Digital tax transformation: Lessons and insights from leading tax authorities

January 2024

Preface

Amazon Web Services (AWS), the international cloud provider, supports the Forum on Tax Administration (FTA)'s vision for the digital transformation of tax administration, referred to as Tax Administration 3.0, under which taxation becomes more of a seamless and frictionless process over time. AWS helps millions of customers around the world, including more than 7,500 government institutions, with their digital transformation journeys.

The way societies interact in the digital era is changing fast. Technological advances and dramatically changing economic conditions have transformed how citizens view and interact with both companies and public services such as tax authorities. Customers, both individual taxpayers and businesses, today prefer fast, frictionless experiences that do not require them to leave the natural systems they use every day and allow them to manage their tax affairs in real time. The shift to digital was underway before the pandemic and government agencies report to us the acceleration of three key trends: improvement of customer experience and service delivery for citizens and businesses; combatting cybersecurity threats, frauds, and scams; and adoption of data-driven ways of working.

Some tax authorities – regardless of their digital maturity – are addressing these trends through the cloud. Instead of buying, owning, and maintaining physical data centres and servers, tax authorities can access technology services such as storage, databases, and computing power on an as-needed basis from a cloud provider, such as AWS. This provides tax authorities with the opportunity to adopt new technology services quickly and scale them as required largely without upfront and fixed expenses. These new technology services can include anything from fundamental infrastructure to advanced capabilities such as machine learning (ML), data lakes, and analytics tools. These services can give authorities the building blocks they need to respond effectively to changing business requirements and citizen and taxpayer expectations. AWS supports multiple tax authorities globally to achieve their digital transformation goals.

We provide the secure, resilient global infrastructure, services, and expertise they need to accelerate release cycles, improve decision making, reduce costs and streamline operations. As a result, some digitally mature tax authorities now embrace cloud both to solve technology infrastructure needs in new ways, create new taxpayer experiences, combat tax evasion, and other tax crimes – and harness the power of data analytics to make taxation easy to comply with and hard not to. Across the industry, we see an array of innovation using cloud solutions.

This includes the use of cutting-edge technologies such as biometric authentication, virtual assistants, generative artificial intelligence (AI) applications to improve customer experience, AI-enabled document processing, ML-enabled fraud detection, and much more.

Crucially, the cloud is not just for the most digitally advanced tax authorities, or those in the wealthiest nations. Cloud computing can also drive positive societal and economic change. In infrastructure-constrained rural areas, and among small, innovative revenue and tax agencies, migration of workloads to the cloud can greatly optimise IT operating costs. This benefits both government services and end users including small- and medium-sized enterprises. It helps incumbent tax authorities and fintech challengers alike to overcome barriers to entry and embrace new opportunities to provide an end-to-end tax system to the unserved and underserved.

While cloud-enabled agility can help deliver better tax systems, another advantage is the ability for tax authorities to turn security and compliance from an obligation to a strategic advantage. Cloud providers can offer a broad set of secure and resilient services including compute, database, analytics, and AI/ML. In our work with tax authorities around the world, they report using cloud services to automate business processes and build modern data platforms to deliver advanced predictive and analytical capabilities. This, in turn, helps them comply with laws, regulations and rules, and adhere to regulatory guidance and best practices in a more mature way. The bottom line is that by using the cloud, tax authorities can arm themselves with the ability to move fast and stay secure and compliant.

Cloud will directly enable the future of digital taxation globally. Different tax authorities may take different approaches to achieve their digital transformation goals. But regardless of the approach taken, the key is to put customers at the centre and work backwards from their desired taxpayer experiences.

On behalf of AWS, I would like to express sincere thanks to Australian Taxation Office (ATO), Inland Revenue Department (IRD), New Zealand, Department of Revenue (DOR) for the Commonwealth of Massachusetts, United States of America (USA), and Revenue NSW, state revenue authority of New South Wales, Australia, for their invaluable contributions to this white paper. We also express our deep gratitude to the Organisation for Economic Co-operation and Development (OECD) for the strong leadership it has provided in defining a vision for the digital tax administration and its maturity model.

Saket Narayan
Head of finance & regulation – Australia, New Zealand & Oceania
AWS Worldwide Public Sector

Introduction

Digitalisation of economies around the world has been underway for more than two decades and, particularly since the COVID-19 pandemic, it has accelerated. Tax authorities have been considering the implications and opportunities that this process presents for some time, notably through the OECD's Forum on Tax Administration (FTA), which brings together officials from more than 50 countries to share knowledge and develop a vision for the future of tax administration. In 2020, the FTA published an important piece of thought leadership: *Tax Administration 3.0: The Digital Transformation of Tax Administration*, framing the issues that tax authorities face as they digitalise their operations and start to take advantage of the key digital technologies of the coming decades, including artificial intelligence and machine learning (AI/ML), and process automation.

This paper represents a contribution to the debate over how to digitalise tax administration. As such, it sets out and explores several of the key ideas that underpin this process, with chapters that examine questions of technology architecture, digital tax systems and the application of AI/ML in tax administration.

It also draws on interviews with senior officials from Australia, New Zealand and the USA who are directly involved in leading digital transformation or data and analytics projects in national and state tax administrations. These five interviewees are: **Patrick O'Doherty**, enterprise leader, strategic architecture, Inland Revenue Department, New Zealand; **Erin Botelho**, chief information officer, Department of Revenue for the Commonwealth of Massachusetts in the USA; **Ben Taylor**, assistant commissioner for data insights, Australian Taxation Office; **Cullen Smythe**, commissioner of state revenue for New South Wales, Australia; and **Dan Bowes**, executive director of taxes and grants at Revenue New South Wales. We are grateful to each of them for sharing their insights on many aspects of the transformation process and hard-won lessons based on recent experience.

Their experiences are especially valuable, as it's often impossible to know when you embark on a multi-year transformation project what your destination will look like. "Where we are now is quite different to what we would have been able to imagine even six or seven years ago," says Patrick O'Doherty, acknowledging the many unexpected discoveries made along the way. The main lesson Erin Botelho offers to others is in a similar spirit: "Understand that it's a learning curve, give yourself grace not to be an expert, and know that you will feel such a bug of creativity and innovation from this." A further lesson many of our interviewees emphasised is that transforming the technology tools that their organisation uses to carry out its role inevitably means transforming the way it works, as well as its culture. They describe seeing their organisations become more focused on the needs of customers, improving collaboration between teams and departments, and delivering higher-quality services more quickly and efficiently.

In the chapters that follow we explain why digital tax should be thought of as a system of systems, how moving to the cloud can open the door to the digital economy, and how the adoption of a modern data architecture allows tax authorities to start to capture the benefits of AI/ML. Finally, we offer a series of key lessons from our interviewees for any tax authority planning or working on its own digital transformation.

Chapter 1

Digital tax is a system of systems

At the heart of the transformation process for tax authorities is the idea of creating fast, frictionless and timely exchanges of data between themselves and third-party organisations. This includes employers and financial institutions across the economy and even internationally, as envisioned by the FTA in its Tax Administration 3.0 paper. The FTA argued for "a break with the current approach, which relies on active, and sometimes burdensome voluntary compliance by taxpayers and on resource-intensive investigations and audits to address non-compliance."

Digitalisation creates the opportunity for tax administration to be "increasingly built into the natural systems used by taxpayers in their daily lives and businesses. This will allow the automation and upstreaming of many aspects of tax administration, making tax administration more seamless and frictionless over time and bringing potentially significant reductions in administrative burdens."

In effect, therefore, digital tax administration can be thought of as a system of systems or a digital environment in which data flows automatically between the different participants, removing almost all form-filling and manual processing of taxpayers' submissions. And as the process matures, this model enables many taxpayers' returns to be calculated by the tax authority using the data shared with it from external sources such as employers, banks and asset managers. Inland Revenue New Zealand, for example, has reached the point in its transformation that 3.1 million of the 3.38 million individual taxpayers no longer need to submit a tax return at all.

Figure 1: Digital tax administration is a "system of systems" in which data flows automatically between different participants – from citizen, businesses, banks, welfare and other agencies.

> "This year we will do an automatic assessment for just shy of 3.1 million people. We believe we've got all the information about all of their income through the year. So, we will do the assessment and ask them to validate it. They don't need to submit a return unless they need to provide additional information."
>
> **—Patrick O'Doherty**
> Enterprise leader, strategic architecture, IRD New Zealand

Tax authorities that aim to move to this model undertake a series of common transitions. From an enterprise architecture perspective, they're linking to external organisations' IT systems via application programming interface (API) integrations to enable information to be exchanged continuously without human intervention. The mechanics of assembling and submitting information to enable tax calculations therefore blends into the systems that taxpayers use for their routine activities – payroll software, bank accounts, small business accounting packages, and so on.

This not only reduces the burden of compliance that individuals and businesses face, but also reduces opportunities for the tiny minority of bad actors to cheat the system. "We wanted our processes, and particularly our customer-facing processes, to make it easy to get it right and hard to get it wrong," says Patrick O'Doherty.

At the level of enterprise technology, tax authorities are transitioning gradually towards a modular, cloud-based tech architecture that replaces large, complex monolithic mainframes and private data centres with a cloud-based architecture. This comprises centralised data stores, the data from which powers a multitude of separate, modular microservices that perform specific functions and are linked together by API calls. These microservices include bots carrying out robotic process automation (RPA) – using software to perform standardised, repetitive tasks previously done by humans. Since implementing RPA two years ago, the Australian Taxation Office has 101 bots that have replaced 319,000 human hours. This allows staff to be diverted to more complex tasks that require human judgement.

IRD, as part of its digital transformation, established a tenet of addressing business process inefficiencies at source. In other words, optimising and/or redesigning inefficient business processes so as not to inadvertently make an inefficient one faster via automation. Addressing business process inefficiencies at source enabled IRD to harness the benefits of an end-to-end digital tax system which does not rely on complex integration or investments in tools designed to speed up inefficient business processes.

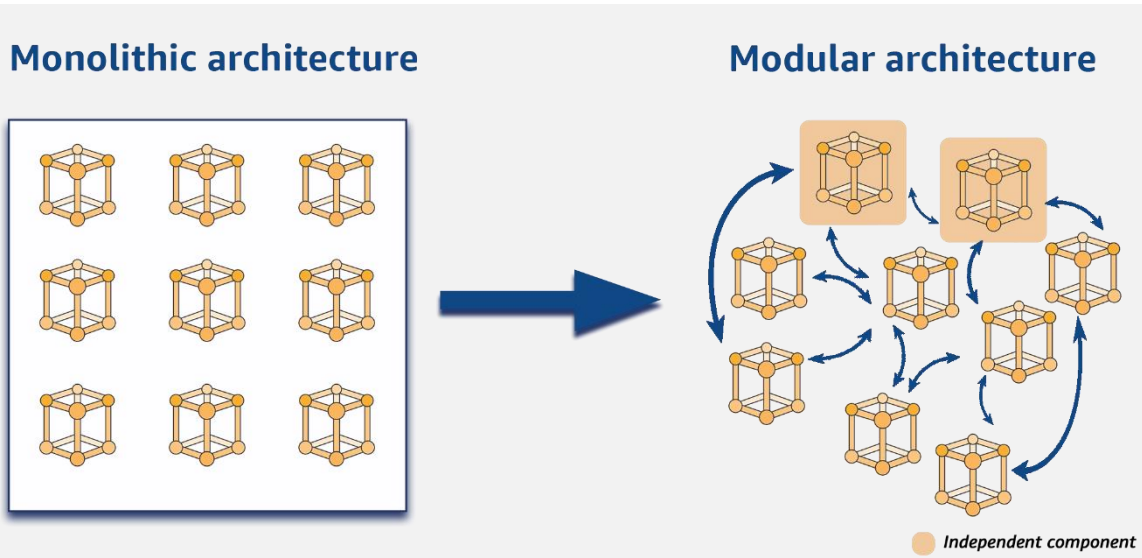


Figure 2: Tax authorities transition from complex, monolithic mainframes to a modular cloud-based architecture

Modern systems are resilient by design

The decoupled architecture described above results in greater resilience. If one part of the system needs updating or a better solution becomes available, microservices can be added and removed without having to update the entire code base. This approach allows change to happen more quickly and be less disruptive to the overall system than with a legacy mainframe. The decoupled architecture approach isn't the only way to deliver a simplified core tax system. For example, IRD took a different approach to deliver an agile and responsive tax platform through implementation of a simplified, tightly coupled architecture built on commercial off-the-shelf (COTS) applications for its core tax system. "We rationalised our IT application landscape from 250-plus applications to less than 10 applications to avoid any complexity in our architecture," says Patrick O'Doherty. The key here is to simplify the complex IT landscape which often remains a blocker of agility, innovation, and connectivity to digital tax intermediaries such as fintechs. Many tax authorities report the use of cloud-based microservices to provide greater resilience, elasticity and connectivity to a broad range of intermediaries in the digital tax system.

A cloud-based architecture also delivers a much-improved customer experience. This enables citizens and businesses to do more for themselves using intuitive online services.

Delivery of an outstanding customer experience is the central goal of the technology development program at Revenue New South Wales, the Australian state's tax authority. Since the COVID-19 pandemic it has benefitted greatly from its close collaboration with Service NSW, the state's digital customer service agency. "The revenue function is part of an all-of-New South Wales government drive to digitalise and focus on customer service," says Cullen Smythe, commissioner of state revenue. The main goal within this is to "get better and better at giving people the right assessment or enabling them, where they're self-assessed, to create their own assessment as quickly as possible with the right number on it first time around," says Dan Bowes.

How cloud environments add resilience

The resilience that a microservices architecture enables at enterprise level has parallels at the level of the public cloud infrastructure, where tax authorities are increasingly choosing to host their data and applications. Cloud architecture is typically divided into separate availability zones, comprising groups of data centres. By adopting an approach that hosts data and applications across more than one zone, tax authorities can achieve high availability and safeguard business continuity because they can switch from one zone to another immediately if any outage occurs. This allows for greater resilience than typical on-premises systems provide.

Distributing data and applications like this has obvious benefits for tax authorities' disaster recovery capabilities. Indeed, some authorities engage with cloud providers initially as a way to enhance their disaster recovery performance. With existing on-premises systems, it can require days or even weeks to allow a return to normal working. Patrick O'Doherty at IRD says that following the Kaikoura earthquake in late 2016, the tax authority had to leave its building in Wellington and rely on its then back-up system.

For many organisations, the need to modernise legacy technology infrastructure is an important part of the rationale for moving part or all of their activities to a cloud environment.

> "It's quite comical in some ways, but our remote access in 2016 had a limit of 500 people. So, if you didn't get online by about 7.30 AM, you couldn't. Imagine trying to operate a digital transformation program with 800 to 900 people working remotely with no email, certainly no Teams or Google Meet or any sort of video conferencing capability. That made us realise that we had a whole lot of core backend infrastructure that we needed to sort out. Roll forwards to 2020 and we were fully operational, fully remote within 48 hours of going into a level 4 lockdown in New Zealand. And we performed a major cutover while operating fully remote."
>
> **—Patrick O'Doherty**
> Enterprise leader, strategic architecture, IRD New Zealand

Chapter 2

Migration to the cloud can open a gateway to a digital economy

Tax authorities identify a variety of reasons to move from on-premises tech infrastructure to a cloud environment. Among the most important is the need to replace legacy IT hardware and applications that are becoming obsolete and increasingly expensive to support. Also, the opportunity that cloud services offer to pay only for the computing power that the authority needs, when it needs it. Tax authority workloads have sharp seasonal peaks and troughs in demand – for example, around annual deadlines to file returns or quarterly payment schedules. An on-premises system requires the authority to over-provision, maintaining sufficient capacity for these temporary periods of peak demand all year round, rather than scaling its computing power up and down as appropriate. Transition to the cloud provides an opportunity both to move from legacy systems to a modern technology architecture and to benefit from the cloud's flexibility to meet changing demand for computing power.

Massachusetts chose to begin with the migration of its core tax application (GenTax) to the cloud, explains Erin Botelho. It's one of the largest of the Commonwealth's applications, but it offered "a great learning opportunity. We've learned how critical cloud services interact with each other and how to secure them. The in-action experience alone has benefitted in upskilling the infrastructure teams for their work ahead in the cloud. As for the core tax application, the cloud environment's flexibility and not having to size like it's filing season 24/7 are the in-progress benefits we're looking to achieve."

> "The biggest drivers for our digital transformation were a significant hardware refresh in our data centre and a direction to modernise our digital footprint by our central IT office. While still a learning process and a manual one due to the tax application, it allowed us to optimise the infrastructure hosting the tax application environments, saving money for the Commonwealth over time."
>
> **—Erin Botelho**
> Chief information officer,
> Department of Revenue for the
> Commonwealth of Massachusetts

> "The biggest game-changer of cloud is that it enables flexible and timely investments to quickly scale our applications to meet evolving needs and community expectations."
>
> **—Ben Taylor**
> Assistant commissioner for data insights,
> Australian Taxation Office

The future of data security

Data security is inevitably a key consideration for tax authorities, and many have historically resisted running production core tax workloads in the cloud for this reason. Public authorities are also concerned about sending sensitive data across borders after they transition from private data centres. They therefore seek transparency from cloud providers about where their data will be stored and processed. Most public cloud providers have responded to these concerns by making security their top priority, coupled with significant investments in their security posture. As a result, the level of security in public cloud services often exceeds private data centres. Over time, this has helped to turn what had been a barrier to cloud adoption into a driver of it.

The flexibility and scalability of computing power and data storage that cloud environments can provide, compared with private data centres, is critical to capturing the benefits of a digitalising economy.

However, arguably the greatest gain from cloud adoption is to enable tax authorities to integrate fully into the digital system with the high levels of assurance on security and compliance that they require. Ensuring end-to-end security when external players such as accounting software providers, software developers and fintechs are interfacing with core tax systems allows the tax authority to operate safely in a much broader digital ecosystem. And it creates the conditions in which these third parties can become trusted intermediaries between the tax authority and taxpayers. One well-documented example of this is the fintech app Hnry, from New Zealand, which automatically calculates sole traders' and freelances' tax liability and sends the payments to Inland Revenue New Zealand.

> "Cloud is providing a key to unlocking the future of data and analytic capabilities for the ATO. As far as I'm concerned, our future is the cloud and we're really excited about the benefits that rapid deployment of proven, fit-for-purpose, integrated applications that we can just plug and play will realise."
>
> **—Ben Taylor**
> Assistant commissioner for data insights,
> Australian Taxation Office

However, as Patrick O'Doherty acknowledges, exposing sensitive data held by the tax authority to third-party service providers via APIs places a significant burden of responsibility on officials to ensure the companies seeking to access tax authority data have good reasons to do so. "The challenge we've got now is how to build a level of governance and due diligence around some of those new requests coming in without making it onerous for players to enter the market," he says.

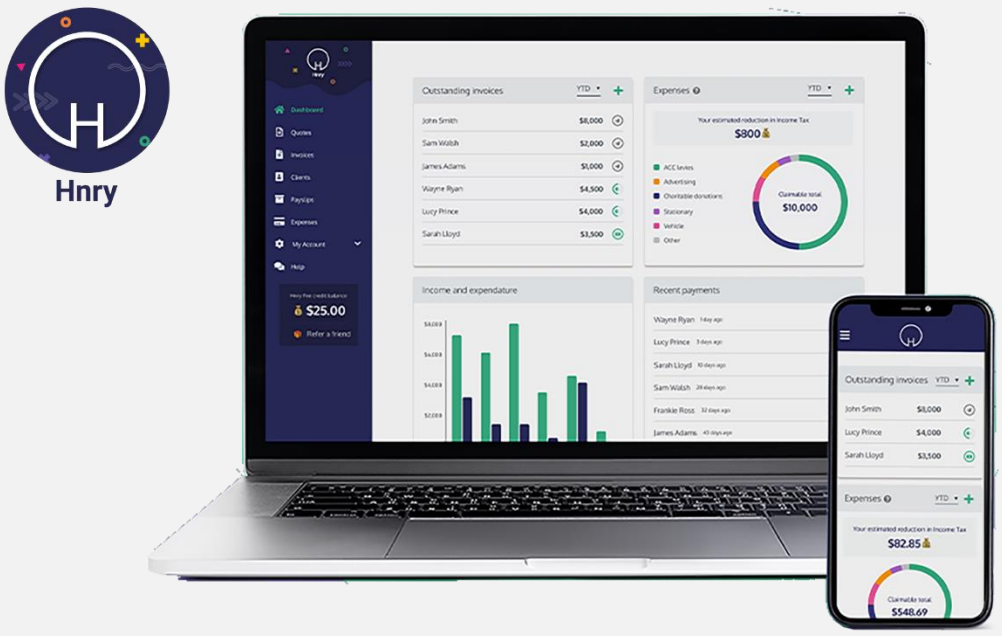


Figure 3: The fintech app Hnry, from New Zealand, automatically calculates sole traders' and freelances' tax liability and sends the payments to Inland Revenue New Zealand.

Tax administration migrates into natural systems

A key priority for most tax administrations as they continue their digitalisation journey is to allow tax administration processes to be incorporated into the natural systems that individuals and organisations use in their everyday activities. Cloud adoption provides a way for tax administrators to do this efficiently and effectively at scale. Australia's Single Touch Payroll offers an excellent example of this process in action. The scheme, launched in 2017, passes data on salary, tax and superannuation (pension) contributions from business software systems to the ATO each time an employee is paid. By linking with goods and services tax systems, e-invoicing systems, and banks' and asset managers' systems, tax information of all sorts (interest and dividend income, salaries and property depreciation, for example) is automatically pushed into the tax authorities by the different players in the digital economy. As already highlighted in the case of New Zealand, this allows tax returns to be pre-populated for approval by the taxpayer in a frictionless filing process that greatly reduces the scope for mistakes and evasion.

> "In terms of the information that comes into Inland Revenue NZ, it's 98 per cent-plus digital. So, we've not quite eliminated paper completely, but it's a really, really small percentage, and 55 per cent of our data comes in through natural systems."
>
> **—Patrick O'Doherty**
> Enterprise leader, strategic architecture, IRD New Zealand

Because information is passed through a software-to-software interface, the opportunity for human error is reduced. Tax authorities have historically accepted that they would have to plan for a level of unreliable data, due to the human element of proving information. By integrating data collection into natural systems, they can access much more accurate flows. Additionally, because information from these natural systems reaches tax authorities in close to real time, instead of once a year, tax liabilities can be calculated much more accurately on an ongoing basis.

This acceleration of data flows could ultimately allow authorities to dispense with the concept of a tax year altogether and move to continuous assessment, removing the peak in workloads around annual tax-filing deadlines. With tax data flowing in constantly, authorities could calculate updated balances every month and request payments or provide refunds when the monthly deficit or surplus exceeded a set threshold. The days of the annual rush to beat the tax-filing deadline are numbered.

Digital Identity: The missing link

A key challenge faced by every tax authority is to match the information it receives correctly to the individual and corporate taxpayer records it holds. The absence of a national digital identity system makes this a laborious process that consumes significant resources, says Dan Bowes of Revenue New South Wales. It also complicates the process of turning data captured by the authority into information it can use. Erin Botelho from the Department of Revenue for the Commonwealth of Massachusetts agrees and states that "digital identity is a huge issue; fraud is scaling to new heights, and it's hard to keep up. Coming together to work on this issue from a society standpoint will serve us all."

A whole-of-society approach to digital identity linked to other forms of identity such as, in Australia, a Tax File Number (TFN), holds the key to linking up information across the tax ecosystem.

> "One of the biggest challenges we always had was that very few people ended up with a zero-tax balance at the end of the yearly process because they had either overpaid or underpaid tax through the year. Now we're down to a single-digit percentage of people who've either overpaid or underpaid. The vast majority end up with a zero balance."
>
> **—Patrick O'Doherty**
> Enterprise leader, strategic architecture, IRD New Zealand

Chapter 3

From data to AI-driven taxation

Data lies at the heart of every tax administration system and is fundamental to the success of any digital transformation project. As Dan Bowes notes: “I’m always on the lookout for more information. Our job is really to piece together a digital representation of the real world that we can use to administer the system fairly, because where we haven’t got it right, we’re by definition making it unfair.”

Secure and efficient sharing of information between tax authorities is widely seen as one of the potential gains of digital transformation. As such, Revenue New South Wales is permitted by national legislation to share its information with other state tax authorities and a number of federal bodies. Cullen Smythe believes the introduction of “automated data-sharing systems between jurisdictions” could have a major impact in areas where the authority has very limited visibility, such as offshore trusts and companies registered in tax havens.

Modern data architecture is critical

As tax authorities shift to a modern technology architecture, they enable the creation of a modern data-management architecture. The latter is based on centralised data warehouses and data lakes that store and structure all the data that flows in and make it available across the organisation for processing and analysis. This is the key enabler of applications of AI and ML in tax administration, for example to identify higher-risk cases for potential audit.

For tax authorities to realise the potential gains available from applying advanced analytics and data-science techniques to the data they hold, they must first put in place the right architecture, governance and operating models.

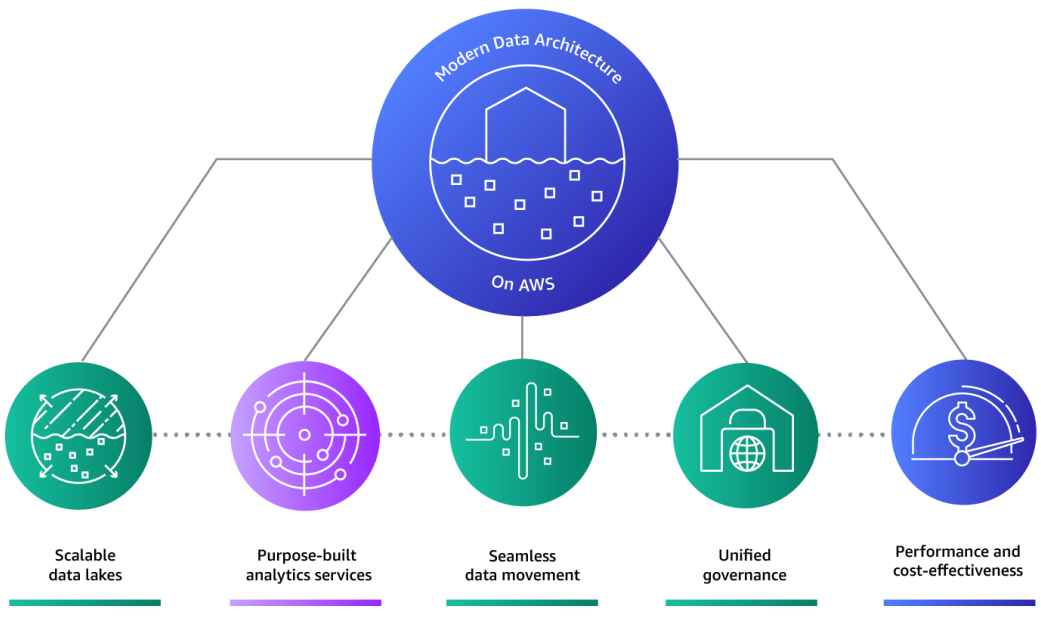


Figure 4: Modern data architecture on AWS

Erin Botelho regards progress towards a modern data architecture as exciting: "We are probably the most excited about this, as transitioning outside of the databases we are running today and into more modern cloud database technologies allows us to rethink data architecture for all our applications. Often in the hurry-up-and-deliver nature of IT or large-scale system replacements, thought isn't given to master data management (MDM). Changing our data architecture gives us a unique opportunity to understand our data and apply those principles to it as we convert out of one technology and into another."

The broad thrust of data modernisation is by now well understood: Data is aggregated from silos across the organisation into a central storage system. From there, it can be used to drive the many applications and analytical models that depend upon it. However, the process of gathering, structuring and making the data available is complex and requires intense focus early in the transformation process, as do the APIs that allow internal and external users to access data for specific applications.

His **Majesty's Revenue & Customs (HMRC)** in the UK manages its plans to transform its technology architecture under five headings: technical, data, business, customer, and strategy. This indicates how critical the right data architecture is to the success of any digital transformation.

Data-quality tooling is a vital consideration, because the legacy systems in which tax authorities historically stored data were lax about what they would allow in. This creates risks that poor-quality data will be transferred into the updated system, compromising its usefulness. So, tools to manage data quality, metadata and cataloguing are critically important.

> "We will enable data insight-led decision-making for tax and customs administration through trusted, quality, consolidated data with robust controls to govern and manage it."
>
> Source: HMRC IT strategy: 2022 to 2025

A new architecture means a new operating model

Tax authorities that have updated their data systems emphasise that changes to the technology architecture require corresponding changes in the organisation's operating model. Before the Australian Taxation Office began its Smarter Data transformation in July 2015, its data and analytics function was decentralised, with more than a dozen business teams across the organisation collecting data and building their own analytical models. This led to different teams capturing disparate information that did not follow a standard structure and was not always linked to the data held by other teams. As a result, assuring the accuracy of the data and the analysis based upon it was challenging, as was enabling the outputs from one team's analytical models to flow into those managed by other teams.

Under the Smarter Data program, the ATO implemented a hub and spoke model, moving its core data and analytics function (with 670 staff) into the hub. Ben Taylor, assistant commissioner for data insights, says this exercise highlighted three critical issues:

1. **Foundations:** Fragmented governance and quality-assurance processes in the different teams led to variable quality, reliance on the knowledge of key individuals to maintain models, and low interpretability and explainability of the results.
2. **Delivery:** Forming the hub revealed the ATO had multiple tools from different teams that served similar functions. This led to higher overheads and slower delivery because the hub needed people skilled in a wide variety of toolsets.

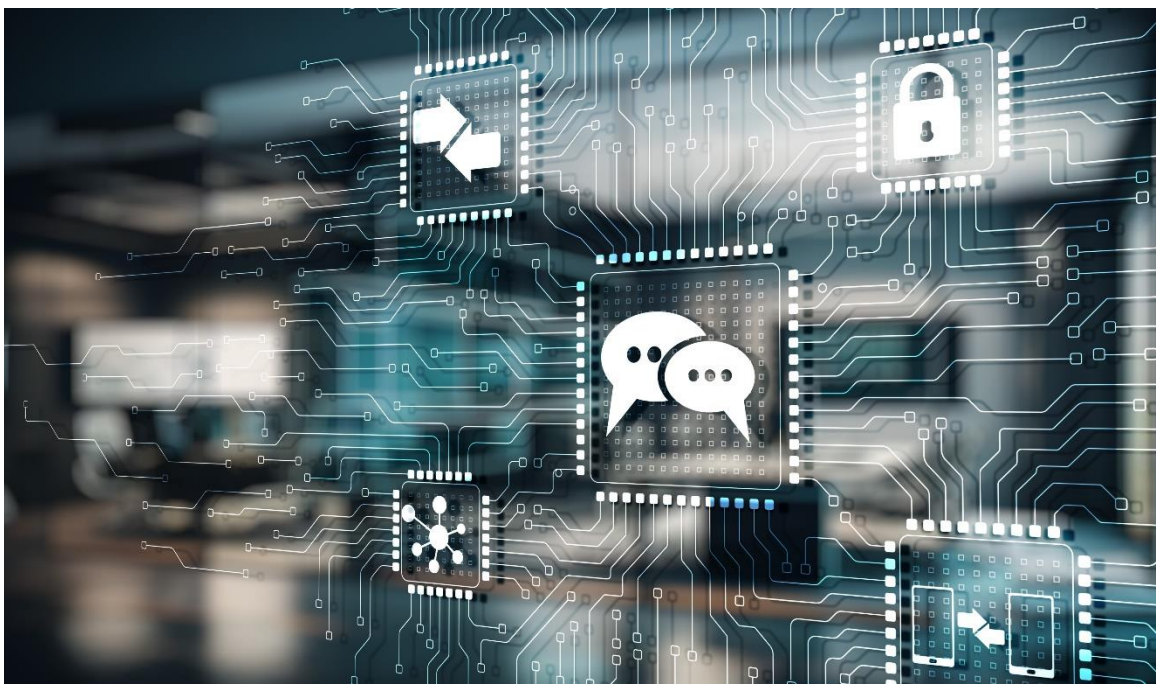
3. **Trust:** The new hub needed to build trust with the wider organisation in the data outputs and models it was producing. This meant addressing issues with model drift (where models lose predictive power, for example, as behaviours change) leading to model abandonment.

Today, the ATO's Smarter Data hub is organised according to capabilities: data engineering, data management and governance, data analytics, data science, robotic process automation, data visualisation, and so on. Projects are delivered by multi-disciplinary teams assembled from the different capabilities within Smarter Data, with requests routed through client account managers who have both a strong data and analytics background and a good understanding of the area of tax involved.

> "We're evolving how we work and we're evolving the technology at the same time. Transformations often end up being just the latest piece of software or a move to the cloud that gets called a transformation. This is a genuine transformation in that the way we work and support the rest of the ATO and Australian Public Service (APS) is changing as a result of our increasing capabilities with modern technology and operating models."
>
> **—Ben Taylor**
> Assistant commissioner for data insights, Australian Taxation Office

Unlocking the potential of AI

Once data is properly stored, structured, and governed, algorithms can be applied to it to perform a wide range of functions. These include checking for anomalies in filings and refund requests against those from similar people or businesses; examining metadata to look for known risk factors, such as the location of the sender or the time of submission; verifying ownership of the address where the filing originated; and comparing data against third-party datasets to flag anomalies. There is also potential for the use of natural language processing (NLP) to build AI chatbots that can answer basic user questions and help people navigate the system more quickly to find the information they need.



Erin Botelho notes: "Data analytics, machine learning, and AI are all the waves of the future, and the people who don't know their data inside and out will not be able to take advantage. Data governance and master data management (MDM) are essential, and we feel it more than ever with these data warehouses and lakes being created. Having that opportunity to 'start from scratch' with some of these applications will put us in the driver's seat for using our data in better and more meaningful ways."

Just as importantly, modern data architecture also enables effective data and model management. By modernising its data architecture, the ATO was able to gain a single view of an individual or organisation built up from the outputs of multiple risk models.

As a result, the ATO now feeds the outputs of its most critical models into its Enterprise Client Profile platform, which provides a single view of the client's risk profile. This enables more targeted and holistic engagement and supports the ATO's prevention before correction approach. As the ATOs example suggests, tax authorities can use AI/ML as a preventative tool, making it easier for taxpayers to comply with their tax obligations.

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The ATO has used ML to enable real-time prompts to get taxpayers to check the amounts they enter, as they complete their income tax returns in myTax. These rely on analytical models that compare what is entered to historical data points of similar taxpayers. If clients enter a value on a form that is outside of the expected range, a nudge message asks them to check that number, which a client can ignore if it's correct.

For example, in 2021/2, the ATO issued over 441,000 prompts to individual taxpayers, helping to protect an estimated $45.5 million in revenue. In that same financial year, it also piloted a program that prompted over 1,400 self-preparing sole traders to check the amounts they reported, where they differed to those in similar circumstances – 25 per cent of those prompted adjusted their amounts as a result. This pilot is now in full implementation.

Generative AI has stoked both legitimate enthusiasm and legitimate caution. AWS has attempted to partially survey the landscape of concerns and to propose forward-looking approaches for addressing them[1]. It should be emphasised that addressing responsible AI risks in the generative age will be an iterative process. This landscape is sure to evolve, with changes to both the technology and the responsible AI guardrails. The only constant will be the necessity of balancing the enthusiasm with practical and effective checks on the caution.

Indeed, not all tax authorities are making use of AI, in part due to issues of explainability. Revenue New South Wales, says Dan Bowes, applies "a bit of machine learning" to train the automated document readers it uses to ingest information and present it as a case for human users to work on. But the algorithms are "all explainable," he adds, and a customer's tax assessment cannot be changed by the software on its own. "We have a deliberate policy of not having AI that no one can explain." The work produced by the document readers is always checked by an expert human user, with errors used to train the algorithm more accurately. "There isn't anything particularly advanced, in the sense that the machine does it by itself and just spits out a result, because that is not something that we would find acceptable."

[1] https://d1.awsstatic.com/responsible-machine-learning/responsible-use-of-machine-learning-guide.pdf

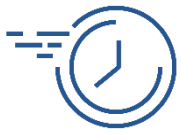
Chapter 4

Seven lessons from the front lines of digital tax transformation

The people we interviewed and the authorities we studied for this paper offered many insights and pieces of advice based on their own experience of leading digital tax transformation projects. Here, we compile seven of the most universally relevant contributions.

TRANSFORMATIONS TAKE TIME: Inland Revenue New Zealand recognised that its transformation project would last up to a decade, which made it likely that there would be a change of government while it was underway. Patrick O'Doherty says the tax authority addressed this risk by engaging with both the government and the main opposition party from the outset to build broad support for the project. It also approached the Minister of Finance to seek a multi-year appropriation to cover the entire program. Moreover, transformation is not a finite process; there is a heavy lift at the beginning, followed by cycles of continuous improvement.

DATA IS THE FOUNDATION: Ben Taylor: "We can't allow ourselves to be techno-dazzled by the latest and greatest widgets that we think are going to transform our business, when we don't have a data architecture defined, we don't know what our data model is, we don't know what our data quality is. Building the foundations to ensure you've got high-quality data that's trusted, on stable platforms, is really, really important."



TRANSFORMATION PROJECTS NEED QUICK WINS: Start small and replicate your successes to build internal confidence and trust, advises Ben Taylor. "Maybe robotic process automation is a place to start. Find a process, or a couple of processes, automate at a small scale, and see what happens." Gaining the trust and support of the organisation in this way can have a big positive impact.

DON'T DIGITALISE TODAY'S PROCESSES. REINVENT THEM: Digital transformation projects offer an opportunity to redesign existing processes using new technologies to remove waste and inefficiency. Avoid simply digitalising existing paper-based forms and processes and instead try to simplify them, says Patrick O'Doherty. "What we see across the board is that most transformation programs skip the simplification piece. All you're doing is digitalising the complexity that already exists. In a lot of cases, all you will end up doing is confusing your customer a little faster than you did previously. Look to simplify as much as you can. In a lot of cases in a government context, that will involve changing legislation. You have to be bold enough to do that."

SEEK INSIGHTS FROM OUTSIDE: Digital transformations are going on in many places. Other government departments and public agencies can all be sources of valuable insight. "Reach out to colleagues in other government departments that might have done something similar, and see what they've done, how they've approached it, how it worked," says Ben Taylor. "Because AI bumps up against legal and ethical considerations. All of these need to be seriously considered. And if one area of the government has considered it, then they might be very appropriate to talk to about your area if you want to start up as well."

CLOUD ADOPTION BRINGS FUNDAMENTAL CHANGE: "Moving to the cloud is not just about migration of the workload – it's a completely different paradigm," says Ben Taylor. Technology teams will be used to an on-premises environment where they manage physical technology infrastructure: switches, routers and cables. Transitioning to the cloud replaces that hardware with an online dashboard. This represents a fundamental change in their role and adapting to this can prove challenging.

DEMAND FOR ADVANCED DATA ANALYSIS WILL EXCEED SUPPLY: Once advanced data analysis becomes available, demand for it is likely to exceed what the data team on its own can provide. It's essential to create an operating model for data and analytics teams that allows them to provide maximum value to the business, which should include prioritisation frameworks to decide which requests are to be addressed first. However, in the longer term the best way to maximise value may be to enable much of the analysis to be carried out by the business within guardrails overseen by the central data team. Under this model, instead of the data team doing everything, business users are supported to carry out the analysis they need by the data and analytics teams or by trusted super-users within their own teams. In this context, low-code solutions that enable people across the business to create their own analytical tools quickly and safely could add significant value.

Conclusion

Digitalising tax administration can bring about huge changes in the way tax authorities operate, with speed and efficiency gains that are nothing short of extraordinary. Between 2012 and 2022, while its technology transformation project was underway, Patrick O'Doherty says that the New Zealand Inland Revenue Department's revenues grew from NZ$48 billion to more than NZ$100 billion. Over the same period, its headcount fell by about 30 per cent, while the IT team shrank from almost 700 people to little more than 50.

This is undoubtedly remarkable, but to regard cost savings as the overriding goal of digital transformation is not the main point: these projects open up a wealth of opportunities for tax authorities to become better at what they do. Digital transformation should enable greater accuracy and better compliance by providing systems that make it easy for customers to get their tax disclosures right and hard to get them wrong. It can lead to a revolution in the customer's experience of interacting with the tax authority.

By enabling real-time data collection from natural systems, digital transformation projects can even allow continuous assessment of the customer's tax position, removing the need to complete an annual tax return at all.

And through automation and the use of intelligent technologies, digital transformation can greatly improve the experience of those who work for the tax authority, taking over large numbers of repetitive, manual tasks and creating the time for them to concentrate on others that require human knowledge and judgement. In fact, several of the tax authorities we spoke to said that making the department a great place to work was one of their main transformation objectives.

In the preparation of this report, our interviews with senior project leaders across multiple tax authorities illustrate how they have gone about grasping these and other opportunities. Central to their approach has been a willingness to embrace uncertainty and a degree of risk in order to realise the gains they were seeking. Digital transformation leaders could not know exactly what the end result would look like, but care and pragmatism in managing the risks enabled them to be "stubborn on the vision and flexible on the detail," as Amazon's founder Jeff Bezos puts it. A central element of that vision is to focus relentlessly on creating fast, frictionless and intuitive user journeys and work backwards from there, transforming technology tools and operating processes to achieve the best possible customer experience.

Organisational transformation has therefore been a constant and essential companion to the technology transformation that is the nominal subject of this study. Time and again our interviewees told us that simply adopting modern, cloud-based, modular technology architecture while leaving the organisation's structures, culture and operating processes alone would leave far too much potential value unrealised. These elements must be considered together as different facets of the same project – the best tools in the world will not fix a poor or inefficient process. Successful transformations happen in organisations that are prepared to change the way they think and operate, as well as the technology they use.

Achieving the shift to a customer-centric service culture in organisations that have historically focused on compliance and fraud risks is challenging. But digital transformation can help. Migration of tax administration into natural systems makes it easier and quicker for the majority of taxpayers who want to get it right to do so.

And better risk models make it easier for the authority to identify and focus resources on the small minority of bad actors. Taken together, these dynamics can help tax authorities adopt a more customer-centric mindset that does not simply assume that everyone is trying to cheat their taxes.

Digitalisation is an economy-wide process, so it will continue to create opportunities for tax events and processes to migrate into the natural systems used by taxpayers in their daily lives and businesses. To harness these opportunities, the tax authorities we spoke to have been prepared to soften the boundaries of their organisation so that – with appropriate safeguards – it can become part of a wider, digital ecosystem and gain the benefits of external innovation and expertise. We see this process as fundamental to the future of tax administration.

There is much still to play for in the digitalisation of tax authorities around the world. We hope that our exploration of these pioneering projects will inspire others to consider the opportunities and provide valuable guidance as they embark on their own journey.

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