

The tax authority of the future

How tax authorities are using analytics to deliver new levels of value



Executive summary

Starting on 1 January 2015, taxpayers in Russia were required to submit value-added tax (VAT) transactional data along with their electronic VAT returns. That year, domestic VAT revenues increased by more than 12%, the equivalent of around US\$4 billion (RUB267 billion). Was an improving economy the cause? Perhaps more likely is the fact that the Russian Federal Tax Service had delivered on its vision for a nationwide VAT analytics platform.

Research from organizations such as the Organisation for Economic Co-operation and Development (OECD) and International Monetary Fund (IMF) estimates that governments worldwide are losing billions of dollars in tax revenue each year through noncompliance, evasion, fraud and non-collection.

The experience of the Russian tax authority provides one example to illustrate the enormous potential of advanced analytics in tax administration. Using various statistical and data-mining technologies to identify anomalies, suspicious relationships and patterns, tax agencies can address a wide spectrum of noncompliance behaviors in a proactive, targeted and cost-effective way.

Many tax authorities have invested in digitalization, data integration and analytics. Several have already improved service, administration and compliance. However, much still needs to be done to leverage analytics as a standard practice across tax-related activities. A number of challenges remain, from technical, organizational and financial issues to legal and cultural concerns.

How are tax authorities seeking to overcome these challenges and realize value through advanced analytics? In our discussions with progressive tax authorities, we have observed a number of steps being taken to transform into an analytics-driven tax authority.

An important starting point is having a clear vision of desired business outcomes and an analytics strategy that aligns with the broader organizational goals. Once the strategy has been defined, the leading tax authorities are selecting the most appropriate operating model for their analytics program. As with any transformation driven by new or emerging technologies, writing the algorithms that can detect risk is

not the greatest challenge. It is far harder to establish – and sustain – an organizational model that allows analytics to not only flourish but also become embedded in a tax authority's day to day operations.

We have identified six key factors adopted by leading tax authorities that underpin a successful analytics operating model by effectively aligning people, processes and technology:

- ▶ Fostering senior, board-level support within the tax authority, and appointing an influential executive to lead the analytics program across the enterprise
- ▶ Creating a talent management strategy that builds the right mix of skills and experience – IT, statistical, analytical and tax domain knowledge – needed to drive informed decision-making
- ▶ Tackling cultural barriers by promoting the use of analytics through formal change management programs, centers of excellence or dedicated teams that spread initiatives across the organization
- ▶ Experimenting with small-scale pilots to develop the proof of concept before rolling out analytics more widely
- ▶ Developing a single view of the taxpayer by creating an integrated information and communications technology (ICT) infrastructure that combines, transforms and consolidates data from a wide range of sources
- ▶ Actively managing data, including quality monitoring and correction processes, to verify that it is fit for purpose and, crucially, relevant to the business questions posed

By focusing holistically on these factors, leading tax authorities are better placed to realize value from their analytics programs. They can reduce losses from criminal attacks, tax evasion and avoidance; make it easier for taxpayers to comply; develop strategies to “nudge” taxpayers toward compliant behaviors; allocate their resources more efficiently; and maximize returns from their debt management activities.

In this paper, we explore, in detail, the essentials of an effective analytics program. We describe the key techniques for data analytics and demonstrate how they are being used to drive value across the tax authority's business.



1. Taxing times: how data analytics can be, and are being, used to support tax authority transformation



Governments are losing significant revenue every year through nonpayment of taxes. According to the OECD,¹ countries are increasingly striving to measure the tax gap: 43% of revenue bodies say they are researching estimates of the aggregate tax gap for some or all of the major taxes (see sidebar, “HMRC: analyzing the tax gap”). The resulting figures demonstrate the sheer scale of fraud, evasion and noncompliance and their impact on the growth of individual countries and on the world economy as a whole.

At the same time, the challenges in detecting and preventing fraud and noncompliance are intensifying. The increase in cross-border and internet-based transactions, the emergence of the sharing economy and disruptive technologies, more mobile populations, and changing employment patterns and lifestyles are just a few of the factors that are contributing to a more complex operating environment for tax authorities. The existence of divergent tax systems and procedures in different countries create an opportunity for tax fraud and noncompliance, especially where there is a lack of cooperation and communication between tax authorities. And with criminals using increasingly complex and sophisticated fraud schemes to circumvent tax rules, the task of promoting compliance is only getting harder.

HMRC: analyzing the tax gap

Her Majesty’s Revenue and Customs (HMRC), the UK’s tax authority, measures the tax gap in the UK to understand where noncompliance occurs. In 2015-16, it estimated the gap at £34 billion, equivalent to 6% of total theoretical tax liabilities. The department also identifies the contributing behaviors, including:

- ▶ Evasion, where individuals or businesses omit, conceal or misrepresent information to reduce their tax liabilities
- ▶ Avoidance, where tax rules are exploited to gain an advantage that the government never intended
- ▶ Participation in the hidden economy, where an entire source of income is not declared
- ▶ Legal interpretation losses, where the customer’s and HMRC’s interpretations of how the law applies to a particular case result in different tax outcomes
- ▶ Criminal attacks, where organized criminals carry out coordinated attacks on the tax system, such as smuggling goods to evade excise duty or fraudulently generating tax repayments

Tax gap by behavior – value and share of tax gap, 2015-16



¹ *Tax Administration 2015: Comparative Information on OECD and Other Advanced and Emerging Economies*, OECD, August 2015.

Leveraging analytics to address tax authorities' most pressing challenges

At a time of heightened expectations for more transparent and accountable government, tax authorities are under political and public pressure to act. The media, non-governmental organizations, charities, special interest groups, trade unions, national audit offices and parliamentary committees are vocal about the need to crack down on tax fraud, evasion and overly aggressive avoidance to increase revenues and create a fairer tax system.

So what more can governments do? One answer lies in the ability to exploit the mountains of structured and unstructured data to which tax authorities have access. Using various analytical techniques to identify anomalies, suspicious relationships and patterns, tax agencies can address a wide spectrum of noncompliance in a proactive, targeted and cost-effective way.

Big data and analytics defined

Data comes in many forms. It may be structured or unstructured, and it may be generated by organizations themselves or obtained from third parties. Big data refers to the huge and increasing volume of the data now available, as well as the variety of it and the velocity at which it can be processed. Analytics is the means for extracting value from this data – the tool through which actionable insights are generated. Without analytics, businesses have no way of using their big data to establish competitive advantage.

What has made this possible? Cheaper storage and advanced computing power are readily available, enabling the processing of large volumes of data in a digital format, regardless of size and complexity. The emergence of powerful and cost-effective analytical tools has also removed cost barriers and helped organizations unlock value from their data.

As Figure 1 shows, analytics can help identify many of the determinants of the tax gap.

Figure 1: Components of the tax gap that analytics can help identify



Source: EY

Tax authorities can recognize major compliance risks, such as intentional attacks on the tax system by organized criminal gangs; undeclared economic activity within the shadow economy; and deliberate tax evasion. They can also spot aggressive tax avoidance, where companies or individuals exploit the rules to gain an advantage that the government never intended – operating within the letter, but not the spirit, of the law.

Analytic models can help assess risks both before and after filing and identify taxpayers that are most likely to be noncompliant. Authorities can then target interventions at those believed to present the greatest risk, including “nudge” approaches that encourage voluntary compliance. The use of analytics can also make it easier for taxpayers to comply, as tax authorities implement service-oriented reforms that make filing easier, eliminate overlapping requests for information and deliver better-targeted services based on a deeper understanding of taxpayers’ needs and behaviors.

Governments' overall spending has been under pressure since the financial crisis and many tax authorities have seen reductions in their operating budgets and headcount at a time when they need to increase tax receipts. Through the use of analytics, tax authorities can allocate their resources more effectively in pursuing those who are noncompliant, and predicting where violations are likely to happen in the future. Some are using it in their debt management activities by modeling the likelihood that a taxpayer will repay the tax owed and identifying interventions that will yield the maximum return.

The capability to use big data and analytics for business advantage has existed for some time. Yet, like a number of private sector players, many tax authorities still struggle to fully capitalize on the opportunities. In the next section, we describe how the leading tax authorities put the right foundation in place and build toward becoming an analytics-driven tax authority.

“A risk-oriented approach means that audits are fewer in number and better targeted, which ultimately leads to a reduction of the administrative burden on those businesses that comply with the law.”

Mikhail Mishustin,
Commissioner of the Russian Federal Tax Service





2. Developing a strategic approach

Like any transformational process, becoming an analytics-driven tax authority is not always quick or easy. Many authorities are grappling with the technical issues of integrating multiple datasets to create a single view of the customer. They must be able to verify that data is accurate, consistent and relevant to their business needs. Another challenge is that the diverse mix of skills needed to leverage analytics is often in short supply. And embedding analytics in entrenched day-to-day processes of tax administration requires a shift in mindset across the organization, which can be difficult to manage.

In this section, we outline the key ingredients for success and draw on the experience of different tax authorities in putting these into practice.

Creating a successful analytics program

In creating an analytics program, leading tax authorities develop a clear vision of their desired business outcomes – reflecting both their statutory responsibilities and their stakeholders' and citizens' expectations of service delivery – and a strategy to translate the vision into reality. Once this has been defined, they select the most appropriate operating model to support their analytics activities.

Developing an analytics strategy that aligns with business objectives

In leading organizations, the analytics strategy is central to the overall business strategy, with a well-defined role in meeting strategic objectives.

The Australian Taxation Office (ATO), for example, initiated the Smarter Data Program as one of six strategies for meeting its overall goals. These include providing more tailored services by engaging with people based on the risk it believes their behavior and affairs present. Similarly, the Irish revenue authority created a Statement of Strategy framed around two key priorities: to make it easier and less costly to voluntarily comply, and to identify and confront noncompliance. Data analytics and risk assessment are one of five key drivers that position the authority to deliver on its commitments. The focus is on maximizing the use of data and deploying analytics to identify the incidence, scale and significance of noncompliance and to target resources effectively to overcome those risks.

Designing the operating model

To realize their strategy, leading tax authorities choose the most appropriate analytics operating model. Some have adopted a centralized model, with a central analytics function (or center of excellence) supporting the rest of the business. The Irish revenue authority, for example, created the Revenue Analytics Group, led by the chairman, to oversee its analytics program (see "Case study: the Office of the Revenue Commissioners, Ireland").²

A centralized model encourages collaboration within the analytics team and provides better supervision of analytics activities and close quality control. It may be more appropriate for tax authorities in the early stages of their analytics journey, when they are building capabilities. However, there is a risk of creating organizational silos between the analytics team and the business units that use the analytics insight.

A number of tax authorities are adopting a decentralized approach, with analytics teams integrated into, or co-located with, specific business units. In the ATO, the analytics, risk assessment, intelligence and data workforces had traditionally been distributed across the organization within various business units, each directing their own resources. The result was suboptimal coordination and knowledge sharing, leading to duplication, fragmentation or missed opportunities. The Smarter Data Program was created as a whole-of-ATO approach to risk assessment, intelligence, analytics, data management and technology. In the new corporatized model, people and resources are managed centrally but deployed across business units. That way, Smarter Data capabilities can be developed in alignment with corporate priorities and within the business context of the ATO's business units.³

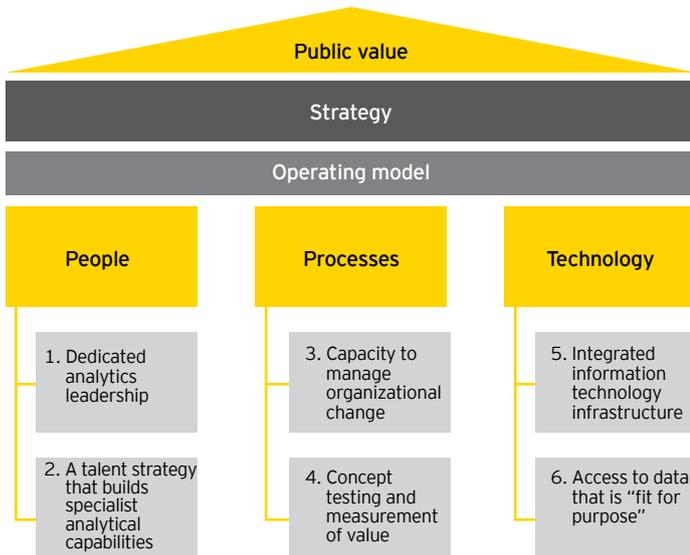
Many organizations will seek to capitalize on the advantages of each approach: a central team that plays a leadership, coordination and enablement role on analytics, coupled with close integration of analytics professionals into the business units.

Whatever the choice, leading tax authorities have some or all of six key ingredients of a successful analytics operating model (Figure 2), based on the alignment of people, processes and technology.

² *Revenue Corporate Governance, Irish Tax and Customs, April 2016.*

³ *Smarter Data Program: Reinventing data and analytics – the ATO Experience, Australian Taxation Office, May 2015.*

Figure 2: Realizing value – components of a successful analytics program



Source: EY

1. Dedicated analytics leadership

Analytics is a multi-faceted endeavor that takes time, technology, data integration and experimentation to deliver results. As such, it requires strong support and commitment from senior leaders with a clear understanding of how it can help meet organizational objectives.

The most effective analytic programs are governed by steering committees made up of senior stakeholders from across the organization – including strategy and planning, operations, IT and finance. C-level executives are ideally positioned to sponsor big data and analytics programs, help them address critical business problems and to steer the transformation.

Beyond top-level support, it is important to appoint an influential executive to lead the analytics program across the enterprise. This leader provides the bridge between the business functions and the analytics and technology teams, aligning them to work toward the common purpose of delivering value to the business. The role requires intimate knowledge of the workings of the tax authority, an ability to build networks and relationships across the business, a willingness to challenge existing behaviors and mindsets, and a desire to innovate.

Some authorities are creating a dedicated executive role – a chief analytics or chief data officer – to oversee their data and analytics activities. In 2015, the Irish Revenue Commissioners announced the appointment of a chief analytics officer to direct the development of its expanding analytics team. Similarly, in its most recent Business Intelligence Strategy, the Canada Revenue Agency announced that a data program, led by a chief data officer, would be established to provide a coordinated, business-led approach to the acquisition, governance and use of data.⁴

Wider government backing and investment are also essential. In many countries, this support is based on the imperative to maximize tax revenues while reducing operating costs. When the new UK Government came to power in 2010, it dramatically cut departmental spending and reduced HMRC staff by 20%. However, it reinvested much of the savings into the department to help transform the digital infrastructure and strengthen its analytics capabilities.

2. A talent strategy that builds specialist analytic capabilities

To get the most out of their analytics and big data investments, leading organizations carefully consider the mix of skills and experience needed to drive informed decision-making. This requires knowledge in three main areas:

- ▶ *Information technology skills* to develop the systems for collating and interrogating the data
- ▶ *Statistical and analytical skills* to develop the algorithms and models
- ▶ *Domain experience* from the business to ask the right questions, interpret the results and make more informed business decisions

Amid a global shortage of analytical skills, the public sector needs to compete with the private sector for the best talent. While some tax authorities may bring in specialist knowledge from external contractors, or even contract out their analytics function, many are developing in-house talent management programs.

⁴ Canada Revenue Agency Business Intelligence Strategy, October 1, 2014 to March 31, 2017: A strategy for data-centric innovation.

In October of 2015, the Dutch tax authority simultaneously announced 5,000 redundancies along with 1,500 new job postings for data scientists. The Canada Revenue Agency has developed a business intelligence talent management program and is launching a recruitment campaign for specialist resources. It is also formalizing long-term relationships with academics in relevant fields who can bring “expertise and innovation to the agency.”⁵ The growing number of established degree programs in advanced analytics offers another alternative for recruiting skilled, if not experienced, analytics workers.

But one issue may be more subtle: data scientists of the type and caliber required may be a totally new breed of talent within an organization. Culturally, organizations unaccustomed to this unique skill set must strive to help these workers feel a sense of belonging and worth, with a defined career path.

To address business-critical problems, analytics teams must understand the language of the business, as well as the technical subject matter. Some organizations are addressing this challenge by rotating staff to work across business silos to broaden their experience. Others are creating analytic SWAT teams that work closely with the business units to embed analytical knowledge across the organization, while helping analytics talent acquire domain knowledge.

Analytics teams must also work closely with the IT function. Increasingly, analytics teams use Agile methodologies, working to a shorter software development cycle where new or revised analytics products are deployed at regular intervals. IT functions must adapt to these schedules.

“If you think about the old world of big production systems, you would have them for 10-15 years. In the world of data and analytics, you’re talking a 2-3 year life cycle. That’s where the agility comes in – you have to have commercial arrangements that you can continually scale and move forward.”⁶

Greg Williams,
Deputy Commissioner, Australian Taxation Office

3. Capacity to manage organizational change

A successful data and analytics program doesn’t depend on technology alone. It requires frontline operational teams to buy in and embrace analytics-driven decision-making. In practice, though, cultural factors often present a major barrier to enterprise-wide adoption. There may be initial skepticism or a lack of understanding about how new analytic techniques can improve compliance, as well as a resistance to any required changes to working practices. Analytics may also be perceived as a threat by operational staffers who are used to making decisions based on experience or intuition.

Progressive tax authorities are addressing these cultural barriers through proactive measures to promote the use of analytics. These include formal change management programs and the formation of teams or centers of excellence to spread these initiatives across the organization. In the Netherlands, the data and analytics unit has created a dedicated change management team staffed by psychologists and organizational behavior analysts. The team works with frontline staff to embed new practices, based on analytical insights and recommendations, across the business.

“Cultural challenges are the real challenge. We’ve tried to embed the analysts with people who have actual operational experience and who know the processes around tax, to have people work in partnership together. One of the hardest things is getting the non-analysts, the operations people, buying into and following up on the product of whatever the project is ... Ultimately you have to have a good case and show good results.”

Niall Cody, Chairman, Irish Revenue Commissioners

Formal training programs also help remove the fear factor from the switch from judgment-based to analytics-based decision-making. Other training sessions develop the capabilities of business users who have to implement change based on analytic insights. In Ireland, the tax authority will roll out an “Introduction to Analytics” course across the business to improve understanding of analytics and its potential.

⁵ Canada Revenue Agency Business Intelligence Strategy, October 1, 2014 to March 31, 2017: A strategy for data-centric innovation.

⁶ “ATO could open door for smaller resellers,” CRN magazine, June 2015.

Case study: Estonian Tax and Customs Board

In 2014, Marek Helm, then chief of the Estonian Tax and Customs Board, announced that VAT collection was up 21% from 2013 and that the sum for all of 2013 had already been surpassed by September 2014. While general economic growth played a part in the increase, the Estonian results are likely due to a combination of two distinct factors: high-quality taxpayer data and world-class analytics.

Executing an analytics strategy was not a straightforward task. As tax authority representatives put it: “Arguably, our main challenge was – and continues to be – to find competent workforce for such a large-scale project.”

Work is now focused on delivering the e-ETCB2020 (e-Estonian Tax and Customs Board 2020), a successor to the current tax administration platform that represents the practical output of the tax board’s strategy for 2017–20. To achieve its vision, the tax board is employing an innovative operating model. Within the authority, data scientists and technologists are distributed among departments. At the same time, the Information Technology Centre of the Ministry of Finance (ITCMF) acts as a center of excellence, providing supplemental assistance.

“We do not have a dedicated development department. We have development analysts and development specialists working in every department of our organization,” the representatives say. “This way, we can ensure that the development needs and ideas come from people who actually work in certain fields and use, or coordinate the use of, tax and customs applications.”

“These analysts and specialists lead the process of development, from analyzing and writing the business case to testing and ‘productization.’ A huge part of IT development work is done for us daily in ITCMF. We have a strong cooperation model with the ITCMF, as they also provide us IT support.

“Working with the private sector on such a large-scale, complex and sensitive project as advisors and vendors has helped, and will help in the future, with planning the project and executing it. We have involved trusted partners to advise on our plans. A big part of realization of the project is done by private companies.”

The relentless quest for client service carries over into future analytics and artificial intelligence work. “We are carrying out a pilot project for creating analysis models to monitor and predict the economy and assess the impact of policies by using large business data generated by enterprises and modern modeling techniques.”

“Regarding the e-ETCB2020 project, our research has shown that taxpayers are interested in information that gives them an overview of tax indicators in certain counties or branches of the economy. We want to give taxpayers the chance to generate reports in the desired form to compare their data with other taxpayers’ and to give them the possibility to share data with other parties. The chance to share data instantly will enhance the transparency of the economic environment, increase tax compliance and give entrepreneurs input to make financial decisions. A part of tax data shall be available in a form not related to specific enterprises – we are going to reflect tax data.”

4. Concept testing and measurement of value

Launching analytics on a relatively small scale by piloting it in one business area, tax regime or geographical location can help provide proof of concept. Keeping to a narrow, tactical scope helps secure buy-in from senior stakeholders, as pilots represent a lower initial investment. Once the pilot is complete, the results provide a more realistic picture of the program’s potential by giving robust estimates of return on investment (ROI) and the benefits of rolling out analytics in the wider organization. They also generate an evidence-based view of what must change with people (training, team composition and structure), processes and technology (the tools, infrastructure and data required). Moreover, identifying issues during the pilot, and investing in solutions before the rollout, may reduce the risk of failure.

Many tax authorities are running pilot projects to test new ideas and gather feedback that can be incorporated into program changes. As part of the Smarter Data Program, the ATO has established a sandpit known as the RAD (Research and Development) Lab that enables agile testing of new concept technology, architecture, data, and analytical methods and processes to establish proof of concept before they are deployed at scale in the ATO’s production environment. The RAD Lab’s methods promote time-boxed resource expenditure and follow a “fail/succeed fast” approach to identify which concepts should progress to production. Its showcases have helped build analytic credibility with ATO executives.

“The pilot program on Pay as You Earn was essential as the return on investment was fairly significant and that proved the concept ... In the context of the overall budget, we started small, proved the concept and then expanded. But the key is in getting buy-in at the senior level.”

Niall Cody, Chairman, Irish Revenue Commissioners

Leading tax authorities also continuously monitor and evaluate the impact of their analytics programs on meeting business objectives, such as increased compliance. Business leaders should set realistic timelines for adopting analytics and develop tangible key performance measures to demonstrate both short- and long-term results. Regularly gathering performance data provides insights that can influence further planning and decision-making, helping organizations determine whether they are moving in the right direction or need to change course. To build momentum for change, the organization should widely communicate the successful results of early analytics efforts.

Case study: the Office of the Revenue Commissioners, Ireland

Ireland's Office of the Revenue Commissioners started an analytics program in 2010 with a relatively small budget and a couple of new recruits with strong statistical backgrounds. A pilot project, focused on payroll tax, helped prove the concept by delivering a fairly significant return on investment. It created a belief in the usefulness of advanced analytics and commitment at a senior management level. The program quickly expanded to include other taxes, such as VAT. This early success was helped in part by an already highly integrated ICT system that had enabled a single customer view since the 1990s.

Prior to 2015, governance of analytics activities was organized on a project-by-project basis. As the core analytics team grew, the lack of a centralized, permanent governance structure made it difficult to build organizational momentum behind analytics. In 2015, the agency announced the appointment of a chief analytics officer to direct development of its expanding team, and it set up the Commissioner-led Revenue Analytics Group, bringing together business, IT and analytics leaders to prioritize and oversee all analytics work. As Chairman Niall Cody put it: “What it's trying to do is show there's a commitment, there's a budget set aside and there is operational resource assigned to this.”

This group defines the revenue authority's overall data strategy, verifies that analytics is embedded in all major decision-making processes, and provides the strategic focus for key operational and business data analytics developments. This new governance structure, combined with ring-fenced funding for analytics, sends a strong signal about the strategic importance of analytics and about the need for support to continually upgrade models for use at the front line.

Cultural integration was another challenge. Initial projects proved the concept to senior management but did not necessarily create full buy-in across the organization or a sense of ownership in non-pilot areas. While business intelligence and rules-based approaches had been in use for years, members of the operational staff have traditionally relied on gut instinct when making decisions. They needed to see the benefits for themselves and then adopt a more evidence-based approach to decisions. The agency encouraged analysts to work in partnership with operational teams to embed analytic outputs into everyday practices. Analytics was strongly painted as a useful tool to achieve operational goals rather than an intellectual exercise or a threat to traditional roles.

The agency has been a magnet for analytics talent, from experienced data scientists to university interns, because it is seen as an interesting place to work. Tax provides an intellectual challenge for analytics professionals because few organizations offer a chance to work with such a raft of data.

5. Integrated information technology infrastructure

An integrated ICT infrastructure is a fundamental building block of analytics. Many tax authorities are wrestling with the technical issues of integrating massive volumes of data. They are hampered by outdated and disparate legacy IT systems developed over the years to deal with individual taxes or programs. And they lack a single view of the taxpayer, hindering their ability to detect cross-program fraud or understand the risk exposure for a particular entity. Moreover, many organizations struggle to build cross-organizational ownership and sponsorship of data projects and investments. Business units often focus on their own projects and data, making it challenging to build common tools and platforms.

Progressive tax administrations are investing in enterprise-wide technology architectures. In Russia, the Federal Tax Service has developed a unified information system that consolidates data from different sources for use by all tax authorities in the country. In recent years, it has undertaken a project to modernize the architecture of its automated information system (AIS), the NALOG-3. Today, every piece of data used in tax administration is stored and processed in a centralized database known as the Data Processing Centre (DPC). A significant driver of this investment has been the rapid growth in the volume of data at the tax authority's disposal.⁷

“Leveraging technology isn’t an add-on, it sits right at the heart of our strategy. ... With the NALOG-3 AIS, all information will be wholly concentrated within big data centers.”

Mikhail Mishustin,
Commissioner of the Russian Federal Tax Service

Emerging technologies such as robotic process automation can help bring together disparate data sources, while artificial intelligence will enhance tax authorities' data mining and machine-learning capabilities. But like any major strategic initiative, pursuing consistency and reducing redundancy at the outset results in a more optimal outcome.

6. Access to data that is “fit for purpose”

To tackle specific business problems, leading tax authorities take great steps to verify that the data they use is fit for purpose. The accuracy of analytic insight depends on the quality, richness and – crucially – relevance of available data.

Tax authorities must first identify what data is needed to address key business questions, what is already available, where any key gaps lie, and where and how any missing data might be sourced. Linking customer records in various computer systems can help establish a single view of a taxpayer, but the main constraint is often the quality of the data used to link the records. Organizations should assess data quality and apply appropriate cleansing techniques based on the issues encountered (for example, the duplication of records).

Forward-thinking tax authorities are continuously seeking out new data that can shed light on taxpayers' behaviors. The German Federal Central Tax Office is believed to source data from more than 100 governmental agencies. Both Canada and the Netherlands supplement taxpayer-derived data with business intelligence sources from taxpayers' use of social media and electronic platforms.

As authorities collect data from an expanding range of sources, they must actively manage the information so it is fit for the purpose of performing analytics. That means defining the level of quality and establishing a data governance framework based on this standard, encompassing activities such as data stewardship, data quality and data cleansing. Because the material is confidential, tax authorities must consider any information security risks posed by big data when defining their data governance strategy.

⁷ EY's Tax Insights for business leaders, No. 14, 2015.



3. Springing into action: driving value through analytics

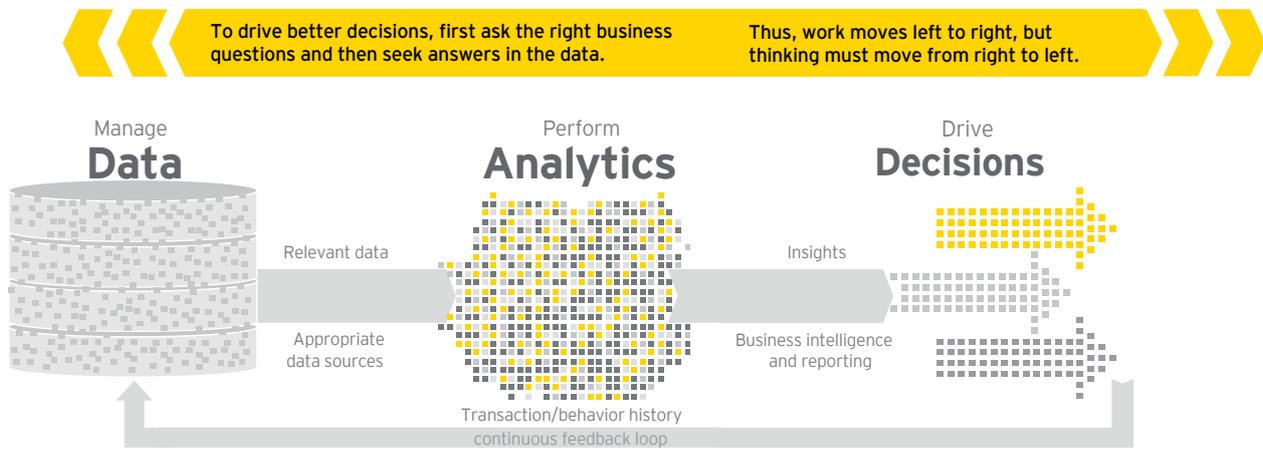
With a strategic vision and supportive organizational model in place, leading tax authorities start to reap the benefits from data-driven decision-making.

The key to implementing analytics in tax authorities is consistent with the three stages of the EY Analytics Value Chain used across all types of business:

- ▶ **Manage data** – developing the tools and techniques to manage, extract and integrate relevant data from various sources

- ▶ **Perform analytics** – deploying analytical techniques, ranging from historical reporting to real-time decision support for the organization
- ▶ **Drive decisions** – using the insights generated by the analysis to inform evidence-based decision-making; and to assess the impacts of actions and interventions, thereby creating a continuous feedback loop for performance improvement

Figure 3: The EY Analytics Value Chain



Source: EY

Manage data

To combat evasion and noncompliance, and to make it easier for taxpayers to comply, leading tax authorities develop a detailed understanding of taxpayer behavior. They can develop a fuller picture by linking customer data held internally and enriching it with information from external sources, such as media reports and financial transactions.

Integrate existing data to create a single view of a taxpayer's activities

Tax authorities administer tax regimes that have evolved over decades, even centuries, and their organizational structures, processes and technology have evolved in parallel, creating silos across the business. To effectively leverage analytics, leading

authorities link data on customers' interactions with each tax regime to produce a single view of the taxpayer, based on one unique identifier for each.

Once the data has been cleansed and linked, it can be stored in various ways. In the last few decades, data warehouses (which incorporate structured data such as tax databases) have been built specifically for this purpose. In the last few years, large organizations have adopted data lakes, which can hold many types of both structured and unstructured data. At the same time, powerful frameworks such as Apache Hadoop can distribute the storage and processing of data across clusters of computers, enabling tax authorities to exploit big data. The ATO, for instance, as part of its Smarter Data Project, has tested a Hadoop-based Enterprise Data Hub consisting of five virtualized servers.

Enrich the single customer view with information from a broad variety of sources

The data available to tax authorities are expanding rapidly as they gain access to more comprehensive and granular information from third parties to develop a more complete picture of taxpayers' profiles. Some governments are legislating to extend their powers to obtain information from an ever wider range of sources. The UK Government, for example, extended HMRC's data-gathering powers to include business intermediaries and electronic payment providers – similar to what is seen in Australia.

Companies are increasingly being asked to submit client invoices (typically in electronic form), statements of account, customs declarations, vendor invoices and bank records. Tax authorities are also asking companies to provide files directly from corporate accounting systems that align with a predefined standard for electronic exchange (the OECD's Standard Audit File for Tax, or SAFT, is gaining traction in Europe).

Recent international developments have made it easier for tax authorities to share information, carry out joint risk assessments and compare taxpayers' declarations. The OECD initiatives on the common reporting standard (CRS) and on base erosion and profit shifting (BEPS) demonstrate this more cooperative approach to data exchange. All these disparate sources have a place in a tax authority's business intelligence strategy.

“We have been looking more closely at the value of information exchanges – and, as a consequence, understanding the overall value of the treaty network. For the last financial year, we calculated that just under half a billion dollars was directly linked to exchanges with other jurisdictions.”

David Allen, Assistant Commissioner,
Internal Engagement and Transparency,
Australian Taxation Office

An enhanced capability to manage unstructured data creates further opportunities to enrich the customer view by making better use of relevant data, such as intelligence reports; communications data from surveillance operations; and “open source” data from news media, social network feeds and third-party electronic sales platforms.

Perform analytics

While the data and technology platforms are crucial, what drives business value is the ability to frame the right questions and focus the analysis on answering them. Leading tax authorities first determine what they are trying to achieve. Then they must consider which analytic techniques can help answer their questions given the data available.

“There's a ‘sophistication spectrum’ for data analytics: ‘reporting’ – what happened; ‘understanding’ – why it happened; ‘identifying’ – given a known risk, identifying who this might apply to; and ‘predicting’ – using analytics to find new and emerging risks.”

Robert Ravello, Deputy Commissioner, Service
Delivery, Australian Taxation Office

The variety of analytics techniques available enables tax authorities to identify historical and recently noncompliant customers for investigation and follow-up, and to flag customers at higher risk of future noncompliance.

Identifying historical and recent noncompliance for investigation and scrutiny

With tax authorities' resources under pressure, leading tax authorities are looking to more effective methods to target noncompliant or fraudulent activity, and to make it easier for taxpayers to comply.

Linking records to create a single customer view enables tax authorities to cross-reference information supplied on tax returns with data from other sources (such as employers, financial institutions and other government agencies). They can detect errors, discrepancies in stated income and potential fraud.

Business rules are used mainly to identify known fraud and compliance risks. If a tax authority is encountering certain repetitive problems, it can create a business rule that will trigger an alert on matching fact patterns and highlight whether any action is needed.

Anomaly detection techniques highlight relationships, behaviors and events that deviate from the standard – a way to identify potential new fraud and compliance risks. Techniques such as statistical outlier detection and cluster analysis uncover anomalies in customer behavior and circumstances. Anomaly detection can also examine changes over time to pinpoint a deviation from a historical pattern, possibly indicating fraud. The “nearest neighbor” approach is commonly used to compare a taxpayer’s return with those of peers – for instance, in a particular sector – to identify outliers or unusual cases for further investigation.

Social network analysis, or “link analysis,” uncovers hidden or unexpected relationships that indicate collusion across suspect groups or organized fraud rings. It is based on linking “entities” in the data (for instance, individuals, businesses, mobile phone numbers and bank accounts) using transactional information – such as utility bills, newspaper reports and phone records collected during criminal investigations – to identify potential criminality across networks of individuals and businesses. Tax authorities can profile individual risk or create a risk-scoring model for the network through rules-based assessments or statistical modeling. The technique is very effective at identifying VAT carousel fraud, for example.

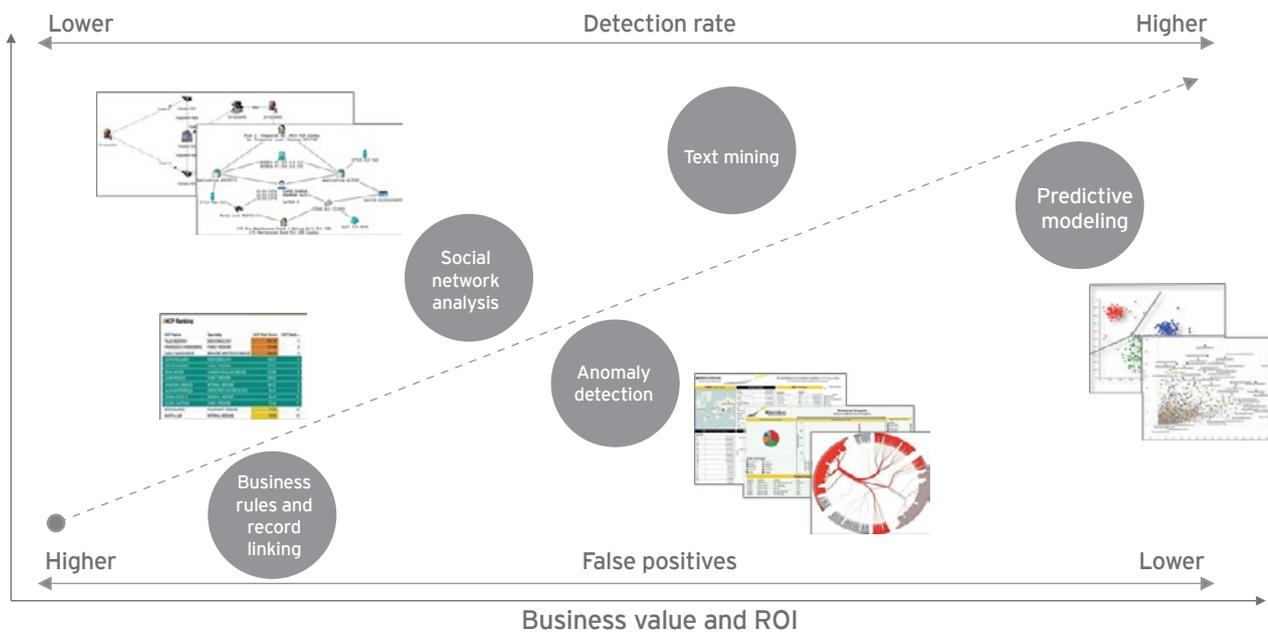
Identifying taxpayers at higher risk of future noncompliance

Predictive analytics capable of identifying high-risk customers can give a high return on investment because the tax authority can formulate the right strategy and take action before the event has happened, preventing losses and improving revenue recovery.

Predictive modeling uses historical information to build models that identify behaviors, attributes or patterns that correlate with known or emerging patterns of noncompliance. The models are used to create risk scores for existing taxpayers, as well as for new taxpayers and dealers. Techniques can be divided into either statistical models, such as regression, or machine-learning algorithms, such as decision trees and neural networks.

Text mining can help tax authorities scan and identify phrases, patterns and entities in different sources of unstructured data – newspapers, videos, social media posts, etc. – using techniques such as natural language processing and sentiment analysis. It can improve predictive models by updating risk scores and determining the probability of future noncompliance through the use of more dynamic information.

Figure 4: Spectrum of analytical techniques and associated value



Source: EY

Using data insights to drive decision-making

While the different analytic techniques can provide insights on key business questions, the real value lies in using those insights to drive decisions. Analytics can improve decision-making and generate benefits on a number of levels: the individual tax caseworker, the business unit, the tax authority and the wider government.

The tax caseworker

Analytics can influence decisions on which cases to prioritize based on the risk associated with different groups and individuals. Analytics is most effective at this level when it is incorporated into the technology and business processes used by staff – for example, through the display of risk scores in case management systems. But it requires training the tax staff on how to use the scores in the broader prioritization and treatment of individual cases.

Analytics also helps drive decisions on the appropriate treatment strategies for different taxpayers. For example, audits and penalties are a fitting response to deliberate tax evasion, but education and assistance may be more appropriate when taxpayers have simply misunderstood the law. In some less-developed countries, tax authorities take a harder line on compliance, believing that violations are usually deliberate. Risk analysis can help shift the mindset of tax caseworkers so they better understand the reasons for noncompliance and take a more customer-centric approach to foster voluntary compliance.

The business unit

Analytics is used to understand emerging trends and identify noncompliance risks that may result from revised business models, economic shifts or legislative changes. For example, tax authorities can use analysis to assess emerging trends and threats, and establish a stronger presence in those sectors through enhanced audits and verification activities, such as targeted inspections. Analytics also helps business units develop better-targeted services and optimize interventions for different groups. By analyzing operational results, business units can continuously improve their compliance programs and activities through more tailored responses and appropriate allocation of resources.

The tax authority

At the organizational level, analytics can be used for decision-making on strategy and policy, including more precise measurement of the tax gap and assessments of how changes in tax policy are likely to affect citizens and businesses. Data visualization and simulation modeling are particularly useful in determining the impact of policy changes.

Analytics can also help identify ways to enhance taxpayer services, for example, by improving service design, informing decisions on channel strategies, and delivering focused outreach and communication programs to help taxpayers understand their responsibilities. Some tax authorities are using behavioral economics techniques to design “nudge” campaigns that influence behavior to improve compliance and uptake of e-services. These include, for example, writing businesses to advise them of common errors; providing in-person assistance with compliance; and working with industry associations to raise awareness and promote compliance.

“Risk differentiation allows us to develop other strategies to support the system, including through customer communications, improving participation and nudge-type strategies.”

David Allen, Assistant Commissioner, Internal Engagement and Transparency, Australian Taxation Office

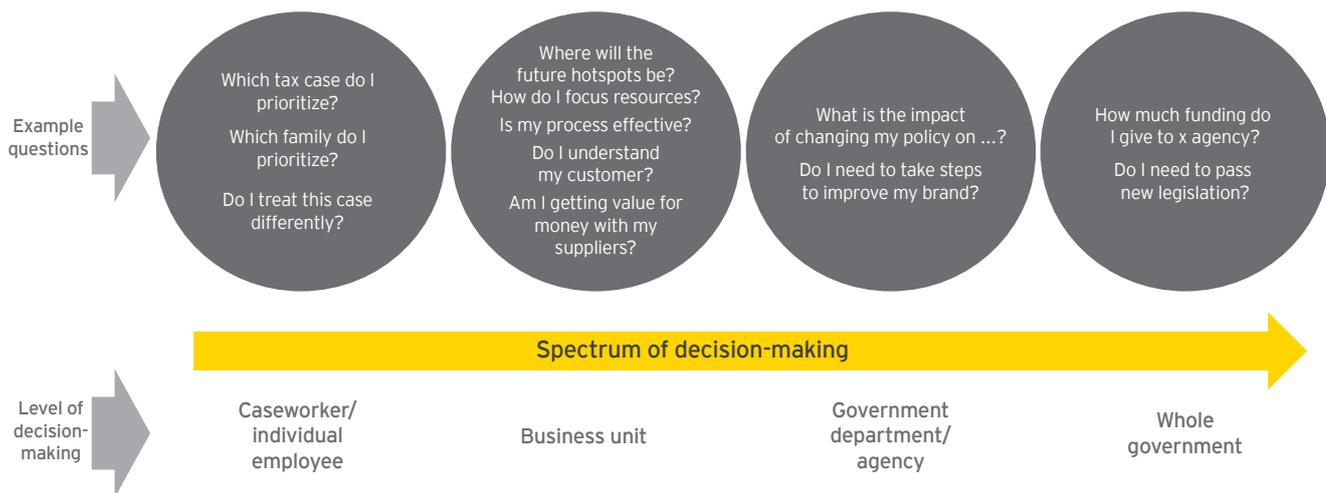
Many national tax authorities are choosing to be more open around the positive results they are achieving with analytics, in the hope that sharing such results will spur higher levels of future compliance. “Taxman unleashes its ‘snooper computer’: what information does it have on you?” read the headline of one article in the UK media in January 2017. This illustrates a growing trend for revenue authorities to publicize their analytics activities to reinforce the need for compliance. With tax avoidance capturing so much media attention, tax authorities are seeking to balance the need for secrecy with the benefits of openness.

The government

Policymakers can use the results from analytics to provide insight and advice to the treasury or the finance ministry on the development of tax policy. “What-if” scenario modeling allows officials to assess the effects of tax regime changes from both a treasury perspective (tax receipts) and a social and political perspective (impact on customer groups). Analytics-based forecasts of the impacts of tax changes can be incorporated into “system dynamics” models of the whole government, helping policymakers understand knock-on effects at a national level.

Many tax authorities are responsible not just for tax administration, but the provision of other services or benefits through the tax system. They find themselves playing a role of “data broker,” sourcing data from many other government departments (such as immigration, pensions, social security and property registries, to name but a few) and also providing valuable evidence in support of criminal activities in return. But while “joined up” government has been a widespread goal for some time, the rapid rise of big data activities does bring potential risks that must be carefully assessed. Data privacy and confidentiality issues must be supported by not only the appropriate legislation, but also the utmost care when it comes to data transfer. More than one national tax authority has learned this lesson the hard way.

Figure 5: Spectrum of analytical decision-making



Source: EY

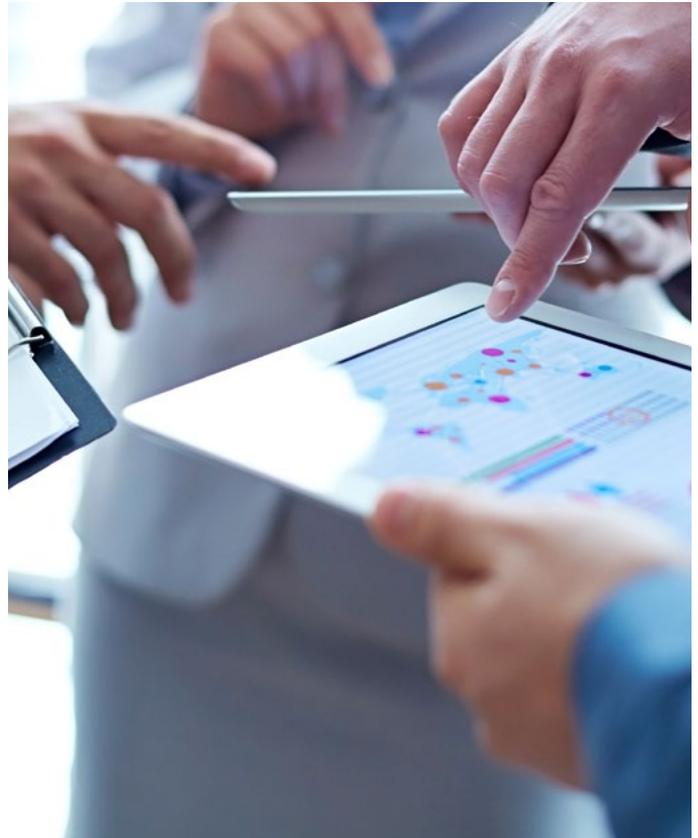


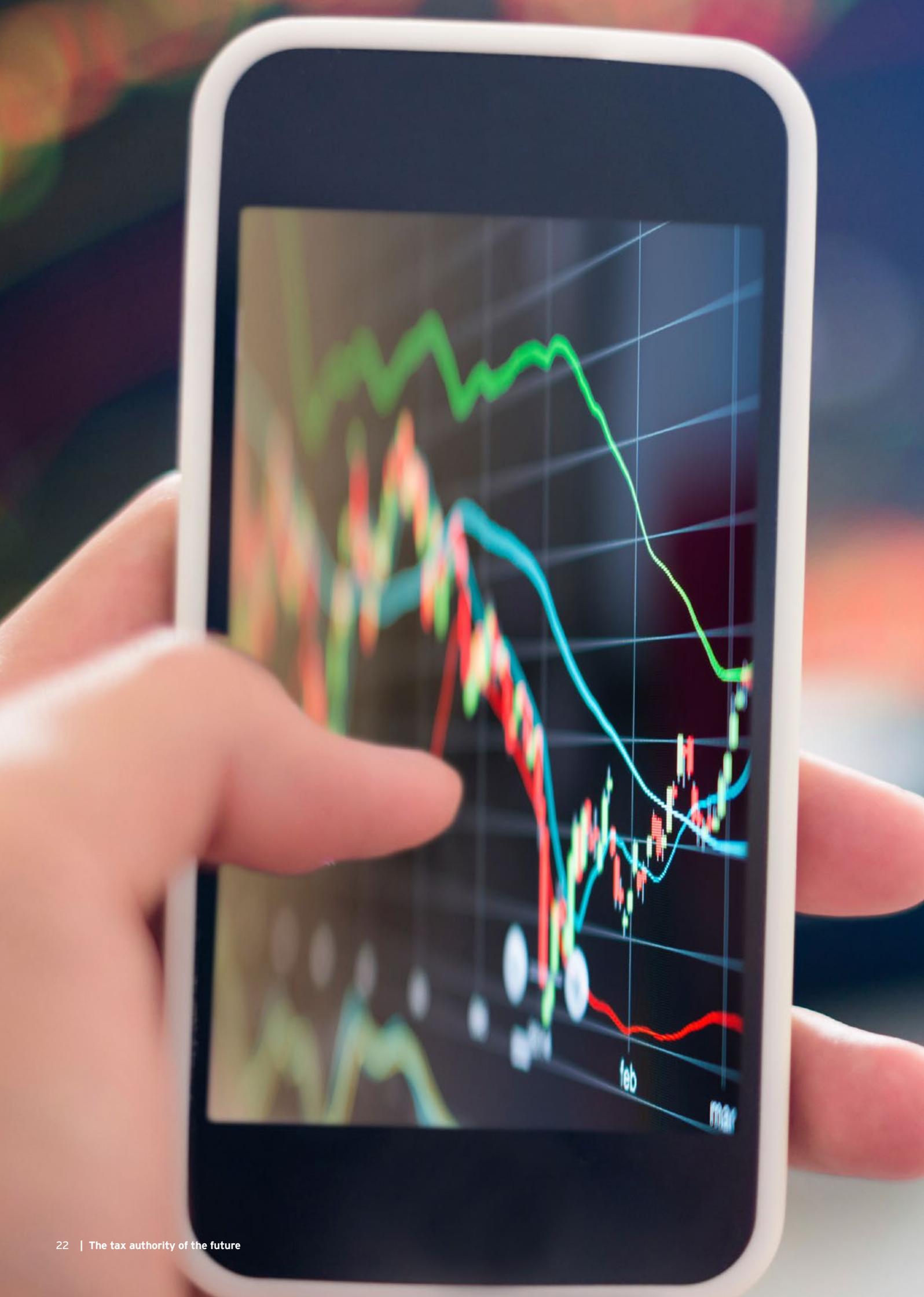
4. Moving forward

Data analytics will play a key role in every tax administration in the future, supporting the human judgment that tax officers bring to decision-making. It will drive efforts to tackle tax evasion, identify overly aggressive tax avoidance and support debt management techniques. It will allow tax administrators to focus their limited resources far more effectively on areas such as promoting cooperative compliance and influencing taxpayer behavior. And it will sit at the heart of managing disruptive new forces such as the shared and “gig” economies and contingent-working methods. At the same time, data analytics also provides the opportunity for tax administrations to improve services to taxpayers, reducing the burdens of compliance.

Many tax authorities are already exploring the next steps for proactive, rather than reactive, analytics. But acquiring, programming and operating the technology needed to support an analytics strategy are just one part of a complex puzzle. Many other pieces are equally important: gaining support from the top; developing the right governance model; making certain that analytics deliverables are embraced and utilized on the front lines; and adjusting the talent model.

Becoming an analytics-driven tax authority is a transformational journey that requires a holistic approach across various pillars – strategy, organization, process, technology and people. Significant benefits await organizations that overcome the challenges and harness the enablers of change.





Find out more about how EY is helping companies transform the way they make business decisions. Visit ey.com/analytics.

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