Big data, big outcomes: how analytics can transform public services and improve citizens' lives

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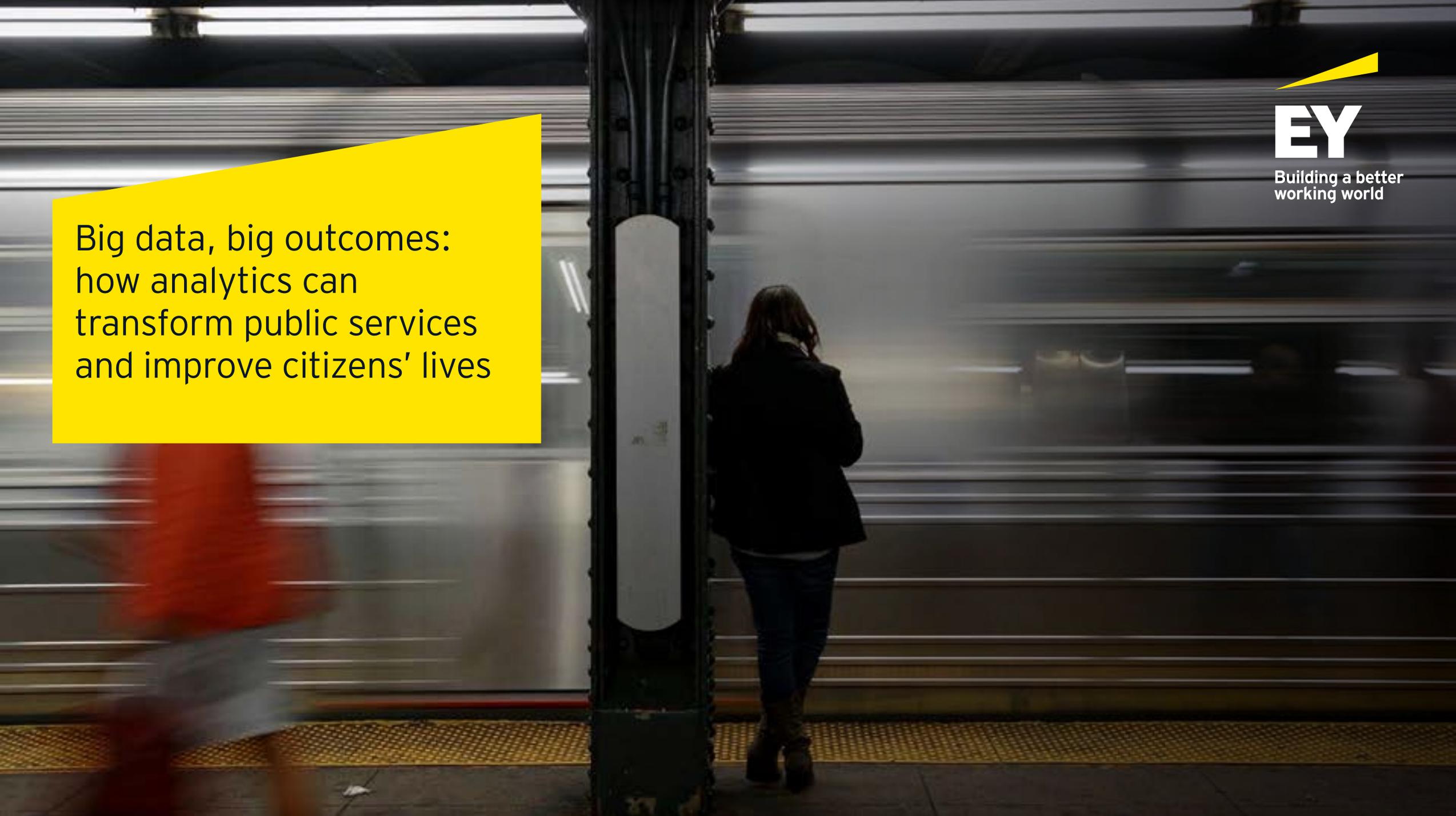
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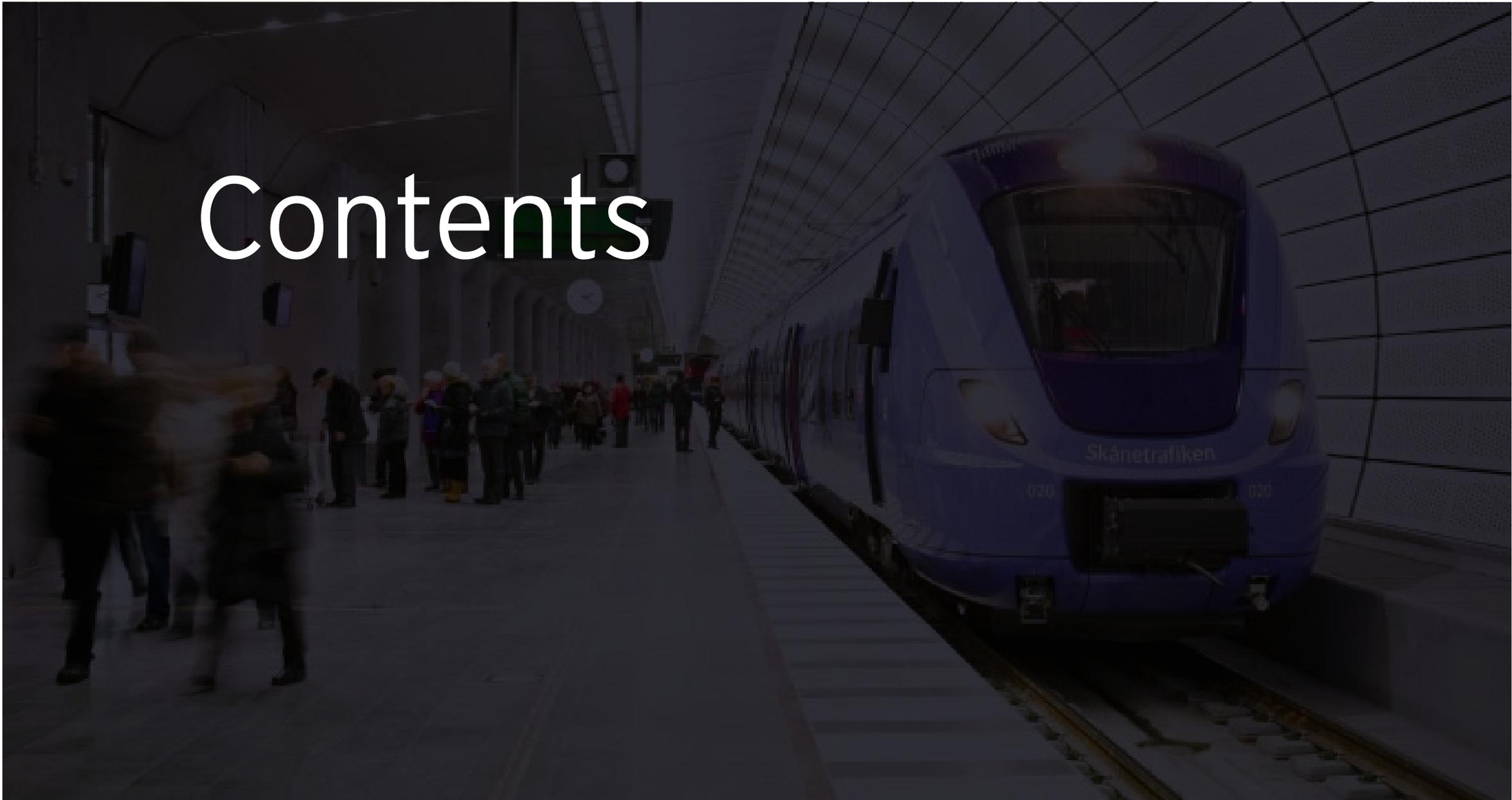
There has never been a better time to capitalize on the potential of data analytics. We have just begun to scratch the surface of possible applications. If governments can unlock this potential, they will make smarter decisions today, and plan better to meet the changing needs of citizens and societies in the future.

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Summary

For a decade or more, we have been hearing about a revolution in big data and analytics. The COVID-19 pandemic has brought good science and the need for reliable data back into the heart of government decision-making. Governments around the world are investing in data as a powerful means of controlling the outbreak and helping economies to recover.

Data analytics offers a way to allocate resources more effectively, optimize operations, reduce operating costs and tailor services to the specific needs of citizens and communities. Perhaps, the most exciting development is that big data is transcending boundaries, enabling collaborative problem-solving on global issues from pandemics to climate change.

Our societies are producing and storing more data than ever before. And the rapid increase in computing power and development of new analytical tools mean that datasets can now be combined and manipulated to identify patterns and interrelationships that were impossible to detect. Advanced simulation models can also help us better predict future trends.

In the private sector, data is already a source of huge competitive advantage. Many established companies have been challenged by start-ups that have disrupted their industry by designing radical new business models. Data-centric service providers, such as Netflix, Uber and Alibaba, excel at using analytics to improve their operations, target their products and deliver an exceptional customer experience. However, unlike the private sector, governments have no real competitors to provide the spur for change. The impetus must come from within.

That impetus is now gathering force, and the constraints that held governments back in the past are being overcome. From Hong Kong to India, the US to Switzerland, pioneering governments are harnessing data analytics to safeguard children, reduce crime, combat fraud and save lives. Government and public sector agencies are investing in more flexible IT infrastructures, such as application programming interfaces (APIs), to facilitate interoperability and information sharing. They are improving collaboration through joint target setting and integrated approaches to service delivery, while actively managing data so that it is fit for analysis. And they are reassuring citizens that their data will be kept safe and used only for the greater good – as is the case with new health apps that track individuals' location and contacts to prevent future COVID-19 outbreaks.

The most important enabler for governments wanting to unleash the power of data analytics is to build an organizational culture where the potential of this technology is understood and valued. There are four actions for public-sector bodies wanting to build this data-centric culture:

1. Appoint a visionary leader who can elevate the importance of analytics across the workforce and give initiatives the best chance of success

2. Enthuse and upskill all employees so that they become more confident at using data insights in their everyday roles

3. Adopt an agile approach to projects – based on rapid research, testing and prototyping – to learn fast and trial new methods

4. Work in partnership with businesses, NGOs, academics and citizens to marshal and analyze relevant datasets, and find new insights and solutions
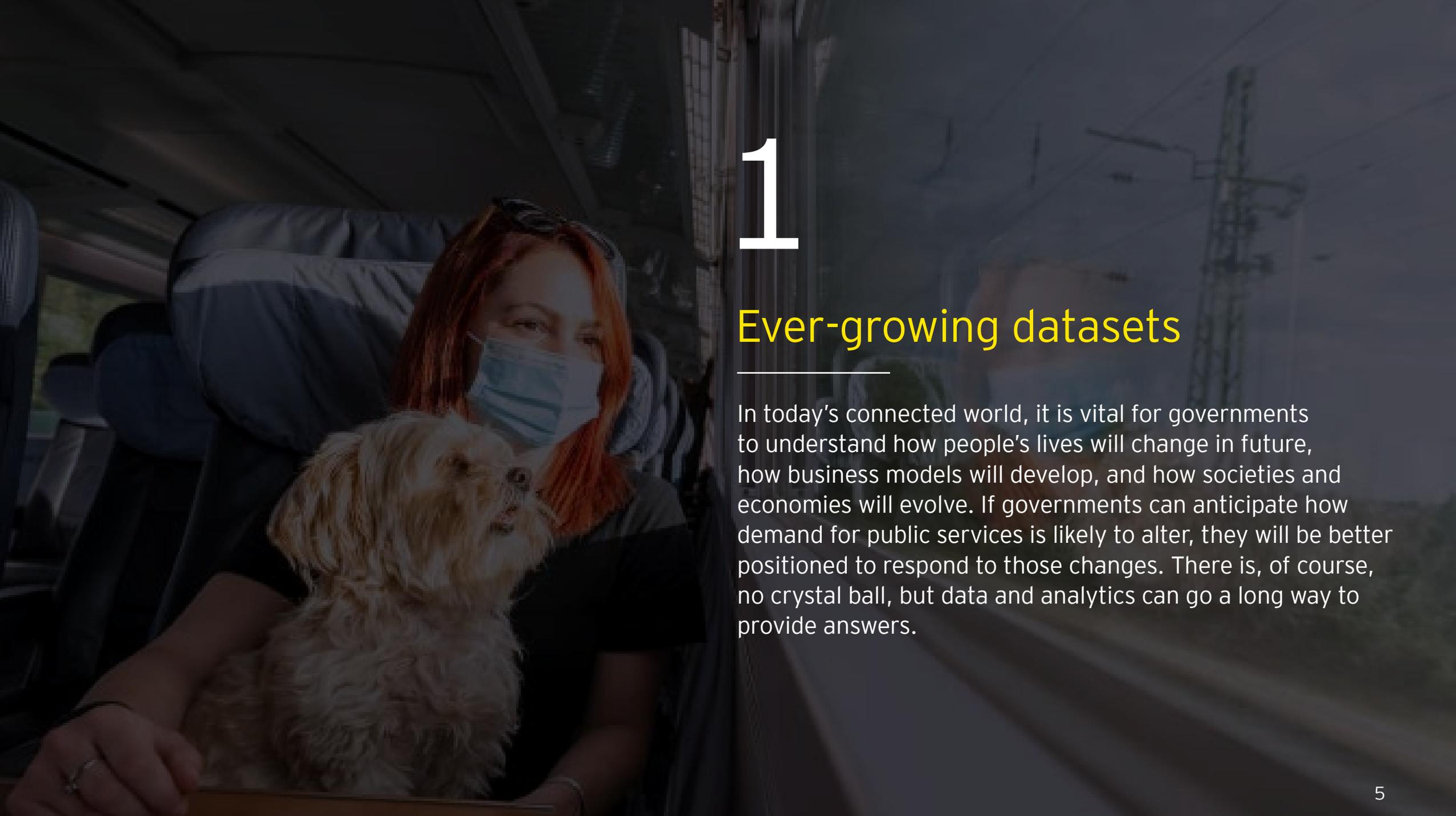
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Ever-growing datasets

In today's connected world, it is vital for governments to understand how people's lives will change in future, how business models will develop, and how societies and economies will evolve. If governments can anticipate how demand for public services is likely to alter, they will be better positioned to respond to those changes. There is, of course, no crystal ball, but data and analytics can go a long way to provide answers.

Governments collect and hold more information than ever before. As citizens and consumers, our use of websites, social media and wearables provides a wealth of data on everything from the items we buy to the places we visit. And now that most of the new devices − from aircraft engines to refrigerators, digital assistants and smart phones − have sensors and processing devices embedded in them, the internet of things (IoT) is generating a whole new range of data and insights. By 2025, the number of IoT devices is expected to reach 75.4 billion. And, over the period 2018-25, the amount of data created is estimated to grow at a compound annual growth rate of 28.7%.

At the same time, technological innovation continues to extend the frontiers of what we can do with such data. The ability to link datasets is expanding, enhancing the usefulness and value of individual datasets. And, with improvements in computing power, increasingly sophisticated analytics tools and artificial intelligence (AI), algorithms can now make connections across disparate sources and spot previously unseen patterns. This not only gives us fresh insights into the present but also enables us to make data-driven predictions about future service needs and resource requirements.

In the digital state − where we increasingly work and play online − there is more data than ever on nearly every aspect of our lives and activity. According to an IDC study, more than 5b people interact with data every day. By 2025, this number will be 6b or 75% of the world's population. It is estimated that each connected person will have at least one data interaction every 18 seconds.

Annual size of the Global Datasphere

175 ZB
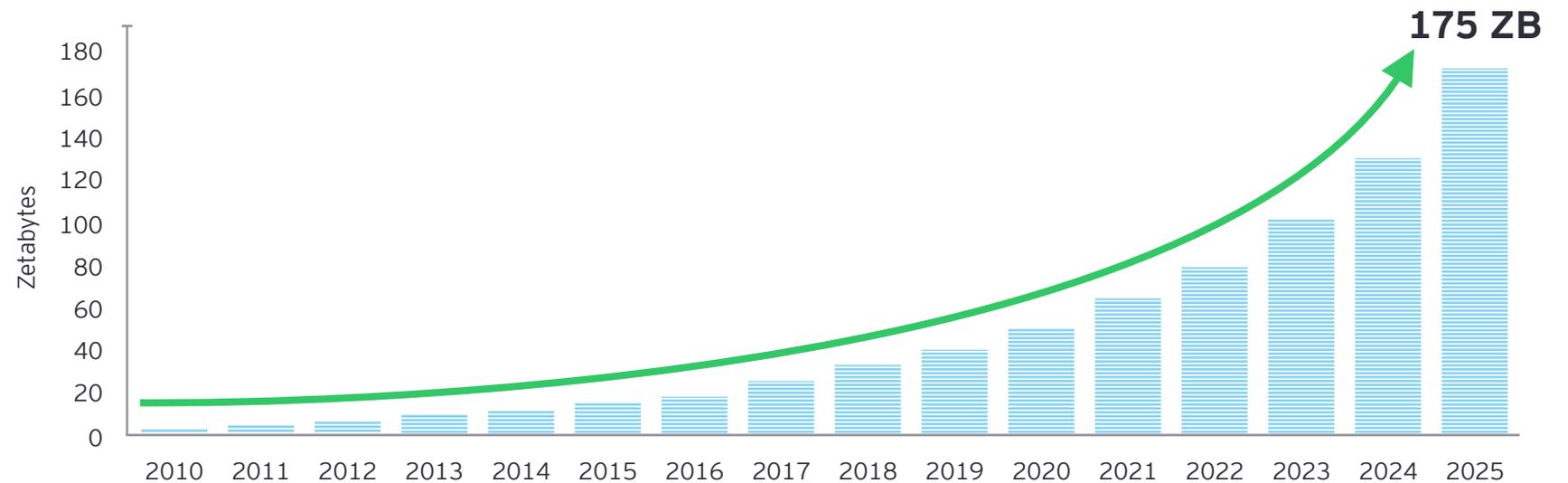
Source: Data Age 2025, The Digitization of the World from Edge to Core, IDC, sponsored by Seagate, Nov 2018

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The potential of data analytics in public policy

In the context of this revolution, leading organizations in both the private and public sector are recognizing the central role that data and evidence can play in improving decision-making, boosting performance and increasing efficiency.

In the wake of the COVID-19 pandemic, the status of data is arguably higher than ever before. In seeking to control the spread of the virus, prevent further outbreaks and find safe ways to get the economy moving again, good science and reliable data have been placed at the heart of government decision-making across the world. This is hugely welcome. Governments will need to demonstrate – and should insist on – strong scientific and evidential support for policies in the new normal, not only within the medical sphere but also with regard to other pressing problems such as long-term unemployment and climate change. Indeed, forward-looking businesses and governments are already using a wide range of analytic techniques to describe issues, diagnose causes, predict trends and prescribe solutions.

Four types of analytics

Complexity and impact →

Key question	Descriptive What happened?	Diagnostic Why did it happen?	Predictive What is likely to happen?	Prescriptive How can we make it happen?
Focus	Mines past data to report, visualise and understand what has already happened, after the fact or in real-time	Drills down into historical data and identifies drivers, patterns and correlations	Models trends and plausible change based on data of what has happened to date and assumptions about what might happen in the future	Complex analytics including AI and machine learning dedicated to finding the best course of action through optimisation models and game theory
Government uses	Activity reporting, dashboards, demographic profiling, monitoring or evaluations	Exploration of cause-effect and interrelationships such as the economic impact on crime levels or the relationship of education to income and economic growth	Scenario planning, strategic development and capacity versus demand modeling (e.g., economic growth projections, rate of expansion for disease and where it will spread, and immigration and population growth)	Decision support for case workers in areas such as social services and justice; also helps build buisness cases for longer term investments (e.g., new infrastructure or investment needed to create jobs in local economies)
Case examples	Smart cities are monitoring energy use in real time, and analysing and presenting this in ways that are readily accessible. The data is used strategically to adjust energy consumption in public buildings at peak time. In the city of Boston alone, this is estimated to generate savings of US$1 million per year.	The US Department of Transportation has embarked on a safety data initiative (SDI), which uses data integration, analysis and visualisation to better understand hotspots for accidents on roads and rail networks, and diagnose related behaviours and contextual factors that might have been a contributing factor. Building on this insight, it is able to identify potential risk areas, and enable more rapid and effective interventions.	Pension funds across the world face similar challenges: how to ensure that members will have enough funds to provide for themselves in retirement. EY teams has developed a predictive model to understand how demographic, economic, political and social changes affect financial behaviours and pension funds. This insight can help individuals to prepare for their retirement, allow pension providers to plan strategically for the future, and help enable government to develop more effective pension policies.	The Centers for Disease Control and Prevention (CDC) analyzes data to examine health determinants and health outcomes, access to health care, health behaviours, and exposure to environmental health hazards relative to a number of factors. The analysis underscored select intervention activities needed to reduce health disparities and identified a need for greater investment in health care funding in rural populations.

In the public sector, the benefits of such an approach fall into two broad areas: better services and outcomes, and improved efficiency.

i. Better services and outcomes

Innovation in data analytics will transform how public services are delivered. As consumers, we have all come to expect a high level of personalization from the companies we interact with: Amazon and Netflix suggest purchasing and viewing options based on past preferences, while supermarkets and department stores make it easier to shop by grouping products according to buying patterns – tactics that can increase sales by up to 20%. Unsurprisingly, as citizens, we are now starting to expect a similarly intelligent and responsive approach from the public sector.

Governments know this represents an important opportunity and are using big data and analytics to tailor services to the specific needs, expectations and preferences of citizens and communities, from improving patient journeys in hospitals, to streamlining tax returns and creating bespoke study programs in higher education. They are integrating different datasets to form a more holistic and accurate picture of citizens' needs and specific social issues, driving continuous improvements in service design and delivery.

Arguably, predictive and prescriptive analytics offer the most promising use of big data, improving safety across a range of policy areas, such as predicting and preventing child abuse. For example, in Kenya, the nonprofit organization Shining Hope for Communities worked with EY to digitize data records, align these with health records, and introduce modeling to predict likely incidents, allowing the smart allocation of resources. There are many other applications, from anticipating extreme weather events to carrying out preventative maintenance of infrastructure to help avert major accidents.

Advanced forms of predictive and prescriptive analytics are also increasingly used to support professional decision-making. This offers unique potential for almost all areas of public services that involve casework, including social services and education; policing and criminal justice; tax collection and fraud and error reduction; town planning and building services; and immigration and integration.

Simulation saves lives

Using many years of incident records, an EY team constructed a resource simulation and incident response model to help an Asian emergency-services provider plan ahead. The model forecasts five years into the future by looking at actual incident response performance, combined with geographic and demographic data. It predicts likely incident patterns by day, week and month, and allows forecasts to be broken down by incident type – from heart attacks to cooking fires. The organization can use this model to make the best use of ambulances and other equipment, as well to secure the investment, to help ensure that capacity meets future demand.

Improving lifetime well-being for vulnerable children

In New Zealand, EY teams worked with Oranga Tamariki (formerly the Ministry of Social Development) to support the transformation of the country's child protection system. A predictive model of children's life courses was developed, based on evidence of risk factors and projecting the outcomes from different paths. Covering all children aged 16 and under, the model draws on a longitudinal research and policy dataset that combines information from a range of organizations to give the Ministry a comprehensive view of each child and their family situation. The model also identifies avoidable fiscal costs associated with poor outcomes, thereby building a business case for early intervention.

Meanwhile, resource simulations are increasingly used to make sure that delivery systems and infrastructure are fit for the future. This is particularly important for emergency services, where it is challenging to match the supply of assets, such as fire stations and specialist equipment with ever-increasing demand.

Perhaps the most exciting development of all is that big data transcends geographical, sectoral and organizational boundaries, enabling governments, businesses and citizens to come together in new ways to tackle the world's biggest problems – from climate change and natural disasters to social inequality. Today, we have only scratched the surface of how data-driven analytics can be used to better predict the future and inform future policies and decision-making.

Tackling climate change with data

Extreme weather events such as floods, storms and wildfires have become more frequent in the recent years. Many meteorological institutes openly share their data to help track changes in weather and climate. In the US, the National Oceanic and Atmospheric Administration, with support from EY, has made data more readily accessible to external parties, including businesses working to reduce the social and economic impact of weather-related damage.

ii. Improved efficiency

Faced with ever-growing pressure on public funds and rising volume and complexity of demand, governments are seeking to make smart decisions about how to improve financial management and get maximum benefits from scarce resources.

Data analytics offers a powerful way to manage costs and allocate resources more effectively. There is a whole spectrum of applications, including optimizing procurement and budgeting processes; identifying new revenue streams; detecting fraud; transforming internal operations; and improving asset management. For example, EY teams helped a European railway company look after its infrastructure more effectively by moving from a time-based, reactive maintenance program to a system of predictive maintenance and renewals. Automation and digital sensors now detect emerging problems before they become major. And, in the US, a university that was facing severe financial pressures worked with EY teams to identify potential procurement

savings, using managed analytics platforms to provide additional information to the key decision-makers.

Analytics techniques can also be deployed to help optimize operations and reduce operating cost. For example, the RECAP e-public service platform, which serves as a monitoring tool for compliance with Common Agricultural Policy (CAP) in the European Union, combines open Earth Observation data (remote satellite sensing) with the data created by farmers using mobile devices. This replaces field visits and other time-consuming and costly monitoring options.

On an aggregated level, combining descriptive and prescriptive analytics can help the overall prioritization of spending and budgeting. By mapping existing spend and analyzing impact, it is now possible to get a comprehensive view of over- or underspending of budgets and value for money. For instance, in Estonia, the highest scoring country in the InCiSE Index for digital services[1], a digital performance budgeting system tracks monthly spending and progress against policy targets.

Streamlining harbor-craft operations

PSA Marine, a marine services provider, wanted to optimize the operation of harbor craft, such as bunker tankers, tugboats and launches in the port of Singapore — the world's busiest container transshipment hub. EY teams helped assess the optimal capacity of the port by analyzing large amounts of untapped data on vessel size and tidal conditions, and creating event simulations. The company now has an app that uses predictive analytics and machine learning to reduce delays, boost productivity and save costs.

[1] The International Civil Service Effectiveness Index (InCiSE) 2019, Blavatnik School of Government, University of Oxford

Due to budget pressures, it is more important than ever to target resources where they are most needed. By combining data from a wide range of sources, governments can assess when and where intervention is needed the most. This is not simply about saving money – it can directly affect citizens' health, well-being and safety.

By improving controls and spotting anomalies in large volumes of data, data analytics can also help reduce accounting errors, identify risks and prevent tax fraud and financial crime. For example, to improve compliance, tax authorities in some countries are using AI models along with data analytics to predict those at higher risk of not paying their taxes. They're also predicting which of those taxpayers are likely to react positively to certain tax interventions. The result is increased revenue collection and lower tax avoidance. Advanced analytics is an

Building public confidence in data analytics and AI

TheTrusted EY AI Platform can help build people's confidence that their data is being used ethically. The platform evaluates, monitors and quantifies the impact and trustworthiness of AI by measuring risk factors, including its underlying technologies, its technical operating environment, and its level of autonomy compared with human oversight.

effective way to predict and prevent fraudulent benefit claims too. By analyzing the massive amount of data created in the health and welfare system, the technology can flag likely fraud before it starts and create an evidence base for fraud examiners and law enforcement to prosecute cases.

Finally, sophisticated analytics can increase the quality of the feedback loop and aid the development of new solutions to complex problems. Rather than waiting years to evaluate a government program, monitoring and evaluation of policy can become almost instant, provided relevant data is available. This can become an engine to accelerate the development of agile government and public services, streamlining strategic planning cycles and ensuring that infrastructure and services keep one step ahead of demand.

US reaps billions through improved tax compliance

In the US, the Internal Revenue Service (IRS) has established a department dedicated to advanced analytics. By its third year of operation, the Office of Compliance Analytics had delivered more than US$30b worth of improved tax compliance annually. A wide range of methods are used to mine public and commercial data, including social media sites such as Twitter, Facebook and Instagram. The resulting data is combined with IRS's own proprietary information and analyzed using pattern-recognition algorithms that help identify refund fraud, detect taxpayer identity theft, and manage noncompliance issues.

Data pioneers in the public sector

Preventing crime before it happens

Police in Vancouver, British Columbia, are cracking down on burglary with a machine-learning solution that uses an algorithm to deconstruct crime patterns. Through spatial analytics, police can predict where residential break-ins will occur and place patrols accordingly. A pilot reduced burglary by more than 20% in a month and the approach is now being made common practice.

Saving lives through flood prevention

After three months of flooding in 2018 left more than 1,400 dead, India's Central Water Commission partnered with Google to create a flood-warning system. The approach uses AI, geospatial mapping and water data to generate alerts so that agencies can take preemptive action. The first alert was issued in September 2018, warning residents of Patna about heavy rain and likely flooding. This saved thousands of lives and helped reduce financial costs.

Meeting demand for childcare services

A government agency in Asia wanted to address the national mismatch of supply and demand for childcare and kindergarten services. EY teams helped to develop an analytical model to better understand local demand. This helped the agency work out how many extra childcare centers were needed and where, and plan for the long term as the population evolves.

Helping asylum seekers into work

The Swiss Government piloted a new algorithm which could boost refugee employment by up to 30%. Built on big data from tracking previous refugees, the tool analyzes asylum seekers' personal characteristics, such as gender, age and nationality, to recommend the region where they are most likely to find work. The algorithm was designed to help officials to resettle individuals in the canton that best fits their profile.

Identifying illegal construction waste dumping

In Hong Kong, a publicly available dataset containing more than 9m waste-disposal records from 2011 to 2017 was used to identify truck drivers who were likely to be involved in the illegal dumping of construction waste. Combining this dataset with other behavioral and geospatial data, a predictive model was developed which flagged potential hotspots and identified more than 500 waste-hauling trucks suspected of illegal dumping.

Tackling fraud in health services

In the US, federal government agencies have joined forces to tackle waste, fraud and abuse in the US$1t spend on Medicare and other health and human-service programs. Using data analytics, the team has helped uncover US$1b in fraud in one year alone and brought to justice thousands of practitioners for malpractice.
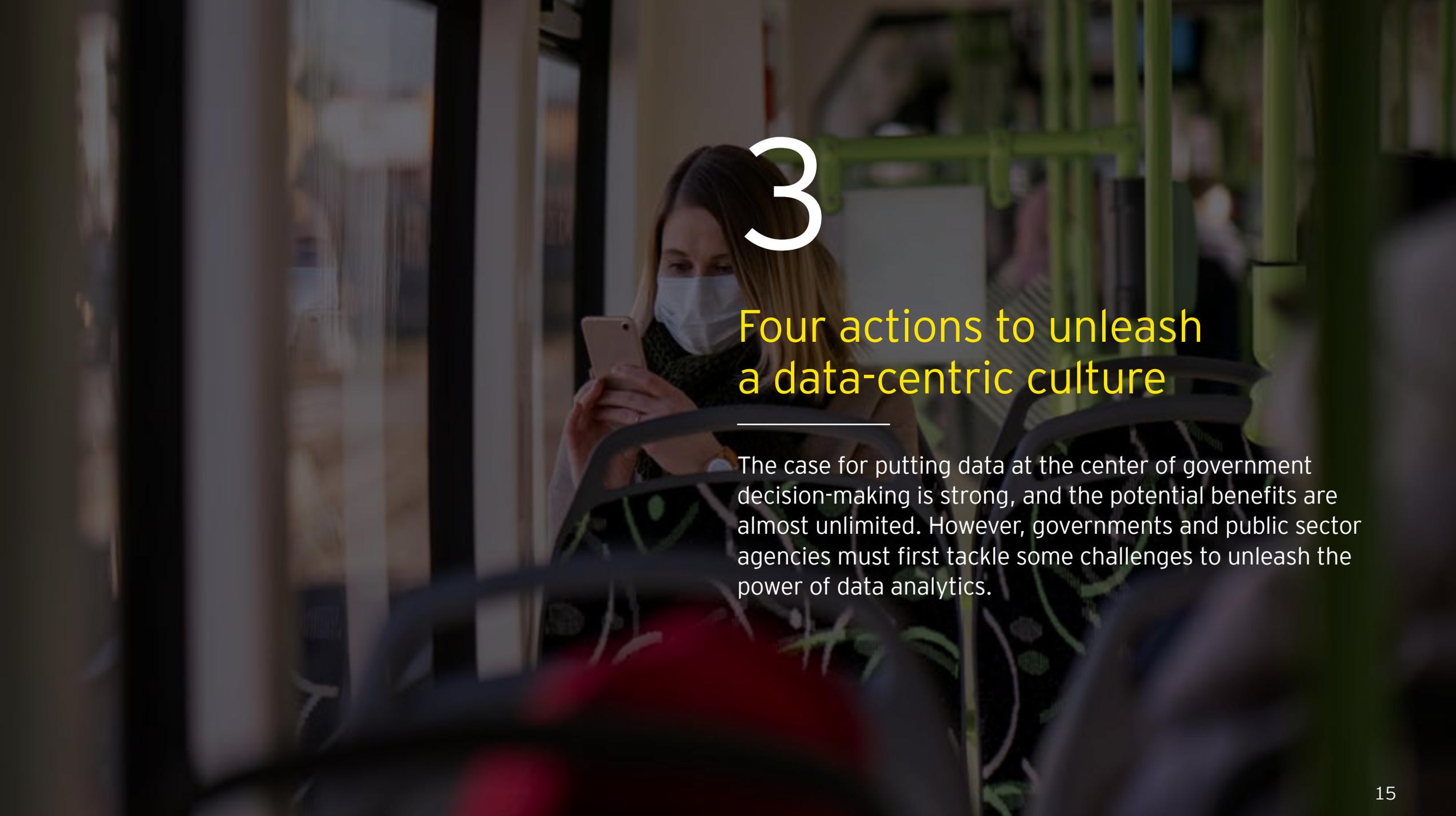
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Four actions to unleash a data-centric culture

The case for putting data at the center of government decision-making is strong, and the potential benefits are almost unlimited. However, governments and public sector agencies must first tackle some challenges to unleash the power of data analytics.

Three issues are often raised as challenges to better use of data: siloed information systems, data quality issues, and public trust. These are not insurmountable. Around the world, we are seeing examples of government agencies investing in more flexible IT infrastructures to facilitate interoperability and information sharing between agencies, while taking steps to improve the quality, richness and relevance of the available data so that it is fit for analysis. And they are working to build trust among citizens by creating appropriate data governance policies and protocols.

However, the most important enabler for governments wanting to unleash the power of data analytics is to build an organizational culture where the potential of this technology is understood and valued. This need for a new mindset is shared by the private sector, where many established companies have been challenged by start-ups that have designed radical new business models and, in doing so, have disrupted their industry. However, since governments have no real competitors to provide the stimulation for change, the motivation needs to come from within.

The most important enabler for governments wanting to unleash the power of data analytics is to build an organizational culture where the potential of this technology is understood and valued. This need for a new mindset is shared by the private sector, where many established companies have been challenged by start-ups that have designed radical new business models and, in doing so, have disrupted their industry. However, since governments have no real competitors to provide the stimulation for change, the motivation needs to come from within.

There is another key difference: the public sector does not usually have the luxury to support innovation with the trial-and-error and 'fail fast' techniques used within industry and commerce. Critical areas, such as health care or social services, cannot afford to experiment, simply because the costs of getting it wrong — including failures in service delivery — are not acceptable. As such, there is a lack of evidence for governments to draw on regarding how to build an entrepreneurial public-service culture.

However, there are pioneers that are daring to do things differently. Specialist skills and pockets of excellence exist in statistical offices, intelligence agencies, innovations labs and other experimental policy and practice development bodies. New digital training academies and exchange programs between the public and private sector are springing up: Singapore is training 10,000 public servants in data science, while in Australia, Data61 — the data and digital specialist arm of Australia's national science agency — is building an ecosystem of data talent through the placement of public sector employees in the private sector, to mutual benefit.

EY teams have worked with many governments and agencies that are successfully transforming their approach, and have identified four actions to building a more data-centric organizational culture and mindset.

1. Lead from the top

In the private sector, the most successful leaders are those who have recognized the power of data to create competitive advantage and improve products and services. For example, Eli Lilly and Company's chief data and analytics officer, Vipin Gopal, is building on the firm's research- and statistics-oriented culture to engage employees with advanced analytics and AI. The average time taken to get a new medicine from initial discovery to commercial launch has been cut by more than two years.

Visionary leaders have proved to be just as important in catalyzing change in the public sector. In the early 1990s, the work of New York City's Police Department was transformed by Police Commissioner William Bratton, who created Compstat, the short for computer comparison statistics, to improve crime data, communication and accountability — a model which is now used by police forces and city governments around the world. During her time at Network Rail, which runs Britain's rail infrastructure, Caroline Carruthers built a case for better information governance and was appointed the organization's first chief data officer. In order to reduce risk and boost efficiency across the organization, she established a small core team operating in a federated manner with a larger matrix team encompassing information security, data protection, freedom of information, records management and business intelligence. Meanwhile, at the UK Government's tax

Direction and vision from senior management is seen as the most important factor in supporting innovation most effectively in an organization.

Source: "Innovation in public finance," ACCA, September 2019

authority, HM Revenue and Customs (HMRC), the former Chief Data Officer Kevin Fletcher suggested that data is key to improving service delivery in an ethical, unbiased and trusted way, and unlocking productivity and innovation.

These examples show the power of having leaders who are passionate about the value of data. In the public sector, such leaders − both political and organizational − elevate the importance of analytics across the workforce and give initiatives the best chance of success. Recognizing this, some governments have gone so far as to legislate for analytics, passing new laws or writing it into their charters. The US, for example, passed the Evidence Act[3] in 2019, requiring agencies to appoint chief data officers and develop multi-year learning agendas and evaluation plans. It also required the agencies to ensure that they collect, share and use evidence in budget, policy and management decisions.

A dedicated executive, such as a chief data or analytics officer, or a chief data scientist, should be appointed to lead the analytics program across the organization. This individual will develop data strategy and governance

frameworks, ideally reporting directly to the head of the organization (chief executive; city mayor). These analytics leaders must act as evangelists for data-driven decision-making, taking inspiration from different fields to solve public-sector challenges (e.g., borrowing ideas from physical sciences about early warning systems). Listening is important too. Talking to a range of staff − from functional leaders to front line employees − is critical to understanding operational challenges, citizen concerns and service issues that could be addressed through better use of data.

Most analytics leaders create a team around them to help achieve their mission. In some cases, the team operates as a centralized unit, where analysts work on specific projects across the organization. Others have adopted a decentralized approach, with analytics teams integrated into, or co-located with, specific departments. Whichever approach is taken, analytics teams must have a thorough understanding of the organization and its key policy areas. Some organizations rotate analytics staff across departments to broaden their experience. Others create analytics

Like other smart cities, Boston has used big data and analytics to transform all aspects of how the city is managed, from filling potholes in roads to health care and urban green spaces. A centralized Citywide Analytics Team has been in place since 2015, with a mandate to equip decision-makers with information on city performance. A single dashboard, CityScore, covers 22 metrics and is updated daily, giving leaders the ability to intervene before issues escalate

[3] Foundations for Evidence-based Policymaking Act.

SWAT teams that work closely with individual units to embed analytical knowledge across the organization.

Analytics teams must encompass a broad range of skills: information technology skills to develop the systems for collating and interrogating the data; statistical and analytical skills to develop the algorithms and models that create insights; and soft skills, such as communication, creativity, curiosity and problem solving. As analytics teams come to understand the context behind user requests, they can start to move from a position of unquestioningly providing whatever they are asked for, to one where requests are anticipated, and to an extent shaped, by the analytics team[4].

Organizations that are establishing data analytics teams for the first time must develop a defined career path for this new breed of professionals. The Australian Public Service, for example, as part of its reform agenda, announced plans to establish digital and data

professions, to build capability and support career progression[5]. Recruitment and staff-management practices must also change – both to bring in digital professionals and to equip them to work in the unique environment of public services. And there needs to be a greater focus on attracting staff with experience in systems design, agile methodologies, and data science.

2. Enthuse and upskill the workforce

A successful data and analytics program requires the whole workforce to see the virtues of the approach and embrace new ways of working. This starts with a well-thought-out strategy spelling out the scope, purpose, implementation plan and potential benefits, which should be communicated to all employees.

As data becomes more and more democratized, the responsibility for turning it into valuable insights no longer rests solely on the shoulders of data-science professionals. However, a study

conducted by EY and *Forbes* showed that a lack of analytics skillsets is a bigger issue for the government sector than it is for other industries (50% versus 40%)[6]. To address this, new skills will need to permeate the entire organization.

Many governments have started to introduce data-literacy training to encourage a broader culture change. For example, the Nepalese Government's Data Literacy Program is designed to drive stronger data-driven decision-making through targeted workshops. The program comprises of a 100-hour modular, customizable training program to support both technical skill-building and efforts to enhance a 'culture of data use' among Nepalese civil servants.

This kind of training fosters curiosity in looking at data and improves employees' ability to ask the right questions: how can existing data be used to optimize outcomes? What combination of data or new data is needed to further improve public value for citizens? It also helps people to interpret results or insights. Alongside

broader change-management programs, such training helps to increase employees' comfort in using data insights in their everyday roles, particularly those who have traditionally relied on their own professional judgment or intuition in making decisions. Any skepticism can be overcome by emphasizing how augmented decision support can aid and enhance, rather than replace, their decision-making. In complex and sensitive cases, such as support for vulnerable individuals, it is still essential to combine the analytical power of the machine with the context and understanding of a human caseworker who can make a final judgment.

Government organizations can be bureaucratic and hierarchical. So, it's important for supervisors to allow staff the time to engage on data-focused projects and develop their problem-solving capabilities. This can be done by incentivizing or mandating personnel to connect with the data analytics team, for instance, through reward and recognition programs or data-sharing champions. In Singapore, for example, every new government

[4] Untapped potential: investing in health and care data analytics, The Health Foundation, May 2019

[5] Australian Government, Delivering for Australians – a world-class Australian Public Service: the Government's APS reform agenda, 2019

[6] Data & Advanced Analytics – High Stakes, High Rewards, EY and Forbes Insights, 2017

employee is allocated to a work-improvement team and helps to address two or three complex operational problems each year. By promoting this kind of innovation program, governments also have a better chance of attracting top talent to fuel further transformation.

3. Become a learning organization

To capitalize on data analytics, governments need to find ways to embrace innovation and experimentation, while of course managing any possible risks to service delivery. They should develop a culture where risk taking is accepted and mistakes are viewed as part of a learning journey.

For example, in Canada, in 2015, the Prime Minister instructed all the ministers to work with colleagues to ensure that they devote a fixed percentage of their time to trialing new approaches and measuring the impact. This learning-by-doing approach, Experimentation Works, has been successful in matching experts with project teams wishing to innovate.

Other governments are cultivating an experimental culture through new structures, such as incubators and accelerators, and using internal hackathons or skunkworks where small, loosely structured groups work on radical new projects. For example, as part of its Smarter Data Program for 2014-2018, the Australian Tax Office (ATO) established a sandpit known as the Research and Development (RAD) Lab. The RAD Lab conducts agile testing of new technology, architecture, data, and analytical methods and processes to establish proof-of-concept before they are deployed at scale. Its showcases have helped build analytic credibility with ATO executives.

Public sector funding is tight, and budgets are constrained. Many analytics programs therefore start by exploring what data they have and how to make the best use of it. A business case is developed to put a value on the opportunity and potential benefits, and funding is then earmarked for innovation and experimentation, while accepting that some initiatives might fail.

Agile project management – based on rapid research, testing and prototyping – allows organizations to drive improvements through an iterative test-and-learn approach. In designing and executing a data analytics program, there must be a willingness to adapt in response to changing needs or unexpected challenges. Piloting analytics on a relatively small scale, for instance in one service area or geographic location, is a cost-effective and flexible way to try new things out. The EY Data Office Framework starts with defining valuable and actionable use cases as a first step toward building the right capabilities, scalable architecture and establishment of a data ecosystem.

Pilots can yield important insights and help provide proof-of-concept to secure buy-in from senior stakeholders. The results provide a more realistic picture of the potential benefits of rolling out to the wider organization. Moreover, identifying and fixing issues during the pilot may reduce the risk of failure.

Collaborating to tackle social challenges in London

The London Ventures (LV) program is a unique collaboration between London Councils (the umbrella body for the city's 33 local authorities) and EY. LV sources and incubates innovative solutions to deep-rooted social challenges. In one London borough, for example, sharing data and developing advanced and predictive analytics helped identify 1,700 new families that were eligible for additional support before they reached crisis point, to help ensure earlier, more cost-effective interventions.

4. Harness the wider ecosystem

Data is a critical resource in tackling complex challenges that cut across different policy areas. Yet, much of the time, vulnerable populations are not getting the interventions they need because crucial data is scattered across different sectors including businesses, NGOs, nonprofits, academia and citizens. Governments cannot tackle these problems alone; they must explore ways to work in partnership with other organizations. Once they have the ability to analyze and cross-reference data across the whole ecosystem, governments can unlock deeper insights and new solutions. In tackling homelessness in cities, for example, they can pull together data on risk factors such as poverty, unemployment, physical and mental health, substance abuse, family relationships, and affordable housing. Predictive analytics models can then be developed to identify those most at risk and take steps to protect them.

There are many different mechanisms that can help to support the creation of such collaboration and generate innovative approaches to social challenges. The Copenhagen municipal government, for example, has launched the world's first marketplace for city data called the City Data Exchange (CDE). CDE is a collaborative project between the city, Capital Region of Denmark, and Hitachi. The platform allows for the sale, purchase and sharing of a wide variety of data from multiple sources among all types of users in a city – citizens, city government and business – to tackle urban challenges. The data offers information on things such as traffic patterns and citizens' energy consumption, which companies can use to develop solutions to create smarter cities. The Government is using insights from the CDE to shape new policies. Another leader in the field is Nesta's program of Offices of Data Analytics in the UK, which helps cities and regions to join up, analyze and act upon data from multiple sources to improve public services[7].

In sharing their own data, government entities enable external parties with a different perspective – such as entrepreneurs, academics and researchers – to produce valuable insights that can inform governmental policies, programs and services. For example, Hong Kong's Smart Government Innovation Lab (Smart LAB) allows start-ups and SMEs to pitch new technologies, including data analytics, that can help improve public services. A dedicated website allows agencies to post challenges and helps businesses and entrepreneurs to pitch their ideas. Governments are also exploring pro-bono and low-cost collaborative partnerships with private sector, nonprofit and academic organizations. For instance, the New York Mayor's Office for Data Analytics (MODA), which aggregates and analyzes data from across its agencies, cooperates with Columbia University and New York University to develop data standards[8].

Meanwhile, Washington D.C.'s Office of the Chief Technology Officer (OCTO) has established an Interagency Data Team, led by the Chief Data Officer, as a community of data analysts and representatives from D.C. agencies to discuss issues of collection, application, sharing, classification and governance. Another example is EY CogniStreamer, an online platform that enables communities to collaborate in the process of innovation.

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[7] Dynamics of Data Science Skills – how can all sectors benefit from data science talent?, The Royal Society, May 2019

[8] As referenced in Hello, World: Artificial Intelligence and its use in the public sector, OECD 2019

Conclusion

In today's hyper-connected and fast-changing world, traditional solutions simply won't work. Powerful drivers – technological advances, urbanization, demographic shifts, global health pandemics, geopolitical and environmental threats – are permanently reshaping the landscape for governments. As such, public bodies need not only to rethink the way they deliver services today but plan better for tomorrow.

Investment in analytics is not an optional extra that may add value at the margins; it is a core tool for governments to tackle deep-rooted, intractable problems in a cost-effective way. This power can only grow as technologies such as AI and intelligent automation develop.

World-class governments should now act to lock in the enhanced position of data and science in the decision-making process that has emerged during the COVID-19 crisis, and continue to offer the greater transparency and openness their citizens deserve. Governments can do this not only by investing in internal and external capabilities but by redesigning formal policy decision-making processes so that they require the inclusion of robust data.

As more and more public bodies venture into data analytics, it is vital that they quantify the results of particular programs and share that success within the government community to build momentum for change. While it is not yet common practice, some organizations are beginning to do this. For example, in the US, the city of Boston has announced that it is saving US$5m a year and eliminating 20,000 pounds of carbon emissions with an algorithm to optimize bus routing. Also, the US Postal Service and the Office of Inspector General revealed that they have used analytics to recover US$920m that was lost through waste, fraud and abuse.

Taking the time to capture and publicize such results can help to win the hearts and minds of political leaders, peers, frontline workers and citizens. Those governments that are ahead of the curve can inspire others' efforts and start to build an understanding and appreciation among the wider society about the benefits of using these new techniques.

Now is the moment to start exploring what big data and analytics can really do for the public good.

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