elligibility,_and_compliancy_in_projects,_norms,_and_futures.pdf

de revista artigo116

Data de envio: 27-jun-2025 10:18AM (UTC-0700)
Identificação do Envio: 2706953640
Nome do arquivo: elligibility,_and_compliancy_in_projects,_norms,_and_futures.pdf (398.25K)
Contagem de palavras: 18663
Contagem de caracteres: 106043

pensar
Revista de Ciências Jurídicas
e-ISSN:2317-2150
10.5020/2317-2150.2022.14127

Legal narratives of smart cities: opacity, intelligibility, and compliancy in projects, norms, and futures

Narrativas jurídicas de cidades inteligentes:opacidade, inteligibilidade e conformidade em projetos, normas e futuros

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Abstract

The study focuses on narratives and legal components that form the legal imaginary of smart city projects. This imaginary consists of archetypes of Law and Technology called to engage with prototypes of public policies and to (re)build legal stereotypes for smart city projects. After all, smart cities take core normative claims and goals into their code, in both the technological and legal senses of the term. The public storytelling of smart cities and the public policies of Big Data projects in the municipalities of Rio de Janeiro and Montréal are used as case studies, targeting the respective contexts, risks, and legislations. Three axes composed of six variables are applied for the legal analysis in the case studies: opacity (privacy and security), intelligibility (transparency and participation), and compliance (accountability and governance). Such components are central for the contextualization of technological issues of smart cities under a narrative that is more accessible by law, the identification of specific concerns that present social risks to the rule of law, and the justification of measures required by legislation to protect fundamental rights. Brazilian and Canadian legislative references are used as hypothetical exercises on the legal frameworks related to the in-house Big Data projects. Normative sources and elements for further research can be found in each analysis.

Keywords: accountability; governance; participation; privacy; security; transparency.

Resumo

O estudo foca em narrativas e componentes jurídicos que formam o imaginário jurídico de projetos de cidades inteligentes. Esse imaginário consiste em arquétipos de Direito e de Tecnologia convocados no engajamento de protótipos de políticas públicas e para (re)construir estereótipos jurídicos para projetos de cidades inteligentes. Afinal de contas, as cidades inteligentes incorporam em seu código as principais demandas e metas normativas, tanto no sentido tecnológico quanto no sentido jurídico do termo. As narrativas públicas das cidades inteligentes e as políticas públicas dos projetos de Big Data nos municípios do Rio de Janeiro e Montreal são usadas como estudos de caso, focando nos respectivos contextos, riscos e legislações. Três eixos compostos por seis variáveis são aplicados para a análise jurídica nos estudos de caso: opacidade (privacidade e segurança), inteligibilidade (transparência e participação) e conformidade (responsabilização e governança). Tais componentes são centrais para a contextualização de questões tecnológicas de cidades inteligentes sob uma narrativa mais acessível ao Direito, à identificação de questões específicas que apresentam riscos sociais ao Estado de Direito, e à justificativa de medidas impostas pela legislação para proteger direitos fundamentais. Referências legislativas brasileiras e canadenses são usadas como um exercício hipotético sobre as estruturas legais relacionadas com os projetos internos de Big Data. Ainda, fontes e elementos normativos para futuras pesquisas também podem ser encontrados em cada análise.

Palavras-chave: *governança; participação; privacidade; responsabilização; segurança; transparência.*

1 Introduction

This article is based on more extensive researchthat was concluded in 2020 and presented as a doctoral dissertation at Université de Montréal in 2021. Aliterature reviewon smart cities employingtext analytics was deployedin the doctoral research to support the variables of analysis for the two case studiesthat are discussedhere.Due to

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objectivity and suitability, this article is limited to the core of legal analysis of Big Data projects in Rio de Janeiro and Montréal.[1]

The objective of this article is to analyze narratives and policies of two smart city projects of two prominent smart city projects in the global context from a legal perspective. Six analysis variables, grouped into three axes, will be used for this purpose.Privacy, security, transparency, participation, accountability, and governance form the legal imaginary of smart cities.

There is not much legislation or jurisprudence to support legal research on smart cities by simply looking into what happened in the recent past, finding out their results in the present, and then making considerations about their possible future. Even without these usual sources of legal scholarship, the researchwas supported by legal resources under full work: several legal practices in the technocratic machines of municipalities trying to make the imaginary of smart cities into a future reality. These legal practices are being developed under the form of public policies for smart projects that are carried by specific narratives, conceived in different sociopolitical conditions, and framed by local normative references. The research took these public policies and contextual elements into consideration to move forward into the legal imaginary of smart cities.

Considering a more literary approach to law, the legal imaginary of smart citieshas much to do with archetypes, prototypes, and stereotypes. Legal practitioners are constantly called to invoke archetypes of law, project prototypes of public policies, and (re)build legal stereotypes for smart city projects. This article emulates these tasks as an exercise of the legal imaginary which must always consider peculiar sets of narratives, conditions, and references of smart cities.

Despite the rich traditions of legal theory, the rationality of law is embedded in practicality and this article could not ignore it to approach the legal imaginary of smart cities. The projects of cities of the near future are not being built in face of a possible absence of law. On the contrary, smart cities take core normative claims and goals into their *code*, in both technological and legal senses of the term. Both senses depend a lot on elements that cannot be discussed only in abstraction, because they depend on contextual conditions that are to be partially emulated here.

Two specific contexts for legal considerations about smart city projects were chosen for analysis: the smart city projects of Rio de Janeiro and Montréal. There are several reasons for this research choice: some of them simply have to do with feasibility (it could be done) and perceptivity (it could be understood), but also with reproducibility (it could be illustrated) and utility (it could be useful). Finally, the narrative contexts of both smart city projects have changed much in the recent past, so their conditions can be better appreciated with some convenient distance, even if their consequences are still *inprogress*-or in similar but divergent words, *in process*.

It is fundamental to clearly state what the research choices in this article are *not* about: it is not a comparative study and it does not use comparative law, even when it contrasts the projects for illustrative goals; the cases of Rio de Janeiro and Montréal should not be generalized as models for understanding Brazilian and Canadian smart cities because the local elements in their public policies present more premises and consequences than their legal contexts; the research did not perform a deep analysis on applicable legislation and related legal doctrine on the cases and specific projects to keep objectivity in the experiment of applying the chosen variables forlegal analysis.

Three steps are taken here to get to the proposed objective. First, the public storytelling about the smart city projects of Rio de Janeiro and Montréal is presented in their respective circumstances; this is followed by more specific descriptions about Big Data projects in these cities that represent much of the smart tech archetypes being deployed around the world; lastly, a synthesis of legal references presents the background for the prototypes of *smartpublicpolicies* and the legal stereotypes forprojecting the cities of the near future.

2 The clever storytelling around two very ambitious smart cities

The dominant academic literature about smart cities draws much from the North American and European contexts, where most of the scholarship on it has been done. But the literature review done for this research points to global characteristics that are always adapted to local contexts. Therefore, it does not take much to bring the attention to a smart city case inLatin America (DE HALLEUX; ESTACHE, 2018), knowing that it shares the archetype

[1] More detailed information about the cases and considerations from legal scholarship can be found in the doctoral dissertation available at: http://hdl.handle.net/1866/25886.

(RENNÓ et al., 2017), while keeping certain peculiarities. The second case, a city in the capitalist roadmap of the future, presents some singularities from the main North American models (KENNEDY, 2013).

Brazilian and Canadian cities have been an important part of the urban debate on intelligence and innovation (BBC BRASIL, 2013; BUSINESS INSIDER, 2019), and the relevance of the subject has grown and spread to many other cities in these countries until its end (GOMES, 2018; WOOD, 2018). This public conversation in Brazil and Canada also involves bragging about smart city rankings (MACLEAN'S, 2010; COHEN, 2013), hosting brand events of the smart city industry (MONTREAL, 2015), and keeping this *emerging trend* alive like a novelty on the news (ARE WE READY..., 2018; MANRIQUE, 2018)-even if it has been a novelty for over 18 years now.[2]

Rio and Montréal have a lot to show and tell about smart cities, both share various drivers and common narratives. Much was done in both cities in short periods of time and with limited budgets, both were conducted by ambitious and broad projects, and both are led by committed and creative city officials. Nevertheless, their underlying narratives may have done even more.

Building an understanding about the sociopolitical narratives of the smart projects of Rio de Janeiro and Montréal is essential to inquire after the imaginary involved in their public policies. They are set in space-time markers that are well delineated, but their consequences go much further than their physical limits; they brought changes to technocratic practices of their municipalities, but the outcome of their propositions is far more powerful to the public debate on smart cities than the eventual results of their smart prototypes; their high-tech projects were born to serve local political projects, but the creatures survived their creators by adapting themselves to new political contexts and to the new political powers as well.

In December 2010, in the second year of the first mandate of Mayor Eduardo Paes, the *COR – Centro de Operações Rio* (*Rio Operations Centre*) was created to become the headquarters of the management of services of the municipality of Rio de Janeiro. The world-famous *Rio Operations Centre* "integrates, in the same environment, more than 30 local and state agencies and utilities" (SCHREINER, 2016), allowing a *24/7 real-timemonitoring* of sensors, cameras, and systems of the city hall. The COR is the main hub of information for several services provided by the city hall: traffic, transportation, electricity, lighting, gas, water, telecommunications, weather alerts, disaster responses, major events, public areas, and order. Other smart initiatives were also gathered under the COR's infrastructure-transparency, communication, participation, data mining-and it came to symbolize the concept of smart city itself at the time following its launch, becoming the main paradigm for smart projects all over the world.

The *smart cityoperationscentre* of Rio de Janeiro became a matter of interest of world media (SINGER, 2012; ARIAS, 2013; SOFFEL, 2013; WAKEFIELD, 2013), a model followed by other cities (PISANI, 2013), and has been recognized as the smart city jewel of the "best smart city of 2013" (LECHA, 2013). The world stage of smart cities found a champion in the Mayor Eduardo Paes (TED, 2012), who professed the emergence of *polisdigitocracy* (PAES, 2013), proposing the use of IT to promote public transparency, citizen engagement, and decision-making in cities. These goals were part of the smart public policies in Rio de Janeiro: the open data web portal *data.rio* that shared almost a thousand sets of data;[3] the LAB.Rio,[4] a laboratory for e-participation like the social network *Rio Ágora* for discussing municipal initiatives (ROMAR, 2014); and the *Pensa Ideas Room,* a Big Data project dedicated to analyzing all sorts of city data and to propose information-driven solutions and preventive measures to urban problems.

These projects reflected the high hopes in the discourses claiming that the combination of open data and Big Data would transform cities like Rio de Janeiro (HWANG, 2018), and celebrating an image of efficiency and democracy promoted by smart city projects. It illustrates the long-lasting references that are still present, despite the fact that the COR and other smart projects of Rio de Janeiro have been transformed, extinguished or simply deviated from their original objectives. Perhaps the best way to represent the long and wide influence of such *command-and-control infrastructure,* which *provides sights that form and perform the city* (RIBEIRO, 2017) came from the exhibition *Control Syntax* Rio at the *Het Nieuwe Instituut* in Rotterdam:

> As Wasiuta told The Architect's Newspaper (AN), the city's "topography, infrastructure, population distribution, disparities between the formalized and informalized parts" make it difficult to manage. "The International Olympic Committee (IOC) wanted Rio to develop something like the center of operations, in order to demonstrate… that they were capable of managing the metabolism of the city."

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[2] Google search on the term since 2004 can be accessed here: http://bit.ly/SmartCityOnGoogleTrends.
[3] It is available at: http://www.data.rio/.
[4] It is available at: http://bit.ly/LabRioAtWayBackMachine.

> [...]
> Complicating Farzin and Wasiuta's task was that this system isn't hidden from the public eye: in addition to serving as a management device, the COR is a public relations tool aimed at Rio's residents and the IOC. The COR is how this smart city "sees itself, how it portrays that image of ongoing information extraction and control, how it portrays that image back to its residents and an international audience…. A representation producing device and mechanism for the city," said Wasiuta. (DELSON, 2017)

While the civil smart centre of Rio's city hall incorporated the international narrative of smart city, the militarized smart centre of the state government of Rio de Janeiro that came as a contractual obligation for FIFA's World Cup remained hidden in obscurity for most of the critics (GAFFNEY; ROBERTSON, 2018). The accessible COR, with its (once) open areas for journalists and researchers, shared data and similar *NASA-like-aesthetics* with the recluse CICC - *Integrated Centre of Command and Control* (*Centro Integrado de Comando e Controle*), which had a bunker-style infrastructure only 500 metres away from the former, but the goals of the latter are far more distanced from public scrutiny. The CICC aimed to integrate municipal, state, and federal forces of security, and to monitor the city of Rio de Janeiro using more than 4.000 CCTV cameras, including those from COR (even if not vice-versa). In sum, the CICC was a smart security project using city structures while not responding to city officials, municipal councils, and the mayor-it is smart city surveillance without any municipal governance or democratic accountability.

In the postmodern networked state, intense flows of information are determinant to guiding the flows of power and, so it is essential to map and analyze the flows between internal institutions and other governments, engaged citizens and implied communities, major market actors, and private service providers. Municipalities undergoing smart city projects can provide examples and factors for such network analysis, especially because the projects are frequently transitory and transformable, with effects that can be observed even over the short periods of electoral mandates. The two municipal cases in this research did not provide enough examples to explore such flexible configurations, but both provided enough factors for the purposes of this research.

While Rio's COR was all the rage in the international media and mayors' events, the proposal of creating a *Smart Montréal* was raised in the political campaign for the city hall (ROLLAND, 2013), an idea that soon evolved into the ambitious goal of becoming the *smartest city of the world* (CORRIVEAU, 2014). In an attempt to achieve it in the short span of three years, a new city division was created with an initial budget to build a team and create a smart city strategy for the endeavor, a first step that would easily consume the first full year of operation (GAGNÉ, 2014). The strategy was publicly launched in January 2015 (MTLVILLE, 2015), based on institutional and community consultations and studies of world-class smart city references-i.e., the contenders of the struggle (BRUEMMER, 2015a)-in which the city traced its priorities: deployment of network infrastructures and technology architectures, development of digital services, release of open datasets, embrace of a culture of transparency and accountability, diffusion of real time data for transportation systems, and community cooperation and inclusion for innovation (VILLE DE MONTRÉAL, 2015a). In sum, Montréal would follow some of the most popular (and hardly achievable) smart city projects (HAZAN, 2015), while also adjusting other diverse smart configurations to the characteristics and potentialities of the city (BRUEMMER, 2015b).

Between all of the potentialities of Montréal present in the smart city strategy, two policies deserve to be emphasized for their pre-conditions and accomplishments: open data and innovation. Montréal was one of the first municipal governments to adopt the (extensive) *CC4 license* from the *Open Knowledge Foundation* (VILLE DE MONTRÉAL, 2014b), allowing citizens and companies to access urban data and apply their expertise to a broad range of datasets (PINEAU; BACON, 2015), and providing an open data policy that reflects the best practices in public administration (VILLE DE MONTRÉAL, 2015d). Montréal also launched a plan of action with a focus on innovation (VILLE DE MONTRÉAL, 2015b), which included (citizen, academic, market) community cooperation with the platform *Faire Montréal* for stakeholder engagement with city projects (VILLE DE MONTRÉAL, 2015c), and the announcement of the NGO *InnoCité Mtl* to act as a "*pont entre Montréal et les entrepreneurs pour les aider dans le développement de projets pour contribuer au développement d'une 'ville intelligente'*" (MONTRÉAL..., 2015).

Public policies for sharing urban data and developing an innovative ecosystem remained a priority for Montréal (CBC NEWS, 2016), and they contributed to achieving the top position of one smart city ranking (MARCH, 2016; MATHYS, 2016). Considering the short period of the smart city project, the *intelligent community award* for Montréal in 2016 was due to *intelligent elements* already present in the city and the policies that came to be further developed (or at least publicized) by city officials and the communities involved in the local smart ecosystem (DUVAL, 2016;

HELLER, 2016). The enhancement of these specific policies would keep being essential for the smart city strategy (KHOMSI, 2016)-and for what would come later, as well.

Montréal's smart projects managed to get the attention of the international media over initiatives that were quite a novelty even in the smart communities (HAMBLEN, 2017; VAN DEN BOSCH, 2017) while the local media would keep the pressure on the achievable promises (HOUDE-ROY, 2017), acknowledging the differences between the optimist discourses and the realist deliveries of smart cities (BOISCLAIR, 2017). Major cities like Montréal are constantly creating, developing, and renewing digital services for internal and external use, these are common facts that barely hit the local news (VILLE DE MONTRÉAL, 2017b). But then Montréal was captured by the imaginary of the smart city in a time of growing concerns about digital surveillance violating fundamental rights and (NORMADIN, 2018), important to remember, well-deserved fears of privatization of cities under similar discourses and contexts (BALKISSOON, 2018).

After the following municipal election, the *smart city brand* took a different turn in Montréal (DAOUST-BRAUN, 2018b), keeping the foundations of an openness culture in the city hall (DAOUST-BRAUN, 2018a), and claiming to pursue a broader approach to innovation that does not necessarily clash with previous public policies and smart projects (GUIDOIN, 2018). In effect, paired with the prevalent conditions of a city with academic strengths in education, research, and the development of new technologies (EASTON, 2018), it was not surprising that Montréal would keep engaging in smart city projects that spread to city halls all over Canada (INFRASTRUCTURE CANADA, 2018). The evidence is clear in media publications and governmental reports, which indicate that much has happened in the short period of the *smart city narrative* in Montréal (ROULOT-GANZMANN, 2018) and, despite all the possible *critiques* that it deserves (DUQUETTE, 2017), it continues a part of the local imaginary (LAPORTE; WARREN, 2018).

There are entire theses dedicated to analyzing the smart city discourses and contexts in Montréal (CÔTÉ, 2017; GÉLINAS DUQUETTE, 2017), which can be useful to subsidize debates on how these narratives can change over time. The effects of change are of interest from the perspectives of communication and law as well, as they are perceived in media and public policies. The changes in the *smart city case* of Rio de Janeiro are particularly useful to demonstrate it.

For the ends of this article, the COR project of Rio de Janeiro is the main illustration of the narrative effects of the public policies of smart cities, of which other cities should not lose sight. The "world's most ambitious integrated urban command centre" still represents the "quintessential smart city project" (FREY, 2014)-even long past its 15 minutes of fame as the "city's brain" under the global attention of FIFA's World Cup of 2014 and the Olympic Games of 2016 (BATISTA, 2016)-but came to change a lot in the short span of time of a new political mandate. Moving away from the basic matrix of transparency, participation and decision making for urban mobility, the new city mayor moved the main narrative of the COR to new policies of public order (FEUER, 2013) and the prevention of crime (Decreto municipal 43.533, de 10 de Agosto de 2017, *Políticas públicas voltadas para a manutenção da ordem urbana e a prevenção do delito*), under a growing submission to CICC policies since the Olympics (KAYYALI, 2016). The changes in the smart city discourse and governance of the COR, with new *chief executives* coming from police and military ranks (RODRIGUES, 2017) looked to the Chinese model of smart cities for practices and investments (O DIA, 2017). In sum, in less than two years, the COR moved from a reference of *polisdigitocracy utopia* in development to a surveillance model in deployment, which warrants concern for more than just Brazilian smart cities researchers (AINBINDER, 2019).

Such sudden changes indicate that smart city narratives and practices are not only flexible, but fragile. For example, even with all the technological apparatus receiving elevated investments, the COR was neither capable of inhibiting or elucidating the most notorious political crime in Brazil because many CCTV cameras were off (BARREIRA et al., 2018), nor capable of preventing or responding to weather emergencies that were once the priority that motivated its creation:

> We have changed the focus of COR. The main problem of the city today is public security. We directed the work toward this. This does not mean that the center of operations is not strategic to face crisis situations in the city caused by problems such as rainfall. When it becomes necessary, we will redirect – said the Secretary of Public Order, Paulo Cesar Amendola, from the department to which the COR is subordinate, who denied that there was inefficiency in the operation – I don't think there were any failures. We have dozens of radio and TV stations with on-call staff in the center to spread the information to the population. (Translated by the author) (MAGALHÃES; CANDIDA, 2017)

The fragility of public policies addressing smart cities is not clearly present in the narrative of smart cities, and the notorious smart case of Rio is an example of it. The storytelling presented the COR as a partnership between an innovative mayor and a global tech company to respond to rainfall emergencies through direct communication with the population (e.g., text messages, siren alarms), no longer depending on radio or TV (SILVERFISH MEDIA, 2016). Despite all the criticism, the *narrative of success of the COR* is still widely diffused in media and academia (SAWYER, 2018), and similar formulas are still sold to governments by corporations as a global solution to local problems (AGGARWALA; HILL; MUGGAH, 2018). It is rare to hear that the most important task of IBM in the COR was to put its *Smarter City trademark* on it and to include Rio de Janeiro in its *corporatesmartstorytelling* (VAN DEN BOSCH, 2017); the stories on the COR during the period between 2012/2016 are present in doctoral dissertations (BENITES, 2016; FREITAS, 2018), but it would be very hard to find critical publications about it after the period of the Olympics (JAFFE, 2016). For all narrative purposes, the COR's mission did not change and Rio de Janeiro is still one of the smartest cities in the world (CRIVELLA..., 2018).

After a period of crisis with several changes of leadership (CENTRO..., 2018), Rio's COR signaled a return to its origins by updating its method of communication with the population by utilizing a dedicated mobile app (BOECKEL, 2019), and signed into a new *brand-partnership* with NASA "to better understand, anticipate, and monitor hazards and environmental issues, including heavy rainfall and landslides, urban flooding, air quality and water quality in and around the city" (KIRSCHBAUM, 2019). Meanwhile, Montréal won a smart city competition promoted by the Canadian government (GREINER, 2019) in which the city commits itself promoting projects for data-driven decision making (MTLVILLE, 2019). Therefore, the future of both cities might remain interlaced with the flexible narratives of smart cities and Big Data projects for urban management.

3 Cities thinking big (with a lot of) data

The practicality in the rationality of law needs concrete cases to draw better normative landscapes with ephemeral lines on the drifting sands of institutional contexts, even if only for imaginary exercises. Legal scholars and practitioners are called upon to declare their opinions, recommendations, and decisions, according to the dialectic relations between norms, facts, and values in given space-times. To access the imaginary of jurists for the next investigative exercise, acontextualization brought some general social facts and prevalent values that are better illustrated in the following pages to provide prospective details for the normative perspectives.

There are innumerous definitions of smart cities available for choosing, dependent on numerous perspectives. No definition would necessarily be the best one.The research kept the initial concept that guided the doctoral project: "[s]mart here is synonymous with a city where everything is environmentally sensitive and produces, consumes and distributes a lot of information in real time" (LEMOS, 2013, p. 48).[5]Alternatively, smart citiescan be understoodas data-driven cities that are *projected* for the near future, in a double sense of projects and projections.

Henceforth, the specific elements that this research investigates are about Big Data projects in Rio de Janeiro and Montréal. Between the predominant technologies associated with smart cities, the technologies associated with data analytics andlabelled as *Big Data*, best corresponds to the archetype of well-informed, tech-based, and efficiency-driven urban management and planning. Therefore, investigating *Urban Big Data* also means getting to core issues of smart cities.

The Big Data projects of Rio de Janeiro and Montréal addressed here have two distinct timeframes for the imaginaries that were built around their cases-considering the imaginary as a set of representations that appear from images and other phenomena perceived by individuals-that will be contrasted yet not compared. The first was created in 2013 and, presented impressive results to the world but, even so, ended by the beginning of 2017; the second was initiated by the time the first one ended, and its results started to pour, though most of them are still ahead. The Latin American experience is practically closed, followed by a *locked smart city model*, but it still has much to be understood; the North American experience is still open, set in an *engageable smart city model*, and has much space to evolve (time is never a certain variable). Both projects involve utopic and dystopic elements that are present in the collective imaginaries, with Rio providing algorithmic lessons to be learned by law and Montréal applying law to its numbers.

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[5] Translated from Portuguese by the author of thisarticle: "Inteligente aqui é sinônimo de uma cidade na qual tudo é sensível ao ambiente e produz, consome e distribui um grande número de informações em tempo real."

[1]

On June 3, 2013, the *decreto nº 37.215* of Rio de Janeiro created *PENSA – Sala de ideias* (which could be translated as *Think – Room of Ideas*), a small department institutionally located inside the structure of the chief of staff and physically located inside the structure of the COR. The ample objective of PENSA contrasted with its restricted team:

> Art. 2 The PENSA - ROOM OF IDEAS aims at researching, analyzing, evaluating correlations and defining impact actions from the intersection of different databases available inside and outside the City Hall with the objective of improving the provision of services to citizens.

The creation of PENSA was inspired by the Mayor's Office of Policy and Strategic Planning (New York), "a geek squad of civic-minded number-crunchers working from a pair of cluttered cubicles across from City Hall in the Municipal Building" (FEUER, 2013), led by the lawyer Michael Flower. There were characteristics shared between the *Geek Squad* and PENSA, such as reduced teams of data scientists, small projects budgets, big data applications for big goals, and lots of open and siloed data waiting for access and analysis ('GEEKS'..., 2013). PENSA was also led by a lawyer, Pablo Cerdeira, and this should not be seen as a coincidence.

When Big Data becomes a public policy in municipalities (SOUZA, 2014), legal knowledge can help a lot in the multidisciplinary efforts related to access, process and distribution of data in the intricate technocracies of governments. Rio's *City Hall nerds* (O DIA, 2014) had even more data and sensors to deal with than their New Yorker counterparts-about 400 Terabytes and more than one million sensor records being added per day-spread across dozens of city departments, in an integration that represented a (legal) challenge for composing fast-response studies with Big Data (CDTV, 2014). The projects supported by PENSA and executed by city departments involved short-term and fast-paced analyses of traffic, transportation, parking, major events, health issues, public emergencies (e.g., floods), among other matters that demanded collaboration and they found convergent conditions in Rio's COR (VEJA, 2017). Partnerships with companies aggregated more data from citizens and, according to PENSA'S Chief Data Officer, added "social layers to help a lot the city management" (ARQ. FUTURO BRASIL, 2018) and more techno-legal complexity.

Rio de Janeiro was one of the first cities to sign a partnership with *Waze* to access real-time data fed by users (drivers) and to integrate it into COR's resources (WAZE, 2014), combining it with passengers' data from the public-transportation app *Moovit* and data from bikers using the app *Strava* (OLSON, 2014). PENSA'S team added data from Twitter and telecom companies to publish a study about where and when traffic jams occurred in the city (CANDIDA; BORGES, 2015) with anonymized data, which was not a simple or unquestioned task (BRAGA, 2015).

News and photos of Rio's COR illustrate numerous publications about the dangers of urban big data (HELBING; RATTI, 2016; DE GRUBEN, 2017), especially when concerning privacy and democracy, the limits of anonymization techniques and consent. Legal and technical uncertainties were always present within the Big Data initiative of Rio, as are always expected when creating data practices capable of reshaping major public policies (LOOS, 2016). Therefore, it was not surprising to find legal professionals with political and technological background composing or leading Big Data teams in governments. Even projects that do not apparently depend much on personal data-e.g., potential savings from rainwater collection on rooftops (FREIRE, 2016)-can imply privacy concerns that are often not clearly addressed in terms of regulation. The end of PENSA in 2017 by the new administration did not end the Big Data projects for urban mobility in Rio's COR that accessed more than a hundred different databases (BATISTA, 2017), and it left a legacy of techno-legal experiences that deserve to be further documented and researched.

The previous references included from media about COR and PENSA are not to be taken as validated facts by this research, but they are valid elements of the narratives that form the imaginary of law (and other areas of knowledge) about smart cities. Apart from the mentioned academic and institutional research on COR, the Big Data experiences of Rio have also inspired publications on PENSA (FERREIRA NETO, 2015), featuring one by its former chief data officer that details some insights into Big Data public policies from an internal perspective (CERDEIRA; OLIVEIRA, 2019).

One of the objectives of this article was to incorporate internal perspectives on the public policies of smart cities that could be found in documentation from the city halls. Studies and reports for internal usage in governments are rarely available for non-involved parties and are hardly in sight for the general public. It was the PENSA leader, Pablo

Cerdeira, who made some of his presentations available to the public. The research accessed these documents on his personal blog, after getting in contact with him, and receiving a message pointing toward the files.[6]

Considering previous research from the Inter-American Development Bank on productivity losses caused by time wasted on traffic, analyses were conducted in PENSA to suggest areas of priority for governmental action. The studies qualified projects for some areas considering the return of investment on GDP gains. PENSA contrasted the traffic accidents reported by Waze's users and the records in the databases of the municipal department of traffic. It allowed a cross-analysis of datasets with other factors and suggestions (e.g., optimizing the timeframe of traffic officers). Cross-analysis of databases from traffic and public transport was also useful for evaluating major areas of flooding in Rio de Janeiro, providing not only knowledge of their location but also the areas which generated more reports from individuals. The data from Waze provided a *social layer* to the studies, which was taken into consideration.A lot more information is available in the files that were consulted concerning studies about bus lines, areas of *dengue* infection, municipal call centre reports, among other topics. The goal here was not to be exhaustive butto illustrate how Big Data was applied for urban management and planning in Rio de Janeiro.

It was through direct contact with Montréal's city hall that the research accessed documents for further enquiry, as well as information available on the Internet.[7] Presentations from the team responsible for the city hall's Big Data projects gave guidelines for documental analysis. The Montréal case brought prospective elements that enriched the legal analysis which was set in the time of the data collection but also in the possible extrapolations of the near future.

The consultation process for the construction of a strategy for smart city projects in Montréal set urban mobility as its top priority (MISC MCGILL, 2015), followed bygoals of improving digital services, way of life, democracy (transparency) and economic development (innovation). Two years later, the city published a midterm report with the results of the period, when the actions of openness and innovation in the city were among the five priorities (VILLE DE MONTRÉAL, 2017a). Among the more than 30 projects completed or in progress, the projects of urban mobility were presented with emphasis, but it is noticeable that the policies for open data and innovative environment were evaluated as the headliners by the communities (BELL; GOYETTE, 2016).

Montréal city hall launched its own monitoring centre dedicated to urban mobility in 2014 (MAGDER, 2014), *Centre de gestion de la mobilité urbaine*-CGMU (VILLE DE MONTRÉAL, 2014c). As the CGMU shared its responsibilities relating to urban traffic with the *Centre intégré de gestion de la circulation* (CIGC), a provincial division of *Transport Québec* (MAGDER, 2015), it did not have the same level of managerial capacity as Rio's COR, but even so, the CGMU had significant surveillance power over essential factors that affect the traffic in the city (DES YEUX..., 2016). At the time of the research, the CGMU had access to more than 500 CCTV cameras, traffic lights, buses, and other departments and control centres of partners for the management of *intelligent transport systems* (VILLE DE MONTRÉAL, 2014a). Montréal was the first Canadian city to access real-time data of Waze users (about 103.000) to be used by the CGMU, which also counted data from sensors able to detect Bluetooth signals from smartphones of drivers and identify their path in the city (ZABIHIYAN; CORMIER, 2016). The emphasis on transit and transportation was kept as a priority for Montréalduring the transition of two political mandates: the first, setting the basis and the following, moving into a more data analysis centered approach.

The narrative of understanding and improving the urban dynamics of mobility through data was present during the mandate of Mayor Denis Coderre (2013 to 2017) and in presentations and publicationsinvolving the city councilor responsible for the smart city project, Harout Chitilian (ZABIHIYAN, 2016). Smart city projects are known to be highly consuming in terms of cost and time. They are hardly achievable during the course of a single political mandate, most of the initial actions are usually set to build basic technological structures, and enough human resources and complex studies to advance to more sophisticated projects later. Montréal's city officials already knew these conditional elements in 2017, so the municipality had to plan for the longer game that would set more a solid basis for Big Data capabilities in traffic, transportation, and other areas.

By looking through the pages of Montréal reports, it could seem that Big Data was only one front of the several activities of which the municipal IT teams have taken the responsibility to execute-it would not be wrong to say it- but in the updated imaginary of the smart city, data analytics now occupies its quintessence. If the *smart essence* was once the image of traffic control centres with dozens of screens, the Big Data cases of New York and Rio de Janeiro(!) figure in the first words of the *decision summary* of a major report for smart cities in Québec:

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[6] The original website is no longer working, but the files can be accessed here: https://bit.ly/PensaFiles.
[7] The files can be accessed here: https://bit.ly/FilesCityMontreal.

> New York et Rio de Janeiro se sont dotées de centres de prise de décision en temps réel, alimentés par la collecte et l'analyse de données massives (big data). À Montréal, les données collectées ou acquises par la Ville sont considérées comme ouvertes par défaut et accessibles aux citoyens sur un portail en ligne. La métropole utilise aussi la géolocalisation pour planifier et suivre le trajet de ses déneigeuses, et compte s'en servir prochainement pour observer les déplacements des utilisateurs du transport en commun qui ont téléchargé une application mobile à cet effet. (COMMISSION DE L'ÉTHIQUE EN SCIENCE ET EN TECHNOLOGIE, 2017, p. x)

The same report from the *Commission de l'éthique en science et en technologie* recognizes that there is no consensual definition of smart cities. Then again, as in this research, the report assumes a concept under a "legal point of view" that highlights the importance of Big Datafor the accomplishment of the objectives on (the present imaginary state of) smart cities:

> Le concept de «ville intelligente» fait actuellement l'objet de nombreuses définitions. Une recension de la législation, de la jurisprudence ainsi que de la doctrine universitaire et administrative a néanmoins permis de construire une définition du concept de «ville intelligente» qui offre des balises juridiques suffisantes: Une ville intelligente est un territoire où l'administration municipale et les autres parties prenantes utilisent et favorisent les technologies de l'information et de la communication (TIC), en particulier la collecte, la diffusion et l'utilisation de données massives (big data), afin d'améliorer la qualité de vie des citoyens. Cet objectif se réalise notamment par l'optimisation de la prestation des services publics, de la participation citoyenne, de la mobilité, de la consommation d'énergie, de la gestion des déchets et de la pollution, de la conservation et de la préservation de l'environnement, de la santé publique, de l'entretien des infrastructures et de la mise en valeur du patrimoine (COMMISSION DE L'ÉTHIQUE EN SCIENCE ET EN TECHNOLOGIE, 2017, p. 3).

Therefore, the imaginary of (what is flexibly called) Big Data is part of the core paradigm for smart cities, in line with the many objectives that justify innovative urban technologies, whether in Brazil or in Canada. Big Data reinforces the idea of smartness as the capability of perceiving data about the urban environment, processing it into information for decision-making in urban management, and sharing knowledge for improving the quality of life in cities through prudent public policies. It seems appropriate given the complexiti COMMISSION DE L'ÉTHIQUE EN SCIENCE ET EN TECHNOLOGIE es of Montréal.Whether calling the applied technologies Big Data, business intelligence, or artificial intelligence, Montréal developed a set of cases that meet the smart city projects described so far. After a period of preparation, some strategic pilot projects were delivered and projects of data analytics for many departments were under development. Not surprisingly, applications for intelligent analysis in mobility remained the top priority and the most expected proof of concept for what is to come for the city of Montréal.

Keeping the data analytics projects in the municipal plans-and urban mobility as the top priority-illustrates a continuity of logic between political mandates (VILLE DE MONTRÉAL, 2018c). The maturation of IT projects often takes longer than political plans, and changing priorities can put the prior efforts at risk-as the lessons from Rio's COR and PENSA may indicate-because technological public policies are both powerful and fragile. The political change in the city of Montréal signalled a compatibility between continuity and renovation.

The new mayor of Montréal, Valérie Plante, signalled such compatibility as a priority for economic development by stating the relevance of Big Data for the future of the metropolis:

> La métropole traverse une période charnière. Les nouvelles technologies et les mégadonnées transforment l'économie mondiale. Les modèles d'affaires, les secteurs économiques et le marché du travail — toutes les sphères de l'économie — sont en évolution. Et les villes sont amenées à jouer un rôle plus important dans le nouvel écosystème mondial. La métropole traverse une période charnière. Les nouvelles technologies et les mégadonnées transforment l'économie mondiale. (VILLE DE MONTRÉAL, 2018a, p. 3)

By keeping data analytics in the narrative forefront (ROULOT-GANZMANN, 2019), Montréal has doubled its bet on innovation for improving municipal services (NORMADIN, 2019). At the same time, Montréal has adopted a political position against the *all-seeing-city model* being adopted by other cities (VÉZINA, 2019), by proposing the creation of a *charter for an ethical management of data* collected and generated by the municipality, and by calling for the adaptation of the existing *archaic legislative framework* (ISKANDER, 2019). These elements, accomplished or not, make Montréal a promising case for future research.

Research is strategic for the development of smart cities and requires external collaboration. Therefore, especially when involving data sciences and digital humanities, partnerships are recommended with "Academic Institutions to sustain operational integration, actionable intelligence and, social participation" (PRICE SCHOOL OF PUBLIC POLICY, 2017, p. 12). As it may be perceived here, the smart city cases of Rio de Janeiro and Montréal have been the objects of research of individual researchers and relevant institutions, and the influence of their measured results and public narratives can go far beyond the available numbers and institutional texts.

Rio de Janeiro, despite no longer being described as *thesmartest city*, still exerts an influence over global cities that needs to be put under updated perspectives. Rio's COR will remain in need of continuous monitoring by research "for its dominant role within public imagination… as an exemplar 'smart city' initiative" (LUQUE-AYALA; MARVIN, 2015). Rio's COR still brings "a number of delegations from abroad… to analyze it as a role model for similar smart city projects elsewhere in the world" (KUHL, 2018). There is not much doubt that the *control centre model* of Rio de Janeiro is still working as an attractive paradigm for other projects, even if it is moving from a *participatory intelligence rhetoric* to a *surveillance black boxdiscourse* that guides all of COR public policies. The experiences from *Smart Rio* contrast with the perspectives on *Smart Montréal*.

Montréal has increased the previous partnerships with research institutions-they include CEFRIO, CIRAIG, CRIM, ENAP, and SERENE-RISC-to evaluate and guide its public policies concerning data analytics, urban sensors, municipal networks, and cybersecurity. Montréal has cases that illustrate the principles of transparency and participation that model the democratic dimension of smart cities, setting conditions for approaching and overcoming some concerns related to data-driven technocratic governance (CLICHE; TURMEL; ROCHE, 2016). *LaCharte des données numériques*of Montréal could be seen as a deployment of the recommendations from the reports of CIRAG (GARRIDO et al., 2018) and CEFRIO, as expressed by Pierre Trudel:

> En somme, de plus en plus, les données sont une composante essentielle de la maîtrise des activités relevant en tout ou en partie de la Ville. C'est pourquoi la Ville de Montréal doit se doter d'une politique relative aux données qui circulent sur son territoire, notamment par le truchement des installations situées sur son territoire et sur son domaine public. (BEAUDOINet al., 2018, p. 20)

Such transposition from research to public policy instigates the approach on the main part of this article, concerning the legal risks in Big Data projects of Rio de Janeiro and Montréal.

4 Analysis of legal elements on the imaginary of big data flowing from cities

Someone could get to this point of the article and ask: "OK, now we know about all these troubles and worries, but where is the law in all of this? What does the law say about smart cities?"

The subject of smart cities is complex, heterogeneous, and highly dependent on context and purpose. Even considering these factors, legally speaking, there is no full walkthrough guide in governmental reports, no affordable instruction manual in corporative papers, and no hidden master key solution in academic documents. Still, answers can be provided because they already exist in the legal imaginary of smart cities-which is not exclusively composed by the imaginary of the people with law degrees-offering possibilities that are being put into practice by the public policies adopted by municipalities.

Legal scholars are being requested to contribute to conferences and publications about smart cities, taking on the sociolegal challenges arising from the projects being put into practice. There is always hope that law professors and lawyers will bring enlightening answers from legislation to the shady problems of smart projects. Or, at least, that legal researchers will be able to provide some recommendations for building new legal frameworks that could set up conditions to mitigate the smart city dilemmas. In short, discovering what guidance the law offers for smart cities is *part of the job* that the public (and the) institutions expect jurists to do, but it takes other parts to get there and, from there, to go beyond to see if they can work as intended.

One way of explaining how to get to such destination could be decomposing the legal approach through a three-step exercise: contextualization, identification, and justification. This can be found in several texts and presentations from legal researchers, privacy authorities, and (municipal or corporative) lawyers about smart cities: the contextualization of technological issues of smart cities under a narrative that is more accessible by law; the identification of specific concerns that present social risks to the rule of law; and the justification of practical measures required by legislation to protect fundamental rights.

The context of smart cities is explored before by many articles and publications in the news, bringing attention to the common social challenges and potential legal issues to be approached. New information and communication technologies (e.g., connected devices, Big Data,) create and develop urban services, bringing forward collective benefits and costs to be considered by local and national governments, and affecting the balance of liberties and constraints for their citizens and communities. While the debate about smart cities in newspapers prioritizes the public expectations on smart projects addressing congestion, safety, and (gig-)economy, the main interest of law must be coupled with the respect of the fundamental and human rights protected by constitutions and courts that can be potentially undermined and restricted.

Smart city projects carry several implications to law, addressing conflicting expectations among governments, companies, and civil movements that include data ownership, intellectual property, public contracts, and responsibility clauses. Legal frameworks are called to approach urban algorithms, set privacy standards, protect databases and networks, open access to government information, build data governance, and improve compliance. The cases of the Brazilian and Canadian smart cities are the challenges to be overviewed here.

The three next parts of this article present a hypothetical exercise on the legal frameworks related to the in-house Big Data projects of Rio de Janeiro and Montréal. Contextualization was done previously,and the two steps of identification and justification are intertwined in the analysis variables of privacy, security, transparency, participation, accountability, and governance.

4.1 The Opacity Axis – Variables of Privacy and Security

Above all other variables, privacy is the most highlighted topic of legal concern in all academic and non-academic documents were consulted during the research. Therefore, it is fair to identify it as the most central element of the debate on smart cities.

Privacy provides the best examples of legal concerns related to smart cities. The risks related to personal data in smart projects arise in all of the debates with city officials, experts, citizens, and advocates because the issues need to be considered and managed. Surveillance cameras and IoT sensors enhance data collection related to the lives of residents in order to be processed by analytics applications and improve city services, but they also entail sacrificing anonymity and endangering civil rights. The rise of invasive urban intelligence poses key challenges to regulation and public policies that cannot be ensured by the present legal models of privacy assessments, anonymization standards, and terms of consent.

All over the world, technologies and laws are being rethought in order to understand and promote ways of protecting personal data and to reconciliate them with smart city applications. Cryptography and other forms of technological safeguards are solutions for some issues concerning the integrity and confidentiality of data from individuals and communities. Good public policies are also needed to enable privacy awareness and preserve freedoms and rights in the present against the potential dataveillance backlashes from the cities of the future.

Despite all the weight on the public debate about privacy in smart cities, the Big Data projects of Rio de Janeiro and Montréal-other global cities do not differ much from them-are able to show that the conformity of projects with legislation does not address all the social concerns and potential risks presented in this article and of the many works available on the topic.

In the Brazilian case, the personal data protection of the residents of Rio de Janeiro in the Big Data projects of the city hall depended a lot more on the *best practices* adopted by the IT teams of PENSA and municipal departments than on any legislation. Until very recently, the personal data of urban dwellers in smart cities would only be protected by the *right to privacy* under the Brazilian Constitution[8] and principles from administrative law. In Rio's PENSA, the anonymization measures which were declared and other practices to protect the personal data of citizens came from internal public policies that went beyond the legal requirements at the time, depending on the daily decision-making of their leaders, city officials, and municipal IT teams.

By the end of the research for this article, a new law for personal data protection became the normative reference for legal conformity concerning smart cities. The LGPD *(Lei Geral de Proteção de Dados*) entered into force in August 2020, establishing a legal framework inspired by the GRDP (General Data Protection Regulation) of the European Union (EU), despite bringing a narrower understanding of personal data, smaller fines, and a weaker

[8] *Constituição da República Federativa do Brasil de 1988*, art. 5, X and XII.

administrative structure for putting the law into real effect in the country. A predominant culture of arbitrary policies for processing personal data in public administration will have to take the fourth chapter of the LGDP into account,[9] but the public policies of smart cities will still involve a large measure of discretion implying local choices for city halls. Time and hard cases are needed for Brazilian municipalities and courts to set the (currently low) bar of privacy in cities from the interpretation of the LGDP.

In the Canadian case, the growing Big Data projects in Montréal were still in *beta status* and still had more to be proved, but they were being developed by the best technical practices and with an institutional culture of *privacy by design* that also goes beyond the expected conformity with Canadian and provincial law. The technical measures adopted by the municipal data analytics team reflected a shared internal stance of legal caution about privacy which, in turn, went along with Montréal city hall's public statements claiming the need for new regulation for the development of urban intelligence applications and the protection of rights in smart cities.

The protection of personal data is not explicitly mentioned by the *Canadian Charter of Rights and Freedoms*, yet it is interpreted as part of the rights protected under Section 7.[10] As the smart project being discussed is in Québec, Québec provincial law is applicable, and the *right to respect for private life* is protected by the *Charte des droits et libertés de la personne*.[11] More specific to the legal issues related to smart cities, Québec has its own personal data protection laws for provincial institutions and municipalities,[12] as well for the private sector.[13] Privacy laws in Canada, especially in Québec, were once considered to be advanced and similar to the EU regulations, but legislative reform are expected to happen soon.

When dealing with personal data protection, information security is always present. They are twinned subjects in the literature review and in legal sources.Several terms used in privacy and information security circles are the same because their concerns are very connected. Cybersecurity is the most complex and critical issue for smart cities since cyberattacks are no longer only *potential problems*: for they have already caused real incidents in cities all over the world. The threats to urban services-traffic, transportation, energy, water, education, healthcare-are very real and require solutions from technologies and law to address the management of their risks.

The integration of the tech ecosystems of smart cities-IoT sensors, video cameras, mobile networks, cloud computing-enhance the possible vulnerabilities. Many experts and companies believe that technologies such as blockchain can bring better solutions to the security of smart projects, serving as efficient ways of providing integrity, authentication and auditing. But many citizens, city officials and experts believe that by implementing even more monitoring technologies for "safety," the growth of the surveillance of communities raises more concerns of security breaches than "hackers" do. Therefore, smart governance frameworks must ensure standards of *security-by-design* and the respect paid to laws of personal data protection.

Before the LGPD, legal requirements for cyber security in Brazilian cities were restricted to few municipal services due to constitutional dispositions (e.g., tax secrecy) and mostly came from principles of administrative law: efficiency, security, reasonableness, regularity, and continuity. At the time of the activities of Rio's PENSA, there was a municipal ordinance more inspired by the best practices and ISO standards of security than by personal data concerns.[14] The municipal scenario of cyber security might change with the LGDP, by bringing explicit principles to the Brazilian legislation (art 6) and requiring best practices of security (art 46) to protect personal data-such as anonymization (art 18) and a personal data officer (art 41).

Security measures are never enough and there is always much to do, but municipalities in Québec may have many (legal) lessons to help Brazilian city halls face security transitions. For example, the Montréal's 2019 IT budget revealed several executed and proposed initiatives for a proactive cybersecurity management. Beyond technical merits, it is due to the dispositions of security spread in provincial laws, as in *Loi sur l'accès aux documents des organismes publics et sur la protection des renseignements personnels* – LADOPPRP (art 63.1).[15]

More could be said about privacy and security legislation for smart cities in Brazil and Canada. Still, providing more detailed descriptions of national laws is not an objective here: exploring legal imaginaries that are also composed

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9 *Lei nº 13.709, de 14 de agosto de 2018*, art. 23 to 32.
10 Canadian Charter of Rights and Freedoms, s 7, Part 1 of the Constitution Act, 1982, being Schedule B to the Canada Act 1982 (UK), 1982, c 11.
11 Charter of Human Rights and Freedoms, CQLR c C-12, s 5.
12 Act respecting Access to documents held by public bodies and the Protection of personal information, CQLR c A-2.1.
13 Act respecting the protection of personal information in the private sector, CQLR c P-39.1.
14 *Portaria IPLANRIO nº 123 de 28/05/2010*, replaced by the *Decreto RIOnº 44276 de 1/3/2018*.
15 *Loi sur l'accès aux documents des organismes publics et sur la protection des renseignements personnels*, RLRQ c A-2.1, art 63.1

by legislation is. Despite the differences between both cases in context and law, this exploration on the Brazilian and Canadian law indicates that they share more convergences than divergences, which always get more attention.

For Brazilians and Canadians consulting this dissertation, detailed information about legislation on the variables of the opacity axis can be found in the bibliography (COMMISSION DE L'ÉTHIQUE EN SCIENCE ET EN TECHNOLOGIE, 2017; MONTEIRO, 2018; GRIEMAN, 2019; PRIVACY INTERNATIONAL; CODING RIGHTS, 2019). A secondary proposition of this subchapter is to give references of Brazilian legislation on personal data protection and cybersecurity to Canadian legal scholars and practitioners, as well as to present Canadian sources for further investigation for their Brazilian pairs. Mutual learning can be useful, especially if Canadian and Brazilian cities keep developing local regulations for smart cities through open and civically engaged public policies that engage on personal data protection and information security.

4.2 The Intelligibility Axis – Variables of Transparency and Participation

The second axis, at first glance, is taken as oppositional to opacity. While privacy and security try to keep city data out of reach of most unwanted eyes and hands, intelligibility calls everyone to approach urban data and collaborate with it. The variables inviting all to understand cities, also called *openness* and *engagement,* are major topics of research on smart cities, bringing some optimistic perspectives to public policies and local democracy.

State transparency is one of the biggest (underachieved) innovations of modernity. It aims at creating and fostering technocratic mechanisms of access and interpretation of information from public administration. Open cities are supposed to promote the awareness of citizens and communities about local infrastructures, services, resources, and problems, increase social understanding about administrative decisions, enhance fiscal assessment of the city budget and public initiatives, and build trust in democratic processes. Several technologies can support such access (e.g., websites, apps, data mining), but opening the data of the *institutional black box* can be neither easy nor adequate: it is complicated and challenging to improve accountability and governance while ensuring privacy and security in smart cities.

At the beginning of research for this article, the Brazilian government was one of the main international advocates for open government, transparency was always present in the political debates of municipalities, and the city of Rio de Janeiro was one of the most vocal promoters. By the end, the 2018-2020 action plan for Brazil in the Open Government Partnership includedimproving transparency in local governments, where there is a low level of compliance with the national legislation in the area, with Rio de Janeiro City Hall being one of the underperformers. Rio presents contradictory cases for analysis on openness, despite all the past narratives on COR-where the city promoted policies of data sharing with (social) media and journalists-and the massive open data portal *data.rio*. The fate of Rio's data analytics project shows how fragile public policies of transparency can be, even when justified by legislation: PENSA was able to become a celebrated smart initiative with significative public access to their projects but, despite all the openness, it was unable to replicate its model in the next political mandate.

The Brazilian legal framework on transparency changed with the Law on Access to Public Information (*Lei de Acesso à Informação – LAI*),[16] which established the rules to access public information held by governments. Municipalities complained a lot about the short period and the costly efforts to adjust their practices to the law, frequently referring to privacy as a reason to avoid releasing public information, even when they are not related at all. This argument and the resistance to release data are still present today, despite the years that have passed and the required municipal decrees for transparency,[17] and the conciliation of practices of personal data protection and transparency in municipalities is still to be seen with the LGPD.

In contrast, Montréal established transparency as the first priority for the smart city plan initiated by the previous political mandate, and the open data practices found continuity in the smart projects under the new mayor. There is a municipal commitment to conciliate openness and Big Data in Montréal's approved proposition for the *Smart Cities Challenge*, with several references having been made to transparency and open data, which finds resonance with the data analytics projects in development in the city hall. The technical preference for open software guiding the Big Data team may bring opportunities for other open policies-*sharingsoftwareand methods* with other cities may help to safeguard them from untimely political changes.

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[16] *Lei nº 12.527, de 18 de novembro de 2011.*
[17] The municipal regulation of LAI in Rio: *Decreto municipal nº 35.606 de 15 de maio de 2012.*

There is no legislation regarding access to information that can guarantee the compliance-there is much place for interpretation in each municipality and city department-or the fulfillment of the increasing expectations of straightforward download of public data in digital format. Still, governments in Canada have been dealing with mirrored legislation of freedom of information and personal data protection since the 1980s.[18]The experiences and technologies should have improved the administrative procedures and decreased the delays for an adequate exercise of the rights that depend on such freedom. If a person looks for data that is not yet accessible in the open data portal, access to information in Montréal does not differ much from other Canadian cities. For building a democratic culture of urban participation, transparency based on open data is not enough: better techno-legal mechanisms are needed for easier, faster and cheaper access to *collective-and-personal* connected data that contextualizes and engages people by implicating them.

The second variable of intelligibility, *participation*, is umbilically dependent on transparency, with which it forms a feedback loop in several aspects including the legal one(s), but they should not be confused. Also called *civic engagement* by many, participation is the most related to the principle of communityand resistant to (neoliberal) business-oriented projects trying to be sold as "people-centric" smart cities, disputing the post-democratic senses of state and law.

Participatory crowdsensing, e-participation, and direct digital democracy are some of the forms that public policies of participation can take in smart cities. Multiple and diverse online tools as social networks and web portals are implemented for consultation programs that are promised to citizens with much enthusiasm and, later, can generate frustration. Technology-driven solutions facilitate communication, awareness, and collaboration practises, but they are not "the solution" to approaching the urban problems which require active democratic engagement to promote social change. Legal frameworks in smart cities should be supporting the participation of communities in critical decision-making processes and empowering the digital literacy of its citizens.

Even when successfully protecting personal data, securing systems and opening data, urban analytics projects might lead to dangerous consequences for participation that democratic states governed by the rule of law are supposed to avoid. The sophistication of detailed numbers and the beauty of well-designed visualizations from urban data processed by Big Data can lead to presumptions that consulting the population for evaluations and decisions would no longer be necessary beyond the (minimal) requirements of law. In a contrary sense, one of the first activities of Rio's PENSA was hosting the *Hackathon 1746*, providing access to municipal databases for more than 80 developers. The creativity empowered by the advanced IT skills of the collectivity of programmers inspired several projects that were later pursued by PENSA. Unfortunately, participation projects are the most fragile of all public policies for smart cities, and the event was discontinued, as well as the participation projects conducted by the *Lab.Rio*.

Participatory processes in Brazilian municipalities should not be fully dependent on political will, according to the law. For example, the federal law which established the *City Statute* determines a *democratic management through the participation of the population* (*Estatuto da Cidade*, art 2º, II),[19] including the decisions related to the municipal budget (art 44) and PPPs (art32) with a *mandatory and significant participation* (art 45). Even with more legislation like this one and the debates on participation by urban law scholars and practitioners-not forgetting urban social movements and urbanists-participation policies in Brazilian smart cities seem to move more toward semi-passive crowdsensing apps than to active democratic engagements.

The proposition of a *smart Montréal* came from political will, no doubt about it, but the debut of the project was marked by several rounds of public consultation, and the city hall would incorporate participation as a principle and a practice for it. Conciliating online platforms and "offline meetings," Montréal also promoted public events like hackathons, and city officials have debated the risks associated with privacy in urban analytics long before the city hall started to really engage in it. The Big Data projects developing in Montréal are still more referred to in general than exposed in detail. Consequently, the lack of awareness about the existence of these projects hinders collaboration with urban communities for their realization. Participation policies may be fragile, but they build networks of people, institutions and ideas which can be strong. Such connections may have helped Montréal to win the Canadian smart city competition, with a final proposition which repeats the terms *participation* and *engagement* dozens of times.

[18] For the Government of Canada, *see*: Access to Information Act, RSC 1985, c A-1; Privacy Act, RSC 1985, c P-21. For the Government of Québec and municipalties in Québec, *see*: *Loi sur l'accès aux documents des organismes publics et sur la protection des renseignements personnels*, RLRQ c A-2.1.

[19] *Lei nº 10.257, de 10 de julho de 2001.*

What could be seen as a commitment from a political mandate, finds coherence within the applicable legislation of Québec. The French-Canadian province adopted a law to normalize the functioning of urban areas in 1903, *la Loi sur les cités et villes*,[20] which is the legal basis for cities like Montréal (most municipalities are under another provincial law).[21] This law has been significantly modified to foster local democracy and it needs to be interpreted in conjunction with other laws and local policies (e.g., elections and referendums)[22]. A more recent law, known as *Projet de loi nº 122*,[23] dedicates a whole chapter (Chapitre II.2) to the adoption of public participation policies for decision-making in municipalities. These legal provisions are in line with several references to participation in the *Charter of Ville de Montréal*,[24] which created a *public consultation office* (Division IX) and the *Charte montréalaise des droits et responsabilités*,[25] a ground-breaking charter of rights.Montréal has served as an inspiration to the legal imagination on urban participation, and there are reasons to believe that its regulatory innovations might keep up with its smart projects to inspire more democratic smart cities.

For Brazilians and Canadians consulting this article, more detailed information about legislation on the variables of the intelligibility axis can be found in the bibliography (SCHREINER, 2016; COMMISSION DE L'ÉTHIQUE EN SCIENCE ET EN TECHNOLOGIE, 2017; LAURIAULT; BLOOM; LANDRY, 2018),one case study about open government data in Rio de Janeiro (MATHEUS; RIBEIRO, 2014), and the winningproposal of Montréal for the Canadian Smart City Challenge (VILLE DE MONTRÉAL, 2018b).

The research invested considerable time in reviewing legislation because it is a part of normativity and takes a significative part of the legal imaginary. It can serve as a pragmatic departing point for legal researchers looking for primary sources of law in the Brazilian and Canadian contexts because all of those references to legislation could not be found in just one document during the doctoral studies for this article.

4.3 The Compliancy Axis – Variables of Accountability and Governance

The axis of compliancy gathers the variables of accountability and governance, which are connected to all the variables of the previous axes. Instead of a simple and homogeneous instrument with a seal of modern science for *measuring the law*,[26] this article is alignedwith the objective ofbuilding prudent knowledge as a complex and heterogeneous process.[27]The axis of compliancy brings a transversal dimension of a network-based legal theory to accomplish it.

One of the best examples of the ongoing process of networked law is *accountability*, the most underdeveloped variable of legal analysis on smart cities. Despite the constant presence of the term *accountability* in smart city discourses and in the legal imaginary built on them, accountability still seems to perform more secondary functions in narratives than practical effects in compliance to laws. This variable may appear to be as a utilitarian element in political statements and articles in the mass media, but it becomes even less relevant in academic papers, with a lot less literature dedicated to the topic. When compared to the other interconnected variables, it seems easy to confirm that there is much work to be done and that there is a need to research the topic further.

Accountability engages with public policies of privacy, cyber security, transparency, and participation, bringing all their blurred values to the core of the administrative duties of smart cities. Many factors of accountability need to be attended to in order to remediate (or at least contain) the dangerous chains of consequences that can emerge from those policies. Smart cities present new technocratic forms to deliver accountability that are brought by Big Data: dashboards showing urban patterns from data analytics can improve not only the decision-making in cities, but also the auditing of costs and performances of governmental actions. Oversight, responsibility, and responsiveness are some of the accountable goals (or utopias) of smart cities.

Accountability is an English term that developed meanings without any exact translations into Portuguese, but it is increasingly used to discuss government functions, responsibilities, and ethics in Brazil. There is a dispute over the conceptions of accountability, reflecting the dispute over the conceptions of public administration; in Brazilian

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20 *Loi sur les cités et villes*, RLRQ c C-19.
21 *Code municipal du Québec*, RLRQ c C-27.1.
22 *Loi sur les élections et les référendums dans les municipalités*, RLRQ c E-2.2.
23 *Loi visant principalement à reconnaître que les municipalités sont des gouvernements de proximité et à augmenter à ce titre leur autonomie et leurs pouvoirs*, LQ 2017, c 13.
24 *Charte de la Ville de Montréal, métropole du Québec*, RLRQ c C-11.4.
25 Ville de Montréal, By-law Nº. 5-56, *Charte montréalaise des droits et responsabilités* (June 20, 2005).
26 By a dominant notion of law that sees it as deterministic, mechanical, divisible, and rigorous.
27 By a transitional approach to law that feels it as unpredictable, fluid, interconnected, and creative.

smart cities, the instrumental sense prevails. The imaginary of accountability in Brazilian smart cities is illustrated by municipal dashboards capable of synthesizing massive amounts of public data in real time, presenting simplified maps, accessible numbers, and informative visualizations to examine and manage the surfaces and innards of cities. Rio's NASA-style-room of COR form the first and lasting image of instrumental accountability for transparency and decision-making in Brazil. Unfortunately, not much was added to this image for Brazilian smart cities since then.

Brazilian law forms a complex web-based system of laws,[28] institutions, and procedures for ex-post measures addressing Brazilian municipalities under a vertical sense of accountability as a process. Corruption is the main legal concern for accountability in Brazil, and the compliance of transparency practises are taken as a major ex-ante mechanism for it. A municipal law Rio de Janeiro was approved for increasing the transparency in contracts with non-profit organizations,[29] one of the most challenging vectors for accountability. Such law was not inspired by Rio's COR or PENSA, but since smart city projects are usually part of partnerships with civil organizations, universities and private companies, public policies of accountability should be taken as a priority for ex-ante actions beyond municipal dashboards.

The experience of Montréal with accountability and corruption-two of its former mayors stepped down in the midst of corruption scandals-could teach some lessons of accountability to the Brazilian context, especially, the lesson of compatibility between transparency and personal data protection. Keeping political leaders, city officials, and public contracts under scrutiny while preserving the fundamental right to privacy is not only possible but required for horizontal accountability in municipalities. Principles of accountability have been present since the first drafts of the smart city plan, notably in policies of transparency and participation, and the technical precautions in the Big Data projects underline them for privacy and security.

As was implied before, cities with smart projects usually claim to be accountable organizations, and several laws are set to call for their responsibility. The bigger the cities are, the bigger the possibilities and consequences which they will have to bear in terms of civil liability.[30] The responsibility of taking care of digital infrastructure and municipal data includes calling for criminal law whenever necessary, including possible cases of corporate liability.[31] In the case of Montréal, procurement and public contracts involve a lot of accountability to comply,[32] and it will often face more challenges than municipal regulation can attend.[33] Finally, even if counting on a vast regulatory arsenal related to accountability, Montréal should not be satisfied because its Big Data projects are simply in accordance with legislation: when urban experiments go wrong, (prudent) ex-ante policies may come in too late to avoid (painful) ex-post measures.

Governance is the most diffuse of all the research variables presented here and is not exactly a legal term, but it represents ideals and practices of concertation that a networked conception of law can put to good use for smart cities. In consonance with the presented variables, governance can bring more legal elements (e.g., intellectual property, environmental law) and public policies to the table of discussion and negotiation for the cities of the near future.

Governance is a multilevel concept that can capture most technical aspects, urban complexities, and social concerns of smart cities. Including governance in the research framework to discuss its key issues (privacy, security, open data, engagement) enabled critical perspectives and new approaches for compliance. Understanding the technocratic, entrepreneurial, and collaborative views on "smart governance" is the best way to set the smart cities models in context, present their outcomes, and project their risks.

Governance is a popular term for smart cities, with wide-open definitions that admit distinct views and practices, while also allowing communication and collaboration between them. Such a "clash" of perspectives was present in the governance of the smart projects of Rio de Janeiro, during which the Mayor was presented as an *efficiency-driven CEO* to city officials, a *social visionary* to IT corporations, and a *democratic partner* to civic movements. These *tailored-to-the-customer* narratives incorporated by Rio's Mayor were reflected in the governance of its smart initiatives, including the Big Data approaches to decision-making, living up to the model inspired and symbolized by New York. Unfortunately, the abrupt end of PENSA precludes observations about the longer-term sustainability of its potentially conflicting instances of governance.

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28 *See: Lei nº 4.320, de 17 de março de 1964; Lei nº 8.666, de 21 de junho de 1993; Lei nº 9.605, de 12 de fevereiro de 1998; Lei complementar nº 101, de 4 de maio de 2000; Lei nº 12.232, de 29 de abril de 2010; Lei nº 12.846, de 1º de agosto de 2013; Lei nº 13.019, de 31 de julho de 2014.*

29 *Lei municipal 6.048, de 2 de março de 2016.*

30 Adding to the dispositions in *Loi sur les cités et les villes* and *LADOPPRP*, *see*: *Code civil du Québec*, RLRQ c CCQ-1991.

31 Criminal Code, RSC 1985, c C-46.

32 *Loi sur les contrats des organismes publics*, RLRQ c C-65.1.

33 *Loi sur les compétences municipales*, RLRQ c C-47.1, art 85.

The legal aspects of data analytics projects in municipalities can vary a lot according to the city departments involved-as software developers (and lawyers) refine customizations to each demand-but *data governance* can be used as a common denominator between them. This transversal variable can deal with one of the most difficult (and often neglected until it is too late) elements of negotiation in public contracts and PPPs: the ownership and sharing of the smart city data. The intellectual property (IP) aspects of *fully in-house projects* are easier to frame, for example, for figuring the ownership of software in Brazilian law.[34] But in some of PENSA cases involving databases from private companies, as in the case of the partnership with Waze, some considerations about the applicable legislation on copyright[35] (and even consumer law in relation to the users of the Waze app)[36] need to be involved, which encompasses many concerns of the previous axes of opacity and intelligibility but can go beyond them as well. Drawing clear IP limits in the quicksand of partnerships with IT corporations is neither a simple nor a short-time task, therefore, the choice for a lawyer to lead PENSA may have been useful for it.

While Rio de Janeiro had a centralized model of governance for the smart initiatives, Montréal kept a more decentralized model: a city councillor was the responsible for the smart city projects and the public voice to communicate them to the public; an administrative structure promoted and connected the smart initiatives that were spread in the city hall, keeping some projects of its own; and several city departments developed their specific projects, according to the mayor's office's guidelines and to authorized plans and budgets. It was a more flexible and adaptable governance model, closer to the business units, and thus demanded more coordination efforts. The governance narratives in Montréal's smart initiatives were more in line with the models of *data sovereignty* that are led by Barcelona and Amsterdam.

Montréal has been involved in partnerships with (small and big) IT companies, thereby it should pay close attention to theirIP assets,[37]and the several other sociolegal dimensions that data governance can imply. A smarter governance for Montréal would not be restricted to protecting the *status quo* from the risks of the technocratic city of the near future. Montréal can contribute to amplifying the debate for the promotion of fundamental rights that will engage other areas of Canadian law, such as consumer law,[38] competition law,[39] and, notably, environmental policies.

Accountability and governance cross all legal areas involving smart cities. Consequently, all the previous references are applicable. Additional information guiding this article about the axis of compliancy can be found in the bibliography,an article about urban governance innovations in Rio de Janeiro (PASCHOAL; WEGRICH, 2019), and a last strong recommendation to visit the website of the *Samuelson-Glushko Canadian Internet Policy and Public Interest Clinic* - CIPPIC (FEWER, 2017) Much of the initial information and continuous inspiration were taken from the CIPPIC project on smart cities in partnership with *OpenNorth*.

5 Conclusion

The presented text originates from doctoral research that compriseda bibliographic data survey and interviews with participants of Big Data projects in the cities of Rio de Janeiro and Montréal. References from media, institutional reports, government documents, and academic publications were used to contextualize the two smart city projects in this article.More information, which includes presentations of specific projects by the municipalities' internal teams and visualizations of text mining, is available in the doctoral thesis.

The two first parts were dedicated to contextualizing the smart city projects of Rio de Janeiro and Montréal in the context of Latin America and North America, as well as delineating the public narratives of their Big Data projects in their convergences and peculiarities.The storytelling of the smart projects of both cities representsimages and models of urban planning and management that are paradigmatic to the legal imaginary of smart cities, both in its potentials and risks.

The main focus of the research was on the application of six variables for legal analysis on the Big Data projects of Rio and Montréal, which were divided on three axes for identifying their risks and justifying the measures required by legislation to protect fundamental rights involved.The axis of opacity, composed of privacyand security, attracts the most attention in the smart city literature, gathering some of most of thelegal and technical challenges for cities

[34] *Lei nº 9.609, de 19 de fevereiro de 1998.*
[35] *Lei nº 9.610, de 19 de fevereiro de 1998.*
[36] *Lei nº 8.078, de 11 de setembro de 1990.*
[37] Ranging in several IP subjects, *see*: Copyright Act, RSC 1985, c C-42; Patent Act, RSC 1985, c P-4; Trademarks Act, RSC, 1985, c T-13.
[38] For cities in the province of Québec, *see*: *Loi sur la protection du consommateur*, RLRQ c P-40.1
[39] Competition Act, RSC, 1985, c C-34.

of the near future;the axis of intelligibility, composed of transparency and participation, encodes the greatest hopes for a more democratic future than the present one, even if its public policies prove to be the most fragile in the face of political changes; and the axis of compliancy, composed of accountability and governance, whose transversality with the other axes demonstrates the complexity and individuality of each smart city project, which must be studied and customized according to their contexts and peculiarities.Elements and sources for further research can be found in each analysis.

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Recebido em: 01.09.2022
Aceito em: 29.11.2022

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