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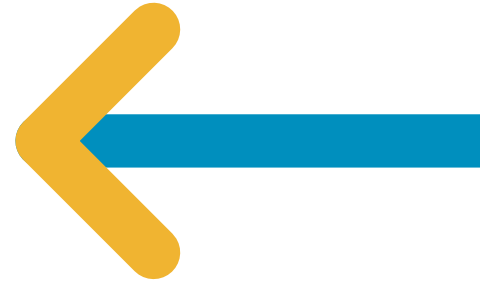
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How to Gov Series

Using Data Analytics in Government

01

**GOVERNMENT OF
UNITED ARAB EMIRATES**

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Using Data Analytics in Government

Introduction

Data is the new oil. We generate data whenever we go online, when we carry our GPS-equipped smartphones, when we communicate with our friends through social media or chat applications, when we shop – and the list goes on. You could say we leave digital footprints with everything we do that involves a digital transaction, which is almost everything. This data is being used by some of the most successful brands of our times. From the big tech giants, Facebook, Google, Amazon, and Netflix to entertainment conglomerates like Disney, to disruptors like Uber and Airbnb, enterprises are increasingly leveraging data analytics to drive innovation, business growth, and profitability.

However, businesses are not the only ones leveraging data to improve their products and services. Technological advancements and the ever-increasing amount of data are transforming governments as well. Government digital archiving rates and data generation are on the rise. Digital information is expanding and becoming more complex. This is making information management, storage, security, processing, and disposition more complex as well. The public sector becoming increasingly aware of the potential value that can be gained from big data in designing policies and services, and ensuring that citizen needs are met.

What is Big Data?

Simply put, big data are large volumes of data – both structured and unstructured - generated through multiple social, digital, and online sources. However, it is not the amount of data that matters. It is what an organization does with data that is important. Government agencies can leverage big data insights in inventive ways, thanks to technological advancements. They can slice and dice data to derive insights, trends or patterns using advanced technologies such as artificial intelligence, machine learning and blockchain – a process that is often referred to as 'data science'. They can also use 'data analytics' to analyze historical and current data to provide actionable intelligence to predict future outcomes.

In the context of falling government budgets and the pressure to cut public sector costs, it makes sense to target areas of greatest need. Data can enable this targeting, as it reveals where the people and places of greatest need are located. In terms of cost savings, governments can use data analytics to eliminate waste, errors and fraud, improve tax

collection and predict challenges even before they arise, thus making them less costly to tackle. There is significant non-financial benefit as well, because as governments improve efficiency and decrease waste, fraud, and abuse, their esteem among the public grows and faith in government improves.

By implementing a big data platform, governments can access vast amounts of relevant information important to their daily functions. The positive effect it can have is nearly endless. It's so important because it not only allows the government to pinpoint areas that need attention, but it also gives them that information in real time. It allows governments to make faster decisions, and it allows them to monitor those decisions and quickly enact changes if necessary. Furthermore, computing technologies and algorithms enable governments to harness big data to gain valuable insights that they can use to deliver public services better. Here are just a few of the areas that big data can positively affect at the government level.

Big data and analytics can be applied to just about any public-sector program to provide tangible outcomes. Here are some examples:

analyze the datasets that might collectively point to cases of highest future risk.

Emergency response

Emergency response. Analytics have been used to improve emergency response, specially in the case of major natural disasters. More specifically, they help relevant public sector departments identify health issues, coordinate thousands of displaced individuals and prevent water and food scarcity issues. Data can also be leveraged to identify areas of need and for more effective resource allocation.

Anti-money laundering

Anti-money laundering. Analytics are being used by governments around the world to prevent money laundering and financial crimes, directly impacting terrorist organizations or unfriendly foreign governments that use illicit financial activities to fund their operations.

Prevention and prediction

Prevention and prediction: Prediction or early intervention is an area of particular interest for governments. Quite simply, it is better to intervene in problems when they are small; when minimum harm has been caused; and when they are cheaper to resolve. Public sector organizations can do this if bring together and

Insider threats

Insider threats. Using analytics to detect anomalies and irregular behavior, agencies can greatly reduce the amount of data that gets leaked or stolen. This helps prevent fraud and cybercrime that drains money and resources that could otherwise be used for programs to help the citizenry.

Workforce effectiveness

Workforce effectiveness. Government agencies can better understand the workforce gaps that could develop as employees either retire or leave for the private sector. By ensuring that new employees can fill the gaps, and by introducing ways to retain employees, agencies can continue to operate effectively.

Big data and analytics provide tremendous benefits to the public sector. Moreover, analytics improve outcomes that have a direct impact on citizens. Whether it's a fight against a nationwide drug issue, response to a local disaster, protection against the loss of sensitive information or intellectual property, or simply making government more efficient, the analytical insights you can gain from your stores of big data make a significant difference.

Who is This Manual For?

This guide is for public sectors organizations who are interested in using data analytics to make better decisions and improve public services. It is designed to help people better design and deliver public services to overcome barriers to using data effectively. Using data well in public services can help streamline processes, improve access to information for citizens, and enable innovators. This guide is designed to be used collaboratively by all involved in public services, not just people with technical skills.

Chapter One
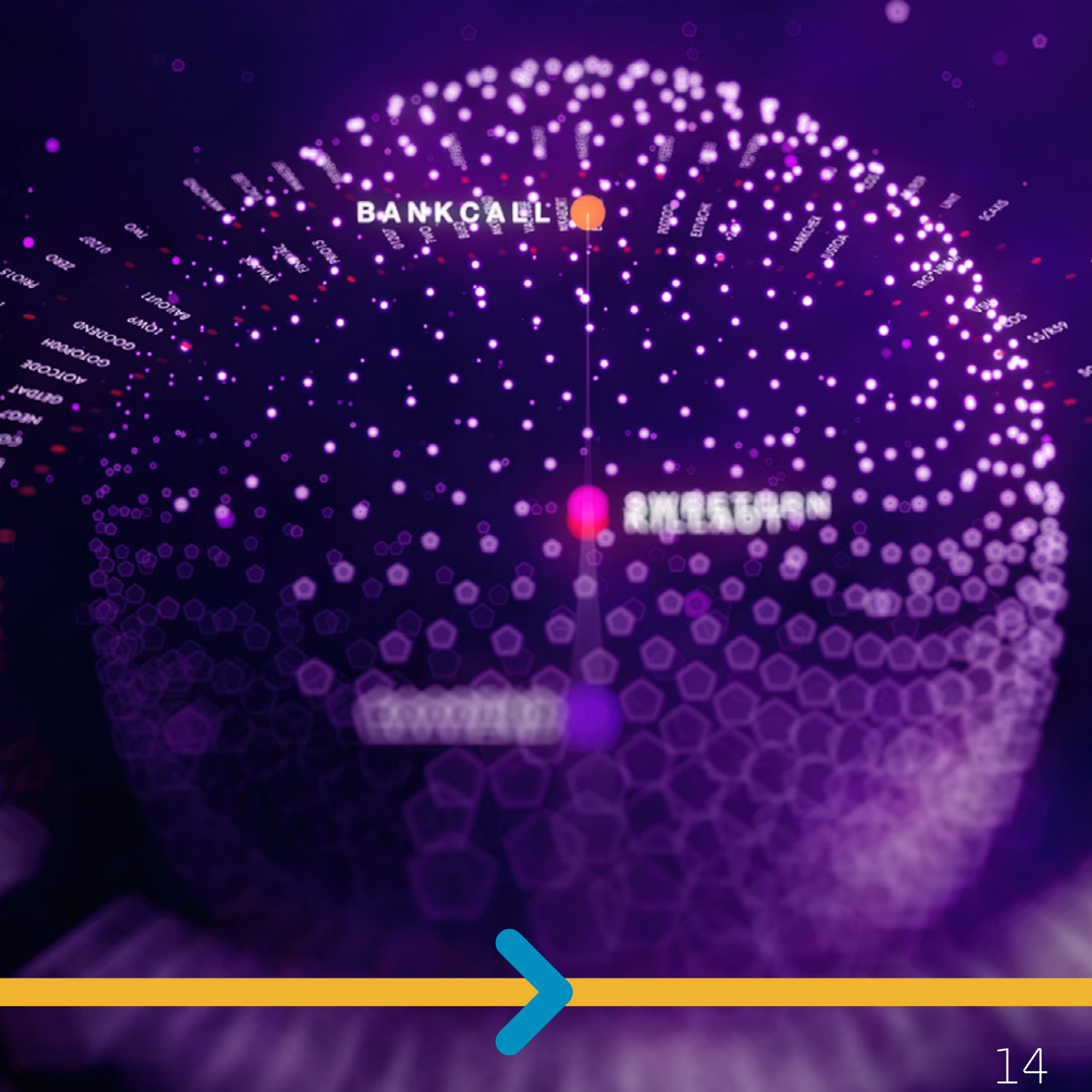
01

What Is Data Analytics?

Is it big data, data analytics, or just analytics?

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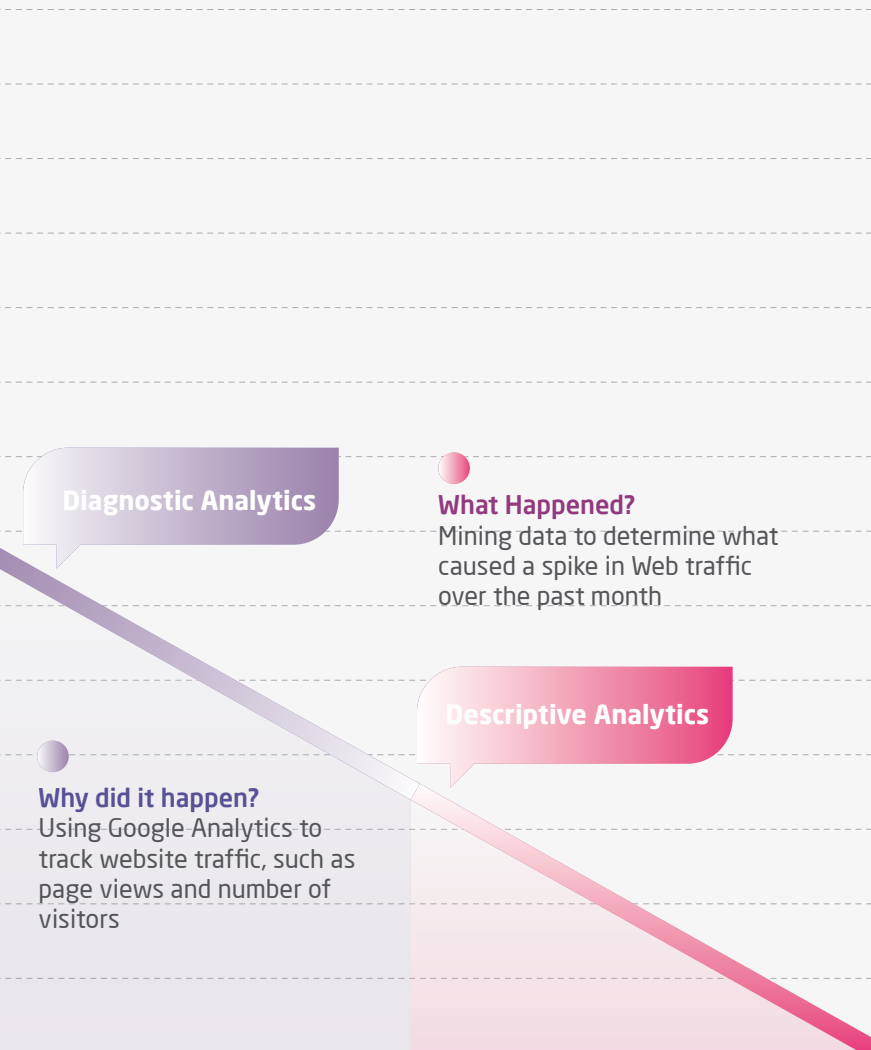
4 Types of Data Analytics

Data is the new oil. We generate data whenever we go online, when we carry our GPS-equipped

1) **What happened?**
2) **Why did it happen?**
3) **What will happen?**
4) **How can we make it happen?**

Prescriptive Analytics

What will happen?
Using algorithms and data to predict where burglaries will most likely occur in a city

How can I make it happen?
Rerouting travel, based on traffic predictions and pedestrians' actions (think self-driving cars)

Predictive Analytics

Difficulty

Take a minute and think about one of your organizations biggest pain points, or perhaps a challenge you face in your everyday work life. Maybe there is a specific project you are working on right now. Think about the type of insights or efficiencies you could gain if you understood what happened, why it happened, what will likely happen, and what to do about it.

Value

Diagnostic Analytics

What Happened?
Mining data to determine what caused a spike in Web traffic over the past month

Descriptive Analytics

Why did it happen?
Using Google Analytics to track website traffic, such as page views and number of visitors

Chapter Two

02

How Data Analytics Can Help Transform Government Organizations

How Data Analytics Can Help Transform Government Organizations

It is a fact of life that for many years the public sector has been asked to do more with less, deliver better and more timely services, provide transparency, give citizens better access to government and improve public services. At the same time commissioners, managers and public sector users within public sector agencies have been relying on the same reports they've been looking at for years, dealing with an IT queue that prioritizes work requests, and trying to match and make sense of multiple spreadsheets many of which are laid out differently. Public sector users know that if they had better access to the mounds of data available to them they could make more informed and better decisions and they could be looking ahead not backwards. We finally have modern user-friendly data analytics tools available to do just that. Let us tell you how.
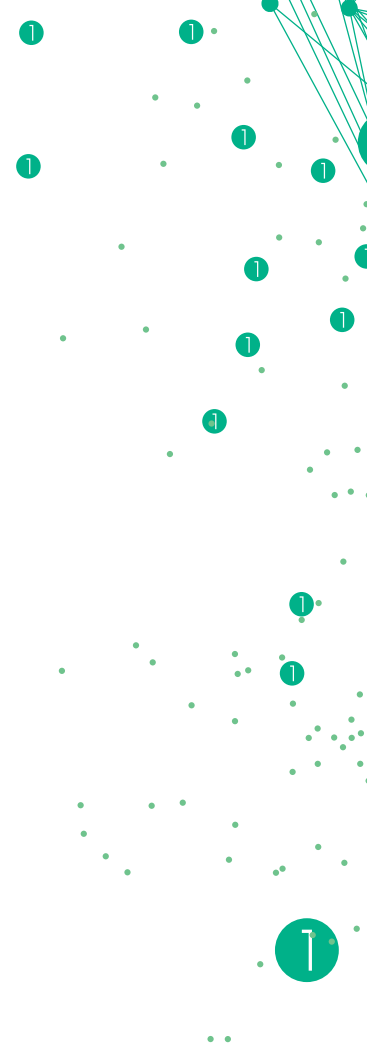
Modern Data Analytics

Data Analytics tools have finally caught up with workplace demands and the public sector has figured out that data analytics can help. Public sector personnel no longer need to review reports and just observe trends; they now have real-time insight into their organizations and can predict what is likely to occur and make decisions based on forward looking information, not on what already happened. Measurements can be put in place to quantify program effectiveness – not after the fact – but as a program or a fiscal year progresses. We can now truly measure the effectiveness of our programs, by getting answers to questions such as:

- Are expenditures in line with the budget or projected to exceed the budget? If there are project over-runs what are they, what are they projected to be and where can those costs be recouped?

- Are we serving as many citizens as promised? Are wait times decreasing?

- Do citizens have access to the information they need? Are those most 'at risk' receiving the services they are entitled to?

- And the list goes on and on…

Modern data analytics tools are built with users in mind. Although IT still has a role to set up the data connections, and data scientists help build the predictive models, public sector users can now ask their own questions and create their own ad-hoc queries. Users can now explore the data without a predetermined list of questions. As an example, a query about the cost of a particular government program per individual served could lead to the discovery of one or more citizens abusing the system by receiving multiple prescriptions for drugs and then having them filled by 'preferred pharmacies' and selling them on the street for profit. In this example, the query was cost per patient served – but when that question was answered and it was clear that one program was way out of line with the others. Further discovery led to why it was so skewed. But that was not where the questioning had started. This one example illustrates how access to data and the ability to interrogate that data is very powerful. This simple line of questioning highlights abuse, fraud and ultimately program savings.
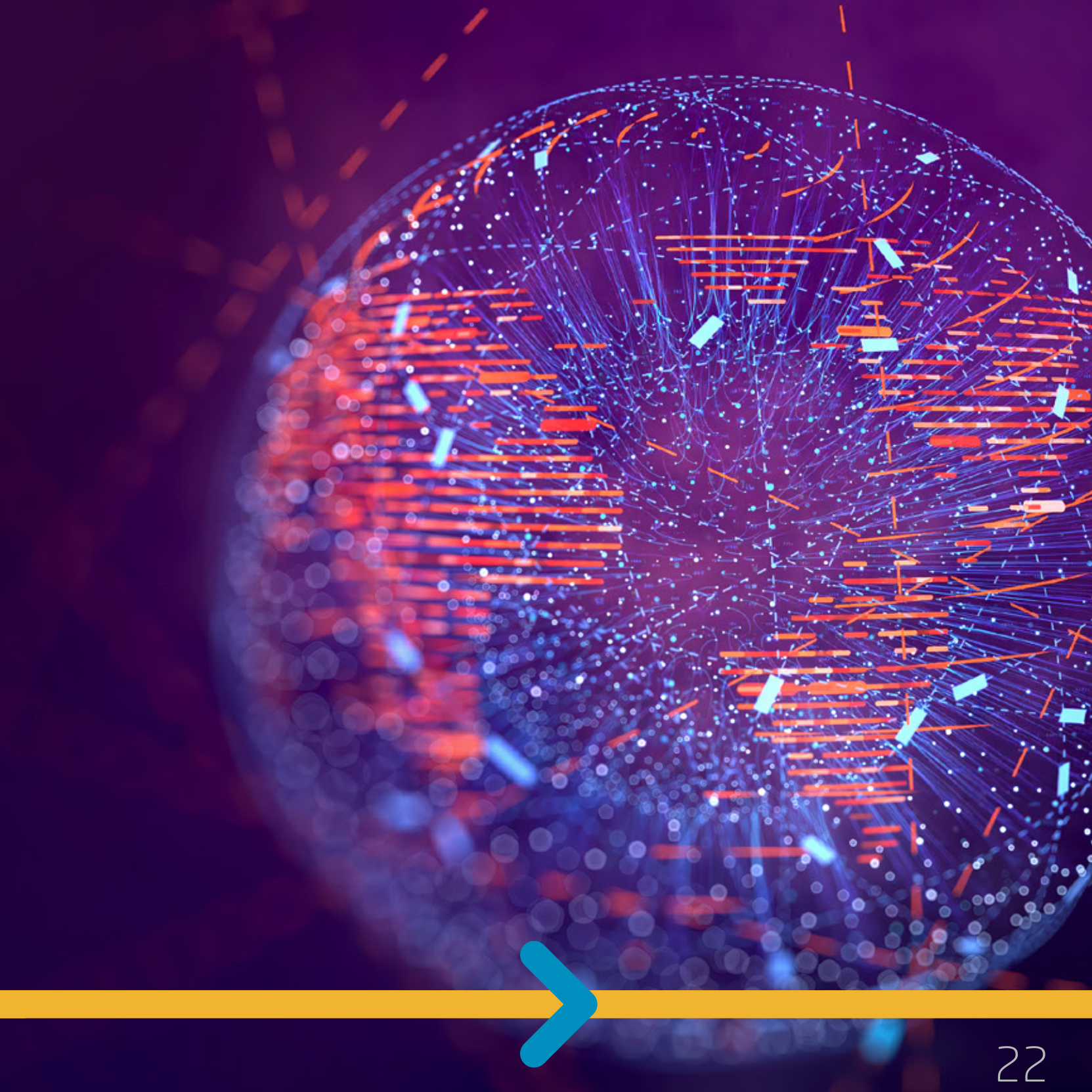
Data Analytics
in Action

Benefits of Data Analytics for Federal and State Governments:

Governments are known for creating and utilizing huge data amounts. Data analytics provide a chance for government agencies to save public funds. In fact, by using data analytics effectively, the federal government can save tens of billions per year. Below are the benefits of data analytics for federal and local governments:

1. Quick and improved decision making

When trends and other insights locked in data are identified, it becomes easier and faster to make organizational decisions. This is achieved by processing the generated real-time data using streaming tools and other technologies. If these tools are not available, decision making has to revert to guesswork or total avoidance of the decision-making process.

2. Enhanced productivity

The availability of the necessary tools for data analytics enables all users to work efficiently with big data sets to find information, make informed decisions, and have better service delivery. Better choices in government translate to enhanced services for the citizens.

3. Improved transparency and cost reduction

Many government tax agencies store personal information, which is replicated in the entire public sector. Citizens are continually required to fill forms to collect data that the government already has. Providing pre-filled forms can help to speed up the processing time and also reducing errors in the collected information.

If data is stored in a central location, it becomes easy for all government agencies to access the information from a shared pool. This also helps in reducing inefficiencies and ensures that only correct data is used.

Governments that avail their big data sets allow for a free flow of information, improve transparency, and build trust with their citizens. The citizens understand the data collected by the government and what the government does with it. This transparency allows citizens to monitor the effect of the government's expenditure and nudges the government to spend wisely. Organizations can offer information as a service through data analytics.

4. Eliminating fraud, removing waste and abuse

One of the core benefits of data analytics in governments has been eradicating fraud. Also, organizations can remove internal waste by identifying discrepancies. Depending on the missions, the agencies can eradicate abuse and fraud within the organization or the people they serve.

5. Reduced crimes and security threats

Data analytics can help state government departments in uncovering crimes and other illegal activities that pose a security threat in society. Data Analytics would also assist local and state governments to work jointly in reducing criminal activities in the community.

Careful analysis of data can aid in spotting abnormal behavioral patterns indicating fraudulent activities. These patterns can be used to come up with profiles and statistical parameters to identify dubious transactions that can then be monitored closely. Applying an information-centric approach built on different data sets helps in improving the effectiveness and efficiency of the criminal justice system.

6. Improve mission outcomes

Data Analytics offers the ability to predict results and model different scenarios for the future. This enables better planning and resource allocation.

8. Identify and reduce inefficiencies

Careful analysis of data helps public sector organizations to understand the mistakes they have done in the past and learn from them. Similarly, it also helps them identify what worked in the past, thus developing best practices for the future.

7. Improved emergency response

Data analytics can be used to respond to hazardous natural disasters, detect health issues, prevent water scarcity problem, and coordinate thousands of displaced people. Prevention is less costly, both in terms of government resources as well as human costs of natural disasters.

9. Workforce effectiveness

Data analytics can help government organizations to understand the workforce gaps created when employees leave or retire for their jobs. Having this information beforehand allows these organizations to plan their recruitment better and ensure that new employees fill the gaps introduced by the retired people.

Other Applications of data analytics in government:

Data's flexibility allows it to be used in different sectors. Through implementing a data platform, government agencies can access large volumes of information which is crucial to its daily functions. Real-time access to this information enables governments to point out areas that need attention, make better and quick decisions, and enact necessary changes. The following are some of the areas where Big Data can be applied in government. However, these are only the tip of the iceberg.

1. Healthcare

Valuable information about public health is found in government records, as well as unconventional sources such as social media, discussion forums, mailing lists, health websites and news outlets. Mobile phone data is also being widely used for monitoring and improving health services. These channels can complement traditional sources to help authorities monitor results and feedback in real-time, and improve performance and outcomes in hospital management operations, insurance processing, vaccinations, nutrition and disease.

Another application in healthcare is day-to-day data about citizens' activity levels. Sensory devices can gather this data and governments can use it to identify at-risk citizens to take preemptive action. Moreover, this data can enable governments to identify the incidence of disease and the types of diseases that the local populace is prone to. For example, some governments in the United States have created a city-level dashboard to monitor activity levels, obesity and the risk of diabetes. This has enabled better preparedness in the healthcare system, and also highlighted focus areas for mass healthcare promotion among the population.

Moreover, many health systems rely on government subsidies and support. Therefore, there is the risk of resource wastage or unfair allocation of government subsidies. Data analytics gives governments the chance to have a clear picture of where the money is allocated and the reasons behind the allocation. This means the government agencies have better control over resources and their effectiveness to the community.

Example:

During West Africa's 2014 Ebola crisis, Swedish nonprofit Flowminder used cellphone data to create models predicting population mobility and potential routes of disease transmission, while experts from around the world created the Ebola Open Data Initiative. This organized access to multiple big data resources and created a tool to analyze them, leading to the development of an open-source global model for Ebola, which allowed health officials to test different scenarios and interventions.

2. Transport

Millions of citizens use public roads every day, whether driving or walking. Many factors contribute to safety on the road, such as the state of the roads, police officers, vehicle safety, and weather conditions. With these factors in play, it is almost impossible to control everything that might lead to an accident. Data analytics allows governments to oversee the transportation sector to ensure safer roads, better and new roads. Local government agencies can analyze the data acquired from traffic flow on different roads. The analytic tools help in aggregating the real-time traffic data transmitted by road sensors, video cameras, and GPS devices. In return, this information allows traffic managers to identify potential threats to road safety. Any identified potential threat to the flow of traffic in urban areas is solved by adjusting public transportation routes in real-time.

2. Agriculture

It is hard to keep track of livestock and the land in a country and also across the globe. It would be a hard task for the government to keep track of the many types of crops grown and livestock kept by its citizens. Data analytics can change the way governments manage and support its farmers and their resources. The ability to gather and analyze large volumes of data makes the management of agriculture simpler.

4. Education

Data analytics help the government to understand educational needs on both federal and local levels better. This ensures the youth have access to the highest quality of education, which would be of great benefit to the country in the future.

Example:

Example: In Kenya, the national government uses a mapping platform to show areas where educational resources are lacking. Tanzania has established the website Shule.info to help assess the quality of schools.

5. Employment Services

Government labor agencies are experimenting with big data to inform the most appropriate policies to help individuals back to work, such as tailoring training services for different segments of job seekers.

6. Public Security

Police forces are drawing on big data and predictive analytics to make better policing decisions. Basic information such as crime type and location can help officers make smarter decisions on patrol.

Example:

Example: PredPol is a predictive policing application used in 50 US cities that analyzes basic data, such as crime type, dates and location, to enable the law enforcement agencies to make better policing decisions. Brazil, the UK and the Netherlands use similar approaches.

Figure: Examples of how data an[...]

Public Sector Segment —— Government Administration ⌄ —— Benefits ⌄ ——

Use Case —— Back Office (Finance, Human Resources, Procurement) ⌄ —— Child Welfare ⌄ ——

Benefits ——

Data analytics helps agencies identify:

- least cost vendor with highest rating,
- sick leave taken by an individual,
- departments that are not in normal range,
- areas where retirement will impact operation,
- types of skills that will be needed,
- query the data to find encumbrances,
- where spending at current rates will exceed budget and why.

Predictive data analytics uses all data available to identify most at-risk children, those least likely to be re-unified and the best services for each child.

alytics can impact positively your mission:

Health & Human Services ⌄

Public Works ⌄

Transportation ⌄

Fraud Detection/ Prevention ⌄

Fleet Management ⌄

Airports - enhance public experience and reduce costs ⌄

Fraud, waste and abuse is something all government agencies keep a watchful eye on. But the use of predictive data analytics can help agencies stay ahead of fraudsters and allow machine learning to identify schemes and the big business behind fraud.

Data analytics can take all of the information about a vehicle, maintenance requirements, warranty dates, known issues from that or similar vehicles and times of least use so vehicle downtime has minimal impact.

Predictive data analytics helps identify terminals not in use to save on maintenance and heating/AC costs, best locations for retail, where long lines are anticipated to assign TSA staff, route expansions to maximize airport revenues

Chapter Three

03

Data
Analytics
Technology

Data Analytics Technology

Data analytics is nothing new. Today, though, the growing volume of data and the advanced analytics technologies available mean you can get much deeper data insights more quickly. The insights that big data and modern technologies make possible are more accurate and more detailed. In addition to using data to inform future decisions, you can also use current data to make immediate decisions.
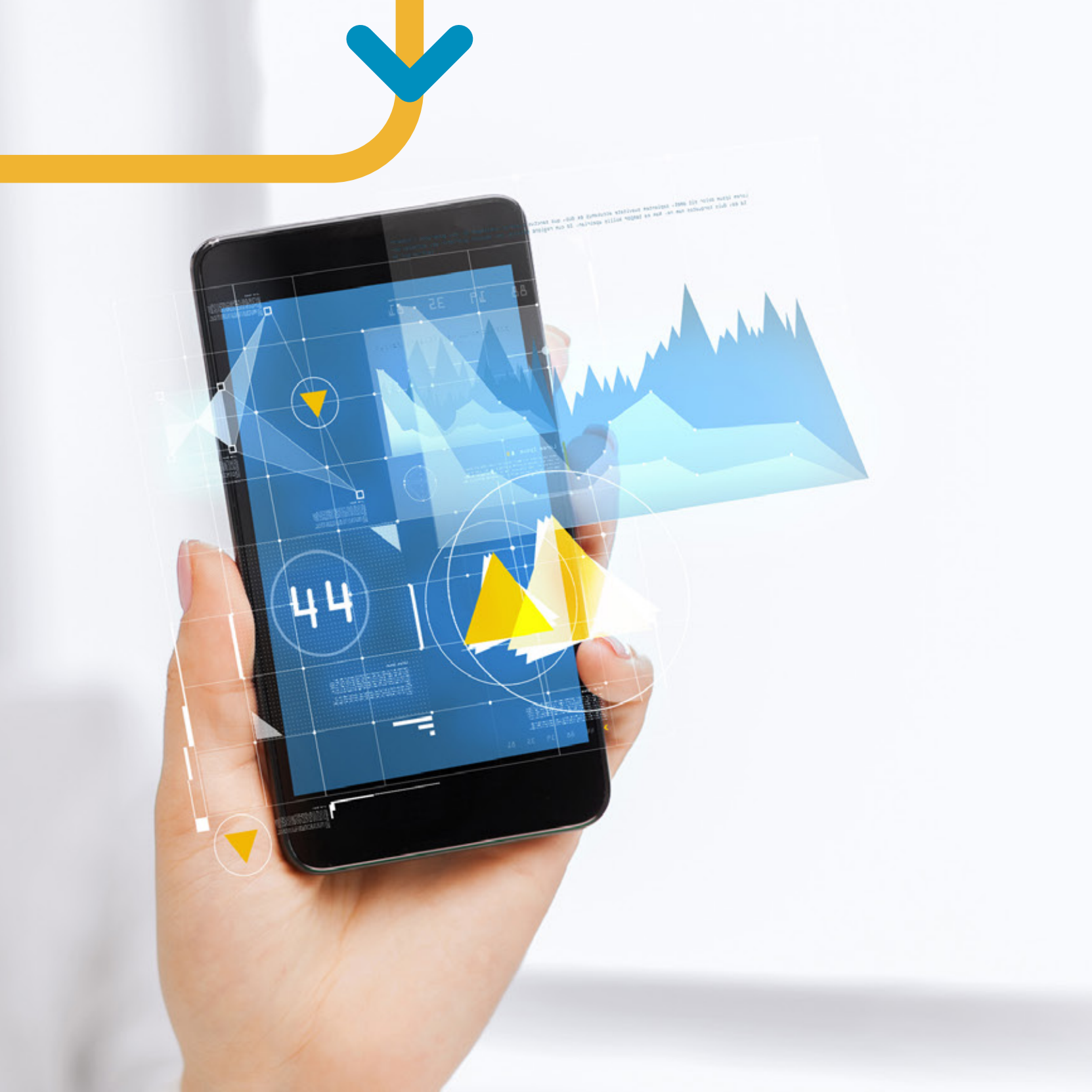
Some of the technologies that make modern data analytics so powerful are:

Machine learning:

Artificial intelligence (AI) is the field of developing and using computer systems that can simulate human intelligence to complete tasks. Machine learning (ML) is a subset of AI that is significant for data analytics and involves algorithms that can learn on their own. ML enables applications to take in data and analyze it to predict outcomes without someone explicitly programming the system to reach that conclusion. You can train a machine learning algorithm on a small sample of data, and the system will continue to learn as it gathers more data, becoming more accurate as time goes on.

Data mining:

The term data mining refers to the process of sorting through large amounts of data to identify patterns and discover relationships between data points. It enables you to sift through large datasets and figure out what's relevant. You can then use this information to conduct analyses and inform your decisions. Today's data mining technologies allow you to complete these tasks exceptionally quickly.

Data management:

Before you can analyze data, you need to have procedures in place for managing the flow of data in and out of your systems and keeping your data organized. You also need to ensure that your data is high-quality and that you collect it in a central data management platform (DMP) where it's available for use when needed. Establishing a data management program can help ensure that your organization is on the same page regarding how to organize and handle data.

Predictive analytics:

Predictive analytics technology helps you analyze historical data to predict future outcomes and the likelihood of various outcomes occurring. These technologies typically use statistical algorithms and machine learning. More accurate predictions mean that organizations can make better decisions moving forward and position themselves to succeed. It allows them to anticipate public needs and concerns, predict future trends and stay ahead of the competition.