additionally, by analyzing vehicle records and fuel consumption data, the agency better understands changing consumption patterns and impacts of electric and hybrid vehicles on funding streams while improving the ongoing reliability of revenue forecasts.

To optimize program delivery, one state Department of Transportation (DOT) forecasts individual project and overall program expenditures using historical and cumulative contract and billing data that considers project types, project milestones, preliminary estimates, regional characteristics and contract values to create predictive models. The result is a refined expenditure model that uses all available information and dynamically adjusts over time.
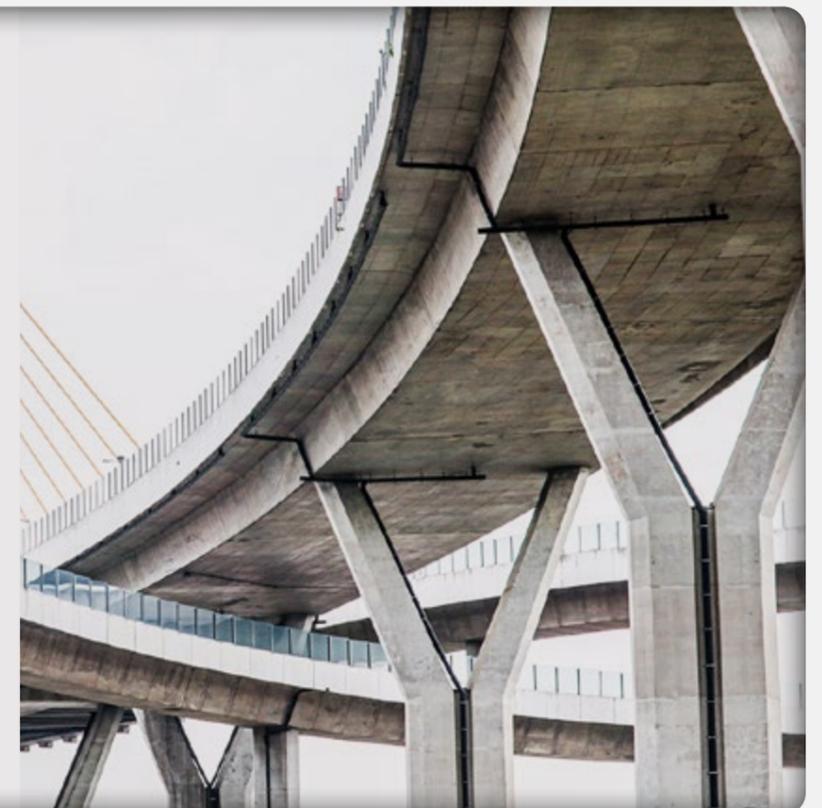

Asset management

Analytics is changing how transportation agencies manage infrastructure. Transportation agencies typically perform bridge safety inspections on a two-year cycle in accordance with federal standards. Instead of disregarding the likelihood that newer bridges don't need frequent inspections, the Federal Highway Administration is in the process of adopting standards that allow a data-driven, risk-based approach to establishing bridge inspection intervals.

One state DOT uses current and legacy bridge inspection data to identify bridge features or attributes that are at reduced or increased risk of structural deterioration. This forecasting helps establish inspection intervals that improve bridge safety and reliability while reducing costs.

Another state DOT used advanced analytics to better understand the rate of degradation of paved highway surfaces. A pilot study analyzed pavement condition data for various road segments and correctly predicted which ones would become deficient and need repair. This allowed the DOT to refine pavement degradation models, the timing of maintenance interventions and lower life cycle costs.
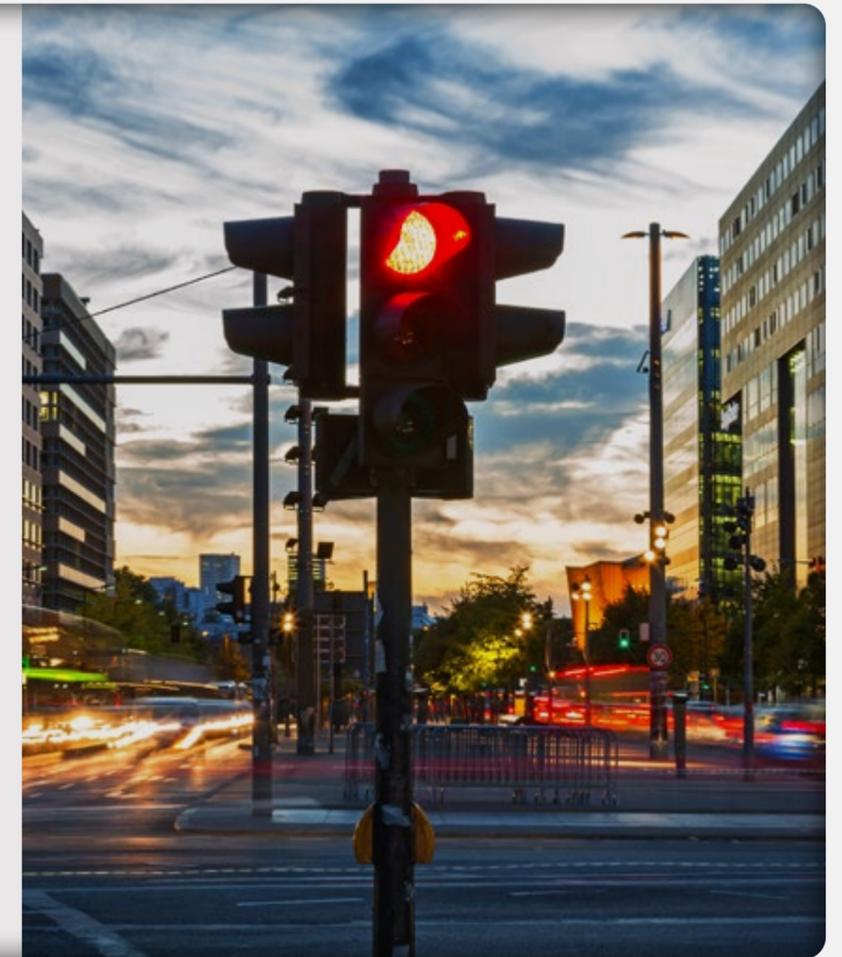
Traffic safety

Safety is the top priority for transportation agencies, and some are using data to support advanced safety analysis and improve decision making. One road safety commission department in Australia uses artificial intelligence (AI) to improve safety efforts and achieve a 40% reduction of road fatalities and serious injuries.

By replacing its existing manual and reactive process for curbing road accidents with machine learning and AI, the commission has version control, governance, self-sufficiency and better insight for devising safety measures. A test scenario using the machine learning method estimated a 25% reduction in crashes compared to the previous method, and the complete analytics lifecycle for a project dropped from 100 hours to 20 hours.

Similar efforts are underway at a state DOT that's combining intersection and crash data to identify priority areas and improve traffic safety. With advanced analytics, the DOT now has the ability to automate comparisons of intersection performance to peer groups, surface potential changes in traffic control devices and support federal reporting requirements.

By using AI to identify critical traffic improvement areas, agencies can prioritize key projects to ultimately make infrastructure safer.

Processing sensor data in real time

Turning instrument or sensor streaming information into decisions can be challenging since the data is usually machine generated and large in volume. One European infrastructure and water management department has sensors on bridges, tunnels and other infrastructure to measure key water levels in areas prone to flooding.

The agency can read and interpret streaming information from these sensors in real time to generate alerts that help protect people and property. The agency can also analyze the data to detect patterns that help it anticipate and prepare for possible threats.

By analyzing information gathered from sensors on infrastructure, agencies can:

• Increase insight into operational asset performance.

• Decrease operational costs.

• Enable proactive maintenance.

• Keep citizens safe and traffic flowing smoothly.

Moving forward

Too often, transportation agencies use the tools they have, not the tools they need. Or they struggle to consolidate data from multiple systems that serve specialized purposes or support specific operational functions.

At SAS, we believe anyone should be able to easily collaborate with others and develop compounded insights in a governed, repeatable way. The best way to use those insights is with an integrated set of capabilities that can overlay existing systems, not replace them. We believe data, analysis and collaboration – with an ability to scale up to any size problem, whether that's a pandemic, disruptive technology or an economic downturn – is integral to moving forward.

You asked, we answered

Here are common questions we hear from transportation professionals – and our answers:

Why does an entire system have to be replaced to better use the information it contains?
Agencies don't have to replace existing tools and techniques used within the organization to understand current infrastructure and revenue conditions and forecast future demands, challenges and opportunities.

Why does it take so many resources to generate a report?
Reports are necessary in a transportation organization, but far too often, agencies are using the wrong tool, making the generation of reports a time-consuming process that results in few new insights.

Why can't the systems that drive the functional areas of the agency work together to improve outcomes?
The specialized tools an agency uses to support specific business functions are designed to optimize decision making in that precise functional area. That doesn't mean the agency can't use the data in that tool, or combine it with data from other systems to generate new insights or solutions that improve outcomes.

Learn how SAS can help you address these questions and more.

How can school systems combat loss of learning from the pandemic?

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Students all over the world have missed months of school due to COVID-19. While the full impact has yet to be determined, the fear is that this could widen the learning gap for those students furthest from opportunity.

While the education system strives to provide all children with fair, equitable access to high-quality education, the sudden switch to distance learning during the pandemic has turned the spotlight on persistent inequalities across the world.

Unbalanced educational opportunities

Some schools had ongoing interaction with families from day one. Other schools had little or none at all. Some families had internet access, computers and the ability to work from home while supporting their child's online learning. Others did not. Some schools provided packets for distance learning. But any type of learning – virtual or with a packet of materials – left to untrained (but well-meaning) parents is less effective in supporting students who are already behind and need targeted support.

These unbalanced educational opportunities due to COVID-19 compound the typical loss of learning that occurs over the summer. The Collaborative for Student Success estimates that students will return to school in fall of 2020 with only 70% of the learning gains in reading relative to a typical school year.

Additionally, in mathematics, students are likely to show even smaller learning gains, returning with less than 50%, and in some grades, nearly a full year behind what we would observe under normal conditions.

Based on previous health emergencies, like the Ebola outbreaks, the impact on education is likely to be most devastating in countries with already low learning outcomes, high dropout rates and low resilience to disruptions, according to the World Bank.

One solution? Analytics.

As educators and stakeholders grapple with how to guarantee every child learns and grows, the old ways of teaching are not the only thing that will need to change. Data can help ensure that every teacher, parent and administrator has the tools they need to best meet the needs of every student. It's not enough to anticipate that students will be behind one grade level on average. This is where predictive analytic tools can provide invaluable information to support decisions at many different levels.

Predictive analytics can inform teachers where individual students are starting their year to help guide day-to-day instruction. And system leaders at the local, regional and state levels can use the data to help make decisions about policy and resource allocation.

The new normal means new data

The way students learn and teachers teach will never look the same. In addition to exploring alternate means and modes of education, educators must consider collecting new and different data to ensure that every child has the best opportunity for successful learning. That data could include metrics such as:

• School opening and closing dates.

• Available and implemented online and blended learning programs, including interventions.

• Student access to online programs, devices, broadband internet and other connectivity data.

• Student surveys.

• Traditional assessment data.

The future of education

Looking ahead, the way educators teach will be vastly different than prior years. Rather than focus on the challenges, our educators of tomorrow should look at this new environment as an opportunity to offer more personalized, flexible and, ultimately, much more effective teaching modalities.

And while data-driven decision making in itself may not guarantee equal outcomes, we must strive to provide every child with an equal opportunity for success. Instead of seeing children as projects of remediation, this unprecedented event opens the opportunity to view them as whole human beings who had a life-defining experience – and who not only survived but have the potential to thrive.

Using data and analytics to maintain a safe, healthy campus environment

Oklahoma State University is among a growing number of universities using data and analytics to streamline reporting and drive data-informed decision making across campus. Led by the office of Institutional Research and Analytics (IRA), the university has transformed the way it delivers information through the use of advanced analytics and predictive modeling.

IRA is now using those same techniques in innovative ways to help solve new issues related to the pandemic. It needs to determine a plan for reopening campuses and reengaging students while confidently maintaining a safe, healthy environment. A key part of its plan is to adopt a time-tested public health strategy known as contact tracing. By supplementing the work of public health

officials, institutions can act faster by using more robust institutional data to stem the spread of disease.

After ensuring access would not violate university privacy guidelines, OSU is securely using institutional data and time and location-based information – such as Wi-Fi access points, building and service access control data, event attendance data, class attendance data and class schedules – to help create inferred links between people, places and times. Campus leaders can see a visual representation of all the contact data for anyone who has a confirmed positive case and anyone in the same location for more than 15 minutes. Additionally, the data will be used to alert health officials if quarantines or isolations are broken as those are also public health concerns.

Finally, the data will be used to help identify areas for increased cleaning, social distance monitoring, and other education efforts based on location or student type.

For many years, university communities have been susceptible to communicable diseases, such as measles, mumps, tuberculosis and now COVID-19. Analytics helps institutions to act quickly in response to any type of health threat impacting their institutions. In the case of COVID-19, speed saves lives. Speed protects the institution's reputation. Being able to use health data and the analytical tools at its disposal, OSU's IRA team is building resiliency for pandemics and crises to keep students, faculty and staff in an environment that is safe and healthy.

Rx for the long-term vitality of our public health systems

Sarah Newton, Manager of US Public Sector Health Policy, SAS

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Public health crises have plagued our world for centuries. Our elderly population, for example, is today at greatest risk from COVID-19. But this same population faced another deadly virus decades ago as children in the first half of the 20th century – polio. For this generation, polio remained an uncured virus. The cruelty of polio was that it took the young; for some it paralyzed, for others it killed. Hope finally arrived in 1955 in the form of the Salk vaccine.

Like polio, COVID-19 has created new and unforeseen pressures on health care systems around the world. Sadly, hundreds of thousands of people have lost their lives to the virus, and that number is still growing. Health care workers are on the front line caring for those stricken, and in areas that lack widespread detection and prevention measures, some health care systems became overwhelmed with patients. Governments and research communities are collaborating to develop safe, effective vaccines and treatment options as quickly as possible.

Fighting COVID-19 and operational challenges

The general lack of knowledge about COVID-19 has made it difficult for governments and health care providers to consistently coordinate responses to the pandemic, and they've faced unprecedented operational hurdles and resource constraints while striving to deliver health care services safely and efficiently. These complex challenges have highlighted multiple ways that would improve our response to public health crises.

One way would be to apply analytics to contact tracing, which is within reach thanks to advances in the adoption of health IT and analytics interoperability. More opportunities for improvement remain with analytic interoperability, such as reporting consistency and data standards

that would improve quality, timeliness and communication of such efforts.

What has emerged amid the disruption of this pandemic is that leading health care communities are saving lives and building resilience with comprehensive response strategies rooted in data and analytics.

Building resilience through analytics

Many rapid-response tactics conducted by leading health care organizations have emerged as best practices for saving lives, slowing the transmission of the disease, and accelerating innovation and research by combining internal and external data and applying analytics. Some organizations have taken the opportunity presented by the pandemic to address their long-standing technology and data analysis gaps. Ensuring adequate health care capacity and optimizing resources will only increase in importance as social distancing fades and a leading transmission control strategy rises.

Using analytics to connect citizens with testing and treatment provides the foundation for resource planning and process improvements, as well as the development of diagnosis and treatment protocols to prepare for the next outbreak.

Linking vulnerable residents to services

A core purpose of government is facilitating safe, healthy communities. To best meet their holistic needs, governments need to understand who our vulnerable populations are and the services they need.

Historically, we would identify vulnerable populations as residents of long-term care facilities, frequent users of hospital care and the homeless. This approach presents a challenge in knowing where to direct resources effectively to help people.
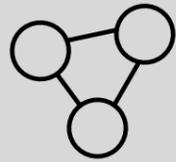
Now, we're increasingly recognizing the importance of a more integrated, whole-person view of vulnerability, need and intervention. It's not just one characteristic that makes someone vulnerable, and it's not just one type of service, either. Rather, integrating information across services that support our communities allows us to get a more complete, accurate picture of community need and the impact of services.

Analytics helps governments meet the needs of vulnerable populations during a public health crisis by applying data in a more meaningful, useful manner to address community needs and resource allocation.

4 ways analytics is building resilience today

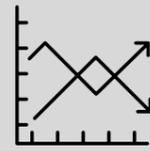These are just a few ways governments have successfully used analytics during the COVID-19 pandemic.

1 Modeling the spread of disease.

Working with some of the nation's largest health systems, including the Cleveland Clinic, SAS has publicly released infectious disease models that help forecast patient volume, bed capacity, ventilator availability and more. These models are designed to help hospitals and health departments optimize care delivery for COVID-19 and other patients to predict impacts on operations, supply chain, finance and other critical areas.

2 Visualizing situational data.

Several US state government agencies use the SAS® Platform and SAS analytics expertise for data visualization projects, including the development of situational awareness dashboards, building custom epidemiological models to forecast peak resource need, and creating scenario simulations to take into account practices such as the impact of social distancing.

3 Planning operational capacity.

One of the greatest challenges during a pandemic such as COVID-19 is coordinating intensive care based on forecasting so that personnel and resources are available exactly where and – most importantly – when they're needed. In Germany, analytics has helped inform those decisions for the Robert Koch Institute and the Deutsche Interdisziplinäre Vereinigung für Intensiv- und Notfallmedizin, which cooperated to build an information and forecasting platform that provides an overview of existing capacity and demand.

4 Ensuring patient safety.

For Copenhagen Regional Psychiatric Centers, a new COVID-19 dashboard plays a key role in managing patients' chronic conditions while limiting the risk of contagion for patients and staff, both from within hospitals and from outside. Having data such as infection patterns and employee absence trends at hand is vital to assess how the pandemic is affecting the centers' ability to provide psychiatric care.

Unfortunately, COVID-19 is unlikely to be our last disease outbreak or major disruption. Given the advance of digital transformation, key elements of resilience in health care involve harnessing the power of data with digital health analytics to ensure patient and health worker safety, effective evolution of operational processes and protocols, and streamlined processes for breakthroughs in treatments and vaccines.

This article originally appeared in the Economist Global Business Barometer.

Social benefits programs need to better respond to crisis. But how?

John Maynard, Senior Solutions Architect, SAS

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My first social services manager told me, "Deal with people where they are and not where you want them to be." Great advice for life and my new job, but the social benefits systems I worked in for decades struggled to live up to this idea. Our structures, hierarchy and bureaucracy prevented us from fully reaching those in need, delivering benefits accurately and efficiently, and helping beneficiaries maintain self-sufficiency. I believe digital transformation will change all this.

Social benefits programs have long needed digital transformation, and COVID-19 has amplified government weaknesses in delivering assistance. Siloed data and manual processes resulted in long delays and overloaded IT systems when citizens needed help the most. Agencies must be more agile to respond quickly in crisis while still fighting fraud and meeting day-to-day service needs. More tech-savvy citizens expect the government to meet them where they are – meaning a digitally connected, efficient and user-friendly experience. But how?

Opportunities for innovation and improvement

Governments can greatly improve by shifting from a program-centric approach to a recipient-centric one. They can do this by using data and analytics to understand the complete picture of citizen needs, innovating for cost-effectiveness, and measuring the impact of such assistance. A consolidated view of individuals, households and communities helps social benefit programs be more responsive, proactive, secure and meet changing public expectations for service and quality. Yesterday's "good enough" won't suffice in a connected world.

The disruption of COVID-19 simultaneously results in more expenditures and fewer tax collections, so every dollar must count. Governments must balance rapid deployment of needed social benefits and preventing fraud to safeguard precious funds. Changing to a recipient-centric focus allows governments to do both by transforming data to boost target outreach, improve intake and reduce the information gaps between programs that fraudsters exploit.

The emergency benefits rolled out in response to COVID-19 have been a prime target for organized fraud and collusion. Personal and business identity theft cost the state of Washington nearly $650 million in unemployment insurance fraud within the early months of the pandemic, while also preventing the real

applicants from getting needed benefits. In the UK, organized criminal rings fraudulently applied for Universal Credit benefits estimated at GBP 1.5 billion, leaving duped beneficiaries to repay bogus loans.

The benefits of a data-driven, recipient-based approach

Making the shift to digital delivery and a recipient-based approach will make it easier, faster and more convenient for those in need to apply for and receive benefits. By using what we already know about our recipients, we can anticipate needs and offer services proactively. By gathering the right data, programs can measure the effectiveness of different assistance services in returning those in need to self-sufficiency and target citizens who need the most help (see the Governing.com article "A Better Way to Connect People With the Benefits They Need").

In the wake of COVID-19, SAS is helping agencies with digital transformation of social benefits programs (see "Governments taking action during COVID-19" sidebar on p. 22). Innovative organizations are finding ways to transform transactional and external data to accurately define households, target benefits using microsegmentation, better understand budget spending and appropriation, and identify fraud through network generation and automated detection.

A road map for change

The strategy map on p. 22 illustrates the journey social benefits organizations must take to move from a program-centric approach to a recipient-based approach. It's not as simple as flipping the switch on technology, but it's also not an insurmountable task.

By focusing the effort on high-impact decisions and interactions, SAS helps customers improve service delivery and secure the integrity of their programs, starting with

existing data and systems and building to a digitally transformed recipient-centric program over time. This means immediate value for the recipient in terms of faster and more appropriate services, and for the program in safeguarding funds that can help pay for the longer-term structural changes.
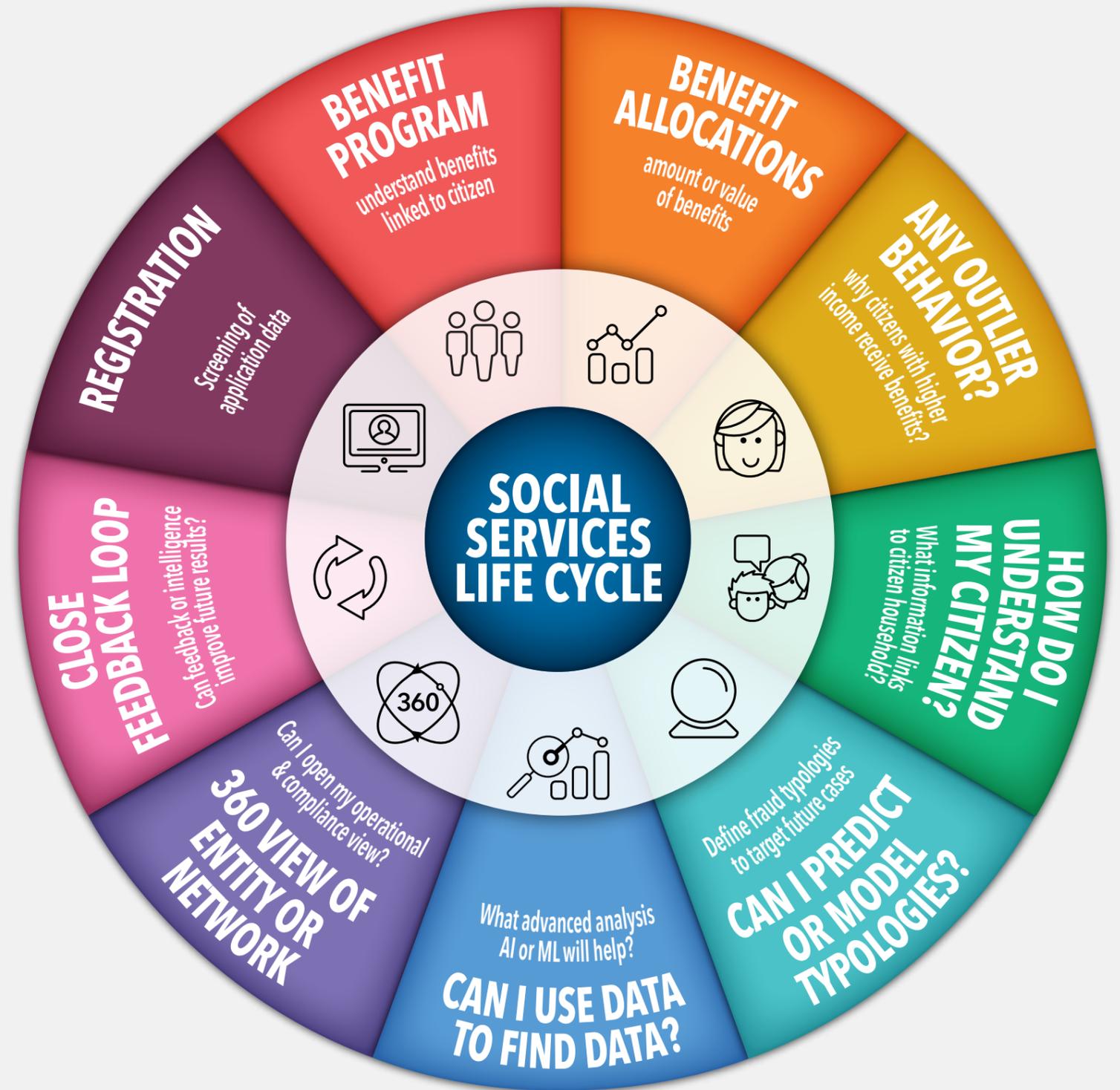
Looking to the future

Governments need to evolve to a more consumer-centric model, similar to retailers and service companies. Citizens expect governments to use the data they provide to deliver better service while respecting privacy and security. Transformation requires analytics-ready data to support the move away from relying on transactional data and toward this recipient-centric view.

Transformation also means advanced analytics and artificial intelligence to handle the speed, complexity and nuance of the real-world experience of a recipient. Data and analytics are imperative to enable a complete picture of citizen needs, cost-effectively meet those needs and measure the impact of needed assistance.

Governments taking action during COVID-19

When COVID-19 closed schools in the US, one state took quick action to convert a school lunch benefit paid by one program to an electronic benefit transaction (EBT) card usable at food retailers from another program. Unfortunately, there was no golden record that tied the 4 million children from the school program to the EBT card program, delaying the benefits to millions. SAS helped connect the data and resolve identities, allowing the program to ensure childhood food security.

SOCIAL SERVICES LIFE CYCLE

BENEFIT PROGRAM
understand benefits linked to citizen

BENEFIT ALLOCATIONS
amount or value of benefits

ANY OUTLIER BEHAVIOR?
why citizens with higher income receive benefits?

HOW DO I UNDERSTAND MY CITIZEN?
What information links to citizen household?

CAN I PREDICT OR MODEL TYPOLOGIES?
Define fraud typologies to target future cases

CAN I USE DATA TO FIND DATA?
What advanced analysis AI or ML will help?

360 VIEW OF ENTITY OR NETWORK
Can I open my operational & compliance view?

CLOSE FEEDBACK LOOP
Can feedback or intelligence improve future results?
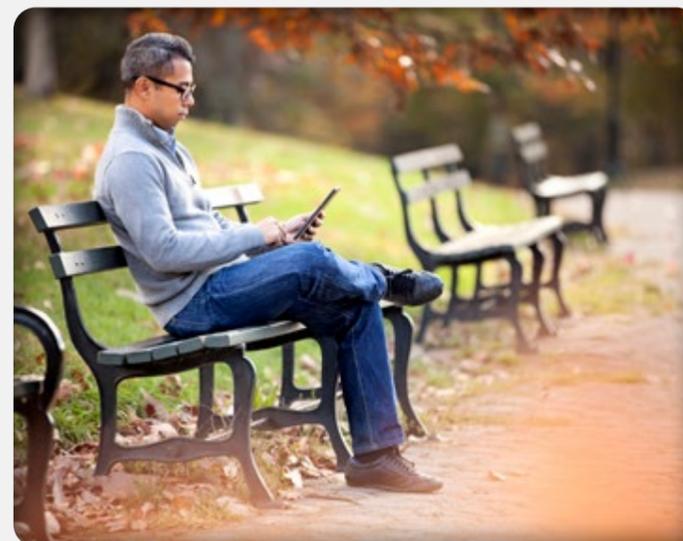
REGISTRATION
Screening of application data

Local government manages flooding and more with platform ecosystem

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Cary is a vibrant community of 170,000 in the heart of North Carolina's Triangle area. The town is repeatedly ranked among the top communities in the country to live or work. Known as the "Technology Town of North Carolina," it's no surprise that the municipality takes an innovative approach to its information systems infrastructure.

While most governments manage hundreds of different information systems within their organizations, Cary officials decided to stop procuring individual applications to support one-off departmental uses and move to a platform-based model.

Platforms are the infrastructure upon which other technologies, processes and applications are built. Cary designed a platform ecosystem to meet the variety of needs that all municipalities have: data management, cloud storage, geographic information system mapping (GIS) and analytics. Cary's platform includes Microsoft Azure for cloud and SAS for analytics, which helped the city rapidly deploy a vital stormwater system.

To show you how any government or organization – big or small – can use this platform approach to accelerate and manage the development and maintenance of its systems, we talked to all the major players. Keep reading for the full story.

Why did Cary adopt a platform, and how is it making a difference?

Nicole Coughlin Raimundo
Chief Information Officer
Cary, NC

Raimundo: When I came to Cary five years ago, I noticed numerous redundant, siloed solutions. For an organization with limited staff, this is not only an unsustainable model; it's ineffective for sharing data and gaining insights on both internal operations and external programming and services. One of my first tasks was to implement a platform strategy.

We've spent the last few years developing our platform ecosystem so that it can work with complementary technologies, expand our capabilities and give us new ones. Our platforms allow rapid application development, component reuse, and the ability to take advantage of prebuilt, plug-and-play apps, all of which significantly decrease solution delivery time.

We saw how powerful this could be when we began our project to track stormwater. Our platform partners came together with a shared purpose of having honest, ego-free conversations about their respective platforms' capabilities, and how to implement each one in a way that best served the project.

This resulted in the strongest possible architecture for our stormwater alert system. When I talk about the power of platforms, this is what I mean – it's not just the technology, but the human collaboration it enables.

What's the value for governments having a platform ecosystem such as the one that Cary has?

Walker: The value of this type of platform is that smaller governments can get the competencies and sophistication in Internet of Things (IoT) solutions that were previously reserved only for the largest cities. They can affordably implement solutions for air quality, parking, congestion and flooding and, through data management and analytics, find insightful correlations between these vertical systems.

There are thousands of cities similar to Cary that are looking for technologies to help solve urban issues such as flooding. Leveraging the Azure IoT platform and SAS Analytics for IoT, these cities can move from being reactive to proactive and, ultimately, predictive in a cost-effective, scalable manner.

Kirsten M. Walker
Global Smart City & Smart Building Lead
Azure IoT Business Acceleration

Why did Cary engage environmental IT company Green Stream, and how does a company like Green Stream work with a customer's platform ecosystem?

Jim Gray
President and CEO
Green Stream

Gray: Flooding is a frequent problem for many communities. It destroys property, threatens safety and causes major transportation problems. Cary has regular flooding problems, but it lacked visibility into when and where the floods were occurring. So it set out to gain situational awareness for its staff to improve response, build early warning capability and predict future flood events. A number of technologies are converging to make real-time flood monitoring affordable, even if a community doesn't have a big budget.

Green Stream provides the infrastructure to monitor stormwater. Small, wireless, autonomous sensors are placed to monitor flood-prone areas in any type of environment – urban or rural.

The size of electronics has come down and the cost has come down, while distributed power, processing power and cloud computing capabilities have advanced. Today, our water level sensors and rain gauges can be installed in 15-30 minutes.

The more sensors you have, the more data you have. But it's not just the sensors. It takes wireless communications, a back-end platform to process and store messages and the ability to do analysis.

With its platform ecosystem, Cary was able to easily bring in Green Stream's water level and precipitation data without the need for additional dashboards, sign-ons and applications.

What role does the SAS® Analytics for IoT platform play in Cary's stormwater alert system?

Tyson Echentile
Principal Business Development Specialist
SAS

Echentile: With SAS Analytics for IoT, the town of Cary has enhanced its ability to acquire and manage new data, generate and deploy predictive models, manage the life cycle of those models over time, and achieve greater insight for quicker action.

In the case of flood detection, the town of Cary can better identify anomalies, such as rising water, and deliver advanced warnings and future predictions of flooding events both within the town of Cary and downstream to surrounding municipalities.

Combined with ESRI ArcGIS for additional geographical analysis, the Azure IoT platform, and other third-party services, SAS Analytics for IoT helps power the ability to automate the flood response workflow process, deliver a data model to better predict flooding and improve overall situational awareness.

Employing a platform can help any government tackle its challenges in a strategic manner – whether it's revenue and economic forecasting, improving road conditions, ensuring students get educational resources, or protecting citizens' health and safety.

New tools for unprecedented challenges

Economic disruptions threaten government financial stability – people are out of work, and the need for social services rises. Pandemic events, like COVID-19, infect millions, creating unprecedented demand on health care resources. Natural disasters destroy homes and infrastructure and put citizens in peril, requiring rapid response, rebuilding and recovery logistics. And in all of these situations, government officials are responsible for making decisions and quickly responding to ensure the safety and well-being of their citizens.

Will you have the key data and insights you need to act? Do you know which segments of your populations need the most help and where they need it?
Can you develop what-if scenarios to anticipate changing circumstances?
Can you react quickly to mitigate impacts and improve outcomes?

The right data at the right time

You need ready access to the right data, the ability to rapidly turn that data into information and the tools to communicate that information so that you, your citizens and businesses can act. Unfortunately, action in these critical times, as well as in normal operations, is often hampered by time-consuming, manual data collection, and the lack of tools to assess and understand what the data tells you.

An overarching analytics program can change that dynamic, ensuring that you and your teams can understand the challenges, answer the questions and drive toward the best responses and outcomes.

An analytics program prepares government for the unknown through the implementation and availability of a program that:

- Drives a business strategy of useful, evidence-based decision making.

- Aligns information infrastructure for data quality, governance and accessibility.

- Supports key business challenges in the beginning, and matures over time to more complex, advanced analytics.

- Facilitates clear and decisive action based on insights gained through trends, patterns, anomaly detection, forecasting, simulation, machine learning and artificial intelligence.

Government preparedness with an enterprise analytics program can ensure:

- A sustainable, ethical and secure framework for using data.

- A systematic approach to efficient, effective analytic solution development.

- A dynamic ability to successfully identify and respond to business challenges.

Where to begin?

Multiple policy areas influence the challenges governments face today. So how should government organizations move toward collaboration, data sharing and access to create the analytic capabilities they need for crisis preparedness?

To build enterprise analytics, you'll need to:

- **Change the culture** to focus on using all data assets in your arsenal to best equip your government operations.

- **Define a strategy and vision** that challenge all sectors of your government to improve operations, innovation and policy decisions.

- **Celebrate the successes** that enhance government transparency, efficiency, responsiveness and citizen engagement.

The world today is facing unprecedented challenges. Governments need new tools to meet a variety of situations we will encounter. SAS enterprise analytics can help government successfully prepare for and navigate this future.

Let us partner with you to take your decision making to a new level. With SAS' experience in enterprise analytics, we can help you:

- **Establish clear vision**, leadership and advocacy for analytics.

- **Build strong teams of analytic and business talent** and align business goals with analytic capabilities.

- **Define outcomes and expectations** that demonstrate value and success to your leadership, citizens and business communities.

- **Ensure secure and governed access** to high-quality, consistent, timely and reliable data to answer your most pressing questions.

- **Implement an analytics platform** that provides the capability and technology to gain critical insights into your data.

- **Iteratively grow and evolve your analytics platform** to meet constantly evolving business needs.

Contributors

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Find out how SAS can help your government agency drive better decisions and better outcomes for citizens.

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