



Future Cities Canada Data Governance Lab

Supporting communities to refine and
test data governance frameworks

Led by:



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SUMMARY

Data Governance for Smart Cities

The use of data is at the heart of building a smart city and increasingly more and more devices are capturing data and responding to burgeoning digital needs. In cities this means that we have an exponential number of data points that can help us understand our urban challenges and improve city operations.

With this digital shift comes the challenge of managing the volume of the collected data and thinking through the notions of data ownership, data protection and the resulting implications on citizens' privacy. It has become more important than ever for cities and communities to understand how, what and why data is being collected to ensure public trust. One such way is to develop data governance frameworks to help cities address how data is being stewarded and for what purpose.

Data governance frameworks aim to manage the availability, usability, integrity, and security of data and data assets. They are not just about managing data but also address other questions such as – Who is responsible for collected data? Who is entitled to set rules for access and use of it? How are rules set? Who will benefit from the data and on what terms? How can the data be leveraged?

Using an experimental process at the **Future Cities Canada Data Governance Lab**, we worked with cities to explore, ideate and identify data governance frameworks to find scalable solutions and address concerns regarding data collection and management.

About the Future Cities Canada Data Governance Lab

The Future Cities Canada Data Governance Lab engaged communities to explore and experiment with new data governance frameworks as a part of their smart city initiatives to better manage and utilize collected data. The Lab worked with three lead municipalities – the Cities of Calgary, London and Mississauga to understand the challenges and opportunities data presents and how to strategically use and manage data to realize their smart city aspirations. A five-phased learning process was employed to understand the needs of each city, explore current policies and practices, and build prototypes to test new solutions. The process was aimed at reducing the risks associated with data and add data's value and cost effectiveness in their smart city initiatives. Through the Lab, the team convened key city stakeholders to advance critical conversations, built pathways for exploring data governance challenges and developed use cases to demonstrate the value of utilizing data.

To further facilitate cross-learning and exchange of innovative ideas, the Future Cities Canada Data Governance Lab developed a '**Community of Practice**' that brought together data experts, practitioners and strategists from across the three cities to advance the dialogue on smart city data governance. It provided an opportunity for participating cities to share lessons learned, best practices and engage in an open conversation around data and connected technology.



City Use Cases

Each participating city team took a distinct path to explore new models and activities to establish a data governance framework in their municipality.

The City of Calgary explored and tested how new camera technology is collecting, managing, storing and disposing data. The city also looked at how to increase the value of collected data for use beyond the business unit who owns the technology.

The City of London built out their data governance framework by modelling a process to engage dialogue between programs and technical teams. The model is geared to reduce late-stage burden and project risks for future initiatives.

The City of Mississauga developed and operationalized data principles with its residents, to modernize their IT lifecycle process (internal process of IT related projects that go through the steps of discovery, business case development, procurement, implementation, and destruction). The team developed a concept prototype of a data report and created an educational program to build capacity on data related risks, best practices and resources that are available to the organization more broadly. Much of this effort was led by the city's smart cities team and provided an approach that focused on data value creation and community engagement to inform its smart city initiatives.

Key Takeaways

Despite each city's distinct use cases, common themes emerged from the Data Governance Lab process and exchange through Community of Practice discussions.

- **Ensuring strategic alignment across departments:** Throughout the process the lab engaged with a variety of stakeholders. A collaborative process across different departments is critical to build robust and transparent data governance policies and practices.
- **Recognizing how cross-departmental collaboration increases value of collected data:** The recognition that creating and fostering collaboration across teams will increase the value of data to further amplify smart city initiatives.
- **Building effective frameworks through small steps:** As demonstrated with the Data Governance Lab prototypes, coordinated small steps can create great value. It is important to build a case for a data governance framework first, and then create a strategy for a larger framework, taking the broader organizational smart city vision into consideration.
- **Recognizing the uncertainty within the process of capturing data:** It is important to realize the complexities of projecting what data will be captured and the associated risks at the onset of smart city initiatives.
- **Identifying the need for data stewardship:** When it comes to data ownership and responsibility and the abundance of data collected across the city, it is imperative to identify the right owners of the generated data. This can help cities avoid friction amongst teams and also establish frameworks that take into account principles of data integrity and interoperability.
- **Experimenting with new data capture techniques:** There can be different ways of collecting, managing, and storing data based on the types of data collected and its associated risks. Through controlled tests, the cities can explore methods like masking, at source or post collection, or creative capture methods such as using thermal imaging to anonymize within the process of data collection.
- **Enabling cross-learning and exchange through networks:** Cities found value in having open conversations around data and technology with each other and data practitioners/experts through Community of Practice platform. This cross collaboration across different cities and communities helped them in gaining unique perspectives on the challenges and best practices in the field of data governance.

This report looks to showcase the extraordinary work and insights shared by the three municipalities through interactions from a variety of city stakeholders as they explored how to manage data and digital technology in their smart city initiatives. The city use cases were developed as inspirations for other cities to learn and discover the challenges and opportunities that exist in the municipal context. Through the Future Cities Canada Data Governance Lab, cities recognize an opportunity to build new data frameworks and policies to reduce risk, create efficiencies, and foster greater collaboration. These new frameworks and policies will help drive new value and impact of their smart city projects.



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VOLUME 1:

The Data Governance Lab

The Data Governance Lab is a place for municipalities and communities to explore a third path – one where data can be governed in ways that don't impede on important privacy concerns and can be harnessed to achieve important public policy objectives.

Recent examples of private companies collecting data in the public realm like Sidewalk Labs¹ experiment in Toronto and Cadillac-Fairview's use of facial recognition camera technology² raise important and divisive questions around how best to govern data and protect citizens' privacy. Data governance in cities is a challenging and complex conversation. The work examined in the report brought together municipalities to understand these complexities and constraints and build some prototypes around smart city data governance.

Evergreen and MaRS initiated the Data Governance Lab to engage with municipalities to help address data governance challenges. The Lab convened city stakeholders to explore data governance challenges and develop use cases through a participatory, experimental and learning approach.

Every municipality and community is working to make things better for its residents and our lab participants were no different. We worked with enthusiastic leaders to explore how data contributes to maximize the benefits and minimize risks in their communities. Together we identified new ways for ideation, tested our assumptions and showed other communities in Canada that data governance can be used to unlock great value.

Impacts and Outcomes of the Lab:

- Refined and tested prototypes to develop novel data governance practices for smart city initiatives.
- Established a community of practice to exchange dialogue across cities to share lessons learned and best practices.
- Fostered greater collaboration across city teams to harness the value of data while safeguarding privacy.
- Enhanced knowledge on the use of innovative tools and processes that helped to identify potential gaps and areas of opportunities.
- Convened city stakeholders from different departments to bring diverse perspectives and enhance shareability, accessibility and usability of data.

The Lab Process

The lab process was designed to bring together smart city and technical teams along with passionate and dedicated business units to co-develop new data governance practices. The lab processes designed activities to understand each city's unique challenges, best practices and opportunities that data and technology offer (as outlined in the figure below). The Lab went through a five-phased process to deeply explore the current policies and practices of each city and build prototypes to test solutions to challenges they were experiencing. These prototypes aimed to build new smart city data governance practices for each of the three cities. The initial two phases created opportunities to understand and identify potential areas to generate impact and value for data-related activities in the city. The later phases of the lab builds on experimentation, through prototypes for internal teams and stakeholders in order to implement a policy or practice in the city. The final phase reflects upon the learnings and sharing best practices and insights for municipalities and communities across Canada.



Community of Practice Platform

Through this design process, we targeted challenges that were:

- Of high value to teams within the city and its residents
- Strategically aligned to the city's smart city initiatives and ambitions
- Low risk to implement and test

Phase I: Lab Selection *(June - September 2019)*

Through the selection process, engaged and willing municipalities were considered to be collaborators and partners through the Future Cities Canada Data Governance Lab. Conversations were advanced with communities small, mid-sized and large, across Canada to understand their appetite and willingness to be champions and lead conversations in the context of smart city data governance. For the first phase of the Future Cities Canada Data Governance Lab, the municipal engagement criteria were:

- Willingness and capacity of municipal government's leadership and staff to collaborate
- A comprehensive smart city plan and strategy
- Momentum around data governance development
- Alignment of smart city initiatives and its implications

Based on the above criteria, the lab developed key partnerships with the Cities of Calgary, London and Mississauga.

Phase II: Discovery *(October - December 2019)*

The lab participants were on-boarded to the design process to participate in a series of problem scoping sessions that would inform our work in the lab. MaRS and Evergreen facilitated discussions and workshops to begin to understand the challenges and opportunities faced by teams and stakeholders across the city. This discovery phase produced process maps, user experience journeys, opportunity areas, problem definitions and reframes, all while building advocates and engaging the organization in the smart city data governance conversations.

Key Activities

- **Initial Scoping and Level Setting** session with each city. Several meetings were held with the city teams to understand the current state of data governance of each city. This included challenges and risks, smart city initiatives, and the resources available for the lab.
- **The Discovery workshops** aimed to identify gaps in smart city data governance models. MaRS facilitated two-day workshops with the City teams. During these sessions, the city teams built capacity and knowledge around data governance. The teams also mapped out current processes to identify potential opportunities, challenges, and gaps to prototype. Lastly, the teams established design principles for each challenge area. These principles would serve as framing for the brainstorming and prototyping sessions in the next 'Build and Test' phase.

- **Build a Community of Practice platform.**

A regular cycle of monthly calls were conducted to discuss major milestones, challenges, learning opportunities and data governance frameworks and best practices from around the world for all the Lab participants.

- **Future Cities Summit 2019**³
(November 7-8, 2019)

- ▶ Provided an opportunity for networking and hosted a session to discover common challenges and opportunities across our participating cities.
- ▶ Shared learnings and thinking around smart city initiatives being planned or currently implemented in each of the three cities.
- ▶ Hosted a Data Governance Lab practitioner convening session on November 6, 2019; a full-day workshop to foster collaboration and understand common challenges across the teams and facilitate discussions around the meaning of smart city data governance in the local context.

Phase III: Build and Test

(December - January 2020)

In this phase of the process, the city teams further developed insights and opportunities that were identified in the 'Discovery' phase to develop potential solutions that are both of high value and low risk for the cities.

Key Activities

- **Contextualization Workshop.** Co-creation workshop was conducted with the core lab team, project teams, internal experts (technical, privacy etc.) to inform and build capacity towards smart city data governance. The session leveraged the broad organizational ambitions to identify areas of opportunity and draft a **design brief** to inform prototyping.
- **Refine and Testing Workshop.** Conducted a workshop to refine ideas to build solutions that address the identified challenges and propose new smart city data governance processes.
- **Community Building.** Continue to provide forums to establish connections across the lab practitioners, initiating dialogue of challenges and opportunities presented in each municipality. These forums created conversations around organizational opportunities and constraints, internal communication, and residents' engagement.

A **design brief** is a document that outlines the design specifications and principles, resources, potential testing methods, and learning objectives for the prototype.

<https://www.shopify.ca/partners/blog/100022086-how-to-write-a-design-brief-to-keep-your-web-design-projects-on-track>

- **Future Cities Canada Summit 2019³**

(November 7-8, 2019)

Organized an in-person workshop at Evergreen Brickworks with the representatives of all the cities to share and discuss pressing smart city data governance challenges. Cities shared insights on data governance challenges through presentations on their smart city initiatives with the larger audience of the summit and brainstormed potential solutions through a structured breakout activity.

Phase IV: Implementation (February 2020)

The implementation phase aimed to take the learnings and prototypes and create a pathway forward to test and implement these solutions. Through the lab, these conversations were embedded into the final in-person prototyping workshops to provide direction on next steps. This phase built the momentum to further smart city data governance through defining ongoing learning objectives, project risks, resources and both near and long-term action items.

Key Activities

- **Implementation planning.** Conducted prototyping workshop where city teams and their key stakeholders shared their perspectives and built partnerships to prototype & test the new smart city data governance processes.
- **Community of Practice platform.** Continued to host the community of practice calls with a focus on global best practices in Barcelona, Estonia, and Indigenous data principles and perspectives.

Phase V: Reflect (March 2020)

Through the final phase, each city worked to advance the conversation of smart city data governance within their organization and across different teams. While cities were coping with the impacts of COVID-19 pandemic, they still engaged in meaningful ways to reflect, communicate and share their perspectives, progress, and challenges with other cities, creating a close-knit group of empathetic practitioners in relation to data governance.

Key Activities

- **Reflection interviews** with city teams to reflect on their experience of the design process, challenges, learnings and next steps.
- **Draft knowledge products and final project report,** close to completion of the overall project.
- **Build a communication strategy** to share learnings in an accessible and meaningful way more broadly.

What's Next?

The Future Cities Canada Data Governance Lab uncovered distinct opportunities and challenges to drive smart city data governance within cities. All the work steered through the lab illustrates an urgent need for public sector leaders, industry experts and policymakers to establish standards, frameworks and models that empower cities and communities to manage the availability, usability, integrity and security of residents' data. The lab's process provided a unique learning and experimental approach that helped each city develop novel data governance practices for smart city initiatives and enhanced greater collaboration and participation across municipalities.

Evergreen together with MaRS, will continue to build on the lessons of the Future Cities Canada Data Governance Lab and explore the opportunity to engage with the three communities through other existing programs like the [Community Solutions Network](#).

Resources

The **Community Solutions Network** is a program of Future Cities Canada, led by Evergreen with Open North and a national community of partners. As the program lead, Evergreen is working with Open North and partners to provide knowledge, expertise, experience and guidance to communities to build internal capacity and navigate the smart cities landscape. The program is designed to run in parallel with the Government of Canada's Smart Cities Challenge and seeks to amplify and sustain its impact. Community Solutions Network has two main objectives:

1. Make information about smart cities issues and approaches available and accessible to everyone. Provide personalized advice and share knowledge, lessons learned and best practices related to complex emerging smart cities issues and experiences in Canada, and around the world (eg. security, privacy, data interoperability, public engagement, outcome-based performance planning, procurement, etc.)
2. Help communities talk to the right people and find the right partners. Engage community and stakeholders from all sectors through new and existing networks, and facilitate connections and conduct active matchmaking between communities and stakeholders.

Below are some key resources from Community Solutions Network that can help communities advance their data and technology journey:

- **[Community Solutions Portal](#)** is a digital hub and collaborative online space that offers variety of resources such as podcasts, research briefs, toolkits, and connections needed to build inclusive and liveable communities.
- **[Community Solutions Network](#)** event-based programming provides advisory and capacity building resources and support in all regions across the country through a series of collision days. Please click here to know more about the upcoming events at Community Solutions Network.
- **[Advisory Service](#)** provide personal support by sharing knowledge, expertise, experience and guidance to municipal and community leaders to build internal capacity and navigate the open smart cities landscape on relevant topics such as technology, data management, security, privacy, procurement, public engagement, outcomes-based project planning, etc. One to One Advisory is offered by Open North at no cost to communities.

A group of people are sitting around a table in a meeting. There are laptops, tablets, and documents on the table. The scene is dimly lit with a blue tint. A woman in the center is speaking and gesturing with her hands. Other people are listening and looking at their devices.

VOLUME 2:

The Lab Learnings

Through the lab and experimentation process it became clear how intentional data governance frameworks can positively impact the way cities utilize data, assess the value and risk of data and how they build awareness for the impact data has on both their projects and on the city. From this, potential areas of opportunities were identified for policy or process recommendations to build solutions that capture varied perspectives existing in our cities.

Each city provided unique perspectives and insights into how their city manages technology and digital assets across the following themes.

1 Ensuring strategic alignment across departments

Coordinating technical standards and best practices are often prioritized over the experiences of data users. Through the city workshops, the importance of working closely with different business units, accessibility and inclusion experts and technical teams to co-develop solutions became even more evident. These teams test feasibility of what's possible with real time feedback. It is critical to bring them into the smart city data governance conversations to mobilize efforts more broadly across the wider organization. They typically have the resources, infrastructure and ways of working that would be conducive to learn best practices, pilot innovative ideas and utilize resources. The highly engaged stakeholders across the city showcase the desire for different teams to discuss the challenges they all face working with, obtaining, and managing data.



“There is a growing community of employees who care about data governance.”

– Calgary Data Governance Lab Participant

2 Building effective frameworks through small steps

To realize the promise of a coordinated and effective smart city data governance policy or framework, tremendous effort, leadership and coordination is needed to align the city towards a common set of principles and practices, starting with an ambitious city-wide vision. Business units can then begin taking steps to realize and adapt their practices to comply and leverage the policies and data for their projects. As demonstrated with the Future Cities Canada Data Governance Lab prototypes, coordinated small steps can create great value. Over time, these small incremental changes can drive towards larger organizational changes in the absence of a large-scale organizational reform. Both a top-down and bottom-up approach is needed to establish the enterprise policies and best practices while mobilizing and creating a positive experience for the business units and data users. Establishing assets such as an organization-wide data catalogue, building an internal data community of practice, among other initiatives, can work towards building a desired smart city data governance model.

What is a Community of Practice? A Community of Practice is a group(s) of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly. We established a community of practice across the three lab cities to create a forum for cities to learn new emerging data governance methods, ask questions to solve common challenges and share best practices. <http://www.communityofpractice.ca/>

3 Identifying the need for data stewardship

With the abundance of data collected across the city, challenges around identifying the proper data owners proved cumbersome and created great friction for the individual or team looking to obtain data from another business unit. With convoluted lines of responsibility, privacy and security can be in risk and jeopardy, time and resources go to waste, and collaborative culture is suppressed. This results in individuals and teams creating unnecessary barriers to obtain data, providing less than adequate amounts or fields of data than is possible or taking inordinate amounts of time to respond to the inquiring team. These challenges pose as frustrating barriers and reinforce the siloed culture that exists in cities. Defining frameworks and governance model for the data not only helps in managing privacy and security risks but also helps in promoting data sharing culture across the business units to drive maximum value from data and technology initiatives.

4 Making data accessible

The ability to find and access data through the city varies. Programs, like the open data portal, give teams quick and easy access to valuable data that has already been collected. We have observed that teams across cities are starting to focus on providing data to open data portals but it is far from common practice for anonymized data. Standardizing how data is collected, categorized, stored, and disposed with emphasis on anonymization practices ensure privacy is maintained, can encourage data accessibility and interoperability beyond the initial purposes for collection. Collectively this will support data-driven decision making and maximize the return on investment (ROI) of the initial project/program.

5 Experimenting with new data capture techniques

New technology can create different paths to collect, manage, and store data, based on the type of data collected and the associated privacy risks. Through controlled tests, the cities can explore methods like masking, at source or post collection, or creative capture methods such as using thermal imaging to anonymize while collecting data across various objects. Each method of collection has various resource constraints on both time and costs.

6 Reducing back-end project risks

With the proliferation and rapid evolution of technology, it is difficult for business units to adequately and timely assess the opportunities and risks these technologies now create. A simple camera setup to count foot traffic in an area now raises questions around what data is captured, if there is *Personally Identifiable Information (PII)*, how it is stored, and the gambit of data life cycle questions that surround the technology. This burdens project teams to fully assess these concerns upfront and place appropriate requirements on procurements. A focus of the participating lab cities was to understand the challenges of project teams and find ways to support them through their business planning and execution to front-load technical and data related due-diligence to reduce the back-end burden for projects. To reduce project risks and burdens, cities will need to critically rethink how they implement and create detailed data plans for their projects, informed by city and subject matter experts, and how they might modernize and include data and digital requirements into the procurement process.

7 Identifying challenges around data classification

Data classification was one of the core focus areas for the technical teams across the three cities. For them, the promise of common data classification would both alleviate concerns and reduce future effort around creating appropriate privacy and security measures, access and permissions of data, and to catalogue and share data across the organization and potential partners.

8 Recognizing how cross-departmental collaboration increases value of collected data

The recognition that creating and fostering collaboration across teams will increase the value of data to further amplify smart city initiatives. Increasing the accessibility, usability and shareability of data within the city was recognized to be a major focus for technical teams to generate value.



VOLUME 3:

The City Use Cases

Calgary

Understanding how to use information captured by cameras to drive value and protect citizen data

Teams engaged: cross-departmental data users and stakeholders



City Overview

Calgarians are innovative people and its community's advantage is the entrepreneurial spirit, that is open to new ideas and not afraid to pioneer new initiatives. Calgary has one of the youngest, energetic workforces of any major city in Canada, a high rate of small business ownership, a burgeoning tech sector, a talent pool of world-class researchers, and a highly educated workforce that is skilled and adaptable. This combination makes the city suitable for implementing new and emerging technologies, testing what has never been done and challenging the status quo. Calgary has always been a city that adapts to a changing environment and has a population that evolves with it.

The City of Calgary has been delivering smart services and investing in smart infrastructure to help make our community better for many years. They have delivered Smart City programs ranging from smart water detection, noise monitoring, real-time snow and ice removal monitoring, and automated traffic monitoring. In addition, Calgary is the first Canadian city that built and owns a Long Range Low Power Wireless Area Network (LoRaWAN). This network, providing near city-wide coverage, has the potential to connect City devices, business units and projects using "Internet of Things" technology to enhance communications, planning and citizen services.

Problem Statement:

How can the City of Calgary identify and manage risk (privacy, security, fiscal and economic) in order to maximize the use of technology and systems within their risk tolerance?

Tools and Activities:

Primary interviews, visioning future exercise, process mapping data flows, opportunity and barriers analysis, design brief, prototype plan, hypothesis + testing approaches, prototype requirements

The Opportunity

New technologies present a great opportunity for cities to create deeper insights into how people interact with the city, how effective city services are, and to generate efficiencies internally. With these new technologies embedded into smart city initiatives, new processes, workflows, and policies must be created to best maximize the value generated by technology and data.

Value Proposition

By understanding and testing how data is collected, managed, stored, and disposed, by new camera technology, the city can create more high-value data for use across the organization beyond the business unit who owns the technology. This increases collaboration across teams, generates opportunities to multiply the uses of data. An examples would be to leverage traffic cameras beyond traffic and safety management would be to gain insights into the utilization of nearby city benches and spaces, and to identify unhealthy trees. This in turn can effectively increase the return on investment the city makes for their traffic infrastructure.

Our Approach

The DGL team worked through an iterative design process to understand the current state of data governance processes and policies and identify gaps and opportunities for creating a more collaborative environment to securely share and utilize data across the organization.

Outputs and Outcomes

The City team identified data governance factors that would catalyze easier to find, more usable and shareable data across the city. The activities that led to these discoveries were process and journey maps, overlaid with opportunities and value drivers.

Testing the various camera data flows, the team discovered the relevant technology that balances data's value while protecting Personally Identifiable Information (PII), and the accompanying classification, security, and privacy measures that allow for effective collaboration across the city. Methods used for data capture and tracking data flows were:

1. Thermal camera technology, capturing heat signatures and no PII
2. Video capture with anonymization at source
3. Video capture with anonymization after collection

Each data flow generated value for the teams across the organization. The teams started developing an understanding of new technology and various capture methods to best orchestrate privacy and security. The major outcome from the Lab process was an appreciation for working in an ambiguous design process to tackle this very large and complex topic of smart city data governance. The process created momentum through the engagement of stakeholders across the city through candid conversations around data management within the city. This style of work

pushed the team to not prescribe the problem areas but to define them based on the input and research done in the discovery phase. Convening stakeholders across the organization, showcased the challenges each department was facing and the contribution of resources and thought leadership that was necessary to create meaningful change for greater success in smart city initiatives. This resulted in teams using broad perspectives to create a test plan that complements the prototype above, such as addressing communication in public spaces, to continue to learn the best practices surrounding the technology used and data that is captured.

What Made This Unique

Applying the Lab process to a live project allowed the teams to bring in stakeholders from both project teams and impacted business units to have deeper discussions around new data governance principles and processes aligned with both business and organizational ambitions.

London

Reducing project risks through proactive smart city data governance processes in the early stages of IT projects

Teams engaged: cross-departmental data users and stakeholders



City Overview

The City of London, situated in the heart of South Western Ontario, takes great pride in the extensive network of recreation amenities, parks, and pathways. With a population of 380,000, London is the economic, healthcare, and educational hub of South Western Ontario. Currently, London is working on Smart Cities projects in various capacities with traffic and roadways, wastewater, and parks and recreation. Additionally, London is investing in infrastructure projects such as a smart traffic signals project, 5G pilot in partnership with Rogers Communications, as well as an open-access ultrahigh speed fibre network in partnership with Southwestern Integrated Fibre Technology (SWIFT), to ensure high-speed capabilities to close the digital divide for as many Londoners as possible.

Reasons for joining Data Governance Lab:

- Ability to connect, learn and share best practices with other cities and organizations
- Seeking support from Data Governance Lab team and finding practical ways to apply data governance principles

Problem Statement:

How might the city of London define and coordinate data governance to help standardize practices, to fully leverage the use of technology.

Tools and Activities:

Primary Research (stakeholder interviews), Journey Map, Process Mapping, Design Brief, Prototype Plan, Paradox Cards, Storyboarding

The Opportunity

With a focus on leveraging Smart Cities solutions, innovation procurement, open data practices, and larger data sets, the city of London has recognized the decentralization of data governance within the city and its impact on the project health of smart city initiatives and the effectiveness of city services. It is difficult, with the rapid technological change and the promise of these new technologies, for business units to fully understand the impact of both the opportunities present to the entire organization and also the potential risks the data might pose for the city and partners. The London team aims to align processes and policies and connect teams to collaboratively formulate best-practices for the city to help support both front line and back end teams.

Value Proposition

By understanding the challenges teams face throughout the project lifecycle, the use case will align the goals and motivations of teams to better support strategic initiatives, thus creating fewer project delays, more accurate procurement of technology and services, and proactively addressing data risks to create efficiencies for the city.

Our Approach

Through engagement from the Homeless Prevention, Municipal Innovation Exchange (MIX), Open Data teams, as well as supporting departments of Records, Information Security, and Innovation teams, the lab was able to visualize and understand the points of friction and challenges business units faced throughout the studied smart city initiatives. Moreover, the underlying motivations and values each department possesses were articulated and captured within the process maps and interviews. The lab process enabled the participants to co-develop insights with their peers which led to testing hypotheses and prototypes developed by the London team.

Outputs and Outcomes

The team in London created very concrete and practical outputs to test post-Data Governance Lab work. Leveraging existing processes, to embed a check-point within the IT intake form to identify potential data and PII (Personally Identifiable Information) risks, as well as connecting relevant teams to educate, inform, and guide the project teams towards data governance considerations and best practices. Learnings around how to best communicate the content, the form and methods of engaging teams, and educational assets to further refine and learn from stakeholder feedback will be tested within the organization after conclusion of the Data Governance Lab.

The London team also surfaced awareness of the complexities that smart city technologies and digital services create for the City. By focusing on live projects, like MIX and Homeless prevention, the London team was able to better frame and focus the research and prototypes to address the specific challenges uncovered in these projects. Through this work they were able to create more collaborative processes between project and back-end teams to better tackle data and technology challenges at the project on-set.

What Made This Unique

With the breadth of smart city projects engaged with the lab, the London city team was able to align towards common standards and principles of smart city data governance by leveraging existing efforts across the organization.

Mississauga

Embedding data principles
co-created by citizens into
the City's IT processes

Teams engaged: cross-departmental data
users and stakeholders

City Overview

Mississauga is a young city at just 46 years old. By population it is Canada's 6th largest city. Mississauga is already a smart city with extensive digital infrastructure including a regional Public Service Network (publicly owned and run internet fibre), over 70 public wifi locations and an *IT network* that covers the city with 780 nodes.

In June 2019, Mississauga City Council endorsed the Smart City Master Plan, an extensive strategic document with human-centered goals – people, living, environment, economy and mobility. Once endorsed, the Smart City Program began starting with community engagement initiatives to co-create data principles with the public that will inform the City's Smart City Policy, to be developed in 2020.

Reasons for joining Data Governance Lab:

- Ability to connect, learn and share best practices with other cities and organizations
- Finding practical ways to incorporate public input into daily operations on an ongoing basis and an attempt to avoid tension between the public and government that is seen in many other cities

Problem Statement:

How might Mississauga internally apply the smart city data principles, that were co-created with the public, to internal IT cycle to have business units and IT staff understand, identify and consider data risks, needs and opportunities including driving innovation and efficiency, while building public trust.

Tools and Activities:

Primary Research (stakeholder interviews), Journey Map, Process Mapping, Design Brief, Prototype Plan, Paradox Cards, Storyboarding

The Opportunity

With the focus on smart cities through Mississauga's new Smart City Master Plan, including extensive public consultation for public data principles, momentum has been created to align the organization to allow these smart cities to flourish, using a modernized data governance framework. The efforts of Mississauga Data Governance Lab was focused to align both the internal processes and policies and data principles to build public trust, gain internal efficiencies, and alleviate hurdles in the IT Lifecycle. By creating standardized process and shared learnings of best practices, teams within the city will be better situated on the onset to deal with the complexities of data and new technologies to better city services and initiatives. Leveraging the insights generated through the Lab will also allow the city to align its data governance principles and policies to reflect these factors.

Value Proposition

By redesigning Mississauga's IT Lifecycle Process, the city will be better positioned to standardize IT processes, data collection and uses while reducing project risks and setbacks in later project stages. Education will also be provided to engage business units across the organization to understand the challenges and potential project risks with technology and digital services.

Our Approach

Strong collaboration and input throughout the lab process enabled productive dialogue to better understand the challenges faced through the many perspectives in the workshop sessions. The first set of workshops in early December 2019, took the Mississauga team through activities to map their current state processes and identify pain-points, opportunities, and resources available. The team then worked at creating design principles and building desired future state processes, with interviews and conversations across the city to inform the work. Lastly, a workshop convening seven departments highlighted the desired future IT Lifecycle and identified activities and projects to embed the public data principles into this process.

The **IT Lifecycle Process** is the internal process of IT related projects that goes through the steps of discovery, business case development, procurement, implementation, maintenance and destruction

https://www.gartner.com/imagesrv/media-products/pdf/provance/provance_issue1.pdf

Outputs and Outcomes

Through the discovery phases of work, the Mississauga team defined the IT Lifecycle Process and identified opportunities and pain-points that created barriers, risks, and inefficiencies. These challenges surfaced in the process and experiences of the participants by creating a desired future process into the final workshops in February 2020. This final two-day workshop took the desired future and overlaid the data principles to identify high-value areas for the team to brainstorm and prototype around. These activities produced over 10 early prototypes, distilled into areas of intervention around:

- A data report to create a transparent understanding of the data needed, its impact and potential risks, and
- An educational program to inform employees of the data related risks, best practices, and resources available to them.

What Made This Unique

Mississauga greatly emphasized on the data principles curated through extensive community engagement workshops over the past year. This work helped frame and prioritize Data Governance Lab's efforts and prototyping areas through the lab process.

The smart cities team led this effort and provided an approach that focused on value creation and a citizen-centric approach, often validated by technical teams in the workshops.

VOLUME 4:

International Case Studies

There are cities globally that are leading the efforts in creating open, collaborative and participatory data governance frameworks. *General Data Protection Regulation (GDPR)*⁴ by the European Union is one of the most important data protection regulations and legislation that can be referenced by the cities and countries around the world. In addition, there are several data initiatives around the globe that can serve as inspiration for the cities and communities in Canada that the Data Governance Lab took into consideration as part of this work. The following are a few examples that inspired the Data Governance Lab team to think boldly and creatively when exploring data governance in smart city initiatives.

Barcelona, Spain

Project: City Data Commons

Challenge

Citizens around the world are concerned about their digital footprints, their privacy and how their data is being used. Data is being considered as a prime and common asset in the knowledge society and is imperative to drive decision-making process in the era of smart cities. In addition the monopolization of data can create economic inefficiencies and inequalities.

Prototypes Developed

The City Council at Barcelona has launched various projects related to Open Data and governance as part of City Data Commons⁵, a program under their digital transformation initiative

Using Blockchain for Data Sovereignty through: Decentralized Citizen Owned Data Ecosystem (DECODE)⁶ is a European project aimed to give

citizens greater control over their data and the means to share their data differently using decentralised technologies such as blockchain and Cryptography.

For the City of Barcelona, data is public infrastructure alongside other city services. It is a citizen's asset that requires their consent as the cities are data stewards and not owners. Therefore, it is essential that citizens are given the freedom to establish the level of anonymity they would like, so that they cannot be identified without consent. The common data infrastructure will be open to local businesses, cooperatives and social organisations so that they can provide data-focused services and create long-term value for the public.

Two of the pilot projects under DECODE are:

- Digital Democracy and Data Commons aims to imagine more democratic forms of data governance that respect people's privacy.
- Citizen Science Data Governance uses environmental sensors, located inside and outside the homes of participants, to detect noise and pollution levels. DECODE technology allows data to be coded and shared anonymously.

Why is it important?

Individuals should be able to decide not just on the use of their data and digital identity, but also on the data they wish to keep private or share and under what terms. Data can be used to adopt better decisions more quickly and more democratically, to promote innovation, improve public services and empower people. Democratic, transparent and regulated management of data by the government is critical to ensure public trust, ethics and privacy.

Read more of DECODE and Barcelona's Blockchain for Data Sovereignty⁷.

Estonia

Project: X-Road

Challenge

Effective data exchange is required between various public and private entities. The exchange of data to and from the public administration information system is slow, inefficient and prone to data thefts.

Prototypes Developed

Estonia implemented a core digital infrastructure project, X-Road⁸, that enabled organizations to exchange data securely and ensured confidentiality, integrity and interoperability between data exchange parties. The ongoing project, X-Road plans to implement a set of following features to support and facilitate data exchange between data exchange parties:

- Address management
- Message routing
- Access rights management
- Organization-level authentication
- Machine-level authentication
- Transport-level encryption
- Time-stamping
- Digital signature of messages
- Logging
- Error handling

In order to enhance public service, scale digital innovation and ensure interoperability of e-governance solutions and platforms beyond boundaries, Estonia established a partnership with Finland to form Nordic Institute for Interoperability Solutions (NIIS)⁹. NIIS aims to develop cross border e-governance solutions by further enhancing X-Road technology. The institute focuses on practical collaboration, sharing of experience and promoting innovation. The operating model of the institute is something quite unique in the world.

Why is it important?

Data Interoperability ensures faster, secure and efficient data exchange between information systems. It can also help in building secure and sustainable solutions for promoting collaboration both nationally and internationally.

Read more at e-Estonia¹⁰ and the Nordic Institute for Interoperability Solutions.

APPENDIX – Supplemental Data Governance Primer

Smart Cities

The world is becoming more urbanized. Currently, cities are home to half of the world's population. This number is expected to increase to 68% by 2050, equivalent to an additional 2.5 billion individuals. With this many people living in cities comes huge energy requirements. Specifically, cities consume two-thirds of energy worldwide and produce 70% of the world's carbon dioxide (CO₂) emissions.¹¹ As a result, cities face increasing environmental pressures, there are pressing infrastructure needs, and growing demands from residents to deliver a better quality of life. All of these challenges must be tackled at a sustainable cost.

With a growing urban population and increasing complex challenges, smart technologies can be employed to start addressing the growing concerns cities face. Smart cities take advantage of the unprecedented rate of advancement and investment in technology. By 2020, it is estimated that \$400 billion a year will be spent building smart cities and by 2050 over 50 billion devices are projected to be connected to the internet.¹²

What are Smart Cities?

Smart cities is a resilient, inclusive and collaboratively-built city that uses technology and data to better the quality of life for all people.

Broadly, are three layers to a smart city:

1. **Technology base:** This layer includes digital technologies, sensors and smartphones connected by high-speed communication networks;
2. **Applications:** Tools that help translate raw data into alerts, insight, and action;
3. **Usage:** The applications and tools used by cities, companies, and the public to utilize and make sense of the data.

Together, the three technological layers of a smart city are often considered the Internet of Things.

Smart cities leverage digital infrastructure and tools to produce insights from data, with a purpose to drive positive outcomes. This can help municipal governments respond to fluid situations, allocate resources wisely, and plan for the future. It also encourages individuals and companies to make better decisions that reduce costs and improve services. Smart cities initiatives have a special focus on the people and environmental dimensions of a city.

Besides technology integration, smart cities must include innovation, learning, knowledge creation, civic engagement and problem solving to solutions. What this means on a grander scale is that cities are better equipped to respond to the pressures of urbanization and are taking a proactive approach to improving the quality of life for the people who use a city while generating positive social, environmental and economic outcomes.

Increasingly city projects are becoming smart city projects as they are increasingly utilizing digital tools to drive efficiencies, improve services and increase citizen engagement and participation. We must consider the implications of data in all projects to understand the risks and opportunities it presents for the business area as well as the city.

Data Governance

Data governance aims to manage the availability, usability, integrity, and security of data and data assets. Although its definition varies broadly based on the stakeholder group, its focus is to understand the risks and opportunities, to best manage data throughout its lifecycle for both internal and external applications. It seeks to manage data, reduce costs and complexity, and realize new sources of value. A sound data governance program includes a governing body or council, a defined set of procedures and a plan to execute those procedures. Data governance is involved at strategic, tactical, and operational levels in both private and public sector organizations, typically within one organization. However, there is increasing interest in using data governance across different organizations.

Traditionally, private sector data governance frameworks focus on data stewardship, data quality, total data management, and use cases to ensure data is consistent and trustworthy. On the other hand, data governance frameworks in the public sector present additional complexities such as sustainable business models, the role of civic engagement, transparency, accountability, data ownership, data sharing and interoperability of data sets, and privacy. According to the City of Philadelphia Department of Behavioral Health and Intellectual Disability Services, data governance is the exercise of decision-making and authority for data-related matters. In other words, data governance is decision making about data-related issues that impact questions of common good, business value and civil rights.

Formal data governance is a system that proactively provides rules and policies to enable ongoing efficient service delivery while providing mechanisms to address data quality issues as they are identified. Data governance also refers to the organizational bodies,

rules, decision rights, and accountabilities of people and information systems as they perform information-related processes. In other words, data governance also includes the identification of those with decision-making responsibility for data management.

It is important to remember that data governance is not purely a technology function. It is driven by the business units and forms a bridge between the business management and technology services and providers. Executive and senior sponsorship must be present as data governance and data stewardship represent collaborations across business and service lines, with impact on the trust and reputation of the city.

According to the Cities Alliance, data governance is an overarching approach that shapes the enterprise-wide philosophy of data acquisition, management and archiving. A data governance programme brings the business and information technology sides of organizations together in an effort to define data elements and the rules that govern data across applications. Cities Alliance proposes four different data governance models;

1. **Top-down:** decisions are made by authority and everyone below must comply,
2. **Bottom-up:** decisions are made by employees and are filtered upward on a daily basis,
3. **Centre-out:** hired experts or centralized resources present the options and consider their impact on participating stakeholders, and
4. **Silo-in:** representatives from multiple stakeholder groups are brought together to make decisions.

Each of these models has its own advantages and disadvantages. It is important to remember that data management succeeds when the adopted governance approach matches the city's typology and management.

Data ownership in a data governance model must be appropriated to individuals within the organization(s) in order to have accountability. Therefore, some level of authority is normally placed on data owners, who will often be picked from the core business teams. Final ownership should be attributed to the data source, that is the person or departments collecting the data. It is the interaction among people, processes, technology and culture that drive the success or failure of data governance. An effective data governance strategy requires careful planning, the right people and appropriate tools and technologies.

Currently, there are many legislative foundations that govern the privacy of data in Government Organizations. Therefore, data governance models are shaped by these regulations and policies. *FIPPA* and *MFIPPA* are acts that provide a right of access to information and protects the privacy of personal information held by institutions (government at all levels). *PHIPA* is an act that establishes rules around the collection,

use, and disclosure of personal health information as well as giving rights to individuals for access and amendment of information. *PIPEDA* is an act that looks to protect personal information collected through electronic commerce to enable the use of electronic means to communicate or record information or transactions. As Smart Cities grow and data governance becomes a pressing concern, we will need next-generation government institutions and agencies that protect and build citizen trust and provide standards to operate in the digital economy.

Urban Data Governance

Smart Cities produce and use a lot of data. When considering data in the public realm, data related issues now include impact questions of common good, business value and civil society. Data related issues become a values and policy driven matter rather than purely about technical and legal considerations. Smart cities also rely heavily on effective partnerships with multi-sector stakeholders. It is likely that not all of the data produced by Smart Cities would belong to the city government. This predicament makes it difficult for cities to realize additional value from data and for citizens to trust companies with proper use of the data. Data governance for smart city initiatives is all about how we identify, collect, generate, share, and employ data and technologies developed for and by citizens, government, business, and academia to create urban solutions in communities.

Urban data governance recognizes the impact digital and technology creates when embedded into the city. The city becomes more responsive, interactive, and personalized allowing for more effective city services. However, this creates greater demand and strain on how we have traditionally thought about the collection and management of data. How might we create more collaboration across teams and organizations?

If we get data governance for smart cities right, we can reap many benefits. Proper and secure data sharing can result in financial gain, innovation, new insights, increased transparency, increased efficiency and new approaches to problem-solving. Open government is a form of data sharing governance that adheres to the notion that data must be open and include a significant level of detail. Raw data should be publicly available without compromising the privacy and security of citizens. When data is more shareable there is an increased focus on interoperability (i.e. data that speaks the same language). This helps cities use more high-quality data to find new insights, which can save costs and act as a benchmark against other city initiatives.

Citizens and users can gain insight into their personal patterns. This can lead them to feel empowered to make decisions since they have control over what and how data is used. When data standards are included in municipal service contracts we can realize additional

innovation and value by providing relevant information to local, regional and national businesses. Adding a standard 'data ownership clause' in procurement contracts ensures that municipalities gain access and ownership of all data produced under a certain third-party service contract. Then, this data can be used to unlock increased value.

Furthermore, Data Governance can produce "reusable data", data that is timelier, more accurate, more complete, more accessible, more useful and less costly. Data reuse is a concept that involves using research data for a research activity or purpose other than that for which it was originally intended. Data reuse can be promoted by submitting data to a global or institutional repository or by ensuring that data is described and comprehensible to any other researcher who may want to use it. Using appropriate metadata schemas can contribute to describing datasets so that they can be repeatedly reused. Similarly, a data dictionary can assist in data reuse by providing detailed definitions of the data types and methodologies used in a particular study so that the study can be easily understood by other researchers. Librarians can also promote data reuse through creating data catalogs that make data easily discoverable for their patrons or by hosting datathons where researchers are encouraged to reuse data in innovative ways during the event.

The Problem

Canadian municipalities are facing new and emerging challenges that will shape the way cities are built and run. We know and understand that the pace of technological change, intense urbanization and environmental concerns already impact the way Canadian municipalities think about their cities. The rise of the smart city and its related initiatives are enabling greater insights into our cities, connection to humans within the city, and responsive, real-time information and analytics. Underpinning those concerns, how we capture, utilize and manage the data that comes from technologies used in the city will be of critical discussion internally, but also from their constituents. Globally, and right here in Canada, municipalities are starting to feel the effects of the growing trends below:

- **Citizen engagement and sentiment**

Citizens are relishing the opportunity to better engage with their city. As shown from the *DECODE* project in Barcelona, giving citizens power and authority over their data in pursuit to create data for their city.

- **Participation and transparency**

Public sentiment over key privacy and data concerns have emerged from the Sidewalk Toronto, *Smart City Quayside* project. Citizens are demanding a voice now that technology enables greater discussion and participation. Amazon's HQ2 debacle in Queens, NYC is another example of citizens utilizing social license to restrict actions of their governments and private organizations.

- **External pressures and power plays from private sector**

With resource constraints felt across Canadian municipalities, public-private partnerships (PPPs) are becoming more common. Projects like *Innisfil's uber transit* and *Sidewalk Labs, Quayside digital neighborhood* are embedding private organizations into the core infrastructure of municipalities. These partnerships create complexities around data; how it is shared, its ownership and stewardship, and how it is managed.

- **Privacy and security concerns**

With data proliferating many aspects of the city, concerns around data breaches and misuses of data are present and need to be managed effectively. What this means and looks like in each city varies; from surveillance states in China, to election manipulation with *Cambridge Analytica*.

These factors have tremendous ramifications for local governments as they balance the need for transparency, the objectives of the city, and partnerships. Cities have an opportunity to proactively manage data-related decisions that balance and protect stakeholder interests. This can be complex, as the data related to smart cities and public realm is a new problem that requires new approaches.

We need to reframe how we think about smart city data

Traditional life cycle management of data has been used to manage risk, which inherently affects how it is utilized within the municipality. The Data Governance Lab looks to reframe how we use data to drive value and efficiencies across departments and key stakeholders.

Thematic challenge areas indicated by Canadian municipalities:

- Siloed data and digital assets
- Little to no standardization across business units
- Unknown ROI for data and digital assets

Using these challenges, we can start designing meaningful data governance elements to supplement existing frameworks.

- How can we properly evaluate our digital efforts to better evaluate potential partnership opportunities?
- How might we create data standards to increase its value throughout city departments?
- How can we create efficient processes to foster collaboration, transparency, and value on our smart city projects?

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