Analytics Playbook

Version

June 3rd 2019

Foreword

Message from the Deputy Minister Champion

Analytics is transforming the world in which we live, and the public sector is no exception. As we deliver programs and services, and strive to meet the needs of citizens, we are increasingly faced with problems that challenge us to think and act differently. To solve these problems we need to use data and evidence differently, and analytics is an essential part of that. While analytics is on the radar of many public sector leadership teams, many lack a clear roadmap for how to become more data-informed and advance the use of analytics within their organizations.

To help respond to this, the Institute for Citizen-Centred Service (ICCS), on behalf of the Public Sector Service Delivery Council (PSSDC), has developed an **Analytics Playbook** to support and advance the use of analytics across public sector organizations. I am very pleased to be the Deputy Minister Champion for this important project because I believe that becoming more data-informed is one of the greatest opportunities and most pressing challenges facing the public sector today. We have access to vast amounts of data that can be used to generate many sources of value including improving service delivery, better use of resources, greater impact of government programs, enhanced transparency and legitimacy of government, and enabling service transformation.

The Analytics Playbook is both educational and instructive, articulating the value of analytics, identifying success factors that policy makers and leadership teams need to be thinking about advancing, and defining how organizations can get started on their analytics journey. Finally, the Analytics Playbook details notable achievements of Federal, Provincial/Territorial, and Municipal organizations with respect to the partnerships and projects that have used analytics to improve service delivery.

I would particularly like to draw attention to the section of the Analytics Playbook that addresses the enabling environment for analytics. To reap the potential benefit of analytics in the public sector, it is essential to address concerns and educate the public about the collection and use of public data assets, including privacy, ethics, and transparency to build public trust and shift public sentiment in favour of the use of analytics to promote evidence-based decision making. In Canada, our data exists in many silos – across levels of governments, across departments, and across programs. These silos create barriers to the effective use of data. Working collaboratively to develop a pan-Canadian analytics framework to build public trust and enable analytics could be a focus of work for the Public Sector Service Delivery Council, and the Public Sector Chief Information Officer Council. I look forward to working with my fellow Deputy Ministers, PSSDC and PSCIOC on this important groundwork.

I want to thank the Data-Driven Intelligence (DDI) Working Group for their efforts and leadership in developing this Playbook. I believe this Playbook is a unique resource for all public sector organizations that will help to advance the use of analytics for the betterment of those that we truly serve.

Scott Sinclair
Deputy Minister Crown Services
Province of Manitoba

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1. Introduction

Introduction

The world is getting more complex. Societal problems have multiple root causes that cross domains and one-size-fits-all solutions are not enough. Public sector organizations face additional challenges related to performance and accountability, increasing fiscal pressure, and meeting rising public expectations for results and responsiveness.

Advances in analytical methods and tools have created opportunities to enhance decision making, better allocate resources, and improve client experience. The public sector manages massive amounts of data. However, the full potential of this data to inform decision making and improve operations can't be realized until the sector makes better use of analytics.

By embracing analytics, public sector organizations can transform data into information and insights that can be integrated across domains and disciplines to stimulate new approaches and present viable solutions to some of the toughest policy and management challenges. Analytics will help close the service gap between the consumer and citizen experience in the public versus private sector, which has expanded in recent years as the private sector has invested heavily in analytics to inform and improve consumer interactions, leaving citizen's experiences with government services falling short of expectations.

This **Analytics Playbook** is intended to help get public sector organizations started on their analytics journey. It articulates why public sector organizations need to use analytics, and highlights the success factors that differentiate those organizations that use analytics to meet their goals from those that are falling behind.

The Playbook recognizes where progress is being made, and includes case studies and lessons learned from across the country, including all levels of government. These examples show how organizations are unleashing the power of analytics to improve organizational decision-making and service delivery to citizens. The case studies demonstrate powerful and impressive results, and show that Canadian public sector organizations are taking important steps on the data analytics journey.

Governments cannot solve tomorrow's problems with yesterday's tools. They need analytics as part of their toolkit – starting today.

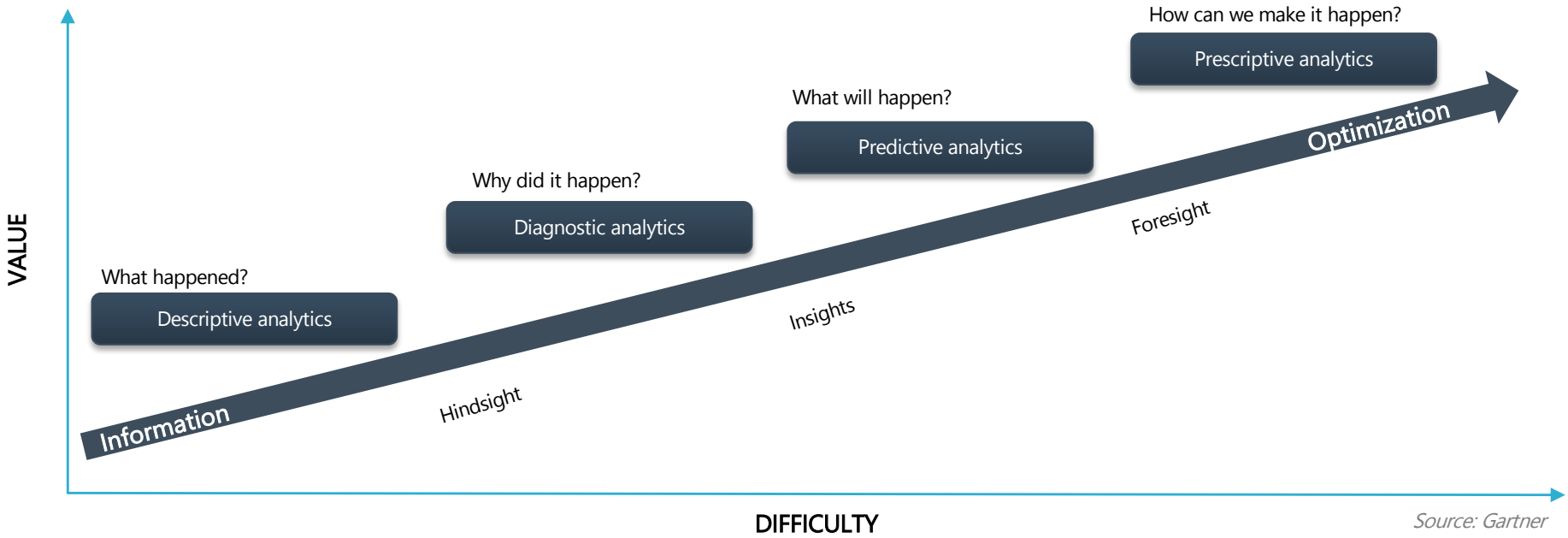
2. Analytics Background

Analytics Definition and Maturity Model

Analytics is the process of systematically transforming data into information that can inform action and decision-making. It is a broad and multidimensional field connected to mathematics, computer science, information technology, and social science that finds insights, patterns, and generates knowledge.

Maturity Model for Analytics

Analytics can range from basic statistical analysis to advanced analytical models that require specialized applications and tools. Different types of analytics can be defined along a continuum according to the maturity model below. The value and insights gained from analytics increases as an organization moves up the continuum.



Source: Gartner

Descriptive analytics is the examination of data or content to answer the question "What happened?" Descriptive analytics include traditional business intelligence and basic summary statistical analysis.

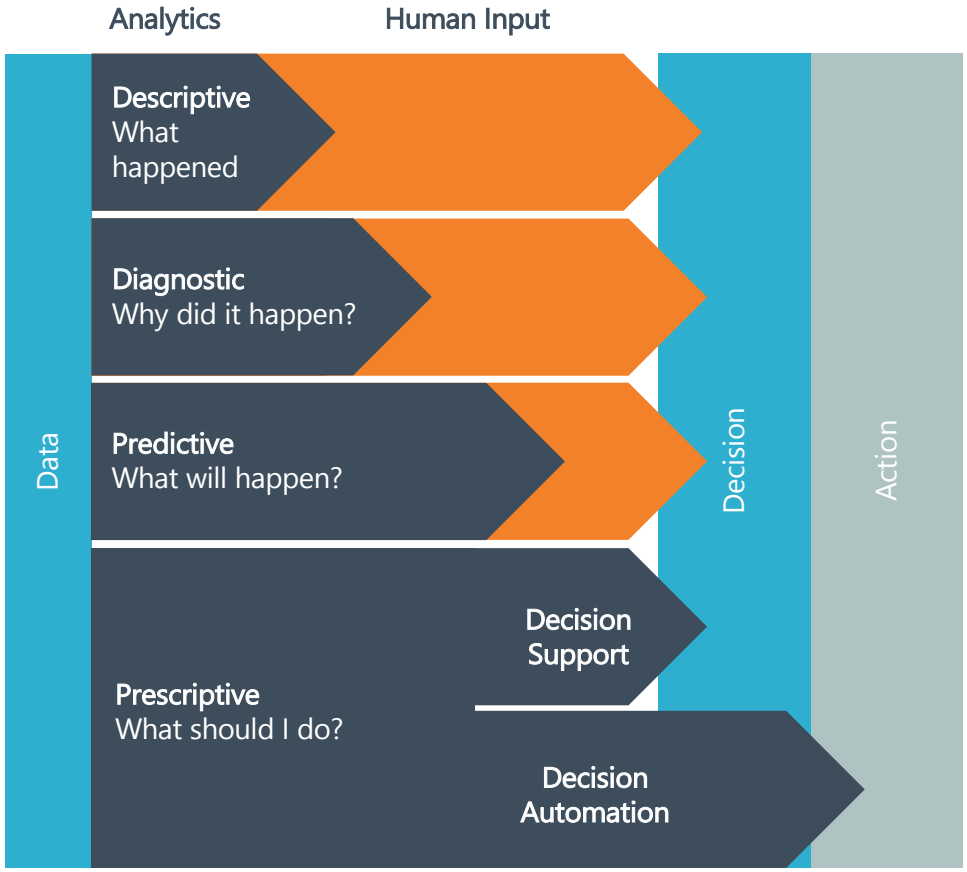
Diagnostic analytics is a more advanced form of analytics which examines data or content to answer the question "Why did it happen?" Techniques used include drill-down, data discovery, data mining and correlations.

Predictive analytics is a form of advanced analytics which examines data to answer the question "What will happen?" Techniques applied include forecasting, pattern matching, and predictive modeling.

Prescriptive analytics is the most advanced type of analytics and seeks to answer the question "How can we make it happen?" Techniques used include simulation, neural networks, heuristics, and machine learning.

Analytics Definition and Maturity Model

As you move up the maturity curve, the role that people play in contextualizing the results and making decisions evolves as well. At the lower levels of maturity, human involvement is high. As the analytical tools get more advanced, the tools take on increasing amounts of the work, eventually at the most mature levels even aiding in or making decisions.



Source: Gartner

The Potential of Artificial Intelligence

Through Artificial Intelligence (AI) we can develop tools to carry out increasingly intelligent behaviours or tasks. Public sector organizations may use these new innovative applications to enhance their operations, and address some of the most difficult policy issues of our time.

Some of the most exciting AI capabilities include, but are not limited to:

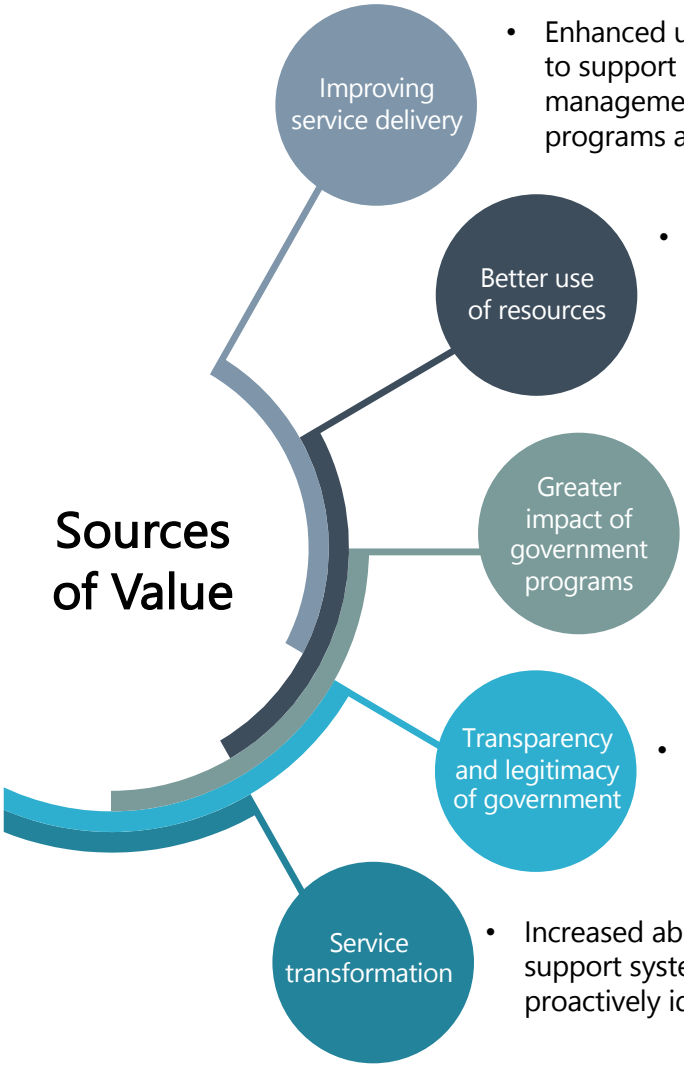
- Computer vision, enabling computers to process and analyze digital images or videos.
- Natural language processing, enabling computers to process and analyze human language.
- Deep learning, that continuously analyzes data to improve predictions or decision-making.

Despite its significant potential, there are several policy and organizational elements that need to be in place to successfully use AI, including large amounts of high-quality data, advanced expertise, powerful computing capacity, and an enabling policy environment including privacy and ethics.

In addition, change in organizational culture to support increasingly complex data analytics is essential.

Sources of Value of Analytics for Public Sector Organizations

As outlined below, public sector organizations can gain significant value from analytics. These benefits are not mutually exclusive, and depend on the broader environmental context. Certain sources of value may be prioritized and pursued more actively than others.



- Enhanced understanding of clients' experience and needs to support the development, implementation, and management of more client-centred and responsive programs and processes.
- Enhanced ability to identify waste, streamline and automate processes, and reduce redundancies so that resources are deployed in the most efficient and effective manner.
- Supporting policy development based on evidence, and the ability to establish and measure outcomes to continuously improve programs and services to increase their impact.
- Improved confidence and trust in government and increased citizen engagement.
- Increased ability to use evidence to inform, plan, and support system and service transformation including proactively identifying and addressing risks.

Data as a Corporate Asset

Data is a basic requirement in all analytics, and public sector organizations have access to a lot of data from many different sources. Organizations need to recognize their data as a corporate asset. Like other strategic assets – such as people, capital, and facilities – data needs to be actively managed and developed.

Recognizing data as a corporate asset requires a cultural shift, and putting in place the strategies, structures, and processes to manage it effectively. These changes will require significant organizational change. Fortunately, many public sector organizations are already well along this path and are successfully leveraging data to improve decision-making and service delivery.

Data needs to be managed like any strategic organizational asset.

High-Potential Domains for Analytics in the Public Sector

The opportunities for analytics in the public sector are widespread. Many organizations across Canada, and internationally, are pursuing and getting significant value from the use cases identified below.

Transactional Services

- Leverage performance indicator data to improve performance against service standards and inform resource planning.
- Leverage AI to triage and answer citizen queries with chat bots.
- Improve efficiency by identifying waste in internal processes.

Healthcare

- Plan and allocate health services based on the needs and characteristics of a local population.
- Identify, plan, and deliver health quality and efficiency initiatives and strategies.
- Leverage AI to triage patients, support diagnosis, assist with care planning, and eventually contribute to treatment.

Urban Issues

- Use positional data from vehicles and smartphones to visualize real-time and historic traffic conditions.
- Plan transit routes based on use patterns and future development.
- Use predictive models to support law enforcement resource planning, allocation, and interventions to increase public safety.

Social Services

- Visualize and integrate data from multiple domains to understand complex patterns in service use and project future needs.
- Predict and identify instances of fraud in social assistance programs.
- Predict complex social outcomes such as homelessness and develop evidence-based interventions.

Education

- Monitor student performance.
- Understand teaching practices.
- Identify where educational resources or performance are lacking or exceptional.
- Identify children who might be struggling academically and where intervention is needed.

Regulatory

- Predict inspection results to support the implementation of risk-based inspections to reduce costs and protect the public.
- Identify areas where regulatory mechanisms are needed to protect the public, and where existing regulations need evaluation to test if they are having their intended impact.

Immigration

- Identify patterns and indicators of conflict to help identify vulnerable populations.
- Predict risk to help inform and facilitate visa applications.

Agriculture

- Analyze weather and satellite data to inform crop strategies, and formulate optimal agricultural policies.

Opportunities for Service Delivery Organizations

Analytics provide opportunities for service delivery organizations to improve the customer experience, encourage a shift from in-person to online channels, improve efficiencies, as well as enhance quality and effectiveness of transactions.

Customer Experience

Analytics can be used to improve customer experience by analyzing customer feedback and responding to customer service issues, reviewing wait time data to adjust staffing and capacity for peak periods, and by analyzing the questions asked by customers to provide better and more timely information on how to complete transactions.

Channel Shift

Analytics can be used to identify patterns of channel use and the demographics of who is using which channels. This information can be used to address concerns of specific groups with respect to channel usage, and to provide active support to encourage channel shift.

Improve Efficiencies

Analytics can be used to break down transaction data to identify drivers of transaction time and to develop approaches to reduce transaction time.

Improve Quality and Effectiveness

Analytics can be used to identify common sources of errors in transactions to support the development of solutions which will help to reduce future errors and re-work and help to ensure the appropriate outcome is achieved for every transaction.

By using analytics to improve the customer experience and efficiency and effectiveness of transactional services, service delivery organizations can become analytics leaders and model the transformational impact of analytics for other parts of government.

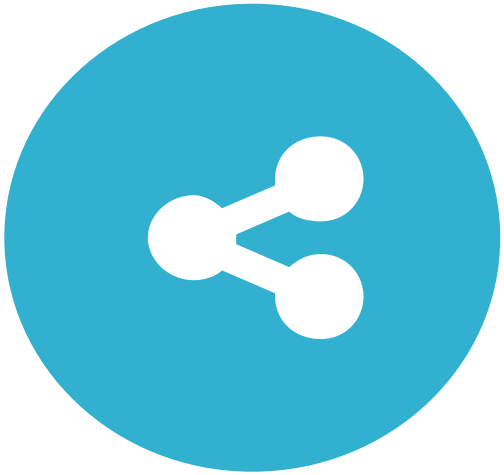
3. Creating an Enabling Environment for Analytics

Creating an Enabling Environment for Analytics

While public sector organizations can do a lot to advance analytics within their own organizations, they must operate within their larger policy and political environment. For the public sector to realize the potential of analytics, the policy and political environment needs to direct and support organizations to share, exchange, and use data in ways that align with and contribute to public interests.

Ethics and Privacy

Data Access, Data Exchange, and Open Data



Public Sentiment, Trust, and Transparency

Privacy

Public sector organizations have access to some of the most personal and sensitive information about citizens, businesses, and other sectors. To ensure this information is protected and used appropriately, there needs to be a robust policy framework that includes privacy and ethics.

In the current environment, there are several challenges that act as barriers to organizations using analytics in ways that align with public interest:

- The regulatory and legislative landscape is complex, and involves many levels of government and different requirements in different jurisdictions leading to a patchwork of regulation across the country.
- Existing privacy frameworks limit data access and data sharing, creating silos within and between organizations, often requiring formal legal agreements and significant administration to facilitate data sharing and exchange.
- Risk-averse operational interpretations of existing privacy frameworks, and organizational cultures often reinforce silos.

For the public sector to realize the full potential of analytics, there needs to be a pan-Canadian framework that reduces complexity and enables the use, sharing, and exchange of data to enable analytics and data-informed decision-making. This framework needs to define:

- The rules associated with the collection, storage, use, and disclosure of personal information.
- Guidance on interactions and exchange between public and private sector organizations.
- Data ownership and rights.
- Security and protection requirements.
- Review and enforcement mechanisms that are both robust and fair.

Global Examples

The **European Union's** General Data Privacy Regulation and **California's** Consumer Privacy Act guide corporate collection and use of personal information and include protections such as requiring consent, anonymization, disclosures and giving individuals more control over their personal data.

Privacy by Design

Privacy By Design (PbD) is the leading framework for working with citizen data. Its key features are:

- Privacy as the **DEFAULT** Setting
- **PROACTIVE** not reactive
- Privacy **EMBEDDED** into Design
- End-to-End **SECURITY**
- **RESPECT** for user privacy
- **VISIBILITY** and **TRANSPARENCY**
- **FULL FUNCTIONALITY**

Ethics

Advances in analytics, such as artificial intelligence and machine learning, are largely unanticipated in traditional ethics frameworks. While these present great opportunities, they also raise ethical concerns, such as bias in algorithms, and potentially increase privacy risks.

Canada is investing heavily in making our country a leader in artificial intelligence by investing $125M in a Pan-Canadian Artificial Intelligence Strategy. This investment will promote research in AI and support the development and retention of talent.

At the same time, the Government of Canada recognizes the potential ethical issues that can arise from the use of AI. It has developed guiding principles for the effective use of artificial intelligence within government. These are:

- "**Understand and measure** the impact of using AI by developing and sharing tools and approaches.
- **Be transparent** about how and when we are using AI, starting with a clear user need and public benefit.
- **Provide meaningful explanations** about AI decision making, while also offering opportunities to review results and challenge these decisions.
- **Be as open as we can** by sharing source code, training data, and other relevant information, all while protecting personal information, system integration, and national security and defence.
- **Provide sufficient training** so that government employees developing and using AI solutions have the responsible design, functional, and implementation skills needed to make AI-based public services better".

In addition, the Government of Canada has recently issued a Directive on Automated Decision-Making, the objective of which is "to ensure that Automated Decision systems are deployed in a manner that reduces risks to Canadians and federal institutions, and leads to more efficient, accurate, consistent and interpretable decisions made pursuant to Canadian law".

The Directive requires an Algorithmic Impact Assessment prior to implementing an automated decision-making system. The nature and extent of this assessment depends on the potential impact of the algorithm. The Directive also has requirements on transparency and quality assurance.

Protecting Against Bias

As public organizations use data to inform decisions, they need to be conscious of bias and whether bias is inadvertently built into algorithms. This is particularly important as organizations move up the maturity model into machine learning and AI, as there are fewer opportunities for review, and detection is harder. Algorithms may use non-fundamental variables such as race, religion or gender to generate outcomes. Additionally, the underlying data that was used to train the algorithms may be biased and embedded with societal bias. This area needs further exploration and oversight to ensure practices are established to respond to and address bias.

https://techvibes.com/2017/03/23/canadian-government-to-invest-125-million-into-artificial-intelligence-strategy

https://www.canada.ca/en/government/system/digital-government/modern-emerging-technologies/responsible-use-ai.html

https://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=32592

Data Access, Data Exchange and Open Data

While most organizations understand the need to make data-informed decisions, many keep data in silos. These silos between organizations and even within organizations restrict data access, thereby limiting analytical uses and the value they can bring.

In recent years, there has been a movement in governments across Canada, and internationally, to advance open data policies and initiatives to increase transparency, empower citizens, and enhance collaboration - as well as generate economic and social value from government data assets.

Enabling access to data and creating an environment where data can be shared are essential to deriving value from analytics. Although this movement has progressed, there is still more work to be done to reduce data ownership concerns, reduce barriers to data access and exchange, and enable secure transfer and use of personal information. The ability to share and aggregate data from several sources is key to using analytics to identify patterns and interactions that may not be evident in one data set alone.

Additional Benefits of Open Data

Open data policies were put in place primarily to support government transparency, but they have also led to a change in perception within public sector organizations. The value and potential for new uses of data under public sector stewardship are increasingly being recognized. Additionally, to prepare data for public access, governments have invested in building data management, analytics, and reporting capabilities, all of which will have long-term value.

Open Data in Canada

According to the Open Data Barometer Report From Promise to Progress issued by the World Wide Web Foundation in September 2018, Canada stands #1 in open data (tied with the UK), and has made significant progress since the inception of the report which can be found at https://opendatabarometer.org/leadersedition/report/#findings. Open Government programs in Canada can be found at https://open.canada.ca/ en/maps/open-data-canada#toc1.

Canada Open Government Working Group

Supported by the Institute for Citizen-Centred Service, the Canada Open Government (COG) Working Group is a forum for multi-jurisdictional information sharing and collaboration on open government initiatives, tools, and principles, including those on common open data, open information, and public engagement across jurisdictions. More information can be found at https://iccs-isac.org/councils/joint-councils/open-data-and-information-working-group

Global Example

The **Government of Singapore** has developed a centralized data sharing platform called APEX which allows public agencies to share data using application programming interfaces (APIs). It includes a catalogue and self-service portal, and the APIs in the platform are reusable for integration with other applications, or for analytics.

One to the biggest cultural barriers to advancing open data for use in analytics is the concept of data ownership.

Public Sentiment, Trust and Transparency

Citizens want digital services and improvements that enhance the effectiveness and efficiency of government. They are generally comfortable with the collection and use of data as part of their transactional experiences. However, it's important to consider public attitudes towards the use of data by public sector organizations more broadly.

Recent news about the inappropriate use of data have heightened sensitivities and undermined public trust. This becomes increasingly important as more advanced analytic methods such as artificial intelligence go beyond the public's general understanding and introduce new risks and challenges.

The concept of trust between public sector organizations and citizens is complex. Evidence shows that more needs to be done to engage the public on this topic to understand their perceptions on the appropriate use of data and build social acceptance.

Going forward, it will be critical for governments to:

- Authentically engage the public in the development of policy, even for complex topics such as artificial intelligence.
- Communicate the potential value of analytics.
- Articulate what's being done in terms of controls, processes and governance to make sure the use of analytics protects public interest.
- Be transparent about the use of data.

Building public trust and transparency will be essential as analytics programs move forward.

Spectrum of Public Engagement Techniques

Inform – sharing and disseminating information

Consult – collecting information through input or feedback

Deliberate – two-way communication to understand and discuss options

Collaborate – shared creation and co-design to develop solutions

Call to Action

Organizations can only make so much progress on their own in the absence of an enabling policy framework that supports the use of analytics for public benefit. Additionally, with so much interest across the country, and high potential for partnership in this area, it will be critical that public sector organizations work within a guiding pan-Canadian framework.

There are a number of priority actions for the Deputy Minister's Table, and Joint Councils, to ensure Analytics is a focus for the public sector moving forward.

Establishing an enabling legislative and policy framework to harness the potential of analytics, including privacy and ethics.

Developing a common pan-Canadian framework to ensure organizations approach data standards and analytics consistently, and avoid creating data silos.

Conduct public engagement to assess public sentiment and educate the public on the value of analytics.

Explore parameters to guide the interaction of public and private sector organizations with respect to data exchange.

4. Key Success Factors of Data-Informed Organizations

Key Success Factors of Data-Informed Organizations

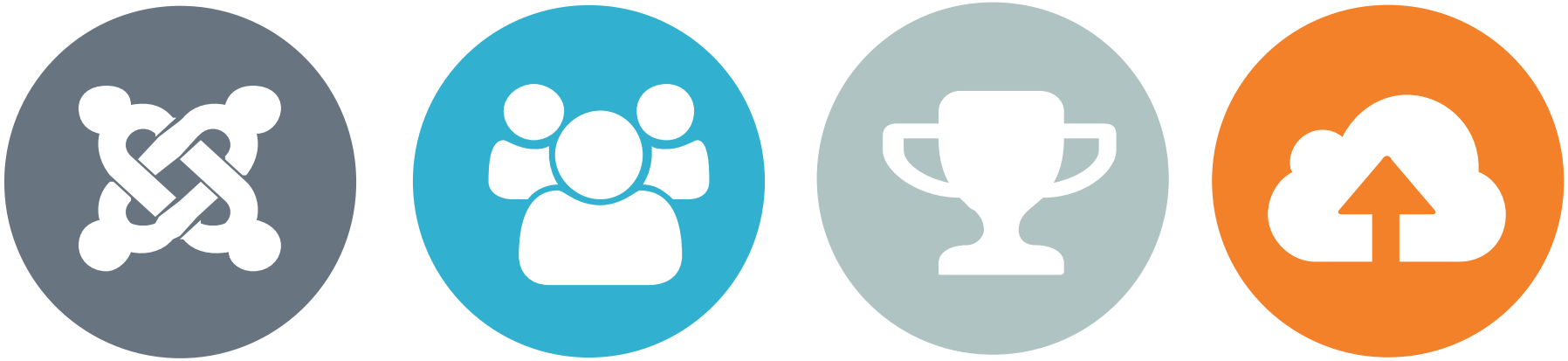
For public sector organizations to realize the full potential of analytics, there are four main success factors that need to be in place, or supported at an organizational level.

Culture

Leadership and Collaborative Governance

Capacity and Competencies

Data Management and Technology Infrastructure



Culture

While analytics helps inform decision-making, it's ultimately people that take that information and do something with it. Therefore, culture is a key contributor to organizations realizing the value of analytics.

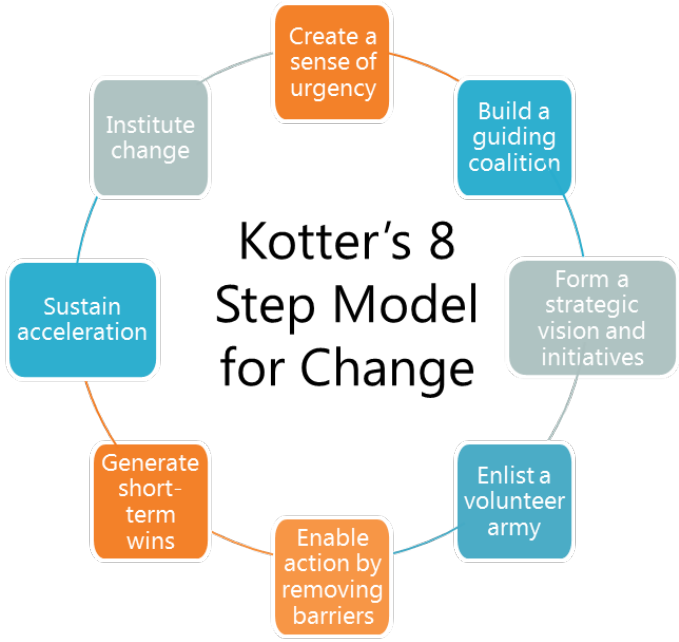
Organizations that recognize data as a corporate asset and re-enforce the use of evidence and measures to inform decision-making will perform better than organizations with a culture that re-enforces decision-making based on personal philosophies, anecdotes, and political factors.

For many organizations, this will be a big change. Becoming more data-informed will transform relationships, reporting structures and decision-making, so a change management approach should be taken.

Key steps to move towards a data-informed culture

- Communicate a vision and strategy for data and analytics, and their role within the organization.
- Set the tone at the executive level by incorporating data and analytics into executive team discussions.
- Hire data-informed people, and provide training and development opportunities for existing staff.
- Accept smart risks and encourage people to experiment, explore new approaches, and innovate.
- Recognize and reward data-informed decision-making and innovation.
- Make all aspects of operations data-informed (e.g. staff performance reviews) not just program or service decisions.

A survey found that 81% of respondents agree that data should be at the heart of all decision-making, however, most organizations do not use data to support this level of decision-making.



Leadership and Collaborative Governance

Executive leadership is one of the key differentiators between organizations that achieve the objectives of their analytics programs and those that under-perform.

Many data-informed organizations in the public and private sectors have created Chief Data or Information Officer positions who are responsible for data management and analytics leadership. Organizations which establish clear leadership accountability for data and analytics report a higher level of success in achieving their analytics objectives.

For analytics leaders to be successful they need broad support and buy-in within their organization. This requires collaborative governance of analytics programs and the engagement of senior management teams. The structures and processes need to be in place to set a shared vision for data and analytics, and make decisions on how to go forward with an organization's analytics agenda.

Chief Data Officers can play an important role in leading the development of a data strategy for the organization as a whole – and in building support for the strategy throughout the organization.

Executive buy-in and leadership as well as engagement and collaboration with program areas were essential to the successes outlined in the analytics case studies featured later in this playbook.

Chief Data Officers

Chief Data Officers are executive leads who have the accountability for an organization's enterprise wide data and analytics strategy, data governance, frameworks and standards, policy development, and business intelligence. Functions may include information technology and management, privacy, data quality, data lifecycle management, and how data assets can be leveraged to generate value.

Capacity and Competencies

Public sector organizations need to make sure that they have the capacity and competencies to manage their data, conduct analytics, and use and interpret the results.

This will require bringing new skillsets into the public sector through hiring and training. More advanced types of analytics will require investing in specialized data-science capacity. However, all organizations will benefit from improving data literacy more broadly so that everyone has basic analytical skills and uses analytics appropriately to support their duties.

Democratizing Data Literacy and Building Collaborative Teams

Not all analytics needs people to have advanced data science skills, and public sector organizations will realize more value and will develop a more data-informed culture by building data literacy across their organization.

Even more advanced analytical models and tools need human action or decision-making to have impact. People need to trust the results, understand how to interpret and use the information coming from analytic models, and put the results into context.

The business questions or problems that are being solved with analytics need to be identified. This means that program and service managers need to work collaboratively with analytics experts.

Organizations across the public and private sector are struggling to build data science capacity since they are a scarce and expensive resource.

Building Specialized Data Science and Advanced Analytic Capacity

Basic literacy is important, but leveraging the power of more advanced analytical models requires a specialized skillset.

Specialized data and analytic skills and knowledge include:

- Designing statistical models and analyses
- Programming (R and Python)
- Machine learning, deep learning AI
- Geographic information systems and spatial analysis
- Data visualization
- Data architecture
- Risk analysis, process improvement and systems engineering

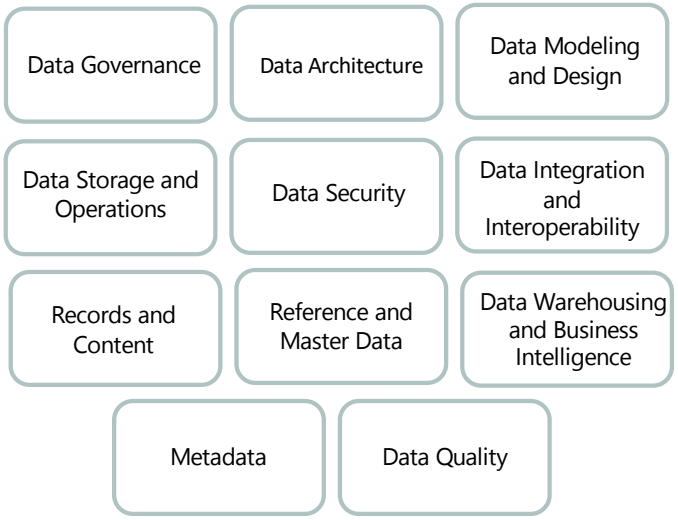
Public sector organizations will be competing with the private sector for these skillsets. Public sector organizations need to give unique consideration and planning to attract these in-demand individuals and appropriately deploy them across organizations. Attracting and retaining these individuals requires specialized consideration in terms of job structure, incentives, and team culture.

Data Management and Technology Infrastructure

The quality of the insights from analytics depends on the quality of the underlying data. Public sector organizations deal with increasingly large and complex datasets. To manage and use this vast amount of data, organizations need the right guiding frameworks, tools, and underlying supporting infrastructure to ensure that data is of high quality, protected, and accessible – and that the right analytical tools are available to get information and insights to the right decision makers within the organization.

Data Management

The Data Management Association (DAMA) sets out the body of knowledge for data management and includes a number of critical areas for organizations to develop to ensure they have high quality data and can trust the analytics that leverage it.



Supporting Infrastructure and Tools

To have impact, data needs to be transformed into information and insight through analytics. The simple end of the maturity curve can be managed using existing applications and tools. However, different tools are needed to democratize analytics and get the insights and information into the hands of decision-makers where and when they need it. Having the necessary infrastructure and tools will also help to attract and retain data science skill sets within an organization.

As you move up the maturity curve, more advanced analytic models require more advanced applications and tools, including:

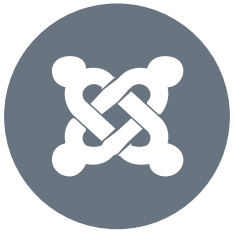
- Statistical analysis tools
- Data exploration tools
- Data visualization and business intelligence tools
- Data reporting tools, especially with self-serve functionality
- Enhanced computing power and storage capacity
- Programming (R language and Python)
- Advanced analytics/machine learning applications

This technology infrastructure is critical to support analytics, but organizations need to be purpose-driven in what technology is acquired. This means first establishing clear business requirements and use-cases before investing in technology.

Data quality is one of the biggest issues facing data scientists and yet many organizations are not taking the action they need to improve it.

Featured Case Studies

The featured case studies in Section 6 of this document demonstrate the importance of these key success factors in the successful use of analytics in the public sector.



Culture:
- Case studies from Service BC, ESDC, Ontario Digital Service, Government of Manitoba and IRCC demonstrate the importance of clearly understanding how analytics would add value to the organizations, and that staff clearly understand the intent of the product or tool.
- Service Nova Scotia highlights the need to demonstrate the business value of analytics early and often.

Leadership and Collaborative Governance:
- All case studies note that it is critical to have senior executive support and buy-in.
- Service BC highlights that it is important to build collaborative and inclusive partnerships with experts within and across government.

Capacity and Competencies:
- Case studies from Service Nova Scotia, York Regional Police and Government of Manitoba highlight the need to have both business and technical expertise involved in analytics initiatives.
- York Region Police highlights the need to train staff on technical knowledge to support and maintain products and tools moving forward.

Data Management and Technology Infrastructure:
- Service Nova Scotia and Service BC highlight the need to decommission legacy processes made redundant by analytics.
- York Regional Police suggests that organizations should always leverage data that exists within an organization and to not go after data that does not exist, unless organizations have to.
- Service Nova Scotia, York Regional Police and Service BC suggest using an agile and iterative approach.

5. Getting Started and Moving Up the Maturity Curve

Start by Solving Real Problems

As organizations or teams begin their journey with analytics there are some key steps to consider. You don't need to wait for broad policy changes or organizational strategies. Get started today with the following.

1 Define the Business Problem

1) Focus on the business use for analytics and pick a problem to solve that is manageable, real, and can demonstrate results.
2) Get executive support and buy-in and put together a team with program or service area expertise, analytics, and IT (if needed).

2 Plan the Project

1) Scope the project and develop a project charter that includes a project plan, work effort, and timelines.
2) Identify at a high level the data that will be used, the type of analysis that will be conducted, and how the result will be communicated and used to inform decision-making.
3) Consider a pilot project, such as testing one hypothesis, or using a subset of data to determine if the analysis provides the intended results before undertaking a full project.

3 Assess Data Availability

1) Assess what data is needed and consider its access and ownership.

A Access the Data

1) Prioritize data you can access directly, and identify data which may need to come from other entities.
2) Gain access to the required data.
3) Standardize and integrate data from different sources – if data quality is an issue, implement a data cleaning process.

B Create the data

1) Create a plan to generate required data.
2) Execute plan to create and collect data.

4 Conduct the Analysis and Develop Insights

1) Complete the planned analysis, start simple and increase complexity over time, moving to predictive and prescriptive analytics as capacity increases.
2) Scale the project to include additional data sources or to address additional questions.
3) Based on the data analysis and presentation through visualization tools, key insights should show how program delivery could be enhanced/improved based on the insights.

5 Translate Insights into Action

1) Translate insights into action, test the improvements, and measure impact of the improvements through ongoing analysis of results.

Getting Executive Support and Buy-In

If you need to get approvals or secure additional resources to support your analytics project, there are a few key items to consider in the business case.

- Clearly articulate the business problem and the challenge you are going to use analytics to solve.
- Demonstrate how the project contributes to your organization's objectives.
- Demonstrate the potential value of the project.
- Have a clear and reasonable ask.
- Keep the business involved throughout the process.

Moving Up the Maturity Curve

As organizations execute increasingly sophisticated analytics projects, they must develop their organizational "infostructure" and build out each of the success factors so that there is a clear organizational framework and strategy to support analytics.

Scaling up the use of analytics across an organization or leveraging more advanced methodologies will require organizations to become increasingly sophisticated in each success factor, in parallel. These should be done as the overarching policy framework and public sentiment allows for new opportunities to derive value from public data.

	From	To
Culture	• Decision-making largely by intuition and personal philosophies. • Limited awareness of the value of analytics. • No regular tracking or reporting of performance.	• Development of measurement and KPIs. • Decision-making based on evidence. • Ongoing innovations to enhance data-informed decision-making. • Funders require data-informed decision-making. • Funding for data maintenance and usage is available.
Leadership and Collaborative Governance	• Leadership has limited understanding of how data can be used to achieve the organization's goals. • There is no accountability for leadership of analytics on the executive team.	• Leadership has a clear vision for analytics and its role in the organization. • There is accountability and expert leadership of data and analytics on the executive team. • Move toward horizontal governance and problems solving.
Capacity and Competencies	• Generalists are responsible for analytics, and there is no analyst or data science capacity. • Data analytics competencies include basic descriptive analytics.	• Skills shortages are not an issue, analysts and data scientists work in integrated teams. • Data analytics competencies include advanced data science. • Staff at all levels of the organization are data literate.
Data Management and Technology Infrastructure	• Data is not available or accessible and quality is poor. • No policies, process or data governance in place. • Basic analytical tools are available.	• Relevant data is available, accessible, and high quality. • Analytic tools are widely available for staff to explore data. • Visualization tools are widely available to provide intuitive presentation of data to support data informed decision-making. • Organization has policies in place for the use, transfer, and sharing of data internally and externally. • More advanced analytic tools and infrastructure (storage and computing) are available.

Moving Up the Maturity Curve

Culture

The level of cultural change is significant and should not be underestimated. This change needs to be led from the top of the organization using a change management approach.

Key Steps to Advance

1. Senior leadership teams need to articulate the role that analytics will play in the organization, including expectations for how it will inform decision-making.
2. Assess organizational readiness, and develop a change management strategy to support cultural change.
3. Incorporate analytics into executive team meetings to support discussion and decision-making.
4. Demonstrate evidence-based decision-making in action in all parts of the organization's operations.
5. Recognize and reward the use of analytics. As pilot projects are implemented, and the value demonstrated, build champions who can advocate and promote analytics across the organization.

Leadership and Collaborative Governance

Advancing the use of analytics will require strong leaders who are willing to engage and collaborate with their partners to set the direction across the organization.

Key Steps to Advance

1. Hire a Chief Data Officer.
2. Establish a centralized team for analytics leadership, framework development, and support within the organization and to build analytics muscle.
3. Clarify accountability and the roles and responsibilities for data and analytics within the organization.
4. Engage the broader organization and business areas to set the organization's direction and priorities for analytics.
5. As pilot projects are implemented, build a strategy for scale, increasingly more advanced analytic tools, and to incorporate lessons learned.
6. Stay connected with, contribute to, and align with changes occurring to the enabling policy framework.

Moving Up the Maturity Curve

Capacity and Competencies

Data-informed organizations require a base level of data literacy across the organization as well as specialized analytic and technical capacity.

Key Steps to Advance

1. Conduct a current state assessment to identify existing competencies and capacities across the organization.
2. Take a multi-pronged approach to acquire and develop capacity in the organization, according to the overarching strategy.
3. Build data literacy through training and development of data, statistics, and analytical tools.
4. Recruit for data scientists and advanced analytic skill-sets as project needs advance.
5. Create communities of practice related to analytics to share lessons learned, and develop approaches to solving problems which arise in analytics initiatives.

Data Management and Technology Infrastructure

Organizations should not minimize the level of effort required to ensure reliable high quality data, and should make strategic investments to acquire and implement the analytical tools needed to achieve their objectives.

Key Steps to Advance

1. Implement data management best practices including improving data quality, establishing processes, and defining data governance.
2. Conduct a needs assessment for analytic tools and technology.
3. As the use of advanced analytics increases, make strategic investments to build infrastructure and acquire supporting tools to enable analysis.
4. Supporting tools should include data visualization tools, which enable interpretation of data for data-informed decision-making.
5. Leverage a change management approach to support implementation across the organization.

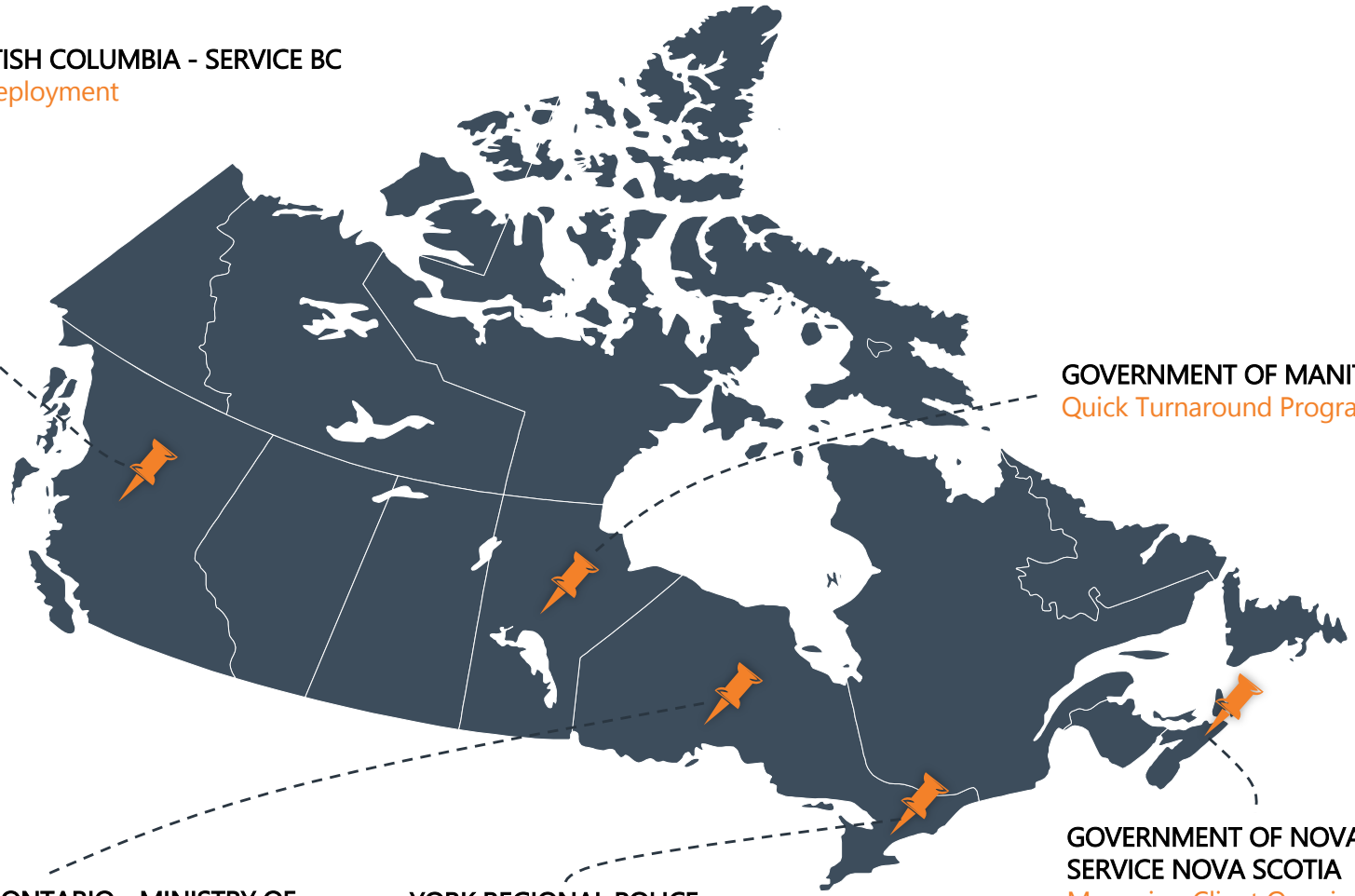
6. Feature Case Studies

Case Study Summary

GOVERNMENT OF CANADA – EMPLOYMENT AND SOCIAL DEVELOPMENT CANADA
Artificial Intelligence Strategy and Automated Processing

GOVERNMENT OF CANADA - IMMIGRATION, REFUGEES AND CITIZENSHIP CANADA
Augmented Decision-Making To Support Visitor's Visa Issuing Process

GOVERNMENT OF BRITISH COLUMBIA - SERVICE BC
Business Intelligence Deployment



GOVERNMENT OF MANITOBA
Quick Turnaround Program

GOVERNMENT OF ONTARIO - MINISTRY OF GOVERNMENT AND CONSUMER SERVICES
Open Data and Data Sharing

YORK REGIONAL POLICE
Enhancing Real Time Operations, Strategic Frontline Policing and Investigations

GOVERNMENT OF NOVA SCOTIA - SERVICE NOVA SCOTIA
Managing Client Queuing at Access Nova Scotia Centres Offices

Case Study Summary

The following case studies demonstrate powerful and impressive results and show that Canadian public sector organizations are taking important steps on the data analytics journey.

Jurisdiction	Project	Maturity Model Alignment	Sources of Value				
			Improving Service Delivery	Better Use of Resources	Greater Impact of Government Programs	Transparency and Legitimacy of Government	Service Transformation
Government of Nova Scotia – Service Nova Scotia	Service Nova Scotia's Executive Team can visualize key performance indicators from millions of service transactions in a single dashboard enabling better management of service systems and improved client experience	Diagnostic	✓	✓			✓
York Regional Police	The police in York Region use visualization tools and predictive analytics to better plan, allocate, and manage resources and empower their front line to prevent crime before it occurs, improving community safety and enhancing public trust	Diagnostic - Predictive	✓	✓	✓		✓
Government of British Columbia – Service BC	Siloed program areas can share information, reducing redundant work effort, increasing efficiency and reducing client frustration	Diagnostic	✓	✓	✓		✓
Government of Canada – Employment and Social Development Canada	Natural Language Processing of agent case notes was used to support Service Canada operations, reducing redundant work and better utilizing staff talent to serve clients	Predictive	✓	✓	✓		✓

Case Study Summary

Jurisdiction	Project	Maturity Model Alignment	Sources of Value				
			Improving Service Delivery	Better Use of Resources	Greater Impact of Government Programs	Transparency and Legitimacy of Government	Service Transformation
Government of Ontario – Ministry of Government and Consumer Services	Changing culture and minds of the people of Ontario and ministry staff through the promotion of open data, as well as platforms for inter-ministry data sharing, to harness the full potential of available data and reduce redundancies	Descriptive		✓		✓	
Government of Manitoba	Program and policy makers could identify complex client and program interrelationships across health and social service domains to enhance value for money and improve access and outcomes of services	Descriptive			✓		
Government of Canada – Immigration, Refugees and Citizenship Canada	Augmented decision making to support visitor's visa issuing process	Predictive-Prescriptive	✓	✓	✓		✓

GOVERNMENT OF NOVA SCOTIA - SERVICE NOVA SCOTIA

Managing Client Queuing at Access Nova Scotia Centres Offices

Updated: April 2019

Contact: Daniel Gautreau, Director, Transformation (Daniel.Gautreau@novascotia.ca)

Service Nova Scotia

Service Nova Scotia's Executive team can visualize key performance indicators from millions of service transactions in a single dashboard, enabling better management of service systems and improved client experience.

Context

Service Nova Scotia (SNS) touches every citizen, business, and municipality in Nova Scotia. SNS conducts over five million client interactions each year for many programs and services, across a variety of channels, on behalf of the government.

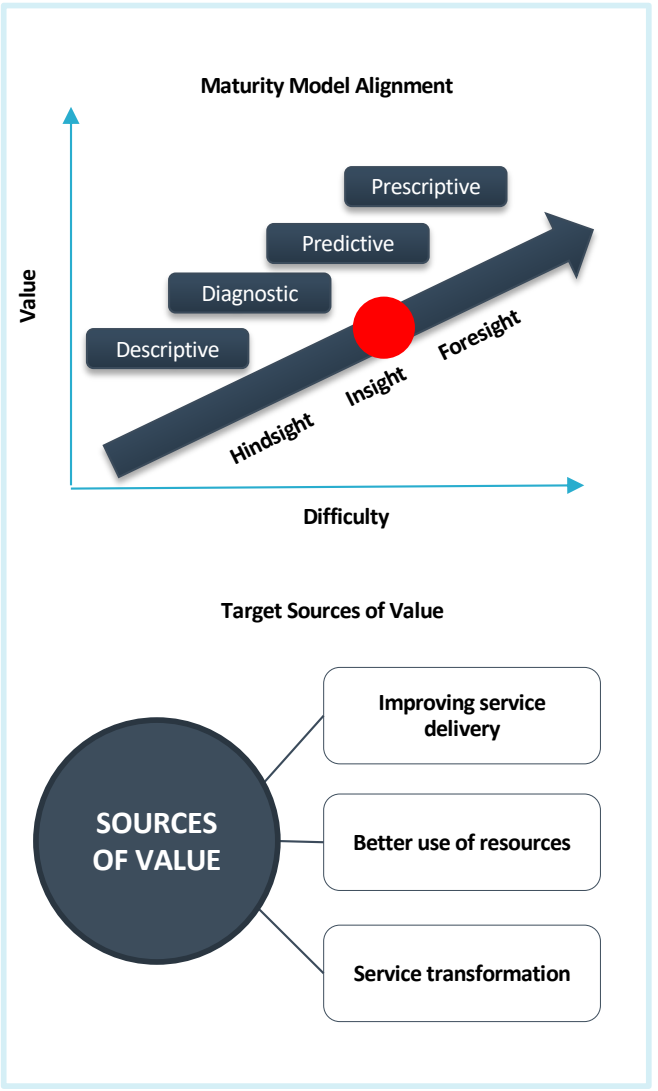
SNS uses a queuing management and customer journey system to manage service interactions at Access Nova Scotia Centres (the SNS in-person channel) across the province.

The Business Problem

In FY 2015, the average client service level at Access Nova Scotia Centres was 67% of clients being served within 20 minutes - well below the service target of 80%. To improve service levels, SNS recognized that data collected by the internal systems could be better leveraged and utilized.

SNS identified the following challenges, which they wanted to overcome through the application of data and analytics:

- Inconsistent, error prone presentation of service level metrics caused by the practice of manually extracting data from internal systems into Excel to generate static weekly reports.
- Inability to correlate metrics related to client demand, workforce supply, and employee performance.
- Limited use of data to inform operations management and evidence-based decision-making with respect to service level patterns, wait times, and transaction times.
- Limited use of data to forecast workload and improve scheduling.
- Limited use of data to support employee performance management.



Service Nova Scotia

Results

Executives, Directors, Managers, and Supervisors now use analytics to leverage the metadata of over 10 million service transactions to generate powerful visualizations and dashboards that provide operational insights into a broad set of key performance indicators related to service levels, client volumes, wait times, and transaction times.

The CEO's dashboard presents a key service level metric (% of clients served within 20 minutes) by week, month and year for in-person service operations. It shows year over-year progress towards achieving the client service target of 80%, beginning at 67% in FY 2015, and then improving to 79%, 88% and 83% in the following three years.

Data analytics has been able to support evidence-informed decision-making and continuous improvement in a variety of ways including:

Service Level Management

- Variance analysis to identify what has happened and why.
- Scenario analysis to predict the impact of a change to hours of operation.
- Regression analysis to forecast client volume.

Workforce Management

- Employee schedule optimization.
- Employee performance management.

Operations Management

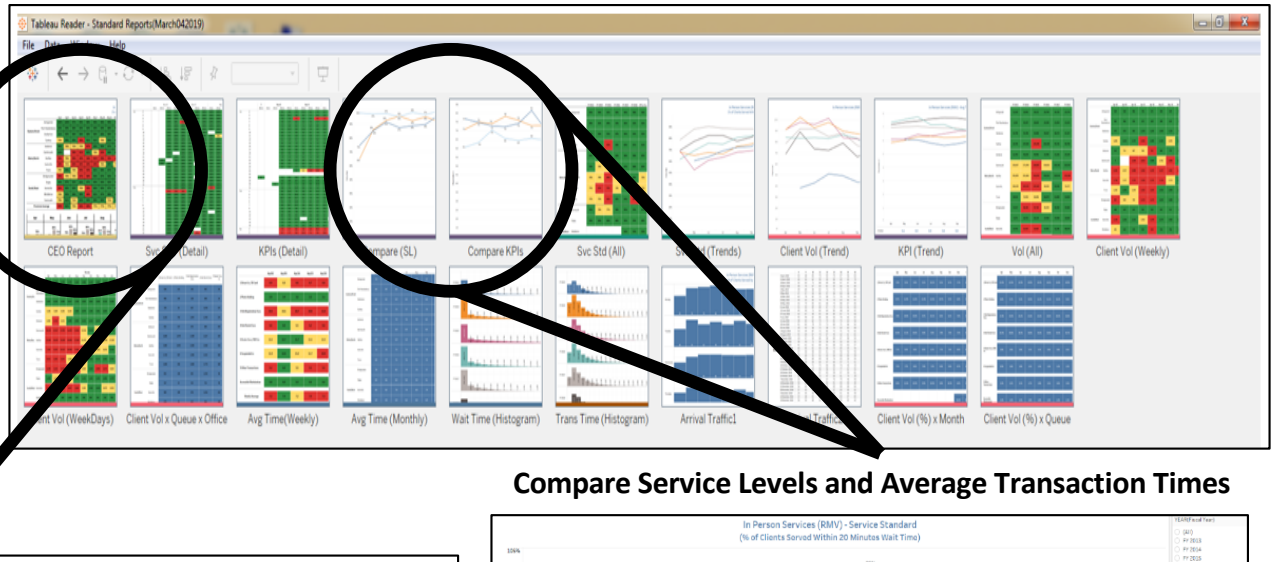
- Earned day off (EDO) feasibility analysis.
- Workload, productivity, and resource allocation analysis.
- Workforce compositions analysis.

Service Nova Scotia

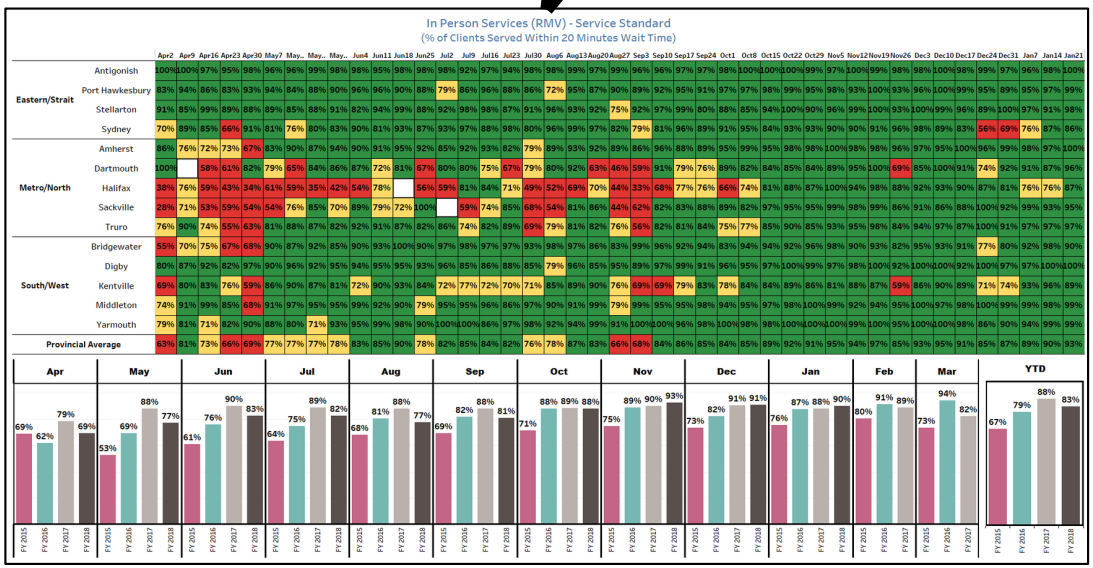
Results

This project demonstrates the considerable value that analytics can have on in-person service delivery. As a result, SNS is aggressively expanding the application and use of analytics and data visualization to support other programs and service delivery channels, including: phone, paper/mail, and digital.

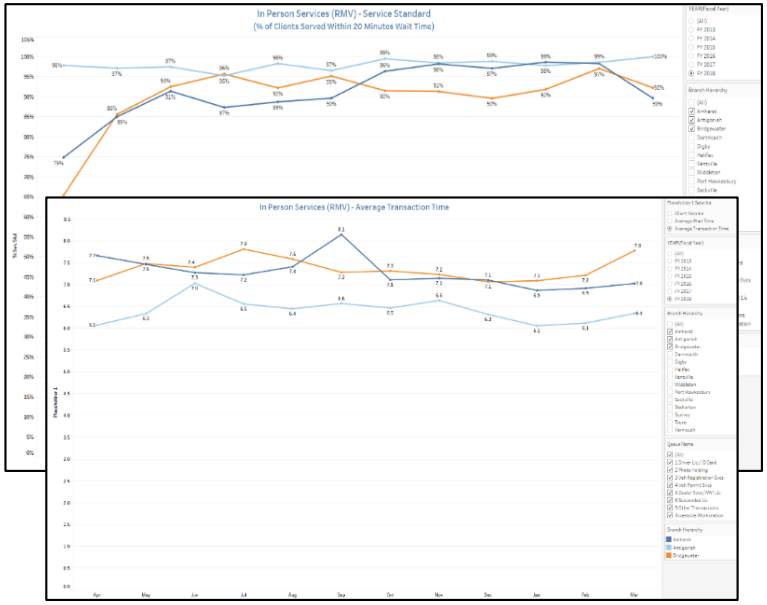
Developed Visualization Reports



CEO Dashboard



Compare Service Levels and Average Transaction Times



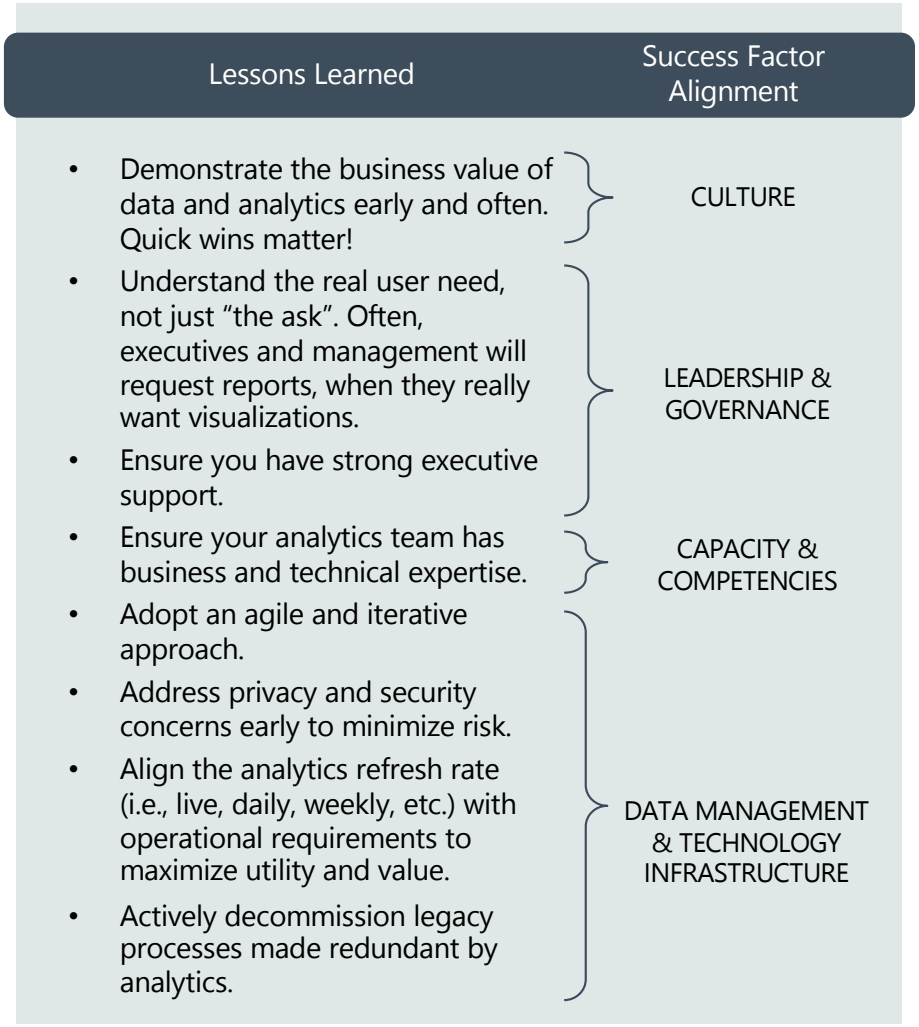
Service Nova Scotia

The Approach

With full access to queuing management data, the Analytics team at SNS used a commercial business intelligence software solution to calculate and present key performance indicators important to Supervisors, Managers, Directors, and the Senior Executive team, in ways that were helpful to manage the business and make evidence-based decisions.

SNS took a number of steps to successfully design, plan, and implement the use of analytics:

1. Clearly understood the business need and the opportunity.
2. Secured access and analyzed the queuing management data using BI software.
3. Developed a preliminary set of visualizations (a workbook) for users.
4. Rapidly iterated the preliminary visualizations/workbook to improve usability and utility.
5. Socialized the visualizations broadly to ensure user needs were being met.
6. Trained users on how to access, navigate, and use the workbooks.
7. Established a "power-user" group to ensure on-going improvement to the workbooks.
8. Decommissioned legacy processes and reports made redundant by the workbooks.
9. Encouraged a continuous improvement mindset towards the use of analytics.



YORK REGIONAL POLICE

Enhancing Real Time Operations, Strategic Frontline Policing, and Investigations

Updated: April 2019

Contact: Greg Stanisci, Assistant Manager Strategic Services Bureau, Business Intelligence and Analytics (5458@YRP.CA)

York Regional Police

The police in York Region use visualization tools and predictive analytics to better plan, allocate, and manage resources, and empower their front line to prevent crime before it occurs, improving community safety and enhancing public trust.

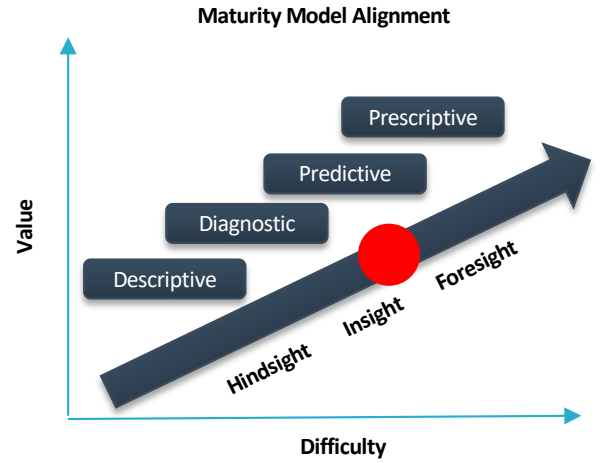
Context

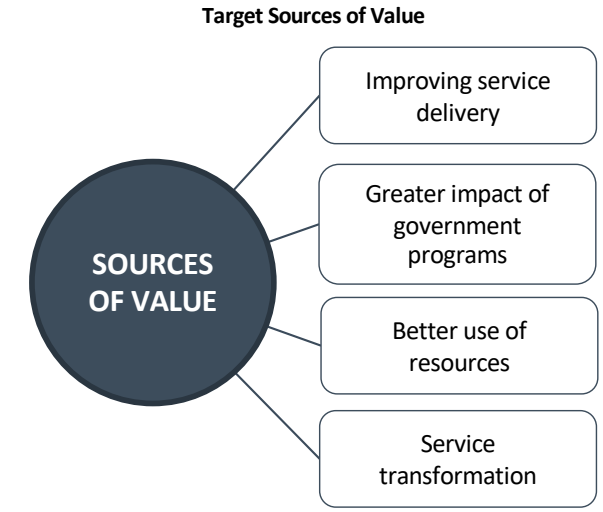
York Regional Police (YRP) serves approximately 1.13 million residents in one of Canada's fastest-growing and most-diverse communities. The hard work and dedication of 1,529 officers and 605 civilians has resulted in YRP's reputation as a national leader in law enforcement and crime prevention programs.

The Business Problem

YRP, like most other police services, has access to a significant amount of data. However, the use of this data to inform important operational or strategic decisions required the manual querying of multiple systems and in many cases was only possible by highly skilled technical staff. This challenge meant there was an organizational bottleneck on the potential insights lurking within YRP's data.

The Business Intelligence (BI) & Analytics (DA) team within YRP recognized the potential of the available data and worked with vendors and experts in the field of BI, DA, Data Warehousing and Machine Learning/Text Analytics to create a unique law enforcement solution that empowers everyone in the organization – from frontline officers and investigators, to senior commanders – with the information they need to be strategic and effective in their roles.



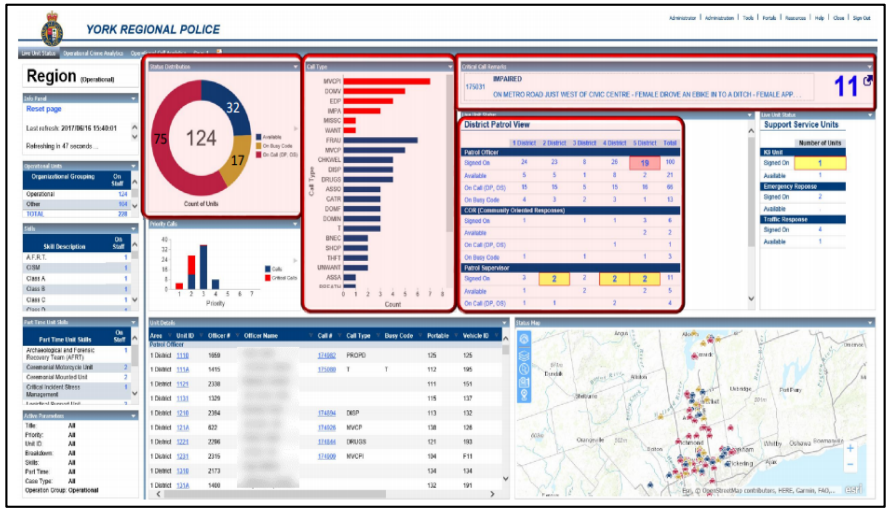


York Regional Police

Results

YRP created 11 Dashboards and 4 separate map based data visualization applications.

Dashboard – Live Unit Status



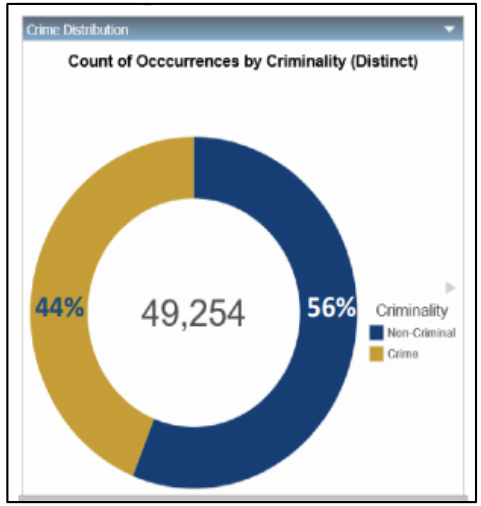
1

Real Time Operations Centre (RTOC) Live Resource Management, which allows the RTOC to monitor real time resource levels across five different Police Districts.

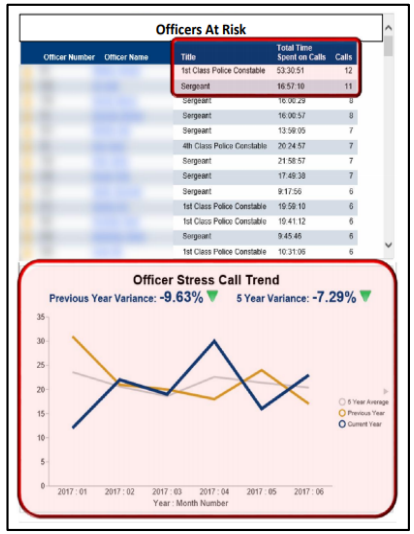
2

Economics of Policing - dashboard that analyzes the total cost of attending any call for service.

Dashboard – Economics of Policing



Dashboard – Officer Wellness



3

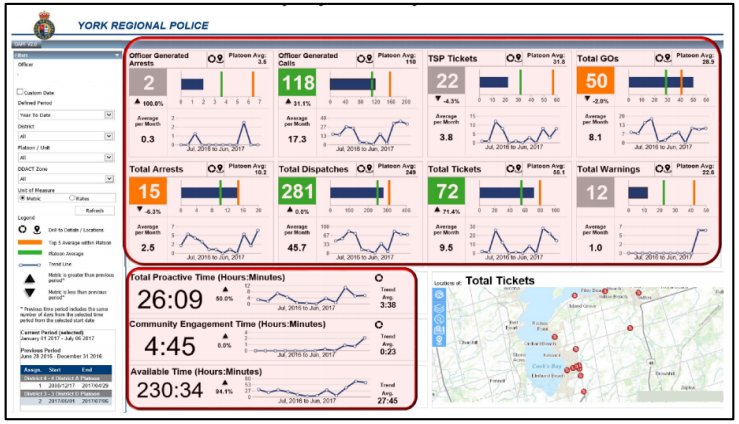
Member wellness dashboard that tracks how many high stress calls YRP members attend which informs member's supervisors, YRP Peer Support team, as well as YRP staff Psychologist.

York Regional Police

Results

YRP created 11 Dashboards and 4 separate map based data visualization applications.

Dashboard – Officer Activity by Priority Patrol Zone

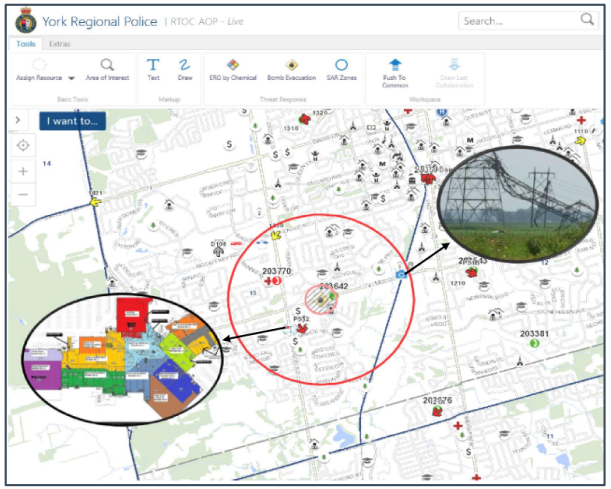


4 Frontline Officer Performance, enables YRP to track officer activities across more than 10 complex Key Performance Indicators (KPIs).

5 Emergency Management through map based solutions.

6 Crime trends by Patrol Sector, City/District.

Dashboard – Active Operating Picture



All dashboards and maps built by YRP could be used by other agencies if they chose the same vendors and had access to similar source data. YRP's RFP specifically incorporated a "piggy-back" clause which allows other organizations to leverage YRP's procurement process – this has the potential to save organizations who are looking to implement similar solutions a lot of time and costs.

York Regional Police

Results

To date, these tools have helped YRP achieve the following:

- Real Time Operations Centre (RTOC) Live Resource Management has helped YRP **save over 2 hours every time YRP responds to a missing person type call** where there is a need to initiate a Search and Rescue mission. This dashboard also makes YRP aware of any resource deficiencies and gives the ability for YRP to immediately address identified deficiencies, which proactively improves Regional Safety and the safety of YRP members.
- Frontline Officer Performance dashboard enables YRP members to **self-assess themselves against their team average and the team leaders** without disclosing who they are. It also allows YRP officers and supervisors to evaluate officer activities by geographic locations defined as Priority Patrol Zones. Prior to the implementation of this solution – this was not possible to analyze.
- Member wellness dashboard enables YRP to **identify officers who many need support**, ensuring members who may need help are reached out to proactively, where in the past this would go undetected until a supervisor or member raised an issue. YRP members have responded positively to this dashboard and its potential benefit for officers – one officer noted that this makes them "extremely proud to be a member of the YRP".
- YRP frontline officers are now **proactively patrolling** based on real time data/crime trends.
- YRP is better able to understand the data that **demonstrates the complexities of policing in York Region** which enables the organization to **make better decisions** which ultimately **improves community safety** and increases public trust.

York Regional Police

The Approach

YRP developed a Data Warehouse that was fed by approximately 7 different internal systems/databases, as well as external data sources. The Data Warehouse was designed to provide a single version of the truth and feed YRP's dashboards and maps with live and historical data.

YRP took a number of steps to successfully design, plan, and implement:

1. Conducted external market research to better understand how organizations, specifically law enforcement services, were leveraging their data.
2. Conducted internal research and stakeholder meetings with all levels of the organization.
3. Created a Business Case identifying key opportunities and goals the solution would support.
4. Created a Request for Proposal (RFP) to select the best vendors, and also identify the goals of the solution and the tasks the vendors would be responsible for.
5. Worked with vendors and internal IT department to build/configure/implement the solution.
6. Trained all relevant members of the organization (2300 members total).
7. Continue to identify enhancements, opportunities, and new use cases.
8. Budget annually to support new enhancements and opportunities, which may be identified through internal analysis or external vendor/industry breakthroughs.

Lessons Learned	Success Factor Alignment
• Every product built was designed to make users' jobs easier and to solve real and meaningful challenges to the business. • Critical to have executive support and buy-in.	LEADERSHIP & GOVERNANCE
• The right people must be selected and hired with both knowledge of the organization's data as well as BI. • Train staff on site to take on technical knowledge to support and maintain solutions moving forward.	CAPACITY & COMPETENCIES
• Use vendor expertise where possible to build and configure dashboards and maps. • Leverage data that exists within your organization – don't go after data that doesn't exist unless you have to. • Follow an Agile approach to project management and application design.	DATA MANAGEMENT & TECHNOLOGY INFRASTRUCTURE

GOVERNMENT OF BRITISH COLUMBIA - SERVICE BC

Business Intelligence Deployment

Updated: April 2019

Contact: Perry Slump, Director, Service Analytics & Standards (Perry.Slump@gov.bc.ca)
Adriana Poveda, Executive Director, Strategic Services (Adriana.Poveda@gov.bc.ca)

Service BC

Siloed program areas can share information, reducing redundant work effort, increasing efficiency and reducing client frustration.

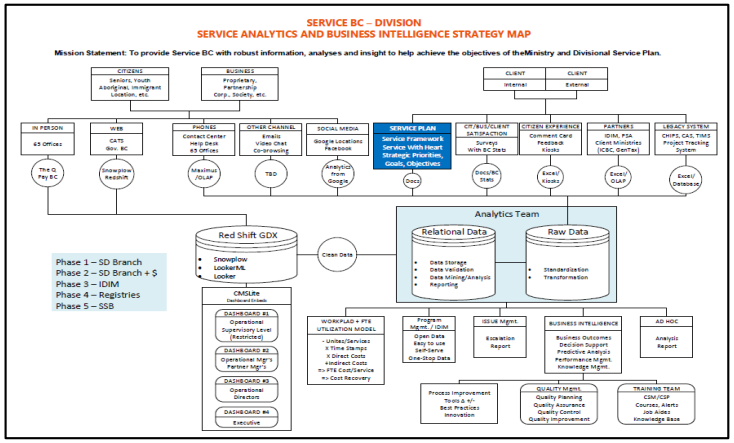
Context

Service BC is British Columbia's leading provider of citizen- and business-centred services. Through a province-wide network of over 60 in-person service centres and a province-wide Contact Centre, Service BC provides over 600 services on behalf of 40 partner ministries and agencies. Service BC is working to expand its service offerings to include more modern channels such as video chat, SMS text, web chat, and co-browsing.

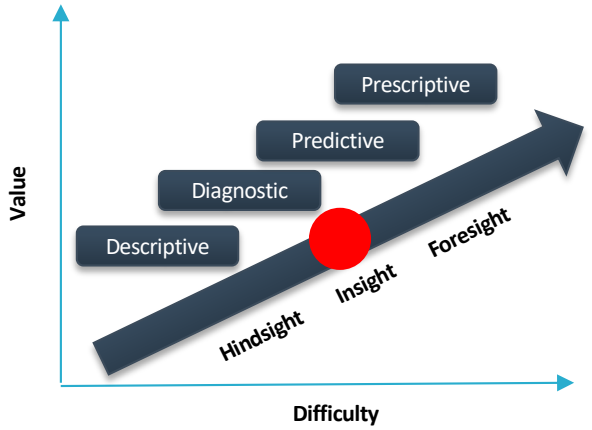
Service BC established the Service Analytics & Business Intelligence Team to pursue its goal of becoming a Best-in-Class service delivery organization. This team is responsible for creating a common approach, protocols, and standards across all branches, and to build a holistic and consistent approach to collecting, analyzing, and interpreting business analytics, to better inform decision-making, continuous improvement, quality standards, and most importantly the citizen experience.

The Service Analytics & Business Intelligence Team has developed an overarching Strategy Map depicting the Team's goal of moving from each Branch having their own approach to analytics, to a model where all data exists on the same platform and Branches use consistent tools and approaches to gain insights from analytics.

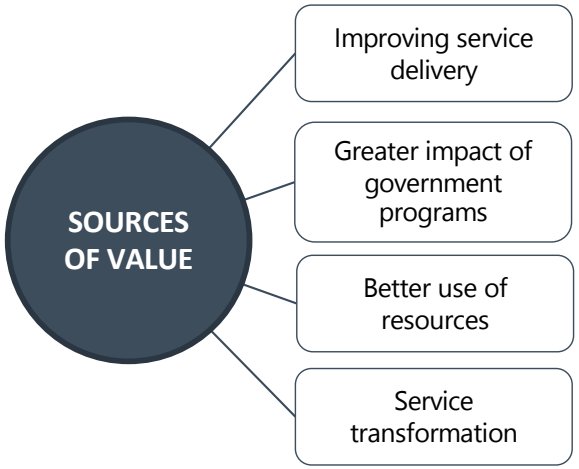
Strategy Map



Maturity Model Alignment



Target Sources of Value



Service BC

The Business Problem

The first priority and project addressed by the Service Analytics & Business Intelligence Team was in the Service Delivery Branch, more specifically at in-person service centres.

The challenges this project set out to address included:

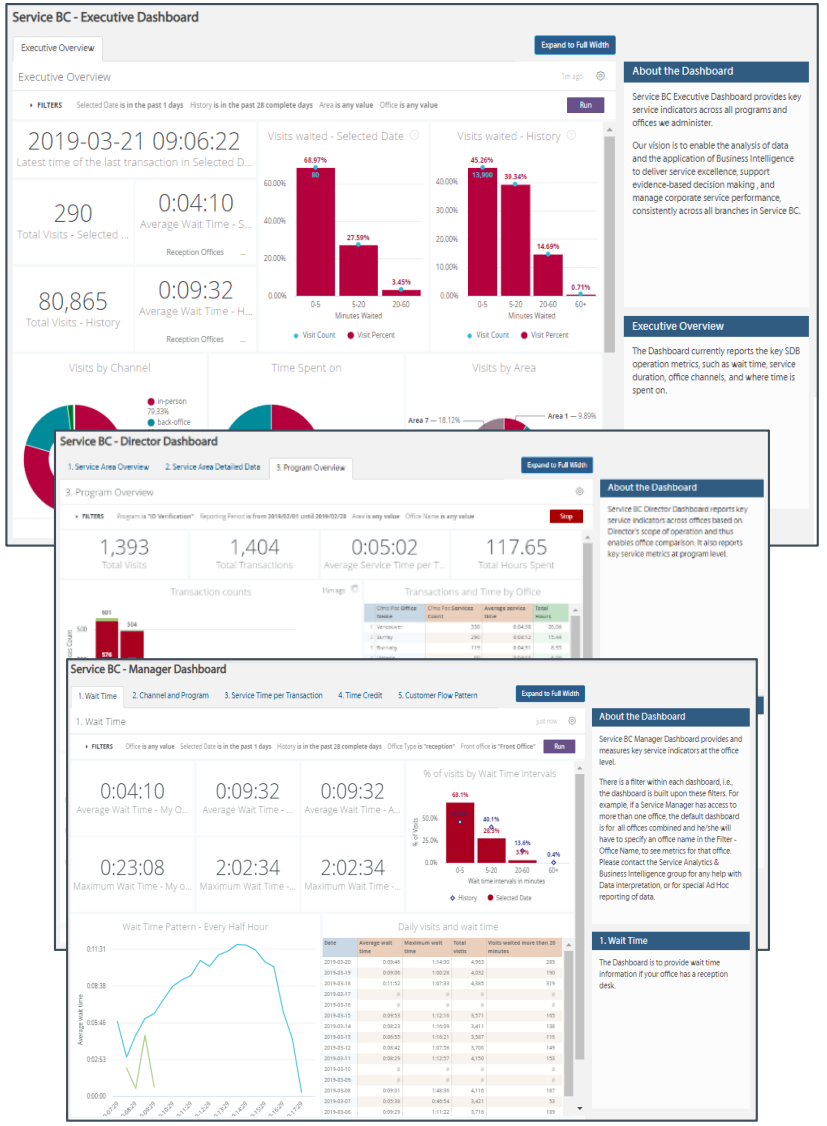
- Information was only available through legacy systems, and each system had its own technical architecture, data model, and access control.
- The same type of data had different scope, meaning and formats.
- Systems from client ministries captured the data of a certain service, but not the flow of the transactional process or the citizen journey.
- Systems had limitations in capturing, processing, and accessing the business information needed to better inform business models (i.e. length of transactions or wait times).

Results

The application of this information has achieved not only the replacement of the Workload Model (WLM), but it is also influencing the way Service BC analyzes the citizen journey through different channels, understanding the demand of government services, and better informing decision-making, continuous improvement, quality assurance, and training.

Users of the deployed dashboard now have access to real time data where they are able to review current trends of their operations and can make comparisons to historical information to assess occupancy, spikes in volumes, staffing levels, team members performance, and wait times across all the service centres.

Dashboards – A. Executive, B. Director, C. Manager



Service BC

Results

Outcomes for Citizens

- Consistent approach to service delivery in all service centres.
- Personalized service.
- In the long term, the application of insights can range from informing channel shifting strategies, service improvements for client ministries, and making data publicly available for citizens so they can choose when they come into the service centres or booking appointments.

Outcomes for Service BC

- Better and evidence-based decisions.
- Scalable and affordable platform available for the division.
- Predictive insights to improve operational efficiency, service quality, and ultimately citizen satisfaction.
- Ability to integrate all channels and all programs.

Outcomes for BC Government

- Reliable and accurate data available to client ministries.
- Comprehensive understanding of demand of government services.
- Ability to positively influence the adoption of digital services as we better understand the citizen journey.
- Affordability and capability to onboard to "The Q" for ministries that have an in-person channel.

Lessons Learned	Success Factor Alignment
• Change management is essential to ensure that staff understand the intent of the dashboards properly (i.e. not for staff discipline purposes).	CULTURE
• Critical to have senior executive support. • The importance of building collaborative and inclusive partnerships with experts within and across government.	LEADERSHIP & GOVERNANCE
• The importance of carefully designing and testing the measurement model in real world circumstances (in person field testing by service design partners with BC government). • The benefits of Agile over Waterfall development. • Built in feedback mechanism within the system to allow for continual improvement. • The BC government has purchased data and analytical tools and applications, and are promoting the use of these tools across the province and ending other vendor contracts over time to encourage standardization.	DATA MANAGEMENT & TECHNOLOGY INFRASTRUCTURE

Service BC

The Approach

The Business Intelligence Deployment (BID) project originated from the tune up of a legacy in-house web application – Workload Model (WLM), which converted service transaction counts, using data from the Government Agent Revenue Management System (eGARMs), into actual staff hours needed, by using time estimates and adjustments.

Realizing the WLM limitations, such as time estimates and quarterly refreshment, Service BC explored many pilot projects to collect transactional data, both counts and timing, from Service BC offices, contact center and web directly, particularly by using ServiceNow and Qmatic.

These pilot projects proved that Service BC service teams were enthusiastic and eager to participate, influence and consume the sets of data and analytics that were being built. Configuration limitations became apparent through the process of working with ServiceNow and Qmatic.

Service BC ultimately decided to design and build a customer flow management system from the ground up, using modern and affordable technologies such as open source and OpenShift (DevOps).

Service BC took a number of steps to successfully implement:

1. Developed minimal viable product in open source.
2. Raised governance models with all stakeholders (developers, IT support, users, office managers, champions).
3. Implemented the customer flow management system, "The Q" in 4 service centres.
4. Through evaluation period and user feedback, made over 100 enhancements.
5. Developed training manuals, change management and communication plans as well as a project plan to deploy the solution to all 65 service centres.
6. Deployed "The Q" to all 65 service centres.

> "The Q" captures all the relevant information needed to inform and improve Service BC business models. This includes transaction types, length of the transactions, and wait times, specific to each program and each service that citizens request. This application also allows service centre staff to capture information related to work activities that don't involve face to face time with citizens, but are fundamental to service delivery such as call backs, inventory management, etc.

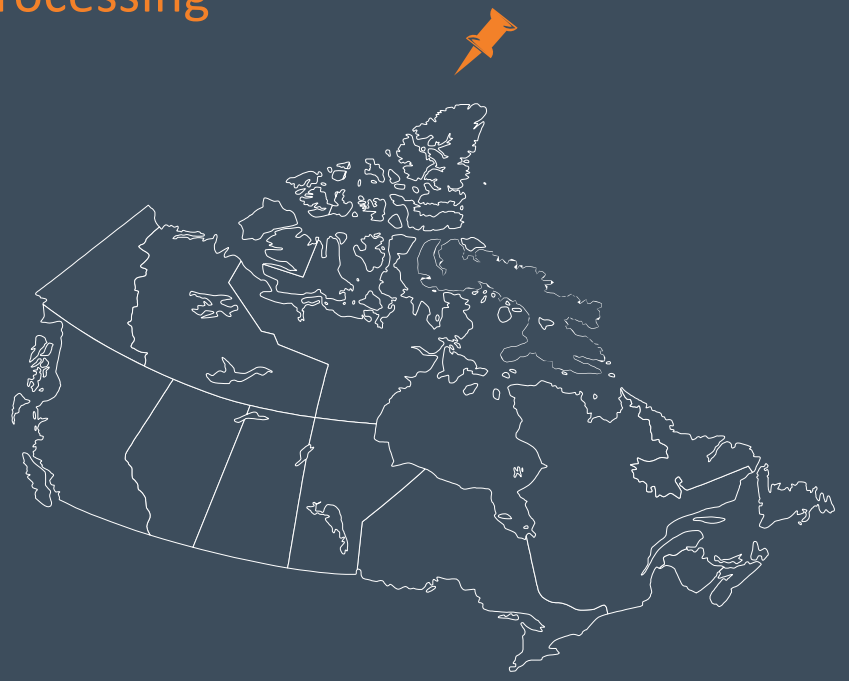
7. Analyzed, refined, evaluated and improved the information captured by Service BC customer service representatives.
8. Deployed Snow Plow and Looker (visualization tools).

> The BID team has developed a self-serve reporting system, close to real time dashboards for office managers, directors and executive directors using Snow Plow and Looker. These dashboards are populated with all the information captured in "The Q".

9. Developed and deployed dashboards
10. Continuous improvement of the tool and analytics

GOVERNMENT OF CANADA – EMPLOYMENT AND SOCIAL DEVELOPMENT CANADA

Artificial Intelligence Strategy and Automated Processing



Updated: April 2019

Contact: Nicolas Vincent, Manager, Data Science Bureau de la dirigeante principale des données
(nicolas.vincent@hrsdc-rhdcc.gc.ca)

Employment and Social Development Canada

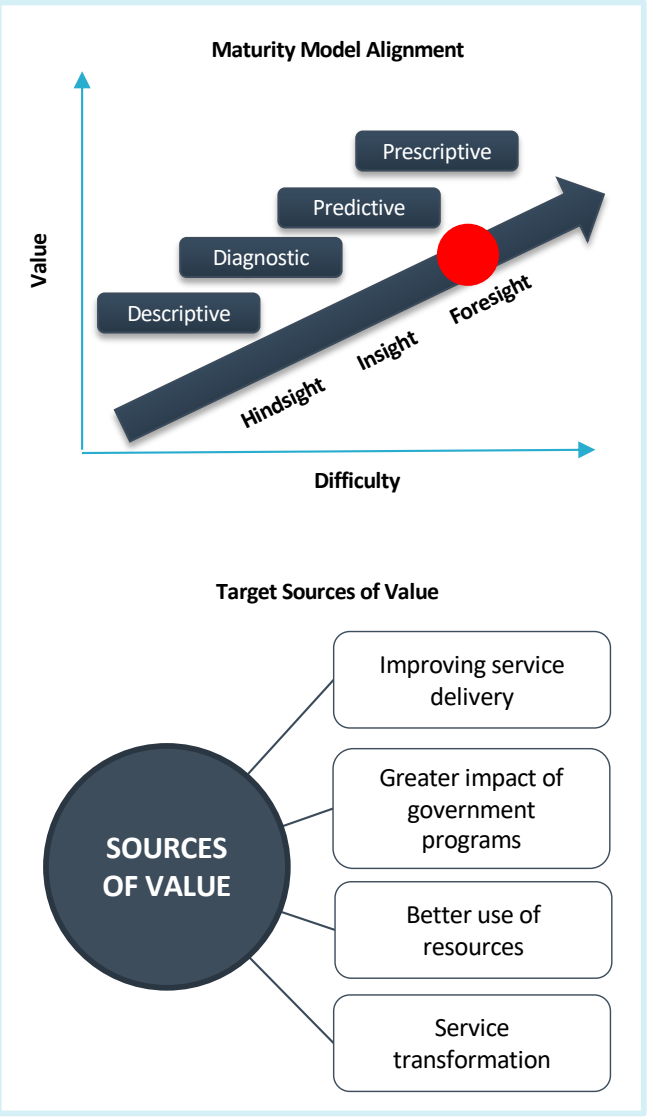
Natural Language Processing of agent case notes was used to support Service Canada operations, reducing redundant work and better utilizing staff talent to serve clients.

Context

Employment and Social Development Canada (ESDC) is a department of the Government of Canada responsible for social programs and the labour market at the federal level. A Data Strategy exists within ESDC focused on increasing the use of and value of data gained from analytics, artificial intelligence, enablement and better data access. ESDC has been using Machine Learning (ML), Artificial Intelligence (AI) and Natural Language Processing (NLP) for a couple of years now on a number of pilot projects.

ESDC is currently developing an AI strategy with the following objectives:

- Develop a modern AI suite to transform the way ESDC delivers service to Canadians.
- Engage across the organization to promote AI and coordinate initiatives.
- Develop a policy for acceptable AI use in light of the risks it poses.
- Develop effective governance, risk management, and control processes for AI models to ensure they do what we want them to.
- Organize ESDC to properly steward the most important component of the current AI wave: the data.
- Strengthen internal capacity in AI development.
- Ensure maximum public value for ESDC investments when procuring AI technology from vendors.
- Put in place the right platform for development and deployment of AI solutions.
- Design a framework for monitoring performance and evaluating success of AI solutions to prove value to Canadians.



Employment and Social Development Canada

The Business Problem

Canada Pension Plan (CPP) and Old Age Security (OAS) recipients are mailed a T4 form containing the benefits received on an annual basis, and this form is needed to submit their tax return. Many T4s are returned to Service Canada due to address changes or other reasons and must be investigated.

Each year, large numbers of clients follow up with Service Canada to request a duplicate T4, which is immediately reissued. However, the reissuance is only captured in call centre notes and the back-office resource intensive investigation of every single individual returned T4 is still performed.

Staff within Service Canada identified the need to use analytics and prediction to close work items for clients who already had their T4 resent.

Results

The implementation of this solution has led to the elimination of approximately 70,000 redundant work items per year which is equivalent to freeing up about 2.5 FTEs of employee time for higher value tasks (i.e. serving client's in need, focusing on complex cases).

Service Canada has been able to change the views of staff through the implementation of this solution. This project has opened up the door for subsequent projects within Service Canada in addition to the awareness of how case notes can be used to improve other services. In addition, the public benefits through improvements in service delivery.

Lessons Learned	Success Factor Alignment
• A strong liaison is required between the business team and the data scientists. • First thing to get in place is a solid understanding of what would add value to the department.	CULTURE
• Need to consider potential forms of bias that can affect outputs – How comfortable is the organization with these? How will the organization counteract their effect?	LEADERSHIP & GOVERNANCE
• Quality of data is critical to success. • Validation is critical – accuracy, precision, and recall – different dimensions to acceptable performance depending on the problem. • Need to move from siloed solutions and figure out how to get all systems and infrastructure talking to each other and bridge up to enterprise wide solutions.	DATA MANAGEMENT & TECHNOLOGY INFRASTRUCTURE

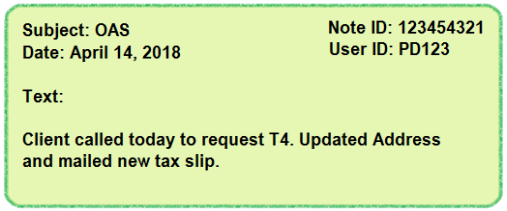
Employment and Social Development Canada

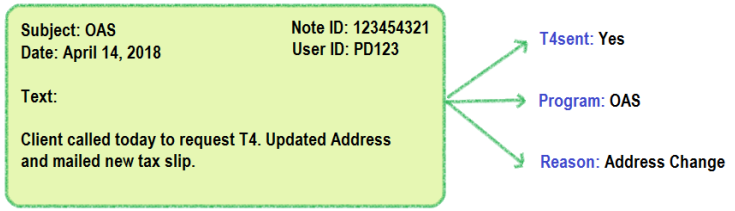
The Approach

To achieve this, ESDC took a number of steps:

1. **Accessed data stored in Agent Case notes**
   - Unstructured text describing the interaction with a client in both French and English, including various Service Canada specific language and acronyms.
   - Approximately 10 million agent text notes are recorded per year.

2. **Trained a machine to identify notes that indicate how the T4 situation was handled**
   - Created training examples.
   - Trained an artificial neural network (ANN) on these examples.



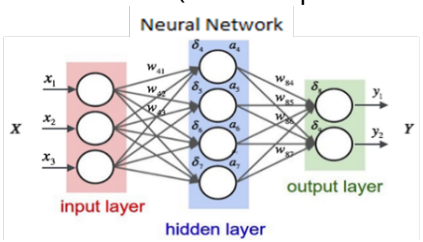


3. **Used Natural Language Processing (NLP) to conduct machine analysis on text data**
   - Pre-Processed and cleaned text.
   - Converted text into a format that the ML algorithm can understand (Vector representation).

4. **Applied machine learning**

Vector Representation

doc ID	The	T4	was	sent	today	not	OAS
1	1	1	1	1	1	0	0
2	1	1	1	1	0	1	0
3	0	1	0	1	0	0	1



T4 Sent Labels

docID	yes	no
1	1	0
2	0	1
3	1	0

5. **Evaluated the model**
   - It is important to validate the model on data that it has never seen before.
   - Evaluation of the model should also be done through manual inspection of the results.

GOVERNMENT OF ONTARIO - MINISTRY OF GOVERNMENT AND CONSUMER SERVICES

Open Data and Data Sharing

Updated: April 2019

Contact: Christine Hagyard, Senior Manager, Ontario Digital Services (Christine.Hagyard@ontario.ca)

Ontario Digital Service

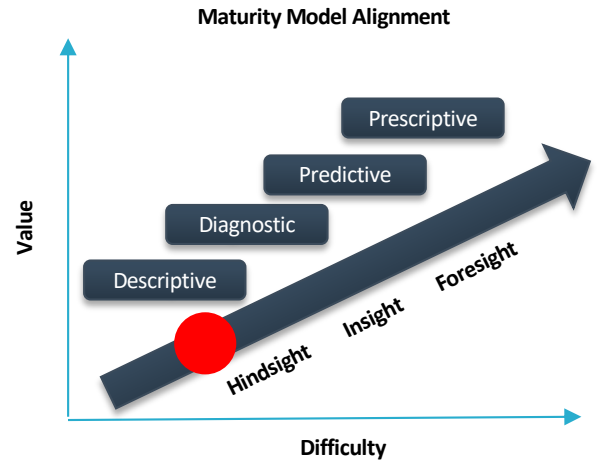
Changing culture and minds of the people of Ontario and ministry staff through the promotion of open data, as well as platforms for inter-ministry data sharing, to harness the full potential of available data and reduce redundancies.

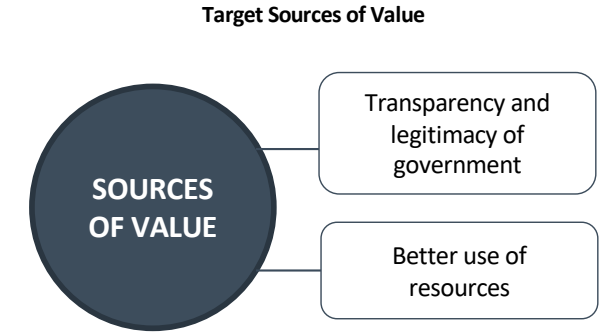
Context

The Ontario government has recently launched consultations to begin developing an Ontario Data Strategy. The Ontario Data Strategy aims to directly guide how data is used and protected in Ontario. By building on Ontario's existing data achievements the strategy aims to:

- Create an environment where Ontario businesses can develop data-driven business models and seize the commercial value of data;
- Introduce world-leading, best-in-class data protections to ensure public trust and confidence in the data economy; and,
- Unlock the value of government data by building the data skills and capabilities of Ontario government employees and promoting the use of data-driven technologies.

The Ontario Data Strategy will also help government explore the changing role of analytics in the private and public sectors.





Ontario Digital Service

The Business Problem

Problem 1:

Ontario government data is contained in various ministries and was often only available to the public through a Freedom of Information (FOI) request.

It was recognized that the public should be able to more easily find and access government data with limited barriers.

Results

Ontario Data Catalogue and Directive Impact:

- Allows the public to see what data the government holds.
- Over **2600 data holdings** from all government ministries are listed in the Data Catalogue at: Ontario.ca/data.
- Over **700 datasets** are available for public use and reuse.
- There have been over **900,000 downloads** of Ontario data from the catalogue since its launch, a process that is incredibly faster, simpler, and easier for people than the previous processes of submitting a paper FOI request or searching through multiple ministry webpages for public data.
- More than **75 Ontario companies** have said they use Ontario open data in a survey conducted by ODX and GovLab for Canada's 150th. This number is growing as innovators across the country and globe find new ways to use our data to drive new solutions.
- More than **12 apps** have been created using Ontario open data, including iamsick.ca and mapyourproperty.com.
- Data is available under open licensing which permits businesses to use the data to power their products and develop services without any red tape or barriers to commercial use.
- The catalogue is now in the process of being upgraded following the Digital Service Standard to create an even better user experience and to provide expanded data access for all Ontarians.

Ontario Digital Service

The Business Problem

Problem 2:

No easy way existed for Ontario ministries to share data and information internally with each other.

Current legislation (FIPPA) treats government institutions as silos with data and records collection decentralized within each ministry. It was recognized that sharing data across institutions would better enable and support cross-ministry insights, and evidence-based decision-making.

More broadly there was recognition that the Ontario government has access to vast amounts of data, however, lack of sharing and access was preventing the data from being used to its full potential to improve services for Ontarians.

Results

CollabON (Colby) Impact:

- The internal data catalogue, Colby, is proving instrumental in **reducing redundancies in government purchasing of external data**. Colby has already **indexed over 100 Statistics Canada datasets** purchased on behalf of the Government of Ontario. Providing all Ontario public servants with secure access to this data empowers individuals with valuable resources for policy and operational analyses and ensures government funds are not wasted procuring the same datasets multiple times.
- Since Colby's launch in November of 2018, ministries have **shared over 200 pieces of data** and information, not previously widely shared in the government, giving the OPS access to new and diverse data from all 22 ministries.
- **50 additional datasets** in approvals to be posted.
- Serving as the technology **platform for 3 ongoing data inventory projects.**
- Ministries are also using new features in Colby to share special collections of data and information with their operational partners both in their ministry and in their inter-ministerial working groups. For example, a government IT team who own the Ministry Applications dataset, found the Ministry Programs data on Colby. They discovered a great business opportunity in **linking the datasets, allowing for more robust risk-based analysis of their applications and understanding of program funding supporting core applications**. Now that the datasets are linked, the team in IT and the wider OPS have access to a new standardized dataset that can be used in future analyses.
- Colby is putting itself in a position to be the technology solution to help ministries with other data management challenges, such as performing their own inventories of resources and avoiding the need to procure similar data sharing tools and software. Ministries can now easily upload and share a more complete list of their data holdings and see the benefit of uploading data to a centralized portal for everyone to have quick and easy access to data!

Ontario Digital Service

Lessons Learned	Success Factor Alignment
• Successful implementation and use of a data catalogue is dependent primarily on organizational culture, not on the technical build of the catalogue itself. • Asking ministries to share and grant unlimited access to data previously restricted, is asking ministries to achieve a shift in control and power dynamics, recognize a data catalogue roll-out as a change initiative, and ensure there is senior organizational commitment to drive large-scale culture change.	CULTURE
• To maximize data sharing, organizations should focus on sharing data to solve a policy or operational problem which is aligned with overarching mandates - publish with purpose as a tactic to realize open by default. • Buy-in and support from multiple senior teams within government, and the latitude of the data catalogue team to reach out across all levels of the organization is critical.	LEADERSHIP & GOVERNANCE
• The platform and infrastructure selected and implemented needs to address the needs of both light and heavy data users. It is important when testing with users to include both types to make sure the catalogue is optimized for the whole spectrum of users. • The rules for Open Data and data sharing across government need to be responsive to the changing digital landscape, and developed in conjunction with the community to ensure trust and transparency. • The importance of addressing both legitimate and perceived barriers to data sharing. For instance the vast majority of OPS ministries do not want to share data due to concerns over negative consequences from others' misuse of the data, issues management resulting from poor data quality, or privacy or security breaches. There is also a long-standing legislative framework within the OPS which was not setup to leverage or share data across ministries, necessitating additional policy and governance supports to enable sharing data on a government catalogue.	DATA MANAGEMENT & TECHNOLOGY INFRASTRUCTURE

Ontario Digital Service

The Approach: Ontario Data Catalogue and Directive

An engagement team was struck to make recommendations to the government on how to achieve openness and transparency. One of the recommendations of that panel was to make non-sensitive government data proactively available to the public. The requirement for open by default was put into force through a Management Board of Cabinet Directive which came into effect April 1, 2016. Access here.

In addition to the new directive making Ontario government data open by default, a public online catalogue was built to display an inventory of all government data. The catalogue also houses, in one central location, all government data that has been made open to the public. This data is now easy for the public to discover and download at their convenience, without the need to submit a Freedom of Information request. The new open license also permits commercial use, removing barriers to businesses wishing to use government data in profit-generating solutions.

The Approach: CollabON (Colby)

There was no single shared platform for data sharing between ministries. To remove as many barriers to data access as possible, the Ontario Digital Service Office built a tool to house data and information that ministries are unable to share publicly, but can share internally. Colby provides ministries with a platform for secure, easy access to internal government data and information.

To enable and support cross-ministry and program analytics and evidence-based decision-making, the Ontario Digital Service took the following steps to build a tool that worked for ministry users:

- Built an initial proof of concept catalogue.
- Once there was a minimum viable product, a task team of ministry partners were enlisted to help shape further development of the catalogue.
- Had an alpha launch, attended by over 200 people (both in person and virtually) and opened the catalogue for all ministries to add data.
- Held more than 70 demos to program areas interested in uploading data to or using Colby in their work.
- Continually promotes awareness of the catalogue through internal communication channels and ministry presentations.
- Built the catalogue using open source software designed by diverse jurisdictions to be a flexible, robust catalogue for data and information. CKAN was developed to work out-of-the-box as a data catalogue but also be infinitely modifiable.
- The Colby team at Open Digital Services continues to iterate and modify the tool based on feedback they receive from users on their data and access needs.

GOVERNMENT OF MANITOBA

Quick Turnaround Program

Updated: April 2019

Contact: Teresa Mayer, Manager, Research and Evaluation, Policy Development, Research and Evaluation, Healthy Child Manitoba Office (Teresa.Mayer@gov.mb.ca)

Government of Manitoba

Program and policy makers could identify complex client and program interrelationships across health and social service domains to enhance value for money, and improve access and outcomes of services.

Context

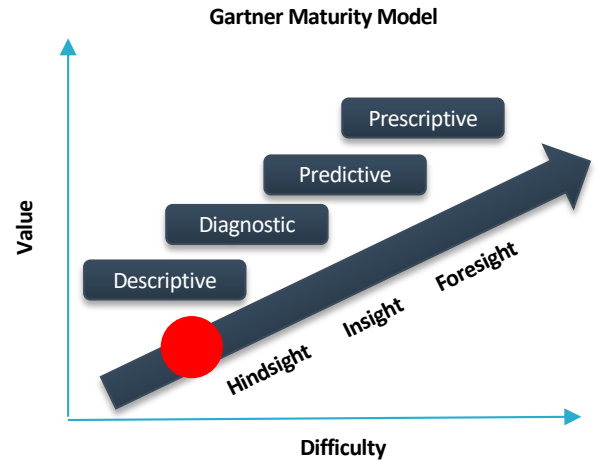
Manitoba is undertaking a proof of concept for data-driven program evaluation projects, to measure outcomes and ensure Value For Money (VFM) by using person-specific, de-identified administrative data. This initiative explores the use of data to identify complex client and program interrelationships to generate predictive models that will shed new light on critical aspects of program volumes, duration, and cost.

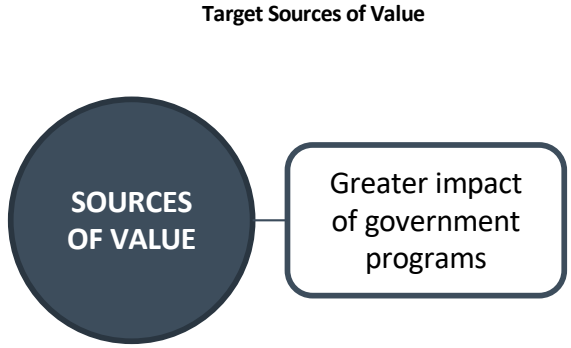
The Business Problem

Manitoba Quick Turnaround (QT) Program is aiming to use analytics to provide insights about complex government social programs. Data analytics may enable program improvements, or, if there is no evidence that the programs are achieving their intended results, to discontinue the programs.

The QT Program will also more broadly help to develop capacity across government departments to leverage administrative data to better inform policy and program development. Many individuals within government have the required data and analytics skills, and, these skills can be fully utilized through the QT Program.

There is recognition that a "goldmine" of data exists across the government and there is potential to use this data to evaluate existing programs, improve programming to help citizens, and enable front line staff to make better decisions.

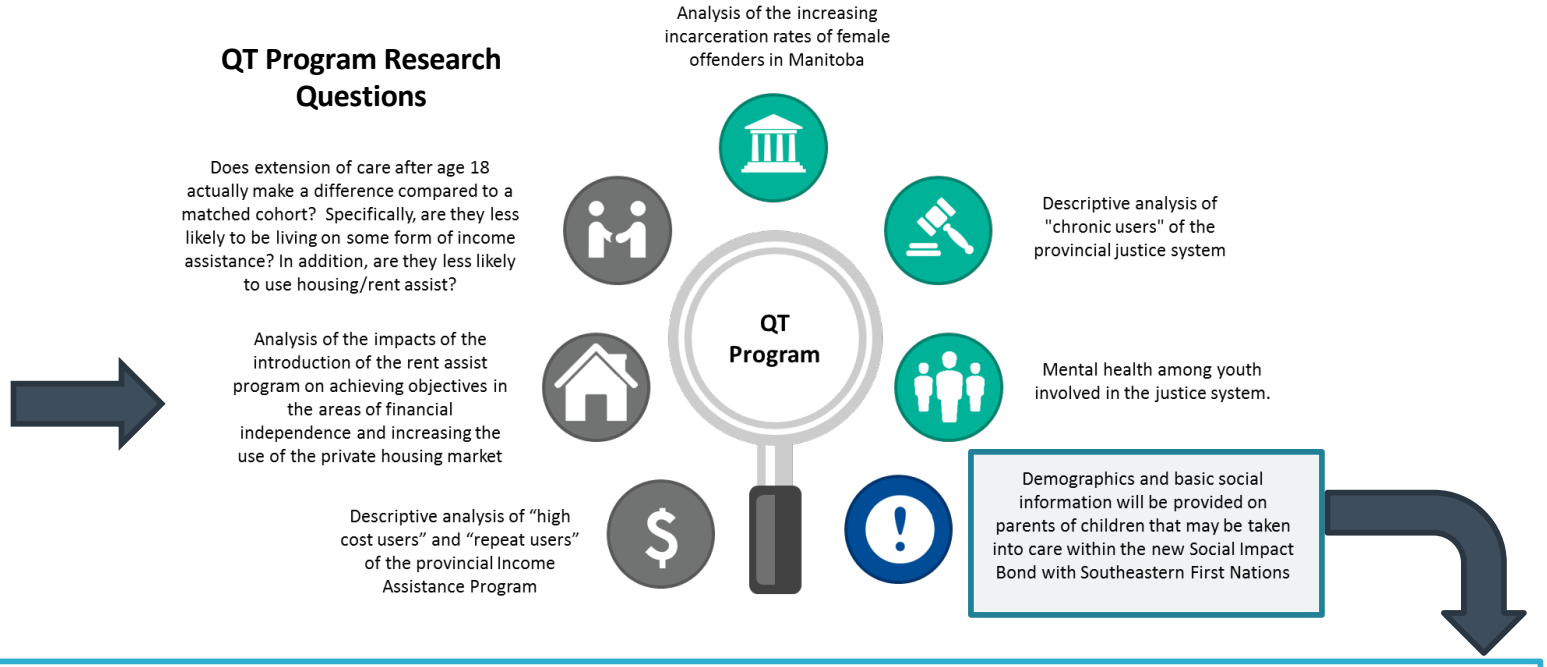




Government of Manitoba

The Business Problem

The QT Program is examining a number of complex issues related to social assistance, justice programs, and child welfare.



In January 2019, the Manitoba government entered a partnership with the Southern First Nations Network of Care (SFNNC) to deliver the province's first-ever Social Impact Bond (SIB)*.

"We want to help strengthen the bond between mothers and children to reduce the number of infants apprehended into the child welfare system".

"SIBs are an innovative way for government to work together with the private sector and community groups to find new solutions to pressing social challenges. Our landmark SIB in child welfare encourages a multi-sector relationship to meet a common goal of preventing the apprehension of infants, and reducing the amount of time children spend in care."

The two-year pilot project, Restoring the Sacred Bond, will match doulas with Indigenous mothers who are at risk of having their infant apprehended into the child welfare system. The doula pilot will support up to 200 at-risk expectant mothers. Program success will be measured on reduced days in care of children in the program compared to children outside the program.

SIBs rely on private investors to fund projects. Additionally, the government will repay investors if the project meets targeted outcomes proven through a third-party validation process. The province has budgeted up to $3 million for investor repayment if the SIB reaches success on its key metrics. The province has also worked with leading Canadian social finance consultant MaRS Centre for Impact Investing to guide its SIB strategy, and MaRS will work with the Southern Network to identify and secure private investors for the project.

Government of Manitoba

The Approach

This project relies on utilizing existing analytical capacity across government, supplemented by the Manitoba Centre for Health Policy (MCHP) and the University of Manitoba.

Using data available through Manitoba's Child and Family Services Information System (CFSIS), demographics and basic social information were provided on parents and caregivers of children that may be taken into care within the scope of the new SIB with Southeastern First Nations. Provincial government administrative data files provided information for this project and include the Manitoba Health Registry, Children in Care (CIC), Children and Family Services (CFS), Hospitalizations, Physician Visits, Education and Birth Screen. These data files were linked to CFSIS to provide a holistic understanding of this group of parents and caregivers. All information provided was in a three year time period.

Results

At this stage, the SIB Doula Project has solely focused on descriptive analytics. Analytics completed as part of the QT program will be leveraged by a third party evaluation firm to evaluate the two-year pilot project, Restoring the Sacred Bond, and measure program success.

The government is currently exploring moving toward predictive analytics and determining how to leverage descriptive analysis to revise programming and/or introduce new programming to prevent children from being take into care in the first place.

Lessons Learned	Success Factor Alignment
• It is critical to engage with departments who will use reports following the completion of the initial descriptive analytics to ensure the reports will meet their needs, and provide the information required to make policy and program development decisions.	CULTURE
• A champion at deputy level is crucial to success and gaining long term buy-in.	LEADERSHIP & GOVERNANCE
• Identify talent gaps early on and identify training needs to get staff up to speed on use of analytics tools.	CAPACITY & COMPETENCIES

Results

The project is divided into three phases:

1. **Phase one –** Description of potential population (number of live births, number of children who entered care within 365 days of birth, etc.).

   Results show that nearly 1/3 of children who enter care do so within 3 days of being born.

2. **Phase two –** Description of mothers whose children entered care within 365 days of birth (e.g., marital status, number of children, received income assistance, etc.).

Mother's Characteristics	Data Source
Younger than 20 years old at the birth of current child	Health registry
Experienced abuse or neglect (as a child)	Children in Care (CIC) or Children and Family Services (CFS)
Previously diagnosed with a developmental disability	Hospital, Physician, Education or Birth Screen
Had 3+ children before the birth of current child	Health registry
Received CFS services or was in care 7 years prior to the birth of current child	CIC or CFS
Is a single mother at the birth of current child	Birth Screen
Had less than grade 12 education	Birth Screen
Used alcohol or other substance during pregnancy	Birth Screen

3. **Phase three –** Number of mothers (whose children were counted in Phase One):
   - Subject to a notice of maternity during pregnancy.
   - In receipt of Child and Family Services (currently or in the seven years before birth).
   - Parent of another child in care or in receipt of CFS services (currently or in the seven years before birth).
   - Subject to a birth alert during pregnancy of child counted in Phase One.

   Results: The main reasons for a child entering into Southern Authority CFS care within 365 days of birth by episode include 1) Conduct of parent or caregiver, 2) Transfer from another Manitoba agency, and 3) Condition of parent or caregiver.

GOVERNMENT OF CANADA - IMMIGRATION, REFUGEES AND CITIZENSHIP CANADA

Augmented Decision-Making To Support Visitor's Visa Issuing Process

Updated: April 2019

Contact: Amine Haffaf, Analyst Research and Evaluation, Operations Planning and Performance, Immigration, Refugees and Citizenship Canada / Government of Canada (Amine.Haffaf@cic.gc.ca)

Immigration, Refugees and Citizenship Canada

Augmented decision making to support visitor's visa issuing process.

Context

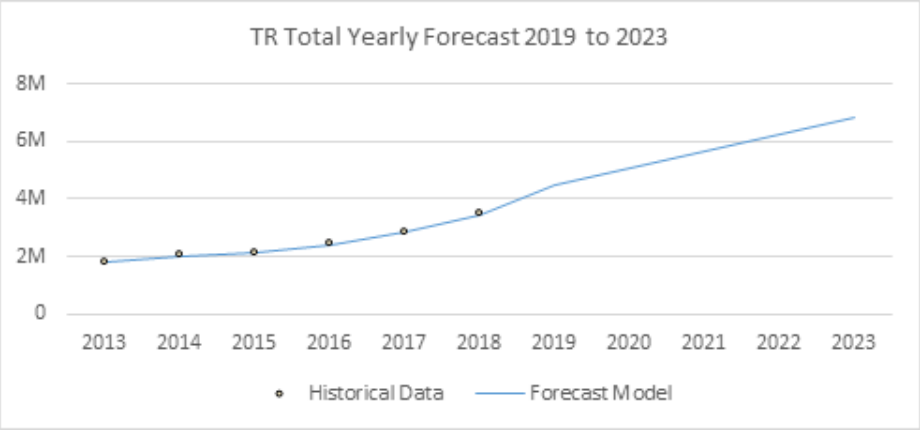
Immigration, Refugees and Citizenship Canada (IRCC) facilitates the arrival of immigrants, provides protection to refugees, and offers programming to help newcomers settle in Canada. IRCC also grants citizenship and issues travel documents (such as passports) to Canadians.

The Immigration and Refugee Protection Act now provides broad authorities for the use and governance of electronic systems, including automated systems.

The Business Problem

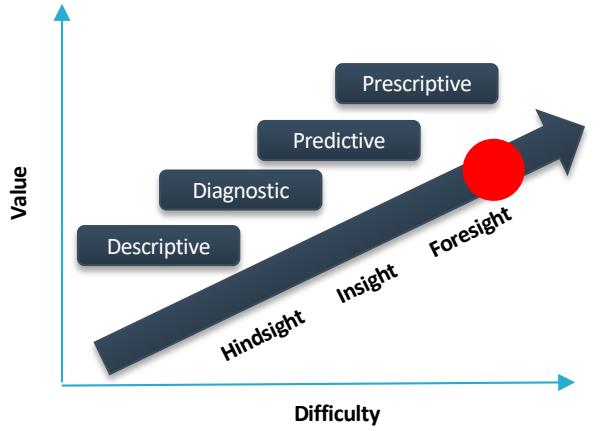
- IRCC has been facing an ongoing and significant volume growth with temporary resident applications (visitors, students and workers), in particular from China and India.

Temporary Resident Applications Forecast

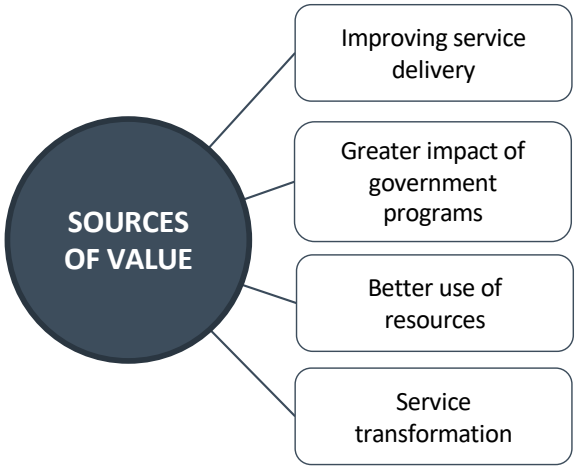


- The Minister's mandate letter is clear: reduce application processing times, improve service delivery to make it timelier and less complicated, and enhance system efficiency.
- Since traditional means to deal with pressures do not suffice, IRCC has been developing its advanced analytics capacity including predictive analytics and machine learning.

Maturity Model Alignment



Target Sources of Value



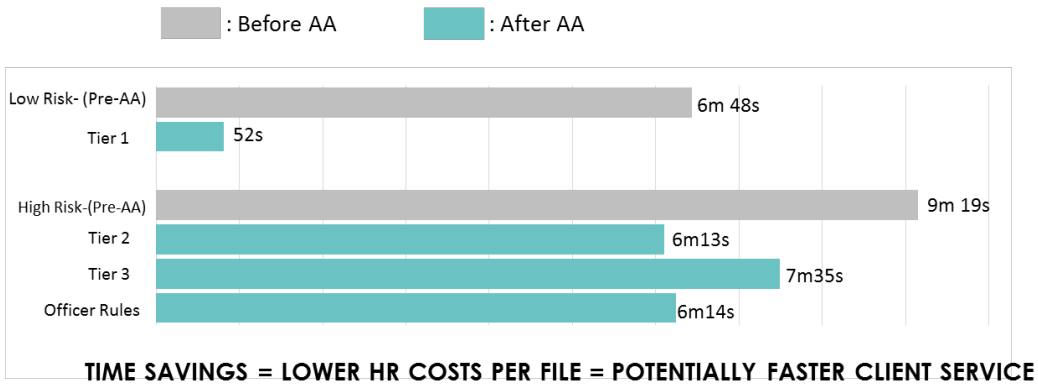
Immigration, Refugees and Citizenship Canada

Results

IRCC started a pilot in 2018 with a focus on temporary resident applications from China in April and India in August. IRCC plans to transition into a steady-state environment in Fall 2019.

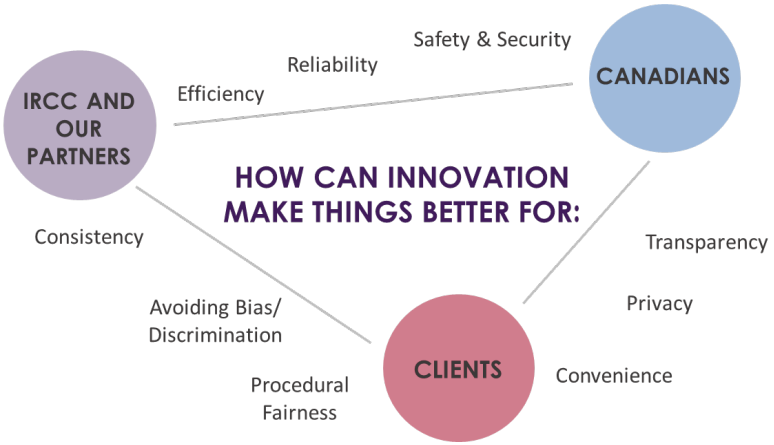
Advanced Analytics (AA) Models have yielded significant results in triaging applications and augmenting decision making, resulting in processing efficiencies and improved productivity, enhancing and strengthening program integrity while generating potential and substantial savings.

China Pilot: Key Results



Tier 1 is 87% faster to process under Advanced Analytics.

How Innovation Can Make Things Better



There is a tremendous potential to use AA to perform administrative and more simple tasks, and rely on a highly-skilled workforce to perform contextual reasoning, deep dives, and complex fraud detection - tasks that are essential for **quality decision-making**.

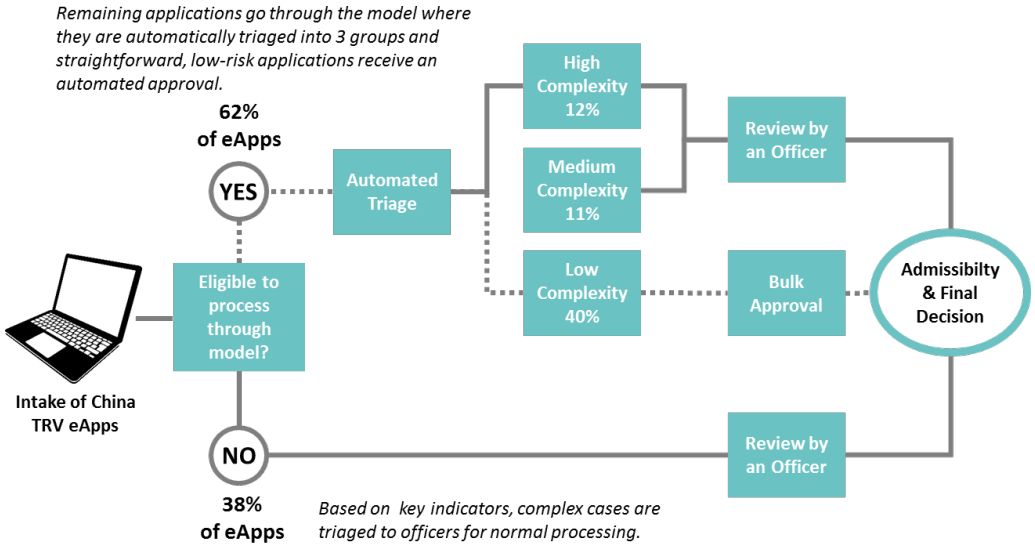
IRCC is now developing a handbook to guide innovators through a linear process when considering the development of a new automated decision system, equipping them to consider the right questions at the right times.

Immigration, Refugees and Citizenship Canada

The Approach

IRCC's goal was to automate a portion of the temporary residence (TR) business process, focusing on on-line applications (e-Apps) from China and India.

- Model was trained to recognize key factors at play in decision making on visitor applications.
- The machine then automatically triages applications and "recommends" applications that should be approved at this step.
    - With the TR model, positive eligibility decisions are made automatically, based on a set of rules derived from thousands of past officer decisions. When an application meets certain criteria, it is approved for eligibility without officer review.



- With feedback data from non-compliant visitors, the machine is automatically adjusting the factors to reflect a changing environment.

Lessons Learned	Success Factor Alignment
• We need to make sure we're connecting the right people, asking the right questions, and taking the right steps. • Officers should be informed, not led to conclusions. • Successful use of automation and AI requires that we look beyond our organization, and even outside the Government of Canada.	CULTURE
• Ensure systems do not introduce unintended bias into decision-making. • Recognize the limitations of data-driven technologies. • Adopt new privacy-related best practices.	DATA MANAGEMENT & TECHNOLOGY INFRASTRUCTURE

7. Acknowledgments

Acknowledgement

Commissioned by The Public Sector Service Delivery Council

This Playbook is brought to you by The Public Sector Service Delivery Council (PSSDC).

PSSDC recognizes the support from the Deputy Minister Champion, Scott Sinclair (Province of Manitoba).

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