



Building Ontario's Next-Generation Smart Cities through Data Governance

Part 2: Towards a Smart City Data Trust
Design recommendations for a personal mobility data trust



I. ABOUT THE SERIES

Building Ontario's Next-Generation Smart Cities Through Data Governance

There are many definitions of a “smart city,” but central to all of them is the implementation of advanced technology for the creation of systems and services to support prosperity and quality of life for people. As cities adopt smart infrastructure, they are beginning to gather useful data. Alone, that data can provide useful insights to help make specific aspects of city life more efficient and more livable. Combined with other data, city data could generate innovative new uses and new value. This emerging opportunity raises important questions on how data might be owned, shared and governed.

It's still early days and cities around the world are still figuring it out, researching and testing new methodologies, and leveraging digital technologies to support them. In such environments, digital research infrastructure is key to the exploration of smart cities data governance.

Rapid advancements in data collection, transfer, and analysis technologies have provided the Government of Ontario with the opportunity to explore new infrastructure systems for economic development. These technologies have enhanced the government's ability to amass volumes of data and interpret them to create data-driven solutions to challenges in infrastructure development and delivery of products and services to the citizens. However, this also raises concerns around privacy, security, individual rights, and privatization of citizen data. In order to balance innovation that leverages this data with individual wellbeing, the Government of Ontario granted Compute Ontario and ORION funding to study smart cities.

To support this deep-dive into smart cities and data governance models, Compute Ontario and ORION convened diverse stakeholders and experts from policy and governance sectors, as well as industry, academia, and research. We brought over 125 stakeholders together at a “Smart Cities Governance Lab” in Kitchener, Waterloo, in March 2019 to discuss and workshop the topic, and assembled a “Smart Cities Advisory Committee” with whom we regularly consulted. The committee brought diverse representation and expertise that informed our areas of exploration, and validated report recommendations. Through three use case studies, we further explored data governance in areas health, personal mobility, and open data architecture to facilitate more equitable access to the data market and enhance economic development within the province.

This series of reports is a culmination of these efforts and focuses on resulting recommendations, existing examples of data governance models, and exploring various data principles, commons, collaboratives, and trusts.

In this report from MaRS Discovery District, we explore improvements to the collection, use, and management of personal mobility data, intended as a prototype for use by Ontario municipalities.

ACKNOWLEDGEMENT

MaRS would like to thank Compute Ontario and ORION for guiding this work as part of the smart cities data governance report supported by the Government of Ontario.

TABLE OF CONTENTS

I. ABOUT THE SERIES

II. THE PROJECT

- The Team..... 5
- Executive Summary 6
- The Challenge 7
- Why a Data Trust 9
- What we Learned 12
- The Users 19
- Building Blocks 22
- Design Criteria 36

III. RECOMMENDATIONS

- Preliminary Recommendations 39
- Conclusion 58
- Appendices 59
- Bibliography 63

Key Terms and Definitions

Data trust: An entity established with a fiduciary responsibility and technical capacity to manage data usage rights and other digital assets on behalf of beneficiaries, who may include residents and stakeholders in a smart city.

Smart city: A city that uses innovation, data, and connected technology to solve problems for and with its residents for public benefit.

Digital layer: The network of interconnected sensors, technologies, databases, algorithms and code, maps, visualizations and models, application programming interfaces, digital services and applications that generate, store, share, analyze, and use data collected in cities.

Personal Mobility: How individuals, embedded in a system, travel to and from destinations of choice.

II. THE PROJECT

THE TEAM

Alannah Dharamshi, Summer Associate, MaRS Solutions Lab

Alex Ryan, VP, MaRS Solutions Lab

Ariel Sim, Director, Design Anthropology, MaRS Solutions Lab

Basil Ennab, Market Development Analyst, MaRS Knowledge & Insights

Chris Makris, Sr. Associate, MaRS Solutions Lab

Malavika Kumaran, Research Manager, MaRS Data Catalyst

Sasha Sud, Director, Smart Cities, MaRS Partnerships

Shaquille Morgan, Summer Associate, MaRS Solutions Lab

Steve Deery, Associate, MaRS Data Catalyst

EXECUTIVE SUMMARY

As cities across Ontario introduce digital technologies to improve their citizens' quality of life and unlock the potential of the digital economy, the amount of data collected and shared among private and public organizations is rapidly increasing. New governance mechanisms are needed to ensure that the data collected about residents is for their benefit, while protecting and advancing their democratic rights and freedoms. One model of urban data governance that has recently received attention is the data trust. A data trust is a legal and technical architecture for data sharing that establishes a fiduciary responsibility between the trustees, who act as stewards of urban data, and the residents, who are the beneficiaries of data assets. While there is growing literature on the concept, few examples of operating data trusts exist in practice. Consequently, there are many open questions about the best way to structure the legal agreement, business model, civic participation approach, and technical architecture of a data trust. There are also particular questions about how a data trust could apply in Ontario's legal and cultural context for specific use cases.

This report frames and begins to address questions about the practical design choices for a smart city data trust. We have selected personal mobility as a high value use case for exploring a data trust due to the significant public benefits, high regional need, strong market interest, unresolved privacy concerns, and current lack of systems-level data governance practices. Through a combination of interviews, secondary research, participatory workshops, and gamification, we developed preliminary recommendations on how to make a data trust work in practice. The data trust game developed for this project received extremely positive reviews from participants and is a novel contribution to increasing user literacy about the potential benefits and risks of smart city data sharing.

The report is organized as follows. The introduction provides the motivation for this project and for exploring a personal mobility data trust. The body of the report starts from the perspective of the potential users of a data trust, spanning public, private, academic, and civil society stakeholders. Based on user interviews, we broadly identify each user's role, existing data sets, unmet data needs, barriers, disincentives, and incentives for data sharing. In the next section, we identify the primary design elements for a smart city data trust and enumerate the possible options. Having identified options for the legal architecture, business model, civic participation approach, and technical architecture, we make preliminary recommendations for each component with the intent of designing a desirable, feasible, and viable solution.

We recommend that a data trust be incorporated as a not-for-profit corporation to uphold impartiality and avoid the conflict of interest created by a profit motive, while maintaining independence from government. A not-for-profit legal structure can provide the benefits of a legal trust, including fiduciary responsibility, while also providing limits to personal liability and additional flexibility to adapt the purpose of the trust over time. We recommend utilizing a range of complementary forms of civic participation throughout the design, build, and maintenance of the trust. Promising approaches to citizen participation include a citizen assembly, citizen jury, and dynamic consent platform. We recommend a decentralized technical architecture, connected through a data trust platform, to enable responsible data sharing. Following the recommendations, we briefly summarize the potential impact of a data trust, and remaining risks and uncertainties that require additional research and prototyping.

There are still many outstanding questions that need to be answered before a data trust can begin operating in Ontario. We call on governments and public-minded corporate sponsors to invest in further prototyping and testing of these concepts so that Ontario can benefit from the opportunities of the digital economy, while protecting and advancing the rights and freedoms of citizens.

THE CHALLENGE

In November 2018, Compute Ontario and ORION submitted a proposal to the Ontario Ministry of Economic Development, Job Creation and Trade for the purpose of preparing a report focused on data governance to advance smart cities, outlining a plan to explore the concept of a data trust model in collaboration with three organizations through three demonstrable use cases. As part of this initiative, MaRS set out to test and illustrate data governance recommendations by working with a number of external partners to prototype a data trust as a novel model for data sharing in personal mobility applications and services.

MaRS is North America's largest urban innovation hub, supporting over 1 200 ventures across Ontario and Canada, and curating 1.5 million square feet of research labs and tech office space in downtown Toronto. As a not-for-profit and registered charity, MaRS has a mission to help innovators create a better world. Our point of view on data governance is guided by our role as an innovation ecosystem convener. The entrepreneurs and innovators we support represent a significant proportion of both the supply of and the demand for data collected in cities. We are committed to promoting practical models for responsible and privacy-protective data sharing that benefits the public.

In this report we define different stakeholders and plausible governance models for the purpose of using multi-sector mobility data in a smart city to better understand, manage, model, and regulate traffic flow and associated infrastructure.

Our Approach

Our research arc spanned a four-month period and consisted of four primary research initiatives: an exploratory workshop, ethnographic interviews, interactive game design and testing, and a prototyping workshop. These efforts were supported by extensive secondary research. Further details are located in Appendix A.



Primary Research

Exploratory Workshop

On March 28, 2019, Compute Ontario and ORION hosted over 125 stakeholders in their Smart Cities Governance Lab. Here, MaRS facilitated a participatory workshop exploring models and best practices in data governance, obtaining thirty-six data sets from two group-based activities. In the first activity, participants were immersed in data governance use cases to identify elements to adopt, elements to critique, and current gaps. In the second, participants self-identified with a stakeholder group to explore their roles and responsibilities in a future smart city, with discussion centered around a particular data type.

Interviews

Between April-June 2019, we completed twelve in-depth interviews with cross-sector stakeholders in the mobility ecosystem. Participants provided insights on: how and what kind of data trust could solve consumer and market problems in the mobility space, their data sharing needs and assets, and the four components of the data trust prototype.

Interactive Game Design and Testing

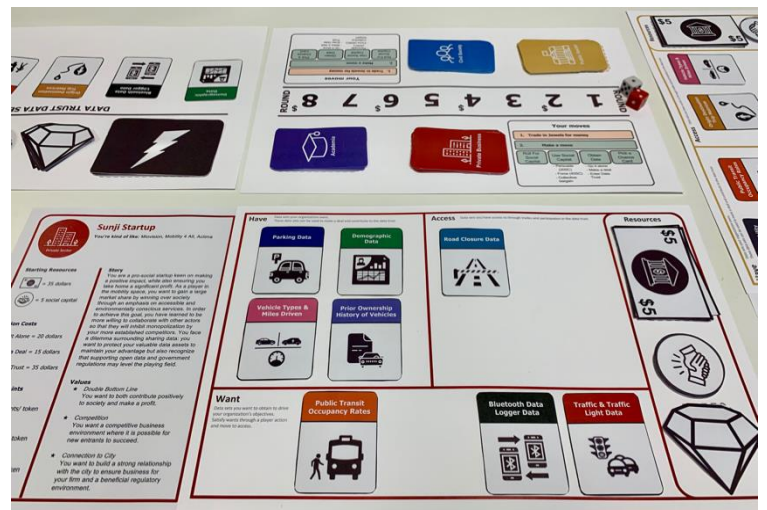
During June 2019, we designed an interactive board-based game as a research tool based on the question: “If we build a data trust, will stakeholders join it?” The logic behind the gamification of engagement and research was to create a tool to help break down communication barriers and encourage unhindered expression of insights. We conducted seven internal tests of the data trust game, ensuring both its functionality and usability.

Prototyping Workshop

On June 26, 2019, MaRS convened fifteen cross-sector stakeholders to play the data trust game. Participants were asked to embody a game character from a different sector than their own in order to facilitate empathy building. During and post-gameplay insights were generated on the relationships, value exchanges, and incentive structures required for a data trust to succeed.

Secondary Research

In support of our primary research efforts and to further inform our data trust recommendations, we conducted secondary research, internalizing over forty articles and reports, ranging in scope from theoretical models to use case analyses. Particular attention was given to civic participation during this phase of work as it is the most neglected aspect of data governance and yet is also the most criticized component of current smart city initiatives.



WHY A DATA TRUST?

Why a data trust?

As cities, including Toronto, increasingly adopt a smart city approach, there is an immediate need to ensure that the primary goal of any implemented technology is to improve outcomes for citizens. This objective requires adequate governance of the digital layer to promote security, privacy, social equity, and economic competitiveness in a smart city.

However, traditional governance models cannot be directly applied to smart cities. The mix of public and private sector actors leads to potentially conflicting data access and ownership rights; a lack of standardized technical architecture; and varying levels of control, communication, and transparency to citizens. A lack of standards and large data assets held by only a few actors could skew the benefits from economic development, while leaving other needs like security, privacy, and social equity unmet.

Consequently, in order to protect the interests of citizens living in the digital age, while allowing other stakeholders to attain benefits, an alternative governance model, such as a data trust, is needed for smart cities.

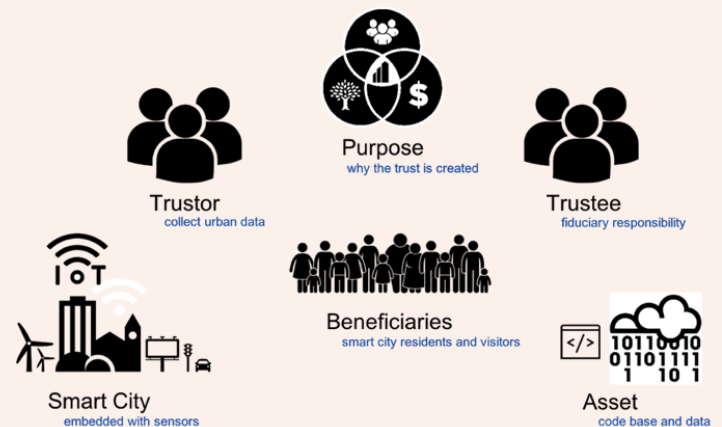
What is a data trust?

An entity established with a fiduciary responsibility and technical capacity to manage data usage rights and other digital assets on behalf of beneficiaries, who may include residents and stakeholders in a smart city.

The **purpose** is the reason the data trust is created, encoded in a mission and governing principles. The purpose should make it clear what value the trust is intended to deliver to its beneficiaries.

The **beneficiaries** are the segments of society that receive benefits from the data trust: residents, visitors, businesses, workers, and institutions in a defined urban zone where data is collected. This “urban zone” could be a neighbourhood, a district, or an entire city.

The **trustees** are a group of people with a fiduciary responsibility to protect the interests of the beneficiaries. A data trust would need to decide if trustees are elected or appointed. It would need to put in place governance structures that include public accountability and participation.



base (database, standards, processing structures and interface) and data that make up the digital layer. The data trust may also manage financial assets to ensure the sustainable operation of the trust.

The **trustors** are individuals, companies, agencies, and governments that donate digital and financial assets to the trust. While the data trust would own the digital assets, they may grant a licence to use the assets back to the trustors under the conditions of use established by the trust.¹

¹ “What is a Civic Digital Trust” in *A Primer on Civic Digital Trusts* (Toronto: MaRS Discovery District, accessed July 19, 2019), <https://app.gitbook.com/@marsdd/s/datatrust/trusts/what-is-a-civic-digital-trust>.

PERSONAL MOBILITY

Why are we starting here?

A data trust has the potential to provide a framework that goes beyond the minimum compliance standards of individual mobility providers to form systems-wide regulations, which overcome the friction of disjointed one-to-one agreements. It could help scale trusted networks of integrated mobility solutions, optimized for citizens and our cities as a whole.

Mobility networks require the use of commercially and personally sensitive information including the location of users and employees, commercial load information, vehicle information, and financial information. Compliance with industry regulations, data protection, and privacy laws are absolutely necessary but still insufficient. Beyond compliance, there is a need for governance on how data is being used by actors in the mobility ecosystem; there needs to be a mechanism to ensure that data is used for its intended purpose, with particular attention to optimizing services in the best interest of the citizens in a city.

In our assessment, one of the highest value use cases within the realm of mobility is mid- to long-range transportation planning across all of the municipalities in the Greater Toronto Area (GTA). For such a unified approach to transportation planning to be possible, acquisition and integration of data from each city is required. However, currently the data collection efforts between each city and municipality differ, and as a result, there is incompleteness, fragmentation, and a lack of standardization within the datasets owned by municipal transportation authorities.

Our interviews identified the following typical challenges that are currently experienced by municipalities in the GTA:

- Fare pricing for public transportation;
- Route planning, preferably segmented by demographic information;
- Understanding pedestrian and cycling patterns;
- Understanding the effect of ride-sharing on curbside maintenance;
- Budget constraints despite opportunities for automation, little to no ability to focus on implementation strategy; and
- Building new infrastructure to satisfy growing demand at a time when budgets are limited.

What is Personal Mobility?

A working definition from RideScout's co-founder and CEO explains personal mobility as “the entire ecosystem of options that connect you with the faces, places and appointments of your daily life”.² It is how individuals, embedded in a system, travel to and from destinations of choice. This human-centred focus on the entire ecosystem is an important distinction from traditional definitions of mobility. Over the last decade, personal mobility has seen a transformation affecting ownership models of automobiles, modes of transportation systems, and both human and organizational behaviour. Individuals have more choices now than ever to get from point A to B.

This new freedom of how to travel around cities includes:

- Personally-owned automobiles,
- shared mobility (Uber, Lyft),
- car sharing (communauto, turo), and
- public transit (TTC, GO) and micro-transit options like e-scooters and bicycles.

² Sabrina Giacomini, “Beyond Cars: the Next Step in Personal Mobility,” *Autotrader*, April 18, 2016, <https://www.autotrader.ca/newsfeatures/20160418/beyond-cars-the-next-step-in-personal-mobility/>.

Therefore, a data trust that helps standardize and aggregate data collected by multiple stakeholders may provide great value to cities and municipalities. Presently, data collected by municipalities varies in quality; however, if each municipality worked with the same high-quality data, better transportation planning across the GTA would likely be achieved. The private sector (e.g. Uber, Google) and transit authorities (e.g. TTC, Metrolinx) could help fill these existing gaps by providing data that municipalities need to make better decisions regarding their transportation planning, such as detailed transit user data and route mapping. For instance, transit authorities, such as the TTC, could use the data to model traffic patterns given certain conditions and modify their operations accordingly. Our research indicated that municipal transportation departments are willing to pay for the data provided by the trust, as long as it meets their needs.³ In relation, a data trust could also make public-private partnerships more feasible, as ridesharing services, such as Uber and Lyft, could better connect with public transit to deliver a more seamless transit experience for citizens.

In addition, a data trust could assist in automating some of the functions that transportation departments are currently doing manually. If enough relevant data exists within the trust, it could either complement or potentially substitute for qualitative data from the Transportation Tomorrow Survey, a study that many cities in the GTA participate in. Moreover, as cities and municipalities also vary in their ability to process raw data, a customized format may alleviate some variation in ability to analyze the data. Overall, the key value from a data trust would lie in what types of data are being collected, as some data types, such as pavement quality, are fairly ubiquitous and are of limited value to cities.

³ Public Sector Interviewee, April 30, 2019.

WHAT WE LEARNED



14

The Users

- Transit Operators
- Public Agencies
- Private Organizations
- Startups
- Academia
- Civil Society



22

Building Blocks of a Data Trust

- Legal Agreements
- Business Model
- Civic Participation Approach
- Technical Architecture



36

Criteria

- Legal Agreements
- Business Model
- Civic Participation Approach
- Technical Architecture

The Users



Through our discussions with various mobility and ecosystem stakeholders within Ontario, we formulated a classification of the types of actors, their potential data contributions, and their motivations and concerns with data sharing. Further insights were extracted from gameplay, which allowed stakeholders in the data trust ecosystem to interact and negotiate with each other. This activity surfaced biases and preconceived notions stakeholders had about other actors, while promoting discussion on options for how they can collaborate in the future. The stakeholder groups we observed and interviewed included public transit operators, governments and public entities, large private corporations, local startups, academics, and citizens. Thus, the following are personas derived from our primary insights, supplemented with secondary research. While informed, this list should not be considered exhaustive, prescriptive, or representative of all actors.



Who they are

Public Transit Operators

Public transit operators represent transit agencies such as TTC and Metrolinx. Depending on the mode of transit (e.g. bus, rail, ferry), transit districts may overlap, such as the TTC's subway system and GO Transit's intercity rail lines. These organizations compete with private companies, such as ride sharing services and taxis, for ridership.



Data has

Public transit operators are generating and collecting data on their riders, such as commute times and ride frequency.⁴ Often their vehicles are equipped with GPS and will log locations along their routes, as well as the number of riders that get on or off.⁵ The use of the Presto Card system has enabled even greater detail on public transit ridership as it tracks and stores individual usage data for at least five years.⁶



Data needs

Public transit operators demand increasing amounts of data in order to provide more efficient and equitable service but are constrained by limited budgets.⁷ With more detailed traffic data, especially along route corridors, they would be better able to plan routes and vehicle frequency. Auxiliary data, such as the number of people using cars compared to the number of transit users in a specified area during a particular time, would allow them to better measure their performance compared to alternative mobility options. Data regarding ridership on rideshare services would be ideal, as it would allow transit operators to plan for better first mile/last mile options for commuters. Access to these data sets could also allow them to provide better coverage in “dead zones” around the city and design flexible transit schedules to meet the needs of citizens.



Challenges and Barriers

One of the reasons public transit agencies are not accessing this data is due to limited avenues and opportunities to see data sets from other departments and organizations.⁸ It is not always clear what data is available, whether or not they may be given access to it, and who they need to contact in order to do so. Despite the benefit of connections to other public agencies within the municipality, there may not be transparent information on external opportunities. Even if there are clear opportunities, external data, such as cell phone location data, may have substantial cost barriers to allow access.⁹

There are a variety of factors that disincentivize data sharing for public transit agencies. The biggest barriers are related to industry competition. Public transit agencies seek to provide a public service and mobility for all citizens, while private companies are generally focused on profit seeking. If rideshare companies are provided an advantage through access to public data, they

⁴ Public Transit Operator Interviewee, May 3, 2019.

⁵ Public Transit Operator Interviewee, May 2, 2019.

⁶ Brenda McPhail, “Presto Change-o Privacy Disappears!” *Canadian Civil Liberties Association*, January 2, 2019, <https://ccla.org/presto-change-o-privacy-disappears/>.

⁷ Public Transit Operator Interviewee, May 3, 2019.

⁸ Public Transit Operator and Public Transportation Department Interviewees, May 6, 2019.

⁹ Public Transit Operator Interviewee, May 3, 2019.

could take market share away from public transit. Costs and capabilities relating to cleaning and altering data are also a concern, as well as quality controls to ensure the legitimacy of the data being shared.¹⁰



Transit agencies see value in data sharing, and would be willing to consider it under certain conditions: a neutral third party to manage and ensure fair value exchanges, transparency in what data is available and who it is being provided to, and data that is already standardized and does not require significant work in order to be useful.¹¹ If these criteria are met, public transit agencies may be more likely to participate.



Government and Public Entities

Within the mobility ecosystem, government and related public entities (i.e. ministries, departments, agencies) can be categorized into two broad categories: those directly within the mobility sector and those adjacent to it. The former focuses on planning and managing mobility and mobility-related infrastructure; it includes entities focused on urban, transportation, culture, and economic development planning. The latter focuses on issues that use or include mobility such as municipal asset management teams and emergency services. Although these entities indirectly participate in the mobility sector, they provide data that can create a more holistic view into other datasets and mobility solutions. Therefore, the inclusion of this stakeholder group is necessary to allow for better city services and efficient use of resources in capital projects. Both categories of actors provide strong opportunities for creating new sharing mechanisms that unlock social benefit.



Data is necessary for the work government entities conduct; their planning processes and strategies rely on the use of data to validate decisions. Of particular relevance, in city departments data is typically created through manual and automated technologies, both above and below ground.¹² The above ground technologies are seen as directly competing with the robust network of private devices, such as smartphones. The physical infrastructure around the city that captures data for city departments include traffic lights, signals, and inductive-loop traffic detectors.¹³ These technologies are used as count mechanisms to assess traffic flows throughout cities. Other manual forms of data capture include human counters, who capture the number of vehicles and occupants within, and the direction of travel.¹⁴ These forms help validate other sources of data. However, they have a low degree of certainty with a high cost. Cities must balance the costs associated with investing in data capture technology and direct data purchases, with the quantity and quality of the derived data.



The city departments gain data from other strategic partners such as the TTC and census data.¹⁵ The TTC data provides more clarity on number of passengers and route times for transit services.¹⁶ These data sources are limited to newer trains and buses as they are equipped with sensors, unlike the older models. Census data, which includes the Transportation of Tomorrow Survey from the Ontario Ministry of Transportation, is a data source utilized by several mobility related departments. This survey identifies a breadth of demographic data, such as age, job, income, as well as trip information to gather the purpose, modes of transportation and locations travelled to.

Nonetheless, government stakeholders are making large capital investments into improving our traffic problems, and are seeking more types of data to deeply learn about the behaviours and

¹⁰ Public Transit Operator Interviewee, May 2, 2019.

¹¹ Public Transit Operator Interviewee, May 2, 2019.

¹² Public Department Interviewee, May 3, 2019.

¹³ Public Department Interviewee, May 2-3, 2019.

¹⁴ Public Department Interviewee, May 2, 2019.

¹⁵ Public Department Interviewee, May 3, 2019.

¹⁶ Public Department Interviewee, April 30, 2019.

motivations of their constituents. Supplementing their current data sets with holistic travel data from the start to the end of the citizen journey throughout the city would help paint a richer picture of their travel experience. In particular, given that many citizens cross municipal boundaries during their commutes, data sharing across municipalities would provide full migration patterns of citizens.¹⁷ Cross-municipal mobility service providers like Metrolinx could supply this data for municipalities to better understand the flow of commuters through the city. Our research indicates the Presto programme possesses this data and that it is difficult for other stakeholders to obtain. Supplementing this information with data from private organizations that track user locations, particularly through alternative mobility services such as ridesharing, will enable greater insights into the complete journey.¹⁸ This information may also unlock insights into zones with minimal data capture technologies, increasing attention to demographics that may be underserved. In addition, our interviewees indicated an interest in data from private cars, which would provide valuable information on the routes travelled by these citizens, road conditions, and traffic flows.

Government and government entities would utilize these new data sets in their planning models to provide greater confidence and predictability. At present, the stakeholders we interviewed would, for the most part, prefer raw data sets so that they can clean and manipulate them into their existing software and models. In addition, finished reports and synthesized data raise concerns around the algorithms and methods used to collect and analyze the data provided. More specifically, the types of questions that city departments, in particular, are looking to inform with data and data derived insights include:

- How should we build rapid transit options?
- What fares should we charge?
- What are the effects of ride share and micro-mobility in the city?
- How should we accommodate the growth and development of our city?
- Are existing areas adequately served?



Government entities face many challenges in trying to obtain the data required to make fully informed decisions. For instance, private sector companies often have an abundance of data and may hoard it to maintain their competitive advantage. Consequently, government interviewees perceived that, in comparison, they have little added value in market and thus have a reduced ability to incentivize larger companies into partnerships. In addition, retaining data in-house allows government actors to reduce the actual, perceived, and reputational risks of data sharing.¹⁹ For instance, high profile data breaches at companies such as Marriott and British Airways, and data misuse by Facebook-Cambridge Analytica has created a strong disincentive to share data with other stakeholders. The consequences for these actions are dire as new regulations, such as the GDPR in the European Union (EU), can place fines of up to 4% of worldwide annual turnover or twenty million euros.²⁰ Another challenge to obtaining data is the unknown value of new data sets and uncertainty around the types of data that exist that would benefit teams. Government entity interviewees expressed that inexperience working with new companies is an additional barrier to maximizing and integrating the different types of data available.

The disincentives that follow the challenges of obtaining new types of data revolve around costs. Generally, government entities are risk averse, due to financial constraints and accountability pressures, and thus need assurance that external data acquisition will create benefits.²¹ While there is monetary value in obtaining new data, there are also costs associated with accessing, cleaning, and adapting it. The costs in obtaining new data can be compounded the more data manipulation is required. Further concerns around reputational risks are apparent. For instance,

¹⁷ Public Department Interviewee, May 2, 2019.

¹⁸ Public Department Interviewee, April 30, 2019.

¹⁹ Public Transit Operator Interviewee, May 3, 2019.

²⁰ Commission Communication to the European Parliament and the Council on Stronger Protection, New Opportunities - Direct Application of the General Data Protection Regulation as of 25 May 2018. https://ec.europa.eu/commission/sites/beta-political/files/data-protection-communication-com.2018.43.3_en.pdf.

²¹ Public Department Interviewee, April 30 and May 2, 2019.

the investigation into StatCan’s collection of personal financial data by the Office of the Privacy Commissioner of Canada demonstrates that as citizens become more aware of data collection and use by public actors, their actions will face increased scrutiny.²²



Nonetheless, from our public sector interviews, we uncovered several ways to incentivize government and public entities to share data. First, creating a standardized ontology of data sets will reduce the burden and costs of data cleaning and manipulation for these entities. Second, providing trials and insights into the data available, potentially through a catalogue, will educate civil servants about new data types, uses, and methods to incorporate into their models. Trials would allow their teams to play with data and see how they can integrate into their work, creating excitement through problem-solving and the generation of valuable insights. Third, creating a safe and trusted exchange of data that reduces the risks of sharing, will help alleviate concerns. Finally, the core value of joining the data trust will be the opportunity to determine unified rules and systems for data collection. By allowing for the co-creation of standards and rules of engagement, the challenges for public sector entities to participate will be diminished.



Private Organizations

Private sector organizations include local, national, and multinational corporations in the mobility and professional services sectors. In the case of the former, organizations, such as mobility technology developers, require data to build their products and services. In the case of the latter, organizations, such as consulting agencies, require data to help other organizations and cities plan.



Private organizations in the mobility sector have access to consumers’ data through usage of their products and services. This data may include user demographics, location data, and movement patterns. Technology developers can collect traffic data at the city-level such as travel time, pedestrian and bicycle counts, road volume data, and traffic analysis at intersections. Companies in the professional services sector work with data at the organization-level to develop algorithms and processes that help improve different aspects of their clients’ offerings. Both types of organizations may seek access to data that will better enable them to serve their users. Specifically, access to complementary data could give them insights into user preferences and needs to help improve products and services or to expand into new markets.



Private organizations are often commissioned by cities and municipalities in order to leverage their scale, technology, and experience to solve pain points that the public sector may not be resourced adequately to address. Organizations we interviewed expressed an interest in combining and opening up data sources to an extent, while allowing for monetization through the development of new products and services. This could take the form of public-private partnerships in which the city maintains ownership of the data and ensures usage in the best interest of citizens, while private organizations are allowed to leverage insights from that data on an aggregate basis to improve other products and services. An example would be to create a central repository (data trust or otherwise) that would collect data from all cars and provide a place where organizations could run analyses to drive public benefit through novel insights adapted into new products and services.



Our conversations with private organizations uncovered two challenges that affect their ability to pursue robust data sharing practices with external entities: ethics and competitive advantage. In the case of the former, there is growing attention to the need for adequate security standards to collect personally identifiable information (PII). Recent efforts by regulators have created greater responsibilities and onus on the private sector to clearly convey the use of their users’ personal data and take measures to protect and report any breaches of their data. These new regulatory norms have influenced private corporations to carefully consider their data sharing and security

²² Peter Zimonjic, “Privacy commissioner launches probe into StatsCan over collection of financial data,” *CBC News*, October 31, 2018, <https://www.cbc.ca/news/politics/personal-financial-information-statistics-canada-1.4885945>.

protocols in order to limit the potential risk of legal and reputational discipline. In the case of the latter, private organizations retain market share through access to and use of proprietary data sources. Thus, by sharing these very same data sources, they may risk losing their competitive advantage.



For private organizations to be incentivized to join a data trust, it would have to contain valuable data that they could not otherwise access or purchase. In addition, there may need to be customizable options for what data needs to be provided to the trust, along with stipulations about what the data may be used for, in order to mitigate their risk of losing competitive advantage and proprietary information.



Startups

Startups are companies working to address or solve particular challenges—be it social, environmental, clinical, etc.—where the solution is not readily apparent and obtaining success is not assured due to myriad of contingencies and elements of risk.²³ Their role in the mobility space is particularly dynamic, as they seek to address consumer concerns by leveraging research-intensive insights and bridging market gaps. Startups, such as Transnomis and Intentful Motion, are altering the mobility space through updated navigation services and comprehensive map-based road information services.



Startups in the mobility space possess variegated forms of consumer data, typically obtained by gleaning consumer consumption patterns, and information from existing technologies and new products. For instance, data possessed by Transnomis includes municipal 511 data (e.g. emergency road closures, current and future construction events, significant weather events, and specifics with respect to location and impact) and public safety exchange data (e.g. emergency access points, incident and event management, and persistent hazards). Data possessed by Intentful Motion includes consumer motion data and ground truth data sets (labelled data used to test algorithms against to ensure products are working effectively



The startups involved in mobility want access to data that will streamline their process and enhance the lives of their consumers.²⁴ This may include additional GPS probe data to detect and correct map deficiencies, and to better architectural designs in cities through better planning of cyclist lanes. What is more, they often want this data to be in the public domain with standards to make the process work effectively.²⁵ Overall these startups perceive themselves as data sources, suggesting that others will benefit from their datasets.²⁶ The intent of accessing these datasets is to use them as building blocks to enhance their current business models, and create a feedback loop with political influence.²⁷ Subsequently, others can use their enhanced business models to build better cities and adjust regulations accordingly.²⁸



From our conversations with startups we have siphoned key themes for disincentives to data sharing. One such theme is the potential for misuse by other actors who may use data in a manner that is unethical, or contrary to the agreed terms of use.²⁹ Ultimately, misuse would erode the public's trust in an organization. Our conversations also revealed accountability as a common theme. Specifically, if a trusted third party, responsible for regulating a data trust, does not hold

²³ Natalie Robehmed, "What is a Startup," last modified December 16, 2013, <https://www.forbes.com/sites/nalierobehmed/2013/12/16/what-is-a-startup/#6f07cb844044>; Jeffery S. McMullen and Dean Shepherd, "Entrepreneurial Action and the Role of Uncertainty in the Theory of Entrepreneur," *The Academy of Management Review*, no. 1 (2006), 133, <https://doi.org/10.5465/amr.2006.19379628>; Marco van Gelderen, Michael Frese, and Roy Thurik, "Strategies, Uncertainty and Performance of Small Business Startups," *Small Business Economics*, no. 3 (2000), 169, <https://doi.org/10.1023/A:1008113613597>.

²⁴ Startup Company Interviewee, May 16, 2019; Startup Company Interviewee, June 12, 2019.

²⁵ Startup Company Interviewee, May 16, 2019; Startup Company Interviewee, June 12, 2019.

²⁶ Startup Company Interviewee, May 16, 2019; Startup Company Interviewee, June 12, 2019.

²⁷ Startup Company Interviewee, May 16, 2019; Startup Company Interviewee, June 12, 2019.

²⁸ Startup Company Interviewee, May 16, 2019; Startup Company Interviewee, June 12, 2019.

²⁹ Startup Company Interviewee, May 16, 2019; Startup Company Interviewee, June 12, 2019.

actors accountable for misuse and unwarranted actions, the enforceability of the data trust itself will be disrupted (due to a lack of consistency and impartiality).³⁰ Moreover, a lack of accountability will prevent other stakeholders from joining the trust, thus diminishing its value. Lastly, inability to control which parties are allowed access to their data may reduce the competitive advantage a startup may have.



In order to convince startups to join a data trust, an incentive structure is necessary. Methods to incentivize this sector begin with articulating the immediate value exchanges that a data trust provides. These value exchanges require a standardized process that is flexible enough to use multiple data formats. It is also imperative to inform stakeholders that it is a more cost-efficient model for a startup that wants to sell their products or services, and that requires external data to better their business model.³¹



Academia

Academics, and academic institutions, explore and connect emerging technologies to address social needs and enhance the public good. They can conduct research and provide expert-based insights for use in the smart mobility system. Academia plays an intriguing role in the ecosystem as a relatively trusted actor. Consequently, multiple stakeholders are willing to collaborate and share information with this sector.³² Notably, mirroring the increased societal focus on knowledge and entrepreneurship, there is a growing prevalence of academic-industry partnerships focused on building new ideas and economies.³³ Thus, given their ability to engage in cross-sectoral relationships, academia is uniquely situated to serve as an anchor sector, leveraging its neutral position to convene and facilitate cooperation between stakeholders.³⁴



Academic institutions have a vast reserve of primary data that often includes PII.³⁵ Specific data content varies drastically by field of study, which ranges from engineering to social science disciplines. Moreover, given their breadth of discipline and depth of expertise, academic institutions have the capability to analyze and manipulate diverse data sets, extracting novel insights.



The data sought after by academia is particular to the needs of departments, and more specifically varies depending on the scope of research projects. However, generally, the academic sector uses data for two main purposes: research and institutional development.³⁶ In the former, researchers use data to gain new insights to further a relatively prosocial agenda. In the latter, the institution itself uses data to enrich educational experiences, attract more students (e.g. reduce commute times), and leverage in collaborations.³⁷



One of the obstacles to academic data acquisition is ensuring adequate resources to maintain subscriptions to databases, and diversifying and increasing the breadth of data sources. In addition, as academic institutions shift to breaking down departmental silos, there is an increasing need for more uniform data practices and sharing.

³⁰ Startup Company Interviewee, May 16, 2019.

³¹ Startup Company Interviewee, May 16, 2019; Startup Company Interviewee, June 12, 2019.

³² Exploratory Workshop, March 28, 2019; Prototyping Workshop, June 26, 2019.

³³ Merle Jacob et al., "From sponsorship to partnership in academy-industry relations," *R&D Management* 30, no. 3 (2002): 255, <https://doi.org/10.1111/1467-9310.00176>.

³⁴ Eugenie Birch, David C. Perry, and Henry Louis Taylor, Jr., "Universities as Anchor Institutions," *Journal of Higher Education Outreach and Engagement* 17, no. 3 (2013): 8,10-11, <http://openjournals.libs.uga.edu/index.php/jheoe/article/viewFile/1035/680>.

³⁵ Exploratory Workshop, March 28, 2019.

³⁶ Karin Axelsson, and Mail Granath, "Stakeholders' stake and relation to smartness in smart city development: Insights from a Swedish city planning project," *Government Information Quarterly* 35, no. 4 (2018): 700, <https://doi.org/10.1016/j.giq.2018.09.001>.

³⁷ Roza Vasileva et al., "What Smart Campuses Can Teach Us about Smart Cities: User Experiences and Open Data," *MDPI - Information* 9, no. 10 (2018): 251 (5, 8-9), <https://doi.org/10.3390/info9100251>.

The disincentives the academic sector has in data sharing center around security and privacy concerns, potential misuses of data, and reputational risk.³⁸ As these institutions store ample PII, there is a concern that security breaches could violate the privacy of research participants.³⁹ In relation, this personal data could be used to do harm, such as the profiling and discrimination of individuals or groups.⁴⁰ Together, these factors pose a significant reputational risk that could undermine the academic sector's status in the community, distinguished reputation, and their position as a trusted actor.



Therefore, to incentivize academic actors to join a trust there would need to be an assurance of proper data standards and a commitment to data accuracy.⁴¹ In order to understand and correct biases inherent in artificial intelligence and algorithms, they will require a degree of transparency from other stakeholders. Additionally, given the current economic environment, a trust will have to be a cost-effective method of obtaining diverse and high-quality data.



Civil Society

Citizens are key players in the mobility system; as “prosumers” they are both core producers of data and consumers of services derived from data insights.⁴² They are active in the mobility space at the level of the individual, the level of community, and the level of civil society organizations.



Reflecting the duality of their role, citizens seek data about the insights they are generating and the resulting services they are using so that they can make informed decisions about micro-level personal mobility and underlying macro-level mobility planning.⁴³ The former reflects citizen's desires for personalized travel experiences, designed around individual mobility, to improve their quality of life. The latter exemplifies the want for civic society to voice their ideal future of mobility; citizens desire to be included in the prioritization of opportunities and identification of barriers to ensure efficient and ethical planning.⁴⁴ Central to both streams are data and derived services that alleviate the pain points of urban mobility: congestion and air pollution, lost time and resources, inconvenience and discomfort, inequality and limited accessibility, and related stresses.⁴⁵



Despite their central role, often citizens view themselves and are perceived by other stakeholders as outsiders to the smart mobility system.⁴⁶ As they are not typically fluent in the technological, legal, privacy, and viability discourses surrounding smart city initiatives, they are habitually relegated to a passive position. Consequently, citizens face challenges obtaining data and shaping related data and mobility policies.⁴⁷

Related to these challenges, three interconnected disincentives for civic data sharing were brought to our attention: transparency, privacy, and security.⁴⁸ Citizens fear that the compromization of

³⁸ Vasileva et al., “What Smart Campuses,” 251(10).

³⁹ Exploratory Workshop, March 28, 2019.

⁴⁰ Exploratory Workshop, March 28, 2019.

⁴¹ Vasileva et al., “What Smart Campuses,” 251 (10).

⁴² Benoit Granier, and Hiroko Kudo, “How are citizens involved in smart cities? Analysing citizen participation in Japanese ‘Smart Communities,’” *Information Polity* 21 (2016): 73, doi:10.3233/IP-150367.

⁴³ Ian Docherty, Greg Marsden, and Jillian Anable, “The governance of smart mobility,” *Transportation Research Part A: Policy and Practice* 115 (2018): 116, <https://doi.org/10.1016/j.tra.2017.09.012>; Exploratory Workshop, March 28, 2019.

⁴⁴ Peter Viechnicki et al., “Smart mobility: Reducing congestion and fostering faster, greener, and cheaper transportation options,” Deloitte Insights, last modified May 18, 2015, <https://www2.deloitte.com/insights/us/en/industry/public-sector/smart-mobility-trends.html>.

⁴⁵ Exploratory Workshop, March 28, 2019; Juniper Research, *Smart Cities - What's in it for Citizens?* (Santa Clara: Intel, 2018), 3-5, 12, <https://newsroom.intel.com/wp-content/uploads/sites/11/2018/03/smart-cities-whats-in-it-for-citizens.pdf>.

⁴⁶ Granier and Kudo, “How are citizens involved,” 63-64, 66-67; Viechnicki et al., “Smart mobility: Reducing congestion.”

⁴⁷ Rob Kitchin, Paolo Cardullo, and Cesare Di Felicianantonio, “Citizenship, Justice and the Right to the Smart City (Programmable City Working Paper 41),” *SocArXiv Papers* (2018): 11, doi:10.31235/osf.io/b8aq5.

⁴⁸ Exploratory Workshop, March 28, 2019; Rob Kitchin, “Getting smarter about smart cities: Improving data privacy and data security,” (Dublin: Data Protection Unit, Department of the Taoiseach, 2016), <http://mural.maynoothuniversity.ie/7242/1/Smart>; Trevor Braun et al., “Security and privacy challenges in smart cities,” *Sustainable Cities and Society* 39 (2018): 499-507, <https://doi.org/10.1016/j.scs.2018.02.039>.

these three factors could lead to diminished free will. Specifically, smart mobility initiatives could result in manipulation due to surveillance opportunities on two fronts: surveillance capitalism by the private sector and the creation of a surveillance state by the public sector.⁴⁹

Furthermore, citizens are wary that data sharing could increase biased practices and discrimination via two channels. The first avenue for unethical practice could occur if personal data is attributable to individuals, groups, or communities through weak privacy practices or insecure storage.⁵⁰ The second avenue is via inherent biases in algorithms or AI.⁵¹ Moreover, citizens are concerned that their outsider status will be maintained, limiting visibility into mobility plans, data, and safety concerns. Underlying these issues is a unifying factor: a lack of citizen control, both personally and systemically.⁵²



Given these strong concerns about data sharing, in order to incentivize civic support for a data trust there will need to be processes that provide for citizen control over the rules of engagement that pertain to all stakeholders in the ecosystem. Citizens will want mechanisms that ensure their personal data is private and secure, with oversight frameworks and enforcement provisions to hold other stakeholders accountable.⁵³ In relation, information about data, data use and practices, and derived initiatives must be transparent so that citizens can understand and influence the value that they are both producing and receiving.⁵⁴

By creating an information environment that fosters smart citizens, individuals will be able to provide informed consent when producing data for other stakeholders. However, consent is currently presented as an ultimatum with no real alternative; citizens have to accept or reject all data sharing terms and do not feel as though rejection is a realistic option.⁵⁵ Thus, to further incentivize citizen participation in a data trust, there will need to be a fundamental change in consent practices to meaningful, convenient, and dynamic consent that allows citizens to choose both whether to contribute their data and the level of that contribution.⁵⁶ Essentially, the empowerment of citizens as active participants in designing, building, and engaging with smart mobility initiatives would incentivize them to support a data trust.

⁴⁹ Roy Coleman, "Images from a Neoliberal City: The State, Surveillance and Social Control," *Critical Criminology* 12 (2003): 21-28, <https://doi.org/10.1023/B:CRIT.0000024443.08828.d8>; Liesbet van Zoonen, "Privacy concerns in smart cities," *Government Information Quarterly* 33, no. 3 (2016): 474-476, <https://doi.org/10.1016/j.giq.2016.06.004>.

⁵⁰ Sawyer Clever et al., "Ethical Analyses of Smart City Applications," *MDPI - Urban Science* 2, no. 4 (2018): 96 (5), <https://doi.org/10.3390/urbansci2040096>.

⁵¹ Exploratory Workshop, March 28, 2019.

⁵² Exploratory Workshop, March 28, 2019.

⁵³ Braun et al., "Security and privacy challenges," 499-500.

⁵⁴ Pereira et al., "Smart governance in the context of smart cities: A literature review," *Information Polity* 23 (2018): 143, 146-148, 156-158, doi:10.3233/IP-170067.

⁵⁵ Emilie Scott, "The trouble with informed consent in smart cities," The International Association of Privacy Professionals, last modified February 28, 2019, <https://iapp.org/news/a/the-trouble-with-informed-consent-in-smart-cities/>.

⁵⁶ Scott, "The trouble with."

Building Blocks



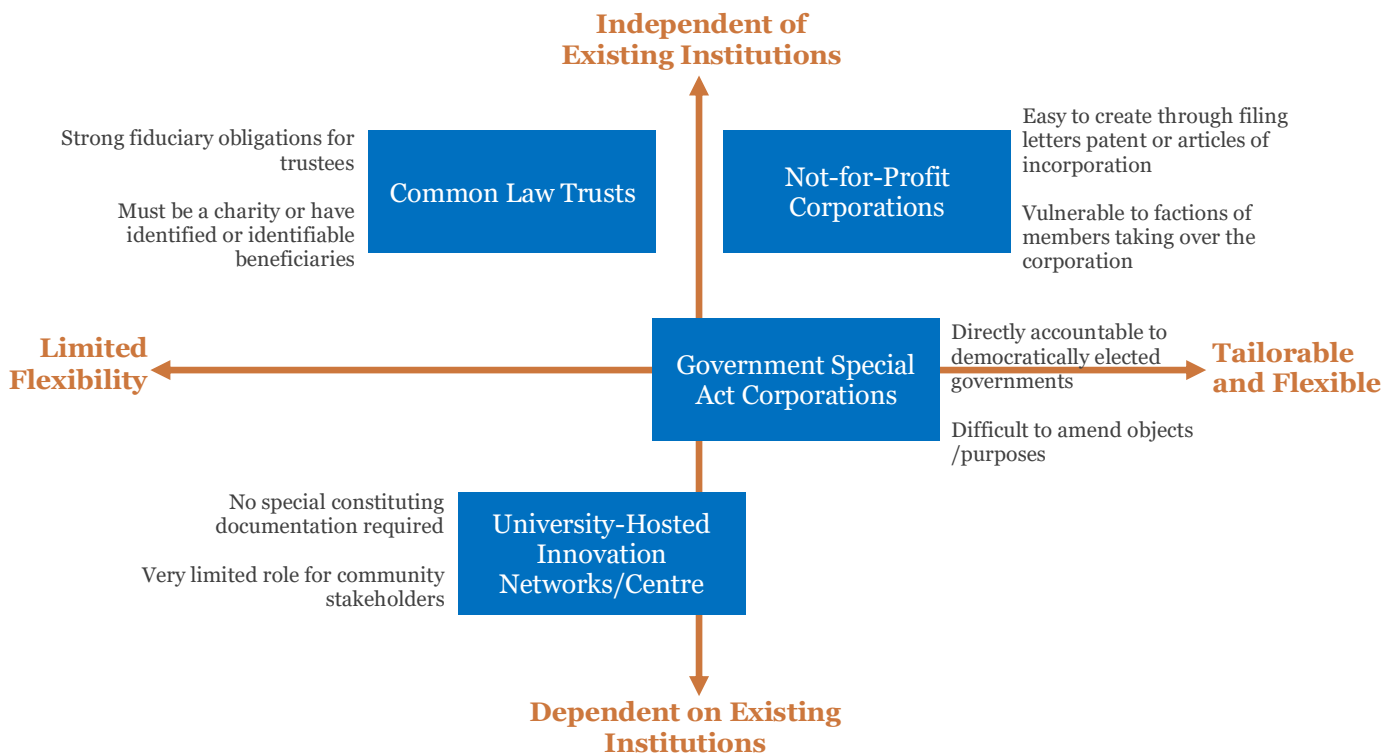
Through our research we discerned four foundational building blocks of digital governance: legal agreement, business model, civic participation approach, and technical architecture. Together, these components form the pillars that need to act harmoniously in order to create a legitimate and sustainable governance model for a smart city initiative.

Legal Context

In the digital age, transparency and accountability are key requirements when dealing with public data. Without these characteristics, the potential for data misuse —resulting in public harm—becomes tangible, subsequently producing a feedback loop of distrust, abuse of power, and abridged consent. Thus, there is a significant need for a legal agreement that oversees, regulates, and enforces compliance to protect public interests, while meeting the demands of institutions and corporations that use data and data derived insights. There are many ways to establish legally binding relationships that each have different benefits and shortcomings.

Legal Agreements

In identifying possible legal agreements to govern a data trust, we use the work of Timothy Banks, a lawyer for nNovation LLP, who was contracted to conduct our legal research. As such, all legal references to legal agreements in this report were gleaned from the work of Timothy Banks. From his research we have identified the following four legal agreements as options for a data trust: common law trusts, not-for-profit corporations, government special act corporations, and university-hosted innovation networks or centres. These legal agreements will be discussed in detail to outline the potential, legal tenets, and distinguishing features of each option.



Common Law Trusts

In a common law trust, trustees hold and manage property for the benefit of beneficiaries or the charitable purposes of the trust. These trustees have well-established fiduciary obligations to the beneficiaries and must use discretion in exercising the powers that the trust declaration gives them. To ensure overall legality and that the actions of trustees are for the benefit of beneficiaries, a common law trust requires that trustees be directly accountable to the beneficiaries, while also indirectly accountable to the court and the Public Guardian and Trustee. In Ontario the trustees are further subject to oversight by the Office of the Privacy Commissioner of Canada in regards to any commercial activities engaged in by the trust. On the other hand, beneficiaries and stakeholders are subject to federal or provincial Privacy Commissioners, depending on their legal status and activities. Generally, the common law trust is overseen by the courts, in addition to governance by Ontario's *Trustee Act*, RSO 1990, c T23. Additionally, if a common law trust's purpose is charitable, it will also be subject to oversight by the Canada Revenue Agency.

Common law trusts have some distinguishing features from the other legal vehicles considered. In this option there is potentially unlimited liability for trustees (as there is no independent personality for the trust); however, trustees are subject to a right to be indemnified out of the trust's assets as long as the liability is not a result of a breach of the trustee's fiduciary obligations. Another distinguishing feature is the limited life of the trust due to the *rule against perpetuities*, which mandates that non-charitable trusts cannot last forever. In effect, all interests in a trust must vest by at least 21 years after the life of an ascertainable individual alive at the time the trust is established.

The flexibility of a common law trust is contingent on the terms of the trust declaration (a legal, written document that establishes the trust and contains the rules for governing the trust). Typically, once beneficiaries and the subject-matter of the trust are set, they are difficult to alter. In addition, even though establishing a declaration of trust is simple, complexity arises in structuring the trust in a way that ensures sufficient protection of trustees from personal liability.

Not-for-Profit Corporations

A not-for-profit entity functions as an independent legal personality, and is governed by a Board of Directors who appoint officers for the corporation.⁵⁷ This option is generally used for organizing activities for charitable or other public purposes. Given that this legal option is best-suited for organizations that benefit a broad class of individuals, for a public purpose, a not-for-profit could be used to manage patents, data licenses, royalties, or components of the digital layer.

Similar to common law trust trustees, not-for-profit directors have fiduciary obligations. Directors must act in the best interests of the corporation and in accordance with its purposes (as outlined in the letters patent).⁵⁸ Annual meetings with members of the corporation serve to ensure accountability to this standard. In addition, regulatory agencies for not-for-profit entities include the Privacy Commissioner of Canada, as well as federal or provincial registrars (depending on whether it is federally or provincially incorporated) that provide basic oversight. Courts also play a role as regulatory bodies to resolve disputes, but they typically refrain from judicial activism in internal corporation issues. Furthermore, if a not-for-profit has a charitable purpose, it will be subject to additional oversight by the Public Guardian and Trustee, and the Canada Revenue agency.

There are a variety of features that differentiate a not-for-profit entity from the other legal options. not-for-profits can more easily adapt to evolving needs than a common law trust, while potentially having public education, policy, and even advocacy roles. While minimum requirements of the corporation's statutes must be met, not-for-profits are highly flexible in regard to the forms of activities that can be carried on, as long as the operations are on a not-for-profit basis. The flexibility of this option is further demonstrated through the anticipatory participation framework that makes it forward-looking and readily adjustable to inclusive public engagement. This is a significant attribute as a prominent issue for instituted legal vehicles is a lack of foreseeability, which diminishes the relevance of law to new and developing phenomena. Being that it is flexible, it has legal grounds to transform in order to address unforeseeable occurrences.

⁵⁷ See for example powers and duties of directors in Corporations Act (Ontario), R.S.O. 1990, c. C.38 (Ontario), Part III, <http://canlii.ca/t/53mnw>; and Not-for-Profit Corporations Act (Ontario)(ONCA), 2010, S.O. 2010, c. 15, Part IV (not yet in force), <http://canlii.ca/t/531bw>.

⁵⁸ ONCACorporations Act (Ontario), s.127.1(1); Not-for-Profit Corporations Act (Ontario), s. 43.

Another distinction is that not-for-profits have limited liability for directors, officers, and members, and is to be managed in the best interests of the corporation (which is determined objectively through the purposes of the corporation).⁵⁹ In addition, not-for-profits have distinguishing elements that are beneficial for data governance. First, these entities are governed in a manner that provides greater scope for direct engagement oversight by the community, as compared to common law trusts. Second, this type of legal agreement can also provide benefits to the community, without being required to qualify as a charity.

Government Special Act Corporations

A government special act corporation is created by either a special statute or a special regulation, and functions as an independent legal personality. It is governed by a Board of Directors appointed by the Lieutenant-Governor in Council. This board subsequently appoints officers of the corporation. Government special act corporations are to be managed in the best interests of the corporation, which is determined objectively with reference to the purposes of the corporation. It is best-suited for fulfilling a governmental policy objective with significant oversight by the government, consistent with democratic accountability. Generally, government special act corporations are vehicles used to facilitate a governmental policy objective; these objectives are well defined and hold public benefit above all else. Also, for government special act corporations there is limited liability for directors, officers, and members.

Moreover, this legal option also has distinguishing elements that are beneficial for data governance. Specifically, it has the advantage of direct accountability and oversight by a democratically elected government; it uses mechanisms, such as government directives and the approval of business and operations plans, to ensure that the entity fulfils public policy objectives. In terms of further enhancing accountability, if a special act corporation in Ontario was made an institution under the Freedom of Information and Protection of Privacy Act, it may be subject to the jurisdiction of the Information and Privacy Commissioner of Ontario. Specifically, stakeholders in the corporation may be subject to federal or provincial Privacy Commissioners depending on legal status and activities. In regard to flexibility, these special act corporations will only be subject to the provisions of the Corporations Act, RSO 1990, c C.38.

University-Hosted Innovation Networks or Centres

A university-hosted innovation network is characterized as a hub within a university for partnership with industry and other stakeholders. It is not independent from the university itself; it leverages the ready-made infrastructure and existing corporate structure of the university. This is significant as there is access to a pool of subject-matter experts, including institutional research ethics boards. This option is advantageous because universities are equipped and experienced in engaging in collaborative activities with the private sector, and have the capacity to manage technology transfers. Generally, university-hosted innovation networks are best for research collaboration between academic researchers and industries.

The distinguishing features of this legal option begin with its governance. University-hosted innovation networks are governed by administrative directors that are accountable to the governing council of the university, whose members may be elected by key constituencies, including the government. These councils typically involve representation from the government and the community, but tend to be dominated by faculty and employees. Such an entity is subject to the jurisdiction of the Information and Privacy Commissioner of Ontario, while stakeholders may be subject to federal or provincial Privacy Commissioners depending on legal status and activities. The university-hosted innovation network is somewhat flexible, as it is set up as a department, function, or other unit, and can be changed or amended subject to an agreement with external funding or other partners.

⁵⁹ Corporations Act (Ontario), s.127.1(1); Not-for-Profit Corporations Act (Ontario), s. 43.

Business Model

While the purpose of the legal agreement is to provide an adaptable structure to regulate the data trust and enforce compliance, a complementary business model is also required to ensure that governance is sustainable (i.e. basic costs of operation are covered). Given this context, the purpose of the business model is to outline how the data trust will create and deliver value, both as an organization and for stakeholders. There are a variety of business model options that each have benefits and shortcomings. In choosing a model, it is imperative to critically assess ownership, cost, and functions. Ultimately, the ideal business model will be one that can avoid conflicts of interest, promote public good, provide sustained funding for operations, and incentivize long-term stakeholder membership.

Ownership Options

To complement the structure of the legal agreement there are three broad options explored for its ownership: not-for-profit, government agency (also referred to as crown corporations), and for-profit social enterprise. Each of the options will be discussed in greater detail in this section.

Not-for-Profit

As outlined in the previous discussion of legal agreements, with respect to the work of Tim Banks, an entity that operates as a not-for-profit provides products or services for the public good. In the context of a business model, a not-for-profit organization is typically focused on or concerned with generating enough revenue to provide support to its members. Revenue is not for the personal gain of directors, officers, or members; it is to be returned to the organization to further its aims.

An example of a relevant not-for-profit is Code for Canada, an organization that connects government innovators with the technology and design communities. Their programs enable governments to deliver better digital public services and empower communities to solve civic challenges.⁶⁰ Code for Canada runs Civic Hall Toronto, which enables government innovators, entrepreneurs, not-for-profits, and the broader community to share, learn, and collaborate.⁶¹ Code for Canada has a privately appointed nine-member Board of Directors.

Government Agency

A government agency business model could take the form of a new department within government or an arm's length agency of government. It would be responsible for the oversight and administration of business functions. In the current state, governments already have representative democratic election processes, are stewards of the public interest, and politicians arguably already have a fiduciary duty to their constituents. An example of a relevant arm's length government agency is the Toronto Public Library. It is the world's largest neighbourhood-based library with a mission to empower Torontonians to thrive in the digital age and global knowledge economy.⁶² The Toronto Public Library is governed by a Board appointed by Toronto City Council. The Board is composed of eight citizen members, four Toronto City Councillors, and the Mayor or his designate.

For-profit Social Enterprise

A data trust could also be a for-profit social enterprise. In this business model the data trust would operate as an organization that implements a broad range of profit-making activities, while also pursuing social or environmental commitments based on the company's mission.⁶³ A for-profit corporation could be lean, agile, and generate sustainable sources of revenue, while ultimately serving a higher public purpose.

An example of a relevant for-profit enterprise is T4G. T4G is a privately held values-based company and certified B Corporation with offices across Canada. It builds intelligent software and provides advanced analytics services.⁶⁴

⁶⁰ "About Us." Code for Canada, accessed July 21, 2019, <https://codefor.ca/about-us/>.

⁶¹ Ibid.

⁶² "About the Library." Toronto Public Library, accessed July 21, 2019, <https://www.torontopubliclibrary.ca/about-the-library/>.

⁶³ "Legal considerations for profit social ventures," MaRS Discovery District, accessed July 24, 2019, <https://learn.marsdd.com/mars-library/legal-considerations-for-profit-social-ventures/>.

⁶⁴ "About." T4G, accessed on July 24, 2019 <https://www.t4g.com/company/corporate-info/>

Data Trust Costs

The costs associated with a data trust would vary depending on the elements of its final structure: ownership of data, technical infrastructure needed to facilitate sharing data and governance, creation and implementation of standards and principles, and mechanisms of civic participation. In the simplest decentralized version of a data trust, the body that oversees the trust would bear the costs of communications, marketing, ecosystem management, and creation of data sharing principles and licenses. In a more centralized version, an entity would also require the technical infrastructure to store, share, and allow usage to data; coordination mechanisms to maintain data standards and interoperability between data; and an interactive platform to provide access and usability of the centralized data.

Funding options

Consequently, a data trust requires significant resources to cover the cost of ongoing operations. Below are common methods to extract value from underlying business assets that are commonly used in today's digital economy.

Freemium

Freemium is a funding method in which a product or service has both free access (usually limited functionality) and a premium version (unrestricted functionality) that allows users to test or utilize the functionality as needed.⁶⁵ In this method, collective private and public actors would contribute data sets for access to other data set repositories, such as open data and de-identified data sets. This model of value capture is dominant in mobile applications; generally, it is free to download the basic version of an application, while any upgrades or further access requires payment.

Subscription Model

The subscription model is a funding option based on a recurring fee for continued service or access. We see this model prevalent with digital assets from hosts such as Netflix and Spotify. It is gaining traction in the digital realm because of a reduction in ownership preferences. This shift to a subscription model is seen in popular digital programs, from software such as Microsoft Office and Adobe to media like HBO and Disney. This prevalent model provides recurring revenues through its subscriptions, and if scaled, could provide lucrative streams of revenue for a business and its investors.⁶⁶

Fee for Access

In a fee for access funding option users can pay a fee for access to the products and services of a business. This model is starting to emerge for online web access to news articles, by charging fees to non-subscribers. This model allows non-traditional users to observe and interact with content for a relatively shorter period of time in order to trial and experience the value of the products and services.

Pay-Per-Use

A pay-per-use method is a metered service in which the user of the product or service has access and is charged for the interactions when it is used. It is typically seen in cloud-based Software-as-a-Service (SaaS) models.

Social Value Exchange

In a social value exchange method, the underlying logic is that value exchanges do not have to be monetary; rather, institutions might gain access in order to provide better public services. For instance, public sector agencies provide investments into education, health, and other programs to drive economic progress and reduce the burden on healthcare over the long-term.

Third Party Pays

In a third party pays option, government, philanthropic, or corporate sponsors may cover the costs of operation. One specific option could be through an endowment that provides the initial funding required to establish the trust and allocates ongoing resources for everyday operations. Due to the financial stability of an

⁶⁵ Vineet Kumar, "Making 'Freemium' Work," *Harvard Business Review*, July 24, 2019, <https://hbr.org/2014/05/making-freemium-work>.

⁶⁶ Patrick Campbell, "Guide to Subscription Business Models for 2019," *Price Intelligently*, July 24, 2019. <https://www.priceintelligently.com/blog/subscription-business-model>

endowment, a data trust would be situated to act in the best interest of beneficiaries and create positive social outcomes and value. Alternatively, building developers, in efforts to create and build neighbourhoods, could provide support to data governance initiatives to ensure safety, well-being, and positive impacts in the long-term. The relative costs to support a data trust are likely to be marginal in comparison to the massive capital investments these organizations are using to develop the physical infrastructure of these large-scale initiatives.

Civic Participation Approach

The Challenge

Smart city initiatives have faced criticism of technocratic, top-down practices that prioritize private sector interests.⁶⁷ This backlash mirrors the growing erosion of civic trust in governments and increased dissatisfaction with political processes.⁶⁸ With the public sector seeking to balance private sector interests, political motives, and citizen demands for accountability, the legitimacy of traditional representative democratic governance has been increasingly called into question.⁶⁹ As a result of this disconnect to civil society, governments have emerged as actors distinct from the citizens they represent. Consequently, public sector decision-making lacks legitimacy without mechanisms to engage citizens more directly in the decision-making process.⁷⁰

In light of this criticism, there has been a shift to re-frame smart city initiatives as “citizen-centric”.⁷¹ This change reflects the reality that citizens are the key constituents of any smart city initiative. They are “prosumers”, meaning they both produce data and consume its derived services. More importantly, citizens have rights and freedoms that must be upheld whenever smart city data is collected and shared.⁷² Thus, citizens’ functional and value-based needs and rights must be advanced in order to create social buy-in and public good.

Despite the shift in dialogue, critics argue that efforts focused on civic participation often serve paternalistic rather than genuine participation functions; the new frame has been critiqued as a rebranding strategy that works to maintain citizen subordination rather than promote their rights.⁷³ While intent is open to debate, it is evident that there is a disconnect between the large focus on citizen-centricity in dialogue and the limited actual practice of meaningful civic participation.⁷⁴

Foundational Knowledge

MaRS surveyed the academic literature and deconstructed precursor use cases to investigate civic participation, with a focus on smart city initiatives.⁷⁵ What emerged from this exploration is a contradiction, willful or otherwise, between the stated guiding principles of civic participation and the form of civic participation activities implemented.⁷⁶ There is ample evidence of an intrinsic relationship between the underlying principles and form of civic participation; certain principles are better served via different forms,

⁶⁷ Paolo Cardullo, and Rob Kitchin, “Being a ‘citizen’ in the smart city: up and down the scaffold of smart citizen participation in Dublin, Ireland,” *GeoJournal* 84, no. 1 (2019): 1, <https://doi.org/10.1007/s10708-018-9845-8>.

⁶⁸ Cities for People, and Dark Matter Labs, *Legitimacies: Notes on innovating our cities from the sidewalk up (Issue #1)* (Montreal: McConnell Foundation, 2019), 4, https://mcconnellfoundation.ca/wp-content/uploads/2019/06/Legitimacies_VF4.pdf; Joan Font, Magdalena Wojcieszak, and Clemente J. Navarro, “Participation, Representation and Expertise: Citizen Preferences for Political Decision-Making Processes,” *Political Studies* 63, no. 1 (2015): 155-156, doi:10.1111/1467-9248.12191.

⁶⁹ Cities for People, and Dark Matter Labs, *Legitimacies*, 10; Kitchin, Cardullo, and Cesare Di Feliciano, “Citizenship, Justice and the Right,” 3, 6; Michael Pal, “The promise and limits of citizens’ assemblies: deliberation, institutions and the law of democracy,” *Queen’s Law Journal* 38, no. 1 (2012): 269, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2176808.

⁷⁰ Cities for People, and Dark Matter Labs, *Legitimacies*, 4, 6, 10-11; Font, Wojcieszak, and Navarro, “Participation, Representation and Expertise,” 154-156; Pal, “The promise and limits,” 264.

⁷¹ Kitchin, Cardullo, and Cesare Di Feliciano, “Citizenship, Justice and the Right,” 12.

⁷² *Ibid.*, 13-17.

⁷³ *Ibid.*, 11-12,

⁷⁴ *Ibid.*, 12; Granier and Kudo, “How are citizens involved,” 67.

⁷⁵ Precursor use cases included: Alberta Climate Dialogue (ABCD) (Canada), B3 - Design your Marketplace (Germany), British Columbia Citizens’ Assembly on Electoral Reform (Canada), Ontario Citizens’ Assembly on Electoral Reform (Canada), Decidim (Spain), Grandview-Woodland Neighbourhood Assembly (Canada), Quayside Project (Canada), New York City Department of Environmental Protection (NYCDEP) “GI Plan” (United States), OpenGrid (United States), Pol.is (Taiwan), SCOPE (Singapore), SmartSantander (Spain), and Smart Communities (Japan).

⁷⁶ Vanessa Thomas et al., “Where’s Wally? In Search of Citizen Perspectives on the Smart City,” *Sustainability* 8, no. 3 (2016): 207 (4), <https://doi.org/10.3390/su8030207>.

and different forms better serve different principles.⁷⁷ In the case of smart city initiatives, either inappropriate civic participation approaches are being chosen to achieve citizen-centric principles, or more pessimistically, the participation approaches chosen are appropriate, but the stated guiding principles do not reflect actual intentions.

As a result, many civic participation approaches effectively result in non-participation; they result in manipulation, with citizens reduced to mere users. These citizens are required as co-producers of a project, but there is no intention to relinquish any decision-making power to them.⁷⁸ Rather, civic participation serves as an instrumental means to an end. It is a disciplinary strategy that allows administering organization(s) of a project to steer citizens through a “behavioural change agenda”.⁷⁹ To avoid this outcome, implementing actors invested in truly realizing citizen-centric principles need to acknowledge and design around the fact that not all civic participation is created equal.

Furthermore, actors need a formal understanding of what citizen-centric principles are. The most prominent principle is legitimacy, defined by the amount of citizen power. Research demonstrates that civic participation can be mapped onto a spectrum in terms of the amount of decision-making power afforded to citizens. On one end of the continuum are initiatives in which power flows from the top-down, while on the other are initiatives in which power is distributed from the bottom-up.⁸⁰ Civic participation that falls into the latter category is considered more legitimate as it provides a deeper and more meaningful connection to citizens.⁸¹

Although such one-dimensional models persist in the literature, critics argue that the effectiveness of a participation design is not limited to citizen power in decision making.⁸² Rather, depending on the underlying principles, aims of participation, and issue at hand, other sensitive dimensions should be considered in evaluating effectiveness.⁸³

In the context of smart cities, in addition to citizen power there needs to be deliberation among citizens in order to create informed and high-quality outputs from decision-making. Essentially, deliberation means moving into a realm of information processing and negotiation, as opposed to stagnant information exchange.⁸⁴ While opening decision-making to diverse citizens may reduce groupthink, in which a cohesive group may converge on a biased outcome, it may increase opportunities for polythink, in which diverse actors with divergent opinions may exhibit incoherent decision-making or decision paralysis.⁸⁵ Therefore, facilitated deliberation is necessary to promote consensus building, while maintaining consideration of multiple options and perspectives.

Furthermore, due to the reality of the growing disconnect between citizens and governments, citizens are not always able to hold stakeholders accountable via their government representatives; accountability of elected officials is hindered by fixed electoral cycles and limited diversity of choice in partisan politics.⁸⁶ Similarly, reflecting the flawed nature of majoritarian democracy in increasingly diverse societies, is the need for inclusive practices that include minority or marginalized voices.⁸⁷ While collectively these voices make up a

⁷⁷ Archon Fung, “Varieties of Participation in Complex Governance,” *Public Administration Review* 66 (2006): 70, 74, <https://www.jstor.org/stable/4096571>.

⁷⁸ Granier and Kudo, “How are citizens involved,” 65.

⁷⁹ *Ibid.*, 73-74.

⁸⁰ Sherry R. Arnstein, “A Ladder of Citizen Participation,” *Journal of the American Planning Association* 35, no. 4 (1969): 217, doi: 10.1080/01944366908977225; Cardullo and Kitchin, “Being a ‘citizen’,” 4-5, 11; Robert M. Silverman, “Caught in the Middle: Community Development Corporations (CDCs) and the Conflict between Grassroots and Instrumental Forms of Citizen Participation,” *Community Development* 36, no. 2 (2005): 36, <https://doi.org/10.1080/15575330509490174>.

⁸¹ Cardullo and Kitchin, “Being a ‘citizen’,” 11; Silverman, “Caught in the Middle,” 47-48.

⁸² Luigi Bobbio, “Designing effective public participation,” *Policy and Society* 38, no. 1 (2019): 44, doi:10.1080/14494035.2018.1511193; Fung, “Varieties of Participation,” 66-67.

⁸³ Bobbio, “Designing effective public,” 45-46.

⁸⁴ “What is Deliberative Engagement (Deliberative Democracy?),” MosaicLab, accessed July 20, 2019, <https://www.mosaiclab.com.au/what-is-deliberative-democracy>.

⁸⁵ Alex Mintz, and Carly Wayne, “The Polythink Syndrome and Elite Group Decision-Making,” *Political Psychology* 37, no. 1 (2016): 3-7, doi:10.1111/pops.12319.

⁸⁶ Stephen Macedo, “Against Majoritarianism: Democratic Values and Institutional Design,” *Boston University Law Review* 90, no. 2 (April 2010): 1036; Pal, “The promise and limits of citizens’ assemblies,” 269.

⁸⁷ Rima Wilkes, and Cary Wu, “Ethnicity, Democracy, Trust: A Majority-Minority Approach,” *Social Forces* 97, no. 1 (2018): 465-466, 468-469, doi:10.1093/sf/soy027; Macedo, “Against Majoritarianism,” 1038.

large segment of society, their influence is systematically suppressed when they are counted distinctly in majoritarian politics.⁸⁸

In relation, accessibility is essential to ensure diverse citizen groups are able to fully participate in decision-making processes. To facilitate buy-in to the process, mechanisms should be geographically easy to access, and implemented in a way that both resonates with citizens and is easily understandable. For instance, current proposals presented to citizens are often inundated with professional jargon. Laymen experience frustration due to difficulties in understanding the content. This renders participation less meaningful, reducing incentives for citizens to engage.⁸⁹ In relation, participation requires time and resources, while its benefits are hard to quantify at the level of the individual. Citizens who have already been marginalized by society often have the most scarce excess cognitive capacity to devote to longer-term planning considerations. It is therefore essential to understand that participation is costly for citizens so it should be made as convenient as possible.⁹⁰

Guiding Design Principles

In order to address the critiques facing smart city initiatives, citizen-centricity must be achieved. Based on the previous analysis, we have developed seven guiding principles for the citizen-centric or meaningful design of a civic participation approach. Any design should be:

Legitimate. We need to redistribute power in decision-making.

Deliberative. We need to cultivate spaces in which high quality insights can be derived from informed and considered exchanges among people with diverse perspectives.

Inclusive. We need to ensure representation of all, especially marginalized and vulnerable groups.

Accountable. We need meaningful consequences for individuals and organizations relative to the harms and benefits of their actions on others.

Accessible. We need to meet people where they are: in safe spaces, at convenient times, in language they understand, with the resources needed to comprehend technical issues.

Convenient. We need to reduce the costs of participation, while maximizing benefits.

Sustainable. We need to ensure that participation can consistently and reliably occur.

Key Design Elements

Different combinations of design elements serve to translate the desired principles of a project into the civic participation approach. Key design elements to consider in this context include: timescales, functions, activities, modalities, and “look and feel”.

Timescales

Citizen and civic participation needs will change over time as we move into different phases of a data trust. Therefore, there is a need to design an approach for each of the different goals of the following three phases:

Design. In this phase of work, the processes, structures, mechanisms, and rules of engagement for the trust will be designed.

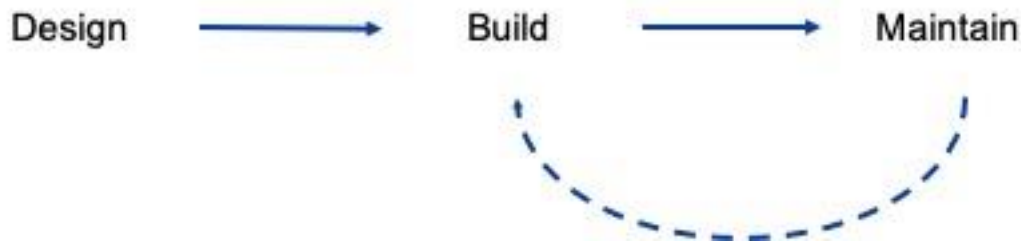
Build. In this phase of work, the trust will be built. As unforeseen challenges or changes take place during building or over time, adaptation may occur.

⁸⁸ Wilkes and Wu, “Ethnicity, Democracy, Trust,” 465-466, 468-469; Macedo, “Against Majoritarianism,” 1038.

⁸⁹ Dick Urban Vestbro, “Citizen Participation or Representative Democracy? The Case of Stockholm, Sweden,” *Journal of Architectural and Planning Research* 29, no. 1 (2012): 10, <https://www.jstor.org/stable/43030956>.

⁹⁰ Alenka Poplin, “Digital serious game for urban planning: B3 - design your marketplace,” *Environment and Planning B* 41, no. 3 (2014): 495, doi:10.1068/b39032.

Maintain. In this phase of work, the data trust will be maintained through ongoing data exchanges, including citizen data sharing.



Functions

During each phase, a civic participation mechanism will need to achieve four different functions: see, learn, choose, and challenge. While the specifics of these functions will vary depending on the phase of the data trust, generally citizens need to:

See. Decision-making needs to be transparent.

Learn. Decision-making needs to be informed.

Choose. Decision-making needs to be open.

Challenge. Decision-making needs to be flexible.

Activities

Given the specifics of the functions required in each phase, different civic participation activities could be implemented. When taken alone, these activities may be more or less suited to realizing the principles of citizen-centric design. However, it should be noted that civic participation activities are not necessarily mutually exclusive; no single activity can serve all required functions and so different forms of participation can be used in conjunction as complementary measures or across different timescales.⁹¹ The following is a list of the most relevant activities to data governance:

Education

In education activities the citizen is a recipient of information.⁹² They become informed, but without the power to use information to directly make decisions. Thus, education functions as a type of tokenism when implemented in isolation; it becomes a symbolic effort that gives the appearance of citizen input.⁹³ Common education implementation methods include online or physical informational materials, expert lectures or presentations, and physical project demonstration spaces.

Consultation

In consultation activities, one of the most prominent forms of civic participation, the citizen is a participant.⁹⁴ However, it most often occurs after an organization has developed a proposal and is thus reluctant to modify it due to their commitment in executing a fixed plan of action.⁹⁵ Given that citizens are often not involved in the initial planning process, reverse planning processes are limited, and that it is up to the discretion of the administering organizations to interpret and select participant feedback to incorporate into plans, civic participation is made less meaningful.⁹⁶ While there is a possibility that

⁹¹ Fung, "Varieties of Participation," 74.

⁹² Cardullo and Kitchin, "Being a 'citizen'," 5.

⁹³ Ibid., 4, 8.

⁹⁴ Cardullo and Kitchin, "Being a 'citizen'," 5.

⁹⁵ Vestbro, "Citizen Participation or Representative Democracy," 10.

⁹⁶ Ibid., 11, 14.

citizens can influence future agenda directions, they effectively do not have control over the decision-making process and so consultation also often functions as a type of tokenism when implemented alone.⁹⁷ Common consultation implementation methods include charrettes, workshops, focus groups, and town-hall meetings.

Consumer Choice

In consumer choice activities the citizen is a consumer.⁹⁸ Here, the market makes decisions, determining available options for citizens to then choose from.⁹⁹ This participation may have limited “meaningfulness” as choice is often constrained. Choice may be limited to uniform options from monopolistic actors and so citizens have a limited ability to influence the parameters of production.¹⁰⁰ In this world, participation is subversive; citizens are subjugated users with the market unidirectionally determining what is in their best interest.¹⁰¹ However, if viable choices exist in a competitive environment, consumers can guide or manipulate the decision-making of other stakeholders using market dynamics.

Co-Design

In co-design activities the citizen is delegated a portion of the power in decision-making.¹⁰² Participation moves from engagement to empowerment, with citizens negotiating the design space with other stakeholders.¹⁰³ This form of participation mirrors the use of citizens in the co-production of data and derived services, but shifts the timescale to the actual design of data processes and uses in smart city initiatives. As such, citizens are not just producers, but design what their production will look like and achieve.

Citizen Control

In citizen control activities, the citizen holds power, controlling or leading the decision-making process.¹⁰⁴ They govern the direction, processes, and structures of a mechanism, with the authority to dictate the terms under which other stakeholders can engage with or enact change in an initiative.¹⁰⁵ In terms of a smart city, on a macro level citizens would have full control over the formulation of data governance and on a micro-level they would have control over their own data, able to dictate its use and purposes.

Modalities

Combinations of modalities will need to be chosen to ensure that the expression of an activity fulfills its functions and embodies the overarching design principles. The modalities essential to the design of civic participation include:

Formal vs. Informal

Formal participation is institutionalized in nature, taking place in the public sphere in a planned manner. Informal participation is part of routine human interaction, primarily taking place in the private sphere with the potential to influence the public sphere.¹⁰⁶

Sponsored vs. Self-Sustaining

Sponsored participation is funded externally, by a benefactor or administering actor. Self-sustaining participation is funded internally, via the citizens themselves.

⁹⁷ Cardullo and Kitchin, “Being a ‘citizen’,” 4, 8.

⁹⁸ Ibid., 7.

⁹⁹ Ibid., 7; Whitney Gent, “‘Expensive’ People: Consumer Citizenship and the Limits of Choice in Neoliberal Publics,” *Communication and the Public* 3, no. 3 (2018): 191-192 doi:10.1177/2057047318794683.

¹⁰⁰ Cardullo and Kitchin, “Being a ‘citizen’,” 7.

¹⁰¹ Gent, “‘Expensive’ People,” 192.

¹⁰² Cardullo and Kitchin, “Being a ‘citizen’,” 5; Gerry Stoker, and Mark Evans, eds, “Co-design with citizens and stakeholders,” in *Evidence-based Policy Making in the Social Sciences: Methods That Matter* (Bristol: Bristol University Press, 2016), 243-246, doi:10.2307/j.ctt1t89d4k.

¹⁰³ Cardullo and Kitchin, “Being a ‘citizen’,” 9.

¹⁰⁴ Ibid., 5, 9.

¹⁰⁵ Jovanna Rosen, and Gary Painter, “From Citizen Control to Co-Production,” *Journal of the American Planning Association* 85, no. 3 (2019): 335, doi:10.1080/01944363.2019.1618727.

¹⁰⁶ Scott Fletcher, “Informal Participation,” *Participedia*, last modified July 3, 2019, <https://participedia.net/method/5083>.

Short-term vs. Long-term (spectrum)

Short-term participation occurs over a brief period of time. It is less costly in terms of time and resources but may compromise depth. Long-term participation occurs over a substantial period of time. It promotes deep investigation but may be costly in terms of time and resources.

Discrete vs. Continuous

Discrete participation occurs at a single point in time. Continuous participation could occur at any point in time.

Active vs. Passive (spectrum)

Active participation is process based; citizens are engaged, participating by doing. It facilitates deeper understanding but has a higher energy costs. Passive participation is thought based; citizens are spectating, participating by absorbing.

Static vs. Dynamic (spectrum)

Static participation is fixed in form. Dynamic participation can change in form.

Individual vs. Group

Individual participation occurs when each citizen is an agent. Group participation occurs when citizens form a collective agent.

Open-Door vs. Mini-Public

In open-door participation the process is open to all citizens and participants are self-selected.¹⁰⁷ While theoretically the openness of this mode means that no one is technically excluded, it may allow for social biases based on the ability of population segments to participate and the intensity of preferences.¹⁰⁸ In a mini-public, participants are selected by the organizers, based on certain criteria, in order to represent a segment or segment(s) of the population.¹⁰⁹ While bias can theoretically be minimized in mini-publics, given that there can be greater control over selecting a representative sample, the selection mechanisms implemented and the incentives that influence whether a chosen citizen participates can also create biases.¹¹⁰

Small Sample vs. Large Sample (spectrum)

The sample size refers to the number of participants, or observations, selected to make inferences about a larger population. Small sample sizes are more efficient and cost-effective, while large sample sizes produce greater confidence that insights represent reality.

Offline vs. Online

Offline participation, in which people can meet face-to-face, facilitates relationship building and deliberation, while online mediums may result in confrontational information exchange.¹¹¹ However, it is often more costly to implement in terms of resources and time, and it limits the amount of people that can participate.¹¹² In contrast, online participation can be less expensive, more accessible, and work at a faster speed, thus including a larger, potentially more diverse, portion of the population.¹¹³ While it may increase accessibility geographically and temporally, an online medium may decrease accessibility for certain segments of the population due to differences in digital fluency and difficulty controlling for appropriate representation.¹¹⁴ Nonetheless, it allows for greater anonymity, potentially reducing

¹⁰⁷ Bobbio, "Designing effective public," 48.

¹⁰⁸ Bobbio, "Designing effective public," 48.

¹⁰⁹ Bobbio, "Designing effective public," 48.

¹¹⁰ Bobbio, "Designing effective public," 49.

¹¹¹ Bobbio, "Designing effective public," 48.

¹¹² Bobbio, "Designing effective public," 47-48.

¹¹³ Bobbio, "Designing effective public," 48.

¹¹⁴ Daren C. Brabham, "Crowdsourcing the Public Participation Process for Planning Projects," *Planning Theory* 8, no. 3 (2009): 255-257, doi:10.1177/1473095209104824.

interpersonal power dynamics and identity politics, and may be more amenable to immersive experiences.¹¹⁵ In addition, some of the limited research on online participation suggests that its reach may allow for innovative solutions through the aggregated wisdom of crowds.¹¹⁶

Look and Feel

The “look and feel” of civic participation refers to the actual design presentation of an approach. How an approach is presented will convey information and influence emotions, thus impacting citizen behaviour. More extensive user research into the look and feel of chosen approaches will be necessary to ensure that the design presentation evokes the desired perceptions and behaviour. However, one clear dimension that emerged from our secondary research on citizen participation in smart city initiatives is:

Serious vs. Playful

A serious design feels heavy, looks official, and conveys importance. A playful design feels light, looks fun, and conveys friendliness.

Technical Architecture

The technical architecture defines how the infrastructure of a data trust works, as well as the critical components to ensure trusted and secure collection, storage, sharing, and oversight of digital assets. It is an integral factor, required to enable the other pillars of a data trust (i.e. legal agreement, business model, civic participation mechanisms). Therefore, it is important to understand how each type of technical architecture affects the other components of a trust.

The most significant choice in terms of the technical architecture is to determine whether data assets will be held in a centralized or decentralized manner across the network. In our earlier phase of data trust research, we explored five distinct options across a spectrum of data centralization.¹¹⁷ These findings are summarized below.

Core Features	Technical Architecture				
	Centralized	Semi-Centralized	Decentralized	Open Data	Marketplace
Data Standard and Storage	Local creation and control of a database, standards, and platforms.	Centralized platforms and infrastructure built by a governing body, with public and private institutions creating and maintaining their own shareable repositories of data.	Governing body creates standards and policies for all partnering entities to follow to ensure ease of access to information and the ability to utilize it. Each entity creates and manages their own repositories, and may provide their own individual platforms for data access.	Common standards are created by an entity or group to create a repository of shared data. This method requires the exclusive use of non-personally identifiable information.	Neutral legal, tax entity, and platform that brings together buyers and sellers of data.
Data Access	Central point of access, controlled by governing body.	A central portal or platform grants access to multiple repositories of data.	Access to each repository separately, but under a common usage or access policy and single approval.	Access to central repository with common usage, standards, access policy and single approval.	Central database of repositories.
Data Analytics	Unified standards that the data and platform must follow in order to allow for the most powerful search, analysis, and quality assurance of aggregated data	Cross-repository search and analytics, metadata, and aggregate statistics can be developed by the central authority.	Because the data are all held by various repositories, an index or catalogue is the only method to obtain data.	Powerful search, analysis and high-quality assurance of aggregated data.	Cross-repository searching and analytics.

¹¹⁵ Brabham, “Crowdsourcing the Public,” 246.

¹¹⁶ Brabham, “Crowdsourcing the Public,” 248.

¹¹⁷ “Technical Architecture Options” in A Primer on Civic Digital Trusts (Toronto: MaRS Discovery District, accessed July 19, 2019), <https://app.gitbook.com/@marsdd/s/datatrust/trusts/what-is-a-civic-digital-trust>.

Depending on the degree of centralization and other components of the civic digital trust, the technical architecture may also need to include features to ensure that proper documentation, agreements, and transactions can take place. Specifically, the technical architecture needs to:

- Manage the trusted identity of users and endpoints for data access;
- Undertake accreditation/certification of data users for them to be allowed to use the services and achieve a level of technical, privacy and security conformance;
- Authorize individual access requests and transactions;
- Create an Application Programming Interface (API) gateway or management layer when managing access to multiple APIs;
- Possess a central registration of data licenses granted and correspondence to Intellectual Property (IP) rights granted to the trust to further license onward to other users; and
- Retain access log of users and points of access, cross-referenced against licenses, and permitted uses.

Future Market Considerations

As we prototype a data trust, it is important to consider the potential futures of the surrounding ecosystem in order to ensure that the design principles selected allow for intended aspirations and functionalities. We have discerned two perceptible market concepts for a data trust: a monopoly and a constellation.

In a monopolistic marketplace, a single data trust platform would govern and manage smart city data. The monopoly would be able to create many efficiencies under its domain due to its breadth and size. These efficiencies include establishing and managing standards, as there would be a single body responsible for governing the data trust. Additionally, the monopoly would allow for the cross pollination of data sets from various sectors and markets, effectively accelerating adoption of the data trust and new innovations. All-inclusive, the monopoly market would require substantial resources to build a data trust, as well as adequate resources to manage the accelerating stores of data and ongoing operations.

A constellation market implies competition, and thus there is potential for many forms of data trusts to exist simultaneously across a myriad of sectors, issue areas, and geographies. This option is far more flexible than a monopoly in adapting to new regulatory changes, market challenges, and most importantly, citizen concerns. With this marketplace, coordination across data trusts will be necessary to establish interoperability between different data trusts, and between data trusts and their users. With each data trust operating in a specialized field, it may be possible to leverage expertise, thereby generating tailored value as data trusts and users become more collaborative across sectors. Although there are many benefits, coordination across data trusts, in terms of standards and best practices, might prove cumbersome and difficult. Furthermore, if there are varying standards from trust to trust it may put strain on the users. Although a constellation market inspires a competitive environment, the repercussions of failing would be a reality that each trust would need to plan for.

Design Criteria



Overall, in order for a data trust to be successful it needs to achieve three criteria:

Desirability. Do people want it? Does it solve a meaningful unmet need?

Viability. Does it make business sense to pursue this solution? Will it be economically sustainable?

Feasibility. Can we build it? Do we have the assets and capabilities needed to make it real?



This approach is called the balanced breakthrough and it is our core methodology for evaluating any new solution.¹¹⁸

In the balanced breakthrough, we begin by identifying the most desirable solution. We then evaluate the most desirable solution with viability and feasibility lenses to land on the final solution design. We are currently in the desirability phase of prototyping.

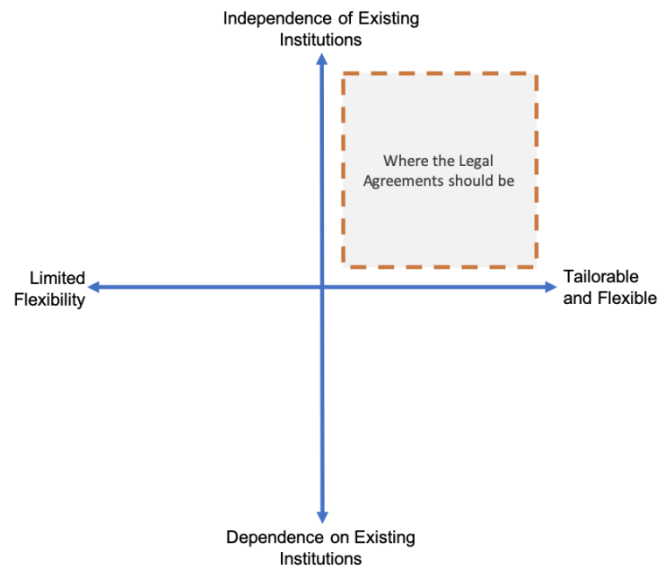
With the balanced breakthrough in mind, we have identified specific criteria for each component of a governance model for the digital layer:

1. Legal agreement
2. Business model
3. Civic participation mechanisms
4. Technical architecture

Legal Agreement

The preferred legal agreement will be selected based on two criteria: flexibility and independence. These core elements are necessary as they allow for a broad scope of potential actions that a data trust could perform in both the present and the unforeseeable future.

In terms of flexibility, it must be adaptable with respect to the types of activities that it can engage in, especially if the entity is not a registered charity, so that it can more easily adapt mechanisms for transparency and accountability. In this light, the legal model must embody the anticipatory participation framework in that it is not only flexible, but forward-looking, and primed for public engagement. This framework supports the legitimacy of civic participation mechanisms and gives it an enforceable base structure. In terms of independence, it must be a distinct legal personality, separate from the government, the private sector, and potential shareholders, so that it can uphold its fiduciary obligation to act in the best interest of beneficiaries and avoid conflicts of interest.

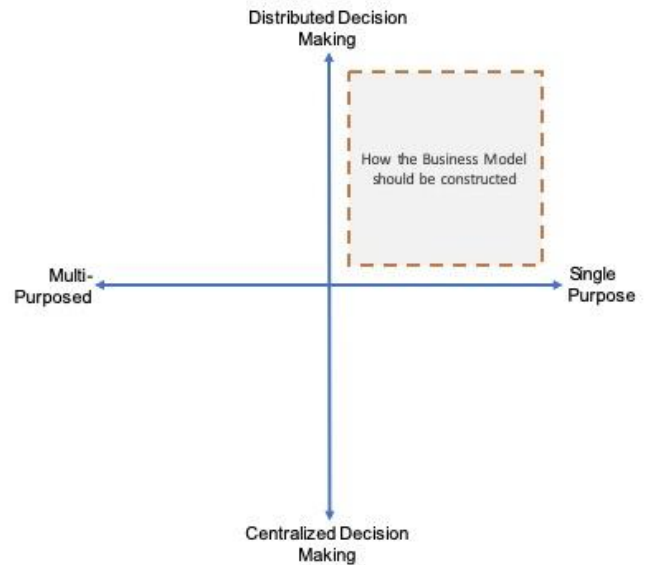


¹¹⁸ For further information please see Idea to Value's overview of the balanced breakthrough concept at <https://www.ideatovalue.com/inno/nickskillicorn/2019/01/what-are-the-three-things-every-idea-needs-to-be-successful-the-balanced-breakthrough-model/>.

Business Model

The business model will be selected based on two criteria: the concentration of decision-making and the purpose(s) of organizational actions.

In terms of the concentration of decision-making, the data trust must have distributed decision-making processes to avoid centralized and authoritative judgements made for trust stakeholders. With respect to the purpose, the business model should have an exclusive focus on actions in the best interests of the beneficiaries, rather than multi-purpose objectives, in order to avoid conflicts of interest, profit driven approaches, and self-interested operations.



Civic Participation Mechanisms

Civic participation mechanisms will be selected based on the degree to which they reflect the seven-guiding citizen-centric design principles.

Legitimacy, cultivated through the redistribution of power in decision-making, will be the most central evaluation criteria as it directly addresses the main critiques of smart city initiatives.

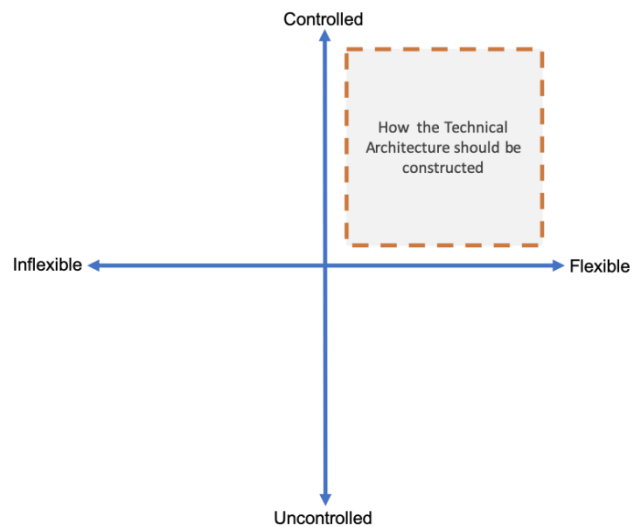
In support of this aim, civic participation activities will also be evaluated on the basis of the degree to which they are deliberative, inclusive, accountable, accessible, convenient, and sustainable.

- Legitimate
- Accessible
- Deliberative
- Convenient
- Inclusive
- Sustainable
- Accountable

Technical Architecture

The technical architecture will be selected based on two criteria: control and flexibility.

In terms of control, there needs to be a degree of security and privacy in order to protect against the misuse of data and to ensure maximum benefits for all stakeholders. In terms of flexibility, the technical architecture needs to be adaptable to advancements in technology. It should include a layer that is accessible to citizens and non-members of the data trust to provide visibility into the objectives and usage of data.



III. RECOMMENDATIONS

PRELIMINARY RECOMMENDATIONS



37

Legal Agreement



41

Business Model



44

Civic Participation
Approach



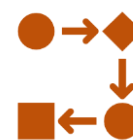
51

Technical
Architecture



52

Use Case
Illustration



53

Actions Required



53

Impact of the Trust



55

Risks



56

Uncertainties &
Assumptions

Preliminary Recommendations

Having considered the legal, business, civic participation, and technical components needed to structure a data trust, we used our criteria to critically assess the options discussed in each section. We have concluded that a not-for-profit corporation legal agreement is best suited to govern the data trust since it provides the flexibility and independence required to ensure that the data trust benefits a broad class of individuals, while embodying the anticipatory participation framework. In addition, it has a robust structure to support a successful business model. Given that we seek to maintain independence from governments and private interests, we also recommend using the not-for-profit entity for our business model, as it is best suited for upholding impartiality, while providing for the protection of citizens. Our recommendations for civic participation depend on the phase of the data trust. Given the phase, we have specified functions and corresponding activities, with moderating modalities and “look and feel” considerations. The conjunction of all of these design elements will be used to achieve and protect our design principles through a potential civic participation approach, with specific use cases given for illustration. With respect to technical architecture of the data trust, we recommend a decentralized model connected through a platform. This option will allow users to easily plug into the trust to access data sets, while the trust itself facilitates and manages the exchange and use of data.

Legal Agreement

Not-for-Profit

Among the relevant legal vehicles discussed, we recommend implementing a not-for-profit legal agreement. We believe it is best-suited for governance of the digital layer, given how it complements our ideal functions of a data trust.

The not-for-profit legal agreement require all actions to be in the best interest of the corporation, promoting and protecting the public good. Given this base, it is well-suited for both non-charitable or charitable organizations that seek to benefit a broad class of individuals. This flexibility in the charitable quality of an organization is a point of significance as it differentiates this legal option from a common law trust, in which an entity must qualify as a charity in order to hold an objective to benefit the community (based on the current state of the law). In contrast, the not-for-profit could have such a public benefit mandate, while not being required to qualify as a charity. In terms of a data trust specifically, the not-for-profit could be used for the purposes of managing data licences, patents, royalties, and the components of the digital layer.

An additional advantage of this legal agreement is its transformative capacity; it easily adapts to evolving needs, potentially allowing an entity to have a role in the arenas of public education and advocacy. Thus, the not-for-profit would embody the anticipatory participation framework required to maintain legal relevance and ensure that civic participation is backed by legitimacy.

A further beneficial distinction between a not-for-profit and other legal agreements is the governance mechanism of the corporation. The not-for-profit would be governed by a Board of Directors and officers who would have a fiduciary duty to act in the best interest of the corporation, in accordance with its objectives addressed in the letters patent, and avoid conflicts of interest.¹¹⁹ In addition, this governance structure would also grant limited liability for directors and officers; members would not be liable for any act, default, or obligation of the corporation.¹²⁰ Yet, given that accountability is also a valued and necessary element of a data trust design, the not-for-profit could still effectively capture this criteria, while providing for greater community engagement. Specifically, this type of agreement facilitates accountability and transparency to members by mandating annual meetings. It could also be more easily adapted to include flexible structures for accountability to stakeholder groups because it prescribes direct oversight by members. Accountability can further be provided for as the not-for-profit could be governed in a manner that enlarges the potential for direct participatory oversight by the community writ large.

¹¹⁹ Corporations Act (Ontario), s.127.1(2); Not-for-Profit Corporations Act (Ontario), s. 43(2).

¹²⁰ ONCA, s.122.

In terms of privacy, a predominant concern in the realm of data sharing, the not-for-profit would be regulated for profits by a privacy regulator at the provincial and/or federal level. In Ontario, while not-for-profit corporations are not subject to the jurisdiction of the Information and Privacy Commissioner of Ontario, they are subject to oversight by the Office of the Privacy Commissioner of Canada for any commercial activities engaged in by the corporation. In addition, based on whether the not-for-profit is provincially or federally incorporated, there would be basic oversight by the respective registrar. Regulatory oversight could also be exercised through the courts, although they typically refrain from judicial activism in internal affairs. Furthermore, at the level of the individual, stakeholders, depending on their legal status and activities, may be subject to oversight by federal or provincial Privacy Commissioners.

Elements of the Not-for-Profit

Articles of Incorporation or Letters Patent: not-for-profits can be established through articles of incorporation (filed with the federal or provincial registrar) or letters patent. Articles of incorporation refer to a document that establishes the existence of a corporation, while letters patent are a published written order by a head of state granting status to a corporation. In the context of Ontario, a corporation is incorporated without share capital (funds that a company raises in exchange for issuing an ownership interest in the company in the form of shares) by way of letters patent. Letters patent are similar to the articles of incorporation, but have members rather than shareholders. The letters patent outline initial members, classes of members, first directors, objects (purposes), basic corporation information, and any provisions of activity restrictions.

Board of Directors: The Board of Directors will manage the affairs of the not-for-profit, and must adhere to the not-for-profits mandates and objects by acting honestly and in good faith. The Board of Directors can be liable if they breach their duties for any liabilities or defaults of the not-for-profit. There must be at least three initial directors who must also be outlined in the letters of patent. Future directors will be elected by the members.

Officers: Officers are individuals elected or appointed by the Board of Directors, given a specific role and carry out the day-to-day operations of the not-for-profit. They are accountable to the members and must act in accordance to the objects of the not-for-profit.

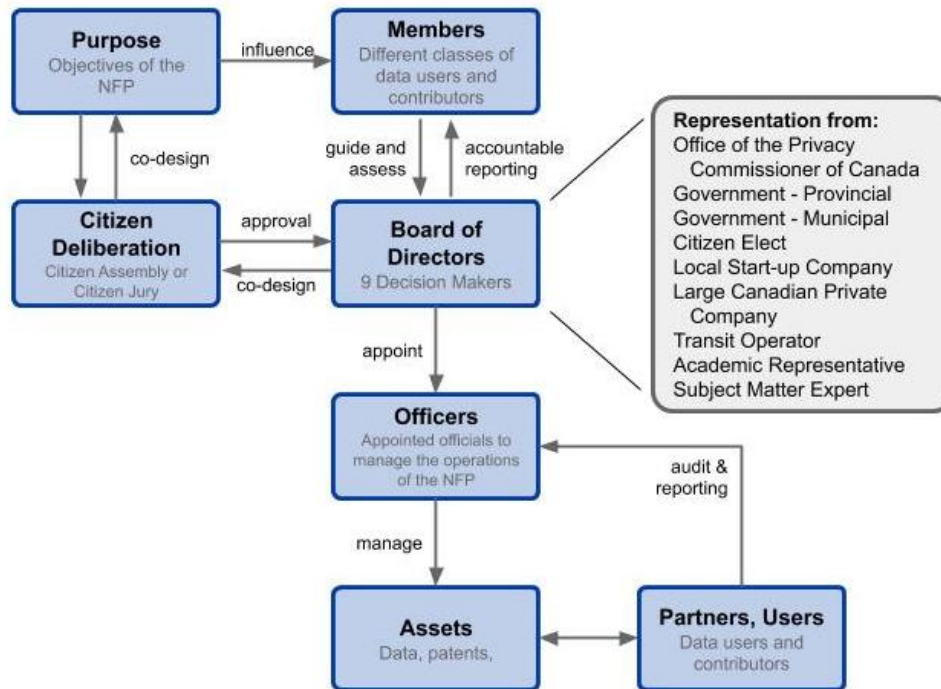
Objects: Objects are the purposes and guiding principles of the not-for-profit. They must be set out in the letters patent at inception. Profits may not be distributed to members. Rather, they must be used to reinvest in the organization and promote the objects of the not-for-profit.

Members: Members should be representative of various data contributors, community groups, marginalized populations, and civil society. Different classes of members can be established for different types of stakeholders with varying degrees of voting rights and influence in the operations and management of the not-for-profit entity. There can be a limited or an unlimited number of members; however, they must be admitted by the directors and approved by the current membership.

Liability: In the not-for-profit entity there is limited liability for members, Board of Directors, and officers of the not-for-profit. Although, in some instances where the Board of Directors or officers breach their duties, they can be held liable.

Assets: Assets are items that hold value and, for a not-for-profit, can include the data licenses, patents, royalties, and components of the digital layer of the city.

Citizen Deliberation: Depending on the phase of work, a citizen-led deliberation mechanism, such as a citizen assembly or jury, should be in place to approve and co-design the trust.



Governance and Organization Flow Chart

Business Model

As we have seen across our research, public and private sector actors have siloed their data and digital assets to retain their competitive advantages, while limiting the risk of data misuse. However, the success of our future mobility solutions is predicated on addressing the opportunities of connected devices and transportation. Looking towards this future, yet conscious of the current reality, in order for a data trust to be viable over the long-term, adaptability and proper oversight mechanisms need to be prioritized.

As such, we recommend a not-for-profit business model in order to create an impartial, sustainable, and flexible governance structure that allows for oversight and accountability. A not-for-profit data trust would provide its users with a mechanism and standards to manage data exchanges, creating a line of sight towards the use of data for positive community and societal impacts. In contrast to a charitable trust and other legal mechanisms, a not-for-profit data trust, as a corporate entity, would have more flexibility in adapting its objects and by-laws. Yet, this structure would still promote accountability, from the Board of Directors and officers, to the members and communities that the data trust serves.

Key Characteristics of a Not-For-Profit Entity

- Independent legal personality
- Limited liability for directors, officers and members
- Managed in the best interests of the corporation

In constructing the not-for-profit, its core purposes and objectives, which should encompass public benefits and interests, would need to be initially established and continuously maintained through the participation of stakeholders, particularly citizens. In the context of data sharing, it would be configured to manage data and other digital assets, licenses, patents, royalties, and components of the digital layer from its stakeholders. This would create a trusted system that ensures the appropriate use of digital assets, captured from the digital layer of the city, towards improving outcomes in mobility for relevant communities.

Internal Governance

A citizen deliberation mechanism will aid in developing and formulating the not-for-profit's objects. These objects would need to be created and documented in order to guide the Board of Directors and officers of the entity. The Board of Directors would then make decisions about specific applications that come in for use of data and would deliberate on the use of data. Decisions made by the Board of Directors would be important in maintaining the standards and upholding the principles of the not-for-profit. The citizen deliberation mechanism would serve an arbitration function in order to ensure that these decisions are made in the best interest of the public. Ultimately, the Board of Directors would be directly accountable to the members and would be required to document and defend their rationale for decisions made.

In addition, members would have the ability to periodically audit the internal practices and functions of the not-for-profit to ensure that proper management is exercised and that the goals of the entity are being achieved.

Review and Audit Cycles

The data trust would have a core function of auditing its users in terms of both their data sharing practices and their use of data. We envision the auditing practice of the partner institutions (users) to be one that both adheres to the existing privacy and regulatory rules, and conforms to the principles and standards outlined by the not-for-profit.

A tool, such as the responsible data impact assessment (RDIA) outlined by Sidewalk Labs¹²¹, could initially be used to capture and understand the potential use of developing and accessing new data sets. Such a tool would create a mechanism to allow the not-for-profit to better understand the motives of a potential user through four key sections: a description of the purpose of the initiative and its key actors; an outline of the data types, sources, and uses; consideration of the impact it will have, both positive and negative, on individuals and various stakeholders; and an analysis of the risks and benefits of the initiative.

Generally, review cycles should be required roughly semi-annually to evaluate if practices and processes uphold the standards of the not-for-profit. This process could include:

- A review of the RDIA
- Review of current data and digital asset uses
- Review of data sharing and use agreements

The Responsible Impact Data Assessment has four core functions to assess the data collection and use activities proposed. They include:

1. Discussion of the purpose for the data collection, who is involved and accountable;
2. Understanding the Data. What data is needed, what it will be used for, and who will be involved;
3. Assess the potential impacts, both positive and negative on people and companies;
4. Analyze the risks and benefits of the activities.

Such review and audit cycles are a necessary step in ensuring that standards are being upheld. and have proved to be instrumental in other industries.¹²²

¹²¹ Sidewalk Labs, "Responsible Data Impact Assessment (RDIA)," in *Digital Governance Proposals for DSAP Consultation (Draft Proposals)* (Toronto: Waterfront Toronto, 2018), 17-22, https://waterfronttoronto.ca/nbe/wcm/connect/waterfront/41979265-8044-442a-9351-e28ef6c76d70/18.10.15_SWT_Draft+Proposals+Regarding+Data+Use+and+Governance.pdf?MOD=AJPERES.

¹²² See the SEC's review cycles for an example of the instrumentality of review and audit cycles; "The Role of the SEC," U.S. Securities and Exchange Commission, accessed July 19, 2019, <https://www.investor.gov/introduction-investing/basics/role-sec>.

Financial Considerations

The cost and revenue component of the not-for-profit will need to balance the reality of business sustainability with the need to foster both impartiality (from both the government and private sector) and data sharing.

Therefore, an endowment, with a data sharing transaction fee, would be an ideal funding mechanism to create and maintain the operations of a data trust. This would allow for independent and sustainable funding for the trust. An endowment at a magnitude of fifty million dollars could provide initial funding for infrastructure, governance, and civic participation. In addition, an ongoing operating budget for core costs of approximately 400 to 500 thousand dollars would also be required. An example of such an endowment is used in Canadian universities to create a pool of funds primarily for future investments and expenditures. The University of Toronto currently sits on a 2.5 billion dollars of endowments utilizing approximately 110 million dollars per year in university spending, other expenditures and fees.¹²³ This provides the university a stable base to make investments and hold its core values in order to support students and drive research, while staying competitive into the future. This sort of stability is an important factor in driving impartiality, and sustainability into the future.

However, finding a party to provide an endowment may prove difficult. Alternatively, funding could come from the real estate developer of a smart city initiative as an investment included in land development costs. Large developments in emerging smart cities and next generation digital communities see large investments into the implementation and infrastructure accompanying traditional buildings. A long-term partner in these smart city developments could provide base funding to enable the not-for-profit to operate. The magnitude of the operating budget required will likely be a fraction of the capital that real estate developers invest in these initiatives. For instance, projects such as MIND in Milan, Italy, view the creation of a robust governance model, overlaid on the digital layer of the community, as imperative.¹²⁴ Thus, in the case of MIND, long-term collaborations with developers are being used to ensure that the culture and well-being of citizens are integral in the development design.¹²⁵

Nonetheless, a data sharing transaction fee may be necessary to supplement base funding with revenue. To promote fair competition and encourage participation from organizations across the spectrum, a tiered system of transaction fees should be created, based on each organization's ability to pay. In this system, large corporates joining the trust would end up paying more than smaller organizations such as startups, which have fewer assets and less ability to capitalize on opportunities from data sharing. Outside of participation from private companies, governments and academic participants could either be exempt from fees or be subject to a low "base" rate to allow participation for the greater societal benefit. To incentivize specific data contributions or contributors to the trust, participants could be given reduced transaction fees for sharing data.

¹²³ University of Toronto, *The University of Toronto Endowment: Strengthening our Future (2017-2018)* (Toronto: University of Toronto, 2018), 3, <https://finance.utoronto.ca/wp-content/uploads/2018e.pdf>.

¹²⁴ Lendlease S.r.l., *MIND: Milano Innovation District* (European Commission, 2018), https://ec.europa.eu/jrc/communities/sites/jrccties/files/20180628_ttocircle-ruckstuhl_en.pdf

¹²⁵ Lendlease S.r.l., *MIND*.

Civic Participation Approach

Our recommendations for a civic participation approach vary depending on the phase of work that the data trust is in. These phases include design, build, and maintain.

However, across the timeline the guiding design principles will need to be realized through the selected design elements. Notably, two modalities will need to be temporally constant in order to meet our criteria. First, formal civic participation that is explicitly integrated into the data governance framework should be implemented. This requirement does not preclude actors from engaging in parallel or complementary informal participation. Second, the chosen approaches must have committed neutral sponsorship to guarantee that there are sufficient resources for participation to occur over time; given fiscal constraints and the current economic climate, the selected approaches must be cost-effective to ensure that sponsorship is sustainable.

Aside from these uniform characteristics, the following sections will describe the functions, activities, modalities, and look and feel that should be implemented, specific to each phase of the data trust. In each section these design elements will be synthesized into a specific description of a possible civic participation approach, supplemented with use cases to provide tangible examples.

Participation in the Design Phase

During the design phase of a data trust, civic participation will be required to ensure that data governance is citizen-centric from initial prototyping to the final design. This includes the determination of a data trust's components, mechanics, objectives, and terms of use.

Key Design Elements

Functions

Within the design phase of work, in order to achieve the guiding principles a civic participation approach must achieve the following functions:

See. Citizens must be able to see the motivations of other stakeholders through the transparent articulation of their intentions and practices.

Learn. Citizens must be able to learn about the benefits and drawbacks of different designs, from both experts and non-experts, across a spectrum of perspectives.

Choose. Citizens must be able to choose the overarching design principles of a trust them and use them to initiate their own design.

Challenge. Citizens must be able to deliberate on and challenge options developed by other stakeholders.

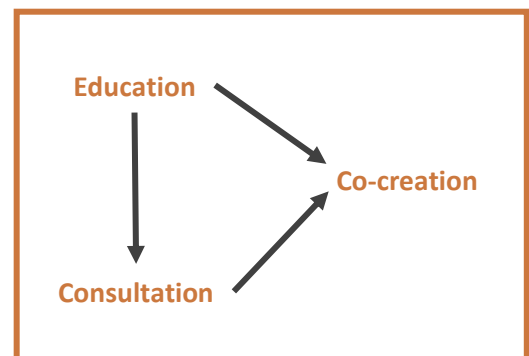
Activities

To realize these functions, a co-design activity, with embedded education and consultation activities, should be implemented.

Modalities

The modalities that should be chosen to ensure that the expression of these activities fulfills the functions required in the design phase of civic participation include:

Long-term. Participation should be long-term to ensure that there is consistent coverage over the entire timeline of the design process.



Discrete. Participation should be a discrete endeavour, culminating at the end of this phase as the underlying design of the trust needs to provide a stable foundation for consistency and assurance of principles.

Active. Participation should be active to encourage ample deliberation on the construction of the base of the data trust. Although, high touch participation means a higher energy cost for citizens, it is appropriate for a concentrated phase of work.

Dynamic. Participation, in terms of specific processes and topical considerations, should be able to change based on different iterations of the design.

Group. Participation should be group-based to facilitate deliberation and consensus building.

Mini-Public. Participation should occur in a mini public, formed through stratified random sampling that ensures the inclusion of diverse and marginalized segments of society.

Large Sample. Participation should include a relatively large sample of the population so that design preferences reflect a broad base of reality.

Offline. Participation should occur offline, with face-to-face interactions, in order to facilitate empathy building and negotiations.

Look and Feel

In terms of the look and feel, a civic participation approach should be:

Serious. Civic participation should be relatively serious, yet engaging, in order to create buy-in from non-participating citizens and legitimacy from the point of view of other stakeholders.

Possible Approach: A Citizens' Assembly

In consideration of our recommended design elements, a civic participation approach could take the form of type of a citizens' assembly.

A citizens' assembly is a type of deliberative mini-public.¹²⁶ If used, a large stratified random sample of citizens would be convened to deliberate on the design of a data trust.¹²⁷ These citizens would first learn about data trusts and essential considerations through a series of education initiatives.¹²⁸ They would then consult the broader citizen base to ground themselves in the reality of public opinion and preferences.¹²⁹ These two subsidiary elements would be used to inform deliberation on a citizen-led design proposal to be submitted to the administering organization(s).¹³⁰ If other stakeholders make changes to that design, the citizens' assembly will reconvene to deliberate and iterate.¹³¹ The design negotiation process would continue until all parties are in support of a data trust plan.

¹²⁶ Pal, "The promise and limits," 265-266.

¹²⁷ Oliver Escobar, and Stephan Elstub, "Forms of Mini-publics: An introduction to deliberative innovations in democratic practice," *newDemocracy Foundation: Research and Development Notes*, no. 4 (2017): 3, https://www.newdemocracy.com.au/docs/researchnotes/2017_May/nDF_RN_20170508_FormsOfMiniPublics.pdf.

¹²⁸ Escobar and Elstub, "Forms of Mini-publics," 3.

¹²⁹ Escobar and Elstub, "Forms of Mini-publics," 3.

¹³⁰ Escobar and Elstub, "Forms of Mini-publics," 3.

¹³¹ Edna Beauvais, "The Grandview-Woodland Citizens' Assembly: An experiment in municipal planning," *Canadian Public Administration* 61, no. 3 (2018): 354, <https://doi.org/10.1111/capa.12293>; Citizens' Assembly on the Grandview-Woodland Community Plan, *Final Report* (Vancouver: City of Vancouver, 2015), retrieved at <https://www.grandview-woodland.ca/about-2/>.

Use Case: The Irish Citizens' Assembly

Citizens' assemblies have been used for highly divisive and politically sensitive topics, most notably in Ireland.¹³² For instance, the Irish Citizens' Assembly was established by the Irish government in late 2016, operating through early 2018, to consider five issues: abortion, the ageing population, fixed-term parliaments, referenda, and climate change. The topic of abortion, specifically, the Eighth Amendment of the Constitution (Article 40.3.3), was predominately considered, taking up five of the Assembly's twelve meetings. The Assembly, consisting of 99 citizens picked through a stratified random sample, considered diverse information from multiple perspectives and consulted the broader public via written submissions on the topic. After a deliberation period, 87% of Members voted that Article 40.3.3 should not be retained in full, 56% voted that it should be amended or replaced, and 57% recommended that it should be replaced with a provision authorizing the legislature to address abortion.¹³³ Members also made recommendations for what should be considered in legislation and related policy issues. The Assembly ultimately called for the government to put the issue to a referendum.

Their report was made publicly available and was presented to the legislature. The legislature accepted the Assembly recommendation and the Thirty-sixth Amendment of the Constitution Bill 2018, which repealed Article 40.3.3 and replaced it with a provision allowing for the regulation of abortion to be made by law, was put forward. A referendum on the issue was then held on May 25, 2018, with a similar proportion of Irish citizens as the Assembly voting in favour of amending the constitution to allow the government to legalize abortion.

This use case demonstrates how deliberative processes can enable societal reflection on contentious issues to increase public consideration. Moreover, it provides evidence that assemblies can be used to tackle controversial issues that are politically costly for politicians to address and provide a gauge of mainstream opinion, rather than that of polarized vocal stakeholders.

Use Case: The Citizens' Assembly on the Grandview-Woodland Community Plan

Citizens' assemblies have been used in urban planning contexts, following public backlash to development proposals.¹³⁵ For instance, Canada's first urban planning citizens' assembly was established following the 2013 release of the "Grandview-Woodland Community Plan: Goals, Objectives, and Emerging Policies", a thirty-year development plan by the City of Vancouver. Although the planning department had engaged in a consultative process, community feedback on key issues was not reflected in the plan released by the City Council. Residents were deeply concerned about the loss of their neighbourhood character. Consequently, protests erupted and diminished public trust persisted even when controversial pieces of the plan were removed.

To regain public faith in the planning process the City engaged citizens in drafting a new plan through the establishment of the Citizens' Assembly on the Grandview-Woodland Community Plan. Residents were invited to volunteer for the Assembly and of the 500 interested citizens, forty-eight were selected using stratified random sampling. These members then went through three phases of work: learning, deliberation, and decision-making. In total, the Assembly convened eleven times over nine months, which was supplemented by three public roundtable meetings and member attendance at City-led workshops for the broader public. In 2015, the Assembly presented their report to the City Council for councillors to vote on. Almost all of their recommendations were incorporated into the City's new plan and any departures were legitimized by reconvening the Assembly for approval.

¹³² David M. Farrell, Jane Suiter, and Clodagh Harris, "'Systematizing' constitutional deliberation: the 2016-18 citizens' assembly in Ireland," *Irish Political Studies* 34, no. 1 (2019): 113-123, doi:10.1080/07907184.2018.1534832; Susan McKay, "A Jury of Peers: How Ireland used a Citizens' Assembly to solve some of its toughest problems," *Foreign Policy*, no. 231 (2019): 5-7, <https://foreignpolicy.com/2019/01/05/a-jury-of-peers/>; "The Eighth Amendment of the Constitution," The Citizens' Assembly (An Tionól Saoránach), accessed July 17, 2019, <https://www.citizensassembly.ie/en/The-Eighth-Amendment-of-the-Constitution/>.

¹³³ "The Eight Amendment."

¹³⁴ Beauvais, "The Grandview-Woodland," 341-360.

This use case demonstrates the effectiveness of citizens' assemblies in forming deliberated consensus that reflects citizen desires as the new plan was largely accepted by the broader community. Furthermore, the process was demonstrated to be more cost-effective than traditional civic participation mechanisms as it cost approximately \$275 000 to implement, while a 1995 Vancouver mega consultation cost \$1.9 million (adjusted to \$3 million in 2016).¹³⁵

Participation in the Build Phase

During the build phase of the trust, unforeseen challenges and circumstances may occur, prompting build questions. Therefore, civic participation will be required to decide and approve any changes to the data trust; it will allow for flexibility while ensuring that the guiding design principles are continuously upheld through situational changes.

Key Design Elements

Functions

Within the build phase of work, in order to achieve the guiding principles a civic participation approach must achieve the following functions:

See. Citizens must be able to see the building process through transparent practices

Learn. Citizens must be able to learn about the advantages and disadvantages of proposed design changes or unforeseen questions from unbiased sources.

Choose. Citizens must be able to choose to accept or reject proposed changes or answer questions that arise while building and as the external environment changes over time. They should also be given an opportunity to determine alternative courses of direction.

Challenge. Citizens must be able to challenge proposals, holding other stakeholders accountable in the determination of acceptable and unacceptable decisions.

Activities

To realize these functions, a citizen control activity, with an embedded education component, should be implemented. There could also be the possibility for a co-design activity based on citizen-led recommendations.

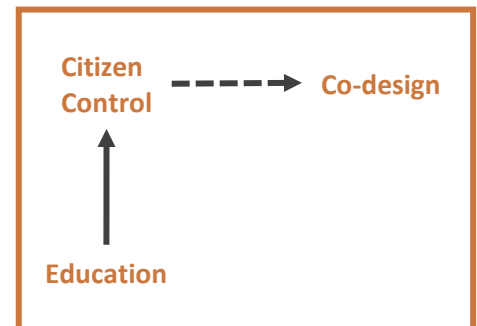
Modalities

The modalities that should be chosen to ensure that the expression of these activities fulfill the functions required in the build phase of civic participation include:

Short-term. Participation should be relatively short-term, balancing the need for enough time to deliberate with cost considerations. In terms of the latter, as build questions may occur at multiple points in time, costs need to be relatively low both in terms of citizen time and financially so that the sponsorship of participation is sustainable.

Discrete and Continuous. Participation should be targeted to a discrete build question or challenge. However, it should also be continuously available for use as issues arise.

Active. Participation should be active or high-touch to encourage increased deliberation. It should be thought of as a sprint; although high citizen energy is required, participation does not require as large an amount of citizen time.



¹³⁵ Beauvais, "The Grandview-Woodland," 344.

Static. Participation should have a static form so that it is replicable and easily implemented whenever required.

Group. Participation should be group-based to facilitate information processing and deliberation.

Open-Door vs. Mini-Public. Participation should occur in a mini public, formed through stratified random sampling that ensures the inclusion of diverse and marginalized segments of society.

Small Sample. Participation should include a relatively smaller sample of the population to ensure agility and efficiency given the shorter time frame.

Offline. Participation should occur offline, with face-to-face interactions, in order to facilitate empathy building and consensus building.

Look and Feel

In terms of the look and feel, the civic participation approach should be:

Serious. Civic participation should be relatively serious, yet engaging, in order to create buy-in from non-participating citizens and legitimacy from the point of view of other stakeholders.

Possible Approach: A Citizens' Jury

In consideration of our recommended design elements, a civic participation approach could take the form of type of a citizens' jury.

A citizens' jury is another type of deliberative mini-public, similar to a citizens' assembly.¹³⁶ If used, a small stratified random sample of citizens would be convened to evaluate an answer to a proposed build question, challenge, or change. These citizens would be exposed to both expert and non-expert "testimony" and "cross-examination" before a facilitated deliberation period.¹³⁷ The jury would then provide a verdict on the issue in question.¹³⁸ Additionally, the activity should provide mechanisms to move beyond the core verdict function by allowing citizens to provide recommendations on alternative directions.¹³⁹ If these recommendations are internalized by the administering organization, or are iterated on to be brought back to the citizen jury, co-design of an alternative direction may occur.

Use Case: The Edmonton Citizens' Jury on Internet Voting

Citizens' juries have been used to reach a "verdict" on controversial issues. For instance, in 2012 as part of broader public involvement campaign to evaluate the possibility of online ballots in municipal and school board elections, the City of Edmonton implemented the Edmonton Citizens' Jury on Internet Voting.¹⁴⁰ Eighteen citizens were selected, with seventeen participating, using a stratified random selection method based on socio-demographic and demographic terms. Participants were given a small honorarium to convene over the course of a weekend.

The Citizens' Jury was tasked with deliberating and providing a "verdict" on the question: "Should the City of Edmonton adopt Internet Voting as an option in future general elections?" Over the course of the process, moderated by two independent facilitators, the participants were provided information from expert witnesses, scholars, industry representatives, and municipal administrators, all of whom were instructed to avoid taking sides to prevent framing biases. Following these presentations participants were given time to deliberate and were provided with academic and popular sources to conduct independent research.

¹³⁶ Escobar and Elstub, "Forms of Mini-publics," 3.

¹³⁷ Kalina Kamenova, and Nicole Goodman, "A New Participatory Model: The Edmonton Citizens' Jury on Internet Voting," *Canadian Parliamentary Review* 26, no. 2 (2013): 13. http://www.revparl.ca/36/2/36n2_13e_Kamenova-Goodman.pdf.

¹³⁸ Escobar and Elstub, "Forms of Mini-publics," 3.

¹³⁹ Kamenova and Goodman, "A New Participatory Model," 13-14.

¹⁴⁰ Kamenova and Goodman, "A New Participatory Model," 13-20; Kalina Kamenova, and Nicole Goodman, "Public Engagement with Internet Voting in Edmonton: Design, Outcomes, and Challenges to Deliberative Models," *Journal of Public Deliberation* 11, no. 2 (2015): 1-28.

Use Case: The Edmonton Citizens' Jury on Internet Voting Continued

After evaluating the evidence, the Jury provided a “yes” verdict on the question; they favoured the introduction of online ballots in Edmonton municipal elections as an additional voting method. In addition, the Jury provided recommendations on how the administration and City Council should proceed. However, despite broader public acceptance of the decision, the Edmonton City Council rejected the verdict, voting against the implementation of internet voting.

This use case demonstrated that citizens' juries can reach verdicts representative of average citizens. However, the effective dismissal of the process by the City Council in this case demonstrates that for a citizens' jury to be an effective mechanism of citizen power, there needs to be a commitment from administering bodies to adhere to the “verdict” given.

Participation in the Maintain Phase

During the maintenance phase of the data trust, civic participation will be required to mediate data sharing interactions between the trust and citizens, as individual data producers and users of data derived services.

Key Design Elements

Functions

Within the maintain phase of work, in order to achieve the guiding principles a civic participation approach must achieve the following functions:

See. Citizens must be able to see how data is being used through transparent practice

Learn. Citizens must be able to learn about the different benefits and consequences of sharing their data.

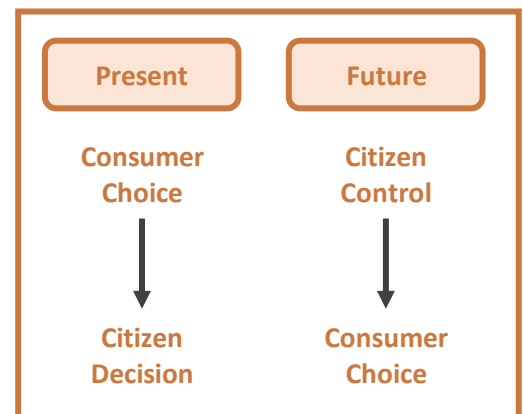
Choose. Citizens must be able to choose the level of data they share, who they share their data with, and how their data is used; they must have agency and a high degree of control over their data.

Challenge. Citizens must be able to change their own data sharing preferences and change the behaviour and choices of other stakeholders engaging with the trust.

Activities

To realize these functions, a citizen control activity and a consumer choice activity, with embedded education components, could be implemented.

The combination of these two activities is essential because in the present state, the market dictates the choices that citizens then make limited decisions on. Participation is thus rendered meaningless as citizens do not have decision-making power in determining the choices available to them for how they share their data. However, in a future state, if citizens have control over their data, then they can shape these choices.



Modalities

The modalities that should be chosen to ensure that the expression of these activities fulfill the functions required in the maintain phase of civic participation include:

Short-term. Participation should be relatively short-term so that it requires minimal time expenditure from each citizen.

Discrete and Continuous. Participation should be discrete in terms of actions but continuously available so that citizens can change their preferences in real-time.

Passive. Participation should be passive or low-touch to reduce the amount of citizen energy expenditure required.

Static and Dynamic. Participation should have a static form so that there is minimal onboarding time for citizens but should be dynamic in terms of the options available for citizens to choose from.

Group. Participation should be individual so that each citizen has direct ownership and control over their data.

Open-Door. Participation should be open-door so that anyone and everyone can be included.

Large Sample. Participation should include all members of a population.

Online. Participation should occur online to increase convenience, the breadth of the population reached, adaptability of responses, and individual customizability.

Look and Feel

In terms of the look and feel, the civic participation approach should be:

Playful. Civic participation should be relatively playful to ensure that participation is a pleasant and desirable experience. It should be interactive, with visuals and varying levels of depth, to appeal to a broad demographic.

Possible Approach: Dynamic Consent Platform

In consideration of our recommended design elements, a civic participation model could take the form of type of a dynamic consent platform.

Through a dynamic consent platform, citizens would be the sole decision-makers in determining how they individually share their data and what it can be used for. Citizen control over their own data would allow them to use their choices to influence the decision-making of other actors that depend on access to their data, thereby shaping future iterations of choices. Through this market-based shaping of the practices and services offered by other actors, citizens will be afforded an opportunity, at the level of the individual, to influence the future of smart mobility.¹⁴¹

Design Case: Hanna Steingrimsdottir's "Node" Project

The concept of a dynamic consent platform addresses the contradiction that in a world of increasing dependence on citizen data, there are glaring inefficiencies in our current model of data consent, with citizens having little control over data acquisition, use, and sharing.¹⁴¹ Hanna Steingrimsdottir, in her thesis at OCAD University, has used design to address this challenge. The underlying design principle of her work is that for real-time collection of personal data to occur, explicit, meaningful, and informed data consent, from those whose data is being collected, must also exist.

Steingrimsdottir's thesis project is called Node, and its aim is to redesign the consent process for potential future residents of Sidewalk Lab's Quayside development project in Toronto, Canada. In her design, residents of Quayside would be provided with a Node, a customizable small device that functions as a key to both resident homes and data. This node would be synced with a corresponding app on which residents could choose and alter their consent profile. Resident consent profiles and data that their Nodes grant or deny access to would then be emitted, via the Node, to a cloud connected database. Devices in the digital layer could then search, identify, and respond to consent profiles through the database, gaining access when consent is given.

¹⁴¹ Hanna Steingrimsdottir, "Node", last accessed July 3, 2019, www.hannasigrun.com.

Design Case: Hanna Steingrimsdottir’s “Node” Project Continued

Her user-centred design serves to promote meaningful, informed, and dynamic positive consent. Steingrimsdottir intentionally designs an accessible, customizable, and passive interface to respond to the different data needs of potential residents. The app is built to accommodate both different levels of digital literacy and interest in data with information provided in varied levels of detail. Moreover, consent profiles are not all-or-nothing; residents can choose what and how they want to share their data in terms of the level of sharing, data types, and category of data, service, and/or technology.

Ultimately, the Node provides a mechanism for informed, meaningful, and freely given consent. This form of consent gives citizens control over choice.

Technical Architecture

The technical architecture of the data trust must have specific capabilities to ensure that it is successful and scalable. Fundamentally, the terms of licensing and use of the data trust must be managed in a manner that securely identifies participating entities and users, while providing authorization, access, and the permissible situations for use of the data itself. Additionally, confidence in the data trust must be established to create buy-in, and thus value for members and the wider mobility ecosystem. The data must also be relevant to stakeholders’ needs and in a form with low costs to convert into readable formats. Moreover, to enable data trust members to collaborate and create value for the public through network effects, mechanisms to facilitate interactions need to be in place. Specifically, sampling rights need to be created to enable open data and aggregated sources for the creation of collaborative data sets. In addition, collaboration can be further enabled through the establishment of common standards and language to facilitate strong data interoperability amongst users. These elements will enable data trust members to drive insights. For example, taking aggregated city movement data from public and private entities to create open data sets could drive deeper insights in solving traffic and movement concerns of citizens.

Of the technical options explored, we recommend using a decentralized architecture, managed on a single platform, as it will allow the required capabilities to be created and governed by the not-for-profit entity. While there will be significant initial costs to develop the system and common usage, overall costs to the governing entity would be reduced due to the decentralized infrastructure, as well as the shared administration of policies, standards, and maintenance of the repositories by each contributor to the data trust. Existing data repositories and platforms could be modified to the mobility use case to enable a data trust for this context. ThinkData Works Incorporated, a Canadian company based in Toronto, has developed initial concepts of what this kind of platform may include. Their work is based on the core principles of transparent data collection and use, and is thus open by design to develop a secure clearinghouse of data.¹⁴²

In addition, the single platform component may provide an additional citizen-facing layer of transparency and accountability. A central platform encompassing adequate licensing and permissions for different data contributors in a single accessible location can give citizens a mechanism to view, change, and inform the trust with their individual data-sharing preferences; they could dictate how their data may be used in a data trust and determine whether to provide it to third-party contributors in the mobility sector. For example, citizens could consent for their data to be shared for the purpose of supporting social justice, enabling environmental improvements, or economic gains. This information could then be measured and reviewed on an ongoing basis by the board of the not-for-profit entity via an impact assessment or audit.

¹⁴² “Data Trusts: A mechanism for data dissemination and governance,” ThinkData Works Inc., accessed July 19, 2019, <https://www.thinkdataworks.com/data-trusts>.

Use Case Illustration

An impactful use case from a city perspective is mid- to long-range transportation planning across all municipalities in the GTA. Such a cohesive approach to transportation requires the acquisition and integration of data from each city. However, presently, data collection efforts between cities and municipalities differ. As a result, there is incompleteness, fragmentation, and a lack of standardization within the data sets currently owned by municipal transportation authorities.

These mid- to long-range transportation challenges manifest into other issues felt by citizens as well as private and public sector actors. Examples of these issues include:

- Developing equitable fare pricing for public transportation
- Accessible route planning
- Understanding effects on vehicle travel versus pedestrian and cycling patterns
- The battle of the curbside between people, ridesharing, and deliveries
- Little to no ability to focus on next generation technology implementation due to budget constraints
- Deteriorating and aging infrastructure

Given this context, the not-for-profit entity could help standardize and create insights using the data convened from multiple stakeholders. Ideally, the private sector (e.g. Uber, Google) and transit authorities (e.g. TTC and Metrolinx) would contribute data to help fill gaps that municipalities have. This could facilitate more efficient and informed decision-making for transportation and associated urban planning, such as detailed transit user data and route mapping.

More specifically, the data trust Board of Directors and officers would analyze the merits of a proposal by municipalities for a detailed mid- to long-range transportation plan. Once the RDIA is approved by the Board of Directors the not-for-profit entity would convene and allow parties to access its services and resources. This sharing of data between partners (users or other companies) could facilitate deeper understanding of root behaviours and patterns.

As data currently collected by municipalities varies in quality, having each municipality work with the same data will likely lead to better transportation planning across the GTA. It could also make public-private partnerships more feasible, as ridesharing services such as Uber and Lyft could connect more easily with public transit, thus delivering a more seamless transit experience for users. In addition, transit authorities, such as the TTC, could use the data to model traffic patterns and modify their operations accordingly.

Fundamentally, the value derived from the not-for-profit entity would depend on what types of data are collected and contributed into it, as some types, such as pavement quality, are common and of limited value to cities.

Setting up the Trust

To preface, there are some key elements to understand in setting up a not-for-profit; particularly, the not-for-profit has an independent legal personality. It has the rights, powers, and privileges of a natural person, indicating that some of the actions it can take include the holding and disposing of property, borrowing money, and entering into contracts, as natural a person is able to.¹⁴³ Another distinct element is that a not-for-profit corporation has directors and members, as opposed to shareholders, trustees, and beneficiaries.

The container of the data trust could be set up through a relatively simple process; the not-for-profit could be established through articles of incorporation, which are to be filed with the federal or provincial registrar, or through letters patent issued by the registrar. The relevant legislation exists at the provincial level; within this context and specifically in Ontario, not-for-profits are established under the *Ontario Corporations Act*, RSO

¹⁴³ ONCA, s.126.1(1).

1990, c.38 (“ONCA”).¹⁴⁴ Under ONCA, a corporation is incorporated without share capital through letters patent. The letters patent are issued by the Lieutenant-Governor in Council and outline the purposes of the corporation, as well as other significant aspects including the identity of the first Board of Directors, the number of Directors, the classes of members and their voting rights, membership qualifications, and special provisions relation to distribution of assets.¹⁴⁵

In establishing the not-for-profit a key requirement is that it must not have a profit-based objective for its members. Therefore, any profits must be reinvested and used to promote the purpose in the letters patent. The purposes of the corporation could be charitable or non-charitable, as long as they are not-for-profit. Given that the not-for-profit should be flexible, it should not be a registered charity, since this designation would limit the actions that could be taken.

Once incorporated, the Directors would pass by-laws, and set out procedural matters regarding the holding of Directors’ meetings, members’ meeting, and other matters.¹⁴⁶ They could also establish qualifications for membership, classes for members (provided that the members are divided into classes) with differential voting rights, and delineate the number of members as limited or unlimited. These outputs should be subject to approval by the members and a civic deliberation mechanism. Generally, there can be no fewer than three Directors, elected by the members at annual meetings.¹⁴⁷ However, it is possible to have ex-officio directors and also possible to have Directors elected in rotation so that directors have a term of no more than five years and at least three Directors retire from office each year.¹⁴⁸

Actions Required to Facilitate Implementation

Implementation will need municipal and other government support; such public actors will need to be active participants in designing the data trust and building its infrastructure. Funding will be a critical component to the data trust’s long-term success as the initial build will need to allow for future flexibility and the installation of proper management structures to allow for ongoing civic participation and neutrality from both the public and private sectors. Furthermore, data providers and users will need to invest into standing up endpoints, access controls, and electronic licensing in order to exchange data. In addition, due to the legal complexities of the trust, actors will need to build their internal legal capacity. Costs of such initiatives will be an order of magnitude of \$10 million.

Moreover, our gameplay with ecosystem stakeholder groups uncovered the need to showcase the value of the trust early in order to avoid lock-in to status quo processes and standards. As a result of this condition, a data trust will need to contain high value data at the outset in order to gain enough initial membership for further value accumulation and resulting incentivization of other actors to join. Consequently, during our next prototyping phase, we will need to further engage key stakeholders to better understand their motivations and preferences so that we can effectively build the data trust’s value proposition.

Impact of the Trust

There is a large economic opportunity for smart city and personal mobility industries to capture value through improved data sharing. However, without adequate data governance in place, privacy concerns, fragmentation of the data landscape, and anti-competitive practices may undermine Ontario’s potential to reap the rewards of

¹⁴⁴ The Ontario Corporations Act, RSO 1990, c.38 (“ONCA”) may eventually be replaced with the more recent Not-for-Profit Corporations Act, 2010, S.O. 2010, c. 15. Although this new legislation is enacted, it is not yet in force.

¹⁴⁵ ONCA, s.125.

¹⁴⁶ ONCA, s.128.

¹⁴⁷ ONCA, ss.283 and 284.

¹⁴⁸ ONCA, s.127; ONCA, s.287(5).

the digital economy. A personal mobility data trust could help Ontario to realize the benefits of data sharing in an ethical and fair way.

Economic Development Outcomes

A More Collaborative City

The creation of a data trust could facilitate greater efficiencies in city assets and services, while also promoting collaboration among stakeholders. The formation of catalogues of data sets, from multiple actors across the city and ecosystem, will create a new culture of sharing to solve complex problems. Businesses and cities alike have been keeping their data closed within their organizations, and as a result, have been making merely incremental improvements to their products and services. With a greater focus on collaboration and utilization of external data sets, companies, organizations, and community groups could accelerate new innovative practices.

Increased Innovation

As new models for data sharing are adopted, this is expected to unlock product, service and business model innovation. The more data that is shared within a data trust, the more connections can be made between data sets, leading to more valuable insights from data analysis and visualization. This creates a network effect, which attracts more data producers and consumers to the trust, which in turn allows for further product innovation.

Reduced Barriers for Startups

Gaining access to relevant data would allow startups to compete with more established counterparts in their sectors. This access to data, combined with improved shareability and interoperability, would help many new businesses reach market and grow faster.

Public Good Outcomes

Improved Mobility

There is a valuable opportunity for public and private sector organizations to create mechanisms that increase their collective capacity to address mobility needs. If consistently scaled, the overall efficiency of mobility may increase through more synergistic delivery enabled by data applications, and also lead to a net reduction in congestion. It could also allow for market-wide adoption of services and more efficient integration of public and private sector services to address existing market gaps. Considerations to licensing and market adoption initiatives will likely negatively impact the congestion impacts because of the growth of mobility as a service and thus must be managed appropriately.

Improved Data Governance

Since the inception of the Internet, data governance has lagged data collection and sharing practices. The uses and misuses of data is a growing societal concern due to frequent data breaches and privacy violations. The data trust mechanism alongside new regulations could lead to more robust and proactive protection of citizen privacy, shoring up confidence in public and private institutions.

Empowered Citizens

Citizens will be core creators of the data trust, setting the purpose and direction of any deliberations regarding data use and concerns. When citizens are informed and contribute to the mechanisms driving their protection around privacy and control of their data, we will see the solutions reflective of their true core values, needs, and future aspirations.

Social Inclusion Outcomes

Designing for the Margins

Realizing social inclusion outcomes in a data trust will require early identification of underserved parts of the population, and active engagement of these groups to ensure that the nominated representatives of the beneficiaries accurately reflect the beneficiaries they serve. With multiple robust methods for civic

participation, the data trust can mediate all of the diverse voices within a community to make decisions that benefit all, not just those with power and influence.

Privacy Outcomes

Given a new legal entity governing the data trust, there is an opportunity to uphold and increase privacy outcomes and adoption of consumer data rights over and above existing legislative requirements, supported by additional scrutiny and enforcement of requirements to participate in the data trust.

Risks

Understanding the Shift in Control

Creating an entity to manage and oversee the use and sharing of data could create hesitation around how companies will open their doors and share data. There was mild concern expressed in interviews around how the data of an organization would be perceived in the market and if it would be up to the standards of other stakeholders. Furthermore, there is still confusion around the ownership of the data that will be placed or flowed through the trust to other stakeholders. How will the authored company be attributed? Will they be held liable for the use of their data by another stakeholder? These concerns may inhibit momentum and critical mass for the trust to gain access to data to generate value for its users.

Moreover, if the onus of maintaining security of the data contributed into the trust is delegated to the trust, there is the potential that users may relax their own internal data governance practices. To avoid this, participants in the trust must understand that the trust's security measures are additive to, not a replacement for, internal data security.

Market Forces of a Data Trust

Our gameplay revealed the importance in creating a strong foundation of initial data set creating momentum for the trust to establish and build value early to allow for a successful implementation. During gameplay we observed that once key stakeholders and data sets entered the trust, the value became a positive force in drawing participation of additional actors. Conversely, if significant value was not established early, it was difficult to overcome the sunk costs and divert data into the trust after bilateral data sharing relationships had been formed.

“If you take too long to establish the trust and people are making deals in other ways then the value of the data trust diminishes.”

- Public Sector Transit Operator, Game discussion

A major uncertainty is the evolution of the data trust marketplace in both the local geography and in the mobility sector. As noted in future market considerations, the market forces may either dictate a single common platform or a constellation model of data trusts that may create dependencies and relationships between one another. As we continue to explore the potential for data trusts, it is important to understand how each market model will affect the structure and value of the data trust.

Market Readiness

Readiness of the marketplace for the data trust is a considerable risk in the success of the trust. Users of the data trust need to have the capabilities to conform to the standards the trust demands. Those standards include the technical capabilities to build secure processes to share data and interact with the trust, to apply the standards and ontology, and to create interoperability between data sets. This may take time and will be a barrier for public institutions with limited resources to comply with changes.

Uncertainties and Assumptions

Although our analysis is robust, it is an initial prototype and our recommendations are preliminary. Beyond solving for the risks previously outlined, there are also assumptions and uncertainties that require further investigation in our next phase design phase. These remaining questions are addressed by component below.

Legal Agreement

Although the not-for-profit model fits the mold of our ideal legal structure to govern the data trust, the model is accompanied with current uncertainties regarding explicit details of how the not-for-profit will be set up. In its present state, the not-for-profit model will be used to ensure accountability, transparency, and flexibility, as well as to ensure the community reaps significant benefits through the charitable objects of the data trust, and by establishing fiduciary responsibilities for the Board of Directors. Nonetheless, there remain uncertainties regarding the following: the exact object(s) outlined in the letters patent; whether members will be limited or unlimited (as we are unaware of the implications this may have in either context); the members that will be involved in the data trust and their potential voting rights; who are the directors and what is the distribution of powers; and how owning technology and data will be organized (as we have an interest in owning technology and data, considering that there is value added in being able to generate insights).

Business Model

In our business model we presented a well-founded case to support our recommendation. Whilst the not-for-profit model has significant benefits there remains uncertainty regarding the capital required to establish, and sustain operations of the data trust. Considering that the financial means of the data trust are uncertain, addressing these gaps will be a crucial focal point. The emphasis on these means will build the business case and financial models necessary to validate the viability of the trust, both from understanding the capital necessary, as well as the willingness of the members to pay for the services provided by the trust.

Civic Participation Approach

While we have presented an extensive and broad civic participation model, a few uncertainties remain. First, it should be noted that while there is a robust distrust of traditional representative governance, some citizens may not favour civic participation processes.¹⁴⁹ Some evidence suggests an emerging preference for expert-based governance.¹⁵⁰ Thus, our model rests on the assumption that citizens broadly want more civic participation in a smart city context.

Second, we have described citizens as the agents in civic participation in general terms. However, we have not discerned the exact breadth of that citizen base that would or should be eligible for participation: residents, business owners, commuters, tourists etc.

¹⁴⁹ Font, Wojcieszak, and Navarro, "Participation, Representation and Expertise," 154-157, 166.

¹⁵⁰ Ibid.

Third, while we focused on reducing the costs of participation and intangible benefits, we did not explore the complexities of tangible benefits, such as honorariums, that could be implemented to both incentivize and ensure a representative sample of citizen participants.

Finally, while well informed, the guiding design principles we selected and resulting civic participation approaches for each phase of the data trust were not themselves designed by citizens. This reality runs contrary to our focus on citizen-centricity. We assume that our research has guided our recommendations, for the civic participation approach and the other components, in the direction of citizen preferences. As we delve deeper into prototyping a data trust, more co-design with citizens will be necessary.

Technical Architecture

Our recommendations for the technical architecture of a data trust specify the core features required when building out the required infrastructure. Nonetheless, there are uncertainties that stem from factors such as:

- The financial and technical resources available to the entity that is the data trust,
- The availability of service providers that can meet the requirements of the trust, and
- Technological advancements in the mobility industry.

The data trust may choose to build in-house or outsource the development of the technical architecture. This will require an in-depth assessment of existing service providers, their capacity, the type of technology available, as well as the cost to build and maintain a secure platform that can process different types and sizes of data. Lastly, the chosen technology and platform provider will need to be adaptable to advances in technology and potentially legislation around data collection, storage, and use, particularly if the scope of the data trust expands over time.

For these reasons, our initial recommendations for the technical architecture are still open-ended in terms of what specific organization/technology could be used to build the infrastructure for the data trust.

CONCLUSION

Now, more than ever, there is a need to focus on citizens and ensure that the primary goal of technology, used by cities, is to improve outcomes for their residents. This objective requires adequate governance of the digital layer.

In this report, we explored the data trust as a governance model through an Ontario-based mobility sector use case. This sector was chosen due to the high potential of unlocking value for the public through the integration of public and private sector data, in collaboration with academia, civil society, and citizens.

In order to proceed from designing to implementing this data trust model, there are three key insights from our research that should be kept in mind. First, civic participation is integral to building legitimacy and trust in data governance. Moreover, there is no one-size-fits-all approach, so a range of complementary forms of civic participation should be used so citizens can actively engage through the different phases of designing, building, and maintaining a data trust. Second, because this is a nascent market, flexibility of the data trust is essential for it to adapt to a rapidly changing environment. Third, the success of the data trust is dependent on starting with high quality data with clear public benefit for multiple stakeholders in order to build support and attract additional data providers to the trust.

Our preliminary recommendations for the components of a data trust, namely the legal architecture, business model, civic participation approach, and technical architecture are made with the intent of building a desirable, feasible, and viable solution for all stakeholders in a smart city. In addition to meaningful and consistent civic participation throughout all phases, we recommend that a data trust be incorporated as a not-for-profit corporation to uphold impartiality and avoid the conflict of interest created by a profit motive, while maintaining independence from government. A not-for-profit legal structure can provide the benefits of a legal trust, including fiduciary responsibility, while also providing limits to personal liability and additional flexibility to adapt the purpose of the trust over time. We recommend a decentralized technical architecture, connected through a data trust platform, to enable responsible data sharing.

It is important to note once again that while these initial recommendations are based on extensive primary and secondary research in this area, the concept of a data trust is still one that is fairly new and evolving even today. Significant prototyping and iteration to test assumptions and uncertainties will need to take place to validate these recommendations. We call on governments and public-minded corporate sponsors to invest in further prototyping and testing of these concepts so that Ontario can benefit from the opportunities of the digital economy, while protecting and advancing the rights and freedoms of our citizens.

APPENDICES

Appendix A: Data Trust Tabletop Game

The world

The year is 2022...

“Smart cities are on the rise, promising economic development and improved social outcomes. However, there is a void in governance over the growing network of connected technologies and databases; current models cannot be applied to this new ‘digital layer’. Traditionally, "bilateral agreements" have been the predominant tool used to navigate this space.

Recently, a data trust has been developed as a new mechanism to govern the digital layer of cities and it is focused in on the mobility sector to help improve many of the challenges our city is facing! The hope of the data trust is to foster a robust sharing platform all while safeguarding and overseeing the use of our smart city data to better social and economic outcomes for the local community.”



Gameplay Photos



Insights learned

On June 26th, 2019, MaRS brought together 18 stakeholders from the mobility and smart city ecosystem in the GTA to play an immersive board-based role-playing game about data trusts. The participants had an opportunity to explore this data driven world, both trading access to data sets and participating in the data trust, while managing their scarce resources and relationships with other players.

What we saw:

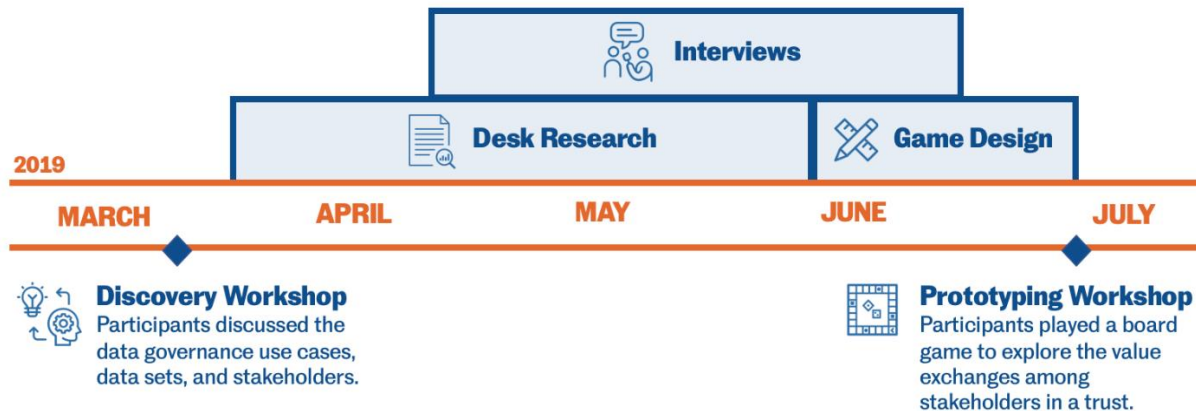
- High levels of engagement, fun and competitiveness within the game world
- Familiarization with data trusts and how they would work in the real-world
- Deep discussions around the pros, cons, risks, and incentives needed for data trusts to be successful

What we heard:

- Creating strong initial value (i.e. data, partners) is important in creating a market that encourages participation
- Importance of keeping public interests and value for the public as the top priority

Appendix B: Research Overview

Our process



Research spanned three major areas to best understand what a data trust is: the potential composition of the trust, use cases in which it could govern, and various ownership forms and enforcement methods critical to its success.

We started at our desks, identifying models of data trusts out in the world, data governance initiatives currently underway, and business & technical models that could be used to form a sustainable business case.

We then talked with twelve experts to understand data trusts from various perspectives: legal, privacy, technical, data, urban, and public.

From our research synthesis, we organized a workshop with 37 participants to discuss the challenges and opportunities of a data trust in various smart city use cases. We also designed our next steps around prototyping possibilities, stakeholder engagement, and limitations of data trusts.

From that initial scoping we continued to refine the trust concept and developed an interactive game to further discover the relationships and value exchanges that would need to be present in a thriving data trust.

What we talked about

Our team's core research questions when talking to stakeholders from the mobility ecosystem:

- What type of consumer or market problems could a data trust help solve in the mobility space? What type of model would best support those consumer and market outcomes?
- What type of data would you want available to the users of the trust? What type of data would you be able to provide?
- What is a specific use case within mobility that we can identify to prototype?

We dove deep into the following section with our stakeholders to gain an understanding of how they interact with data.

- Data Sharing
- Data Analysis and Value from Data
- Data provider contributions
- Data Customer

Who we talked to

Workshop Participants

- 52 Total Participants
 - 16 Prototyping Participants
 - 36 Discovery Participants

Research dashboard

40

reports reviewed

12

public agencies

2

workshops

12

interviewees

3

academic institutions

7

board game usability tests

52

workshop participants

11

private companies

300+

collective hours spent reviewing documents and processing findings

30

organizations total

4

civil society organizations

BIBLIOGRAPHY

“About.” T4G. Accessed July 21, 2019. <https://www.t4g.com/company/corporate-info/>.

“About B Corporations.” B Corporation. Accessed July 21, 2019. <https://bcorporation.net/about-b-corps>.

“About the Library.” Toronto Public Library. Accessed July 21, 2019. <https://www.torontopubliclibrary.ca/about-the-library/>.

“About Us.” Code for Canada. Accessed July 21, 2019. <https://codefor.ca/about-us/>.

Arnstein, Sherry R. “A Ladder of Citizen Participation.” *Journal of the American Planning Association*. 35, no. 4 (1969): 216-224. doi: 10.1080/01944366908977225.

Axelsson, Karin, and Mail Granath. “Stakeholders’ stake and relation to smartness in smart city development: Insights from a Swedish city planning project.” *Government Information Quarterly* 35, no. 4 (2018): 693-702. <https://doi.org/10.1016/j.giq.2018.09.001>.

Beauvais, Edna. “The Grandview-Woodland Citizens’ Assembly: An experiment in municipal planning.” *Canadian Public Administration* 61, no. 3 (2018): 341-360. <https://doi.org/10.1111/capa.12293>.

Birch, Eugenie, David C. Perry, and Henry Louis Taylor, Jr. “Universities as Anchor Institutions.” *Journal of Higher Education Outreach and Engagement* 17, no. 3 (2013): 7-15. <http://openjournals.libs.uga.edu/index.php/jheoe/article/viewFile/1035/680>.

Bobbio, Luigi. “Designing effective public participation.” *Policy and Society* 38, no. 1 (2019): 41-57. doi:10.1080/14494035.2018.1511193.

Brabham, Daren C. “Crowdsourcing the Public Participation Process for Planning Projects.” *Planning Theory* 8, no. 3 (2009): 242-262, doi:10.1177/1473095209104824.

Braun, Trevor, Benjamin C.M. Fung, Farkhund Iqbal, and Babar Shah. “Security and privacy challenges in smart cities.” *Sustainable Cities and Society* 39 (2018): 499-507. <https://doi.org/10.1016/j.scs.2018.02.039>.

“British Airways faces record €183m fine for data breach.” *BBC News*, July 8, 2019. <https://www.bbc.com/news/business-48905907>.

Campbell, Patrick. “Guide to Subscription Business Models for 2019.” *Price Intelligently*, July 24, 2019. <https://www.priceintelligently.com/blog/subscription-business-model>.

Canada. Ontario. Not-for-Profit Corporations Act (ONCA), 2010, S.O. 2010, c. 15. s. 126.1(4). <http://canlii.ca/t/531bw>.

Cardullo, Paolo, and Rob Kitchin. “Being a ‘citizen’ in the smart city: up and down the scaffold of smart citizen participation in Dublin, Ireland.” *GeoJournal* 84, no. 1 (2019): 1-13. <https://doi.org/10.1007/s10708-018-9845-8>.

Cities for People, and Dark Matter Labs. *Legitimacies: Notes on innovating our cities from the sidewalk up (Issue #1)*. Montreal: McConnell Foundation, 2019. https://mccconnellfoundation.ca/wp-content/uploads/2019/06/Legitimacies_VF4.pdf

Citizens’ Assembly on the Grandview-Woodland Community Plan. *Final Report* (Vancouver: City of Vancouver, 2015). Retrieved at <https://www.grandview-woodland.ca/about-2/>.

Clever, Sawyer, Tyler Crago, Alex Polka, Jameela Al-Jaroodi, and Nader Mohamed. “Ethical Analyses of Smart City Applications.” *MDPI - Urban Science* 2, no. 4 (2018): 96 (1-23). <https://doi.org/10.3390/urbansci2040096>.

Coleman, Roy. “Images from a Neoliberal City: The State, Surveillance and Social Control.” *Critical Criminology* 12 (2003): 21-42. <https://doi.org/10.1023/B:CRIT.0000024443.08828.d8>.

Commission Communication to the European Parliament and the Council on Stronger Protection, New Opportunities - Direct Application of the General Data Protection Regulation as of 25 May 2018.

https://ec.europa.eu/commission/sites/beta-political/files/data-protection-communication-com.2018.43.3_en.pdf.

“Data Trusts: A mechanism for data dissemination and governance.” ThinkData Works Inc. Accessed July 19, 2019.

<https://www.thinkdataworks.com/data-trusts>.

Docherty, Ian, Greg Marsden, and Jillian Anable. “The governance of smart mobility,” *Transportation Research Part A: Policy and Practice* 115 (2018): 114-125. <https://doi.org/10.1016/j.tra.2017.09.012>.

Escobar, Oliver and Stephan Elstub. “Forms of Mini-publics: An introduction to deliberative innovations in democratic practice.” *newDemocracy Foundation: Research and Development Notes*, no. 4 (2017): 3.

https://www.newdemocracy.com.au/docs/researchnotes/2017_May/nDF_RN_20170508_FormsOfMiniPublics.pdf.

Farrell, David M., Jane Suiter, and Clodagh Harris. “‘Systematizing’ constitutional deliberation: the 2016-18 citizens’ assembly in Ireland.” *Irish Political Studies* 34, no. 1 (2019): 113-123. doi:10.1080/07907184.2018.1534832.

Fletcher, Scott. “Informal Participation.” Participedia. Last modified July 3, 2019, <https://participedia.net/method/5083>.

Font, Joan, Magdalena Wojcieszak, and Clemente J. Navarro. “Participation, Representation and Expertise: Citizen Preferences for Political Decision-Making Processes.” *Political Studies* 63, no. 1 (2015): 153-172. doi:10.1111/1467-9248.12191

Fung, Archon. “Varieties of Participation in Complex Governance.” *Public Administration Review* 66 (2006): 70, 74. <https://www.jstor.org/stable/4096571>.

Gelderen, Marco van, Michael Frese, and Roy Thurik. “Strategies, Uncertainty and Performance of Small Business Startups,” *Small Business Economics*, no. 3 (2000), 165-181, <https://doi.org/10.1023/A:1008113613597>

Gent, Whitney. “‘Expensive’ People: Consumer Citizenship and the Limits of Choice in Neoliberal Publics.” *Communication and the Public* 3, no. 3 (September 2018): 190–204. doi:10.1177/2057047318794683.

Giacomini, Sabrina. “Beyond Cars: the Next Step in Personal Mobility.” *Autotrader*, April 18, 2016.

<https://www.autotrader.ca/newsfeatures/20160418/beyond-cars-the-next-step-in-personal-mobility/>.

Granier, Benoit, and Hiroko Kudo. “How are citizens involved in smart cities? Analysing citizen participation in Japanese ‘Smart Communities’.” *Information Polity* 21 (2016): 61-76. doi:10.3233/IP-150367.

Jacob, Merle, Thomas Hellström, Niclas Adler, and Flemming Norrgren. “From sponsorship to partnership in academy-industry relations.” *R&D Management* 30, no. 3 (2002): 255-262. <https://doi.org/10.1111/1467-9310.00176>.

Juniper Research. *Smart Cities - What’s in it for Citizens?* Santa Clara: Intel, 2018. <https://newsroom.intel.com/wp-content/uploads/sites/11/2018/03/smart-cities-whats-in-it-for-citizens.pdf>.

Kamenova, Kalina, and Nicole Goodman. “A New Participatory Model: The Edmonton Citizens’ Jury on Internet Voting,” *Canadian Parliamentary Review* 26, no. 2 (2013): 13-20.

Kamenova, Kalina, and Nicole Goodman. “Public Engagement with Internet Voting in Edmonton: Design, Outcomes, and Challenges to Deliberative Models.” *Journal of Public Deliberation* 11, no. 2 (2015): 1-28.

Kitchin, Rob. “Getting smarter about smart cities: Improving data privacy and data security.” Dublin: Data Protection Unit, Department of the Taoiseach, 2016. <http://mural.maynoothuniversity.ie/7242/1/Smart>.

Kitchin, Rob, Paolo Cardullo, and Cesare Di Feliciano. “Citizenship, Justice and the Right to the Smart City (Programmable City Working Paper 41).” *SocArXiv Papers* (2018): 1-28. doi:10.31235/osf.io/b8aq5.

Kumar, Vineet. “Making ‘Freemium’ Work.” *Harvard Business Review*, July 24, 2019. <https://hbr.org/2014/05/making-freemium-work>.

“Legal considerations for profit social ventures.” MaRS Discovery District, accessed July 24, 2019,

<https://learn.marsdd.com/mars-library/legal-considerations-for-profit-social-ventures/>.

- Lendlease S.r.l. *MIND: Milano Innovation District*. European Commission, 2018. https://ec.europa.eu/jrc/communities/sites/jrccties/files/20180628_ttocircle-ruckstuhl_en.pdf.
- Macedo, Stephen. "Against Majoritarianism: Democratic Values and Institutional Design." *Boston University Law Review* 90, no. 2 (April 2010): 1029-1042. <https://heinonline.org/HOL/P?h=hein.journals/bulr90&i=1035>.
- McKay, Susan. "A Jury of Peers: How Ireland used a Citizens' Assembly to solve some of its toughest problems." *Foreign Policy*, no. 231 (2019): 5-7. <https://foreignpolicy.com/2019/01/05/a-jury-of-peers>.
- McMullen, Jeffery and Dean Shepherd. "Entrepreneurial Action and the Role of Uncertainty in the Theory of Entrepreneur," *The Academy of Management Review*, no. 1 (2006), 132-152, <https://doi.org/10.5465/amr.2006.19379628>.
- McPhail, Brenda. "Presto Change-o Privacy Disappears!" *Canadian Civil Liberties Association*, January 2, 2019. <https://ccla.org/presto-change-o-privacy-disappears/>.
- Mintz, Alex, and Carly Wayne. "The Polythink Syndrome and Elite Group Decision-Making." *Political Psychology* 37, no. 1 (2016): 3-21. doi:10.1111/pops.12319.
- "Montreal Data License." Element AI. Accessed July 24, 2019, <https://www.montrealdatalicense.com/en>.
- Pal, Michael. "The promise and limits of citizens' assemblies: deliberation, institutions and the law of democracy." *Queen's Law Journal* 38, no. 1 (2012): 259-294. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2176808.
- Pereira, Gabriela Viale, Peter Parycek, Enzo Falco, and Reinout Kleinhans. "Smart governance in the context of smart cities: A literature review." *Information Polity* 23 (2018): 143-162. doi:10.3233/IP-170067.
- Poplin, Alenka. "Digital serious game for urban planning: B3 - design your marketplace." *Environment and Planning B* 41, no. 3 (2014): 493-511. doi:10.1068/b39032.
- Riley, Charles. "UK proposes another huge data fine. This time, Marriott is the target." *CNN Business*, July 9, 2019. <https://www.cnn.com/2019/07/09/tech/marriott-data-breach-fine/index.html>.
- Robehmed, Natalie. "What is a Startup." Last modified December 16, 2013, <https://www.forbes.com/sites/natalierobehmed/2013/12/16/what-is-a-startup/#6f07cb844044>
- Rosen, Jovanna, and Gary Painter. "From Citizen Control to Co-Production." *Journal of the American Planning Association* 85, no. 3 (2019): 335. doi:10.1080/01944363.2019.1618727.
- Scott, Emilie. "The trouble with informed consent in smart cities." The International Association of Privacy Professionals. Last modified February 28, 2019, <https://iapp.org/news/a/the-trouble-with-informed-consent-in-smart-cities/>.
- Sidewalk Labs. "Responsible Data Impact Assessment (RDIA)." In *Digital Governance Proposals for DSAP Consultation (Draft Proposals)*, 17-22. Toronto: Waterfront Toronto, 2018. https://waterfronttoronto.ca/nbe/wcm/connect/waterfront/41979265-8044-442a-9351-e28ef6c76d70/18.10.15_SWT_Draft+Proposals+Regarding+Data+Use+and+Governance.pdf?MOD=AJPERES.
- Silverman, Robert M. "Caught in the Middle: Community Development Corporations (CDCs) and the Conflict between Grassroots and Instrumental Forms of Citizen Participation." *Community Development* 36, no. 2 (2005): 35-51. <https://doi.org/10.1080/15575330509490174>.
- Stoker, Gerry, and Mark Evans, eds. "Co-design with citizens and stakeholders." In *Evidence-based Policy Making in the Social Sciences: Methods That Matter*, 243-262. Bristol: Bristol University Press, 2016. doi:10.2307/j.ctt1t89d4k.
- "Technical Architecture Options." In *A Primer on Civic Digital Trusts*. Toronto: MaRS Discovery District, accessed July 19, 2019. <https://app.gitbook.com/@marsdd/s/datatrust/trusts/what-is-a-civic-digital-trust>.
- "The Eighth Amendment of the Constitution." The Citizens' Assembly (An Tionól Saoránach). Accessed July 17, 2019. <https://www.citizensassembly.ie/en/The-Eighth-Amendment-of-the-Constitution/>.
- The European Data Protection Board. "Infographic GDPR in numbers." European Commission. Accessed July 19, 2019. https://ec.europa.eu/commission/sites/beta-political/files/infographic-gdpr_in_numbers_1.pdf.

“The Role of the SEC.” U.S. Securities and Exchange Commission. Accessed July 19, 2019. <https://www.investor.gov/introduction-investing/basics/role-sec>.

Thomas, Vanessa, Ding Wang, Louise Mullagh, and Nick Dunn. “Where’s Wally? In Search of Citizen Perspectives on the Smart City.” *Sustainability* 8, no. 3 (2016): 207 (1-13). <https://doi.org/10.3390/su8030207>.

University of Toronto. *The University of Toronto Endowment: Strengthening our Future (2017-2018)*. Toronto: University of Toronto, 2018. <https://finance.utoronto.ca/wp-content/uploads/2018e.pdf>.

van Gelderen, Marco, Michael Frese, and Roy Thurik. “Strategies, Uncertainty and Performance of Small Business Startups.” *Small Business Economics*, no. 3 (2000): 165-181. <https://doi.org/10.1023/A:1008113613597>.

van Zoonen, Liesbet. “Privacy concerns in smart cities.” *Government Information Quarterly* 33, no. 3 (2016): 472-480. <https://doi.org/10.1016/j.giq.2016.06.004>.

Vasileva, Roza, Lucelia Rodrigues, Nancy Hughes, Chris Greenhalgh, Murray Goulden, and Jeni Tennison. “What Smart Campuses Can Teach Us about Smart Cities: User Experiences and Open Data.” *MDPI - Information* 9, no. 10 (2018): 251 (1-13). <https://doi.org/10.3390/info9100251>.

Vestbro, Dick Urban. “Citizen Participation or Representative Democracy? The Case of Stockholm, Sweden.” *Journal of Architectural and Planning Research* 29, no. 1 (2012): 5-17. <https://www.jstor.org/stable/43030956>.

Viechnicki, Peter, Abhijit Khuperkar, Tiffany Dovey Fishman, and William D. Eggers. “Smart mobility: Reducing congestion and fostering faster, greener, and cheaper transportation options.” Deloitte Insights. Last modified May 18, 2015. <https://www2.deloitte.com/insights/us/en/industry/public-sector/smart-mobility-trends.html>.

“What is a Civic Digital Trust.” In *A Primer on Civic Digital Trusts*. Toronto: MaRS Discovery District, accessed July 19, 2019. <https://app.gitbook.com/@marsdd/s/datatrust/trusts/what-is-a-civic-digital-trust>.

“What is Deliberative Engagement (Deliberative Democracy?).” MosaicLab. Accessed July 20, 2019. <https://www.mosaiclab.com.au/what-is-deliberative-democracy>.

Weissman, Cale Gurthie. “Facebook knew of Cambridge Analytica’s data abuses earlier than we thought.” *Fast Company*, March 22, 2019. <https://www.fastcompany.com/90323869/court-documents-reveal-that-facebook-allegedly-knew-about-data-misuse-earlier-than-we-thought>.

Wilkes, Rima, and Cary Wu. “Ethnicity, Democracy, Trust: A Majority-Minority Approach.” *Social Forces* 97, no. 1 (2018): 465-494. doi:10.1093/sf/soy027.

Zimonjic, Peter. “Privacy commissioner launches probe into StatsCan over collection of financial data.” *CBC News*, October 31, 2018. <https://www.cbc.ca/news/politics/personal-financial-information-statistics-canada-1.4885945>.



Compute Ontario

ORION

ORION



MaRS
Solutions Lab and
Data Catalyst