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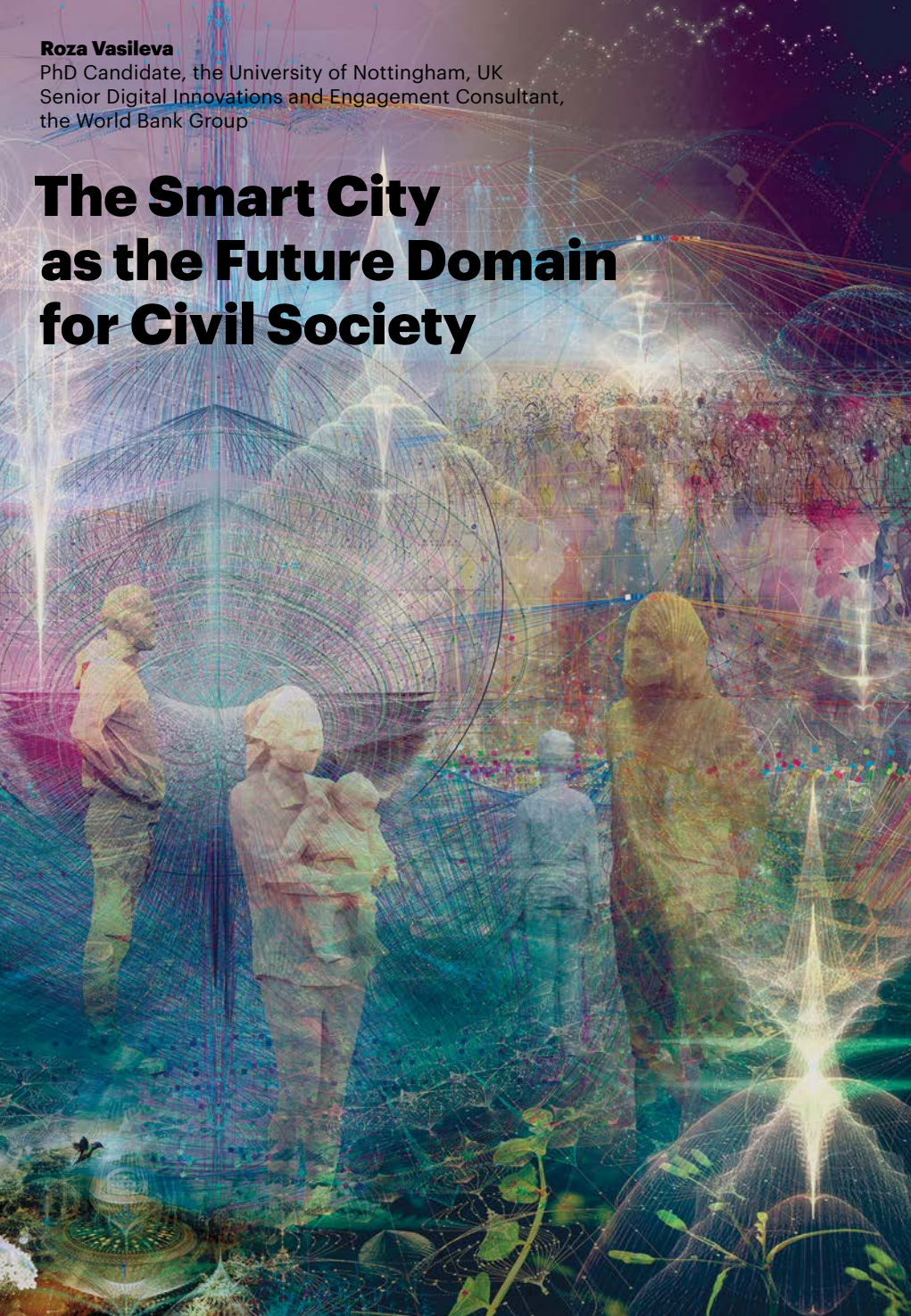
The Smart City as the Future Domain for Civil Society



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Introduction

Rapid urbanization has become one of the strongest global trends, which is recognized in the United Nation's Sustainable Development Goals (SDGs) agreed upon by almost two hundred countries, as goal 11: "*Make cities and human settlements inclusive, safe, resilient and sustainable*." While connecting people to more opportunities, cities bring a number of challenges such as poor air and water quality, traffic congestion, solid waste management problems, and high energy consumption. Governments as well as civil society groups have turned to "smart" technologies and data-enabled tools to address these challenges.

The smart cities concept emerged as a strategy to mitigate the negative impacts of rapid urbanization with a key objective to *"foster more informed, educated and participatory citizens."*[1] Tackling urban grievances gave rise to forms of civil society movements known as urban activism or "citizen-led city-making."[2] However, smart city solutions mostly driven by large technology corporations and urban civil engagement practices have been developing in parallel, and in many ways conflicting with each other.

Modern cities produce, collect and process large volumes of data. City governments have discovered that the data they collect from various transactions offer important insights that can transform their operations and make them more efficient. For example, combining historic traffic data with the "real-time" movement of vehicles gathered from road tolls can help to prevent congestion. It can also enable better coordination between agencies, such as in times of crisis. In the book *The Responsive City*[3] the authors provide a number of examples when the city managers were able to better critical city services through the use of data, from more precise and coordinated crime fighting in New York

City to streamlining business licensing periods in Boston. Civil society organizations also can take advantage of open data. In New York, the Housing Data Coalition[4] uses public data to eliminate housing discrimination. In Boston, Code for America helps coordinate community effort to keep street hydrants clean in heavy snowy season through an interactive online platform Adopt-a-Hydrant.[5]

City governments and other city data producers could also provide open data relevant to people's lives, e.g., on energy, transport, housing, pollution, including 'big data' in real-time or "*massive, dynamic, varied, detailed, inter-related, low-cost datasets that can be connected and utilized in diverse ways*."[6]

Experts often connect providing data publicly and enabling open-source access, using or sharing, with the potential to empower communities to drive sustainable development in cities and "*transform the public realm and the way we live and interact in urban areas*"[7]. This would not be possible without the right technologies in place. In fact, after an extensive review of the available definitions of a smart city in various fields, Gil-Garcia et al.[8] concluded that technology is one of the common features between many of them.

Smart cities are considered critical for the engagement of citizens in a more comprehensive way, leading to a more participatory governance of the urban space. Technologies applied to cities can facilitate these new ways of participation and civil society activism. This chapter analyses technological trends in smart cities and provides some recommendations of how civil society stakeholders can take advantage of smart city technologies to address critical factors of urban citizen participation.

Smart City and Civil Society

Using smart cities as an open innovation platform where data provides new opportunities for civic engagement is

considered a relatively recent concept, with only a few cities having been able to implement it.[9] This is what some authors call *"a new breed of smart cities."*[10] This type of data exchange assumes that local governments are open to collaboration and co-creation with the public and private sector of services, which have been traditionally provided by the public sector. Examples of such cities are Barcelona[11] and Tel Aviv[12], both of which made a deliberate effort to build their smart cities based on open innovation.

Indeed, more and more cities all over the world employ open data platforms, which are claimed to foster a co-creative environment in which citizens are equal participants in making their cities a better place. Such data platforms supported by open application programming interface (API) and common standards foster more inclusive and innovative cities. The 'City as a Platform Manifesto' offers a set of ten principles that cities should adopt in order to use digital data platforms to ensure that it creates *"a shared collaborative framework between residents, the public and private sector to drive the desired outcome of sustainability, inclusivity and targeted innovation that benefits cities and their residents."*[13]

Experts articulate a number of benefits of open data initiatives, the most prominent of which are: economic gains through data-driven business opportunities, transparency and accountability, increased efficiency within government through data exchange, and data-informed policy making.[14] However, the greater benefits are seen on a local level, in cities and local communities. These include improved service delivery to city dwellers, greener cities and increased efficiency by making more informed decisions about daily urban living situations. Open access to data has the potential to empower local communities to become more sustainable, making cities more people-centered and engaged.[15]

While open data is considered key to open innovation, the strategy suggesting that if you build a data portal, users will create smart city tools and applications, and

benefits will follow, did not prove to be successful. Despite an increasing number of polished data portals, public engagement and participation in community action have not increased. On the contrary, existing smart city programs have been criticized for insufficient engagement of citizens, or even for whitewashing autocratic governments (like Russia), who would simulate openness by releasing data that is not useful to the user. An example of demonstrating such 'radical openness' through a large number of datasets released could be done by disassembling complex datasets into single tables and hence inflating the numbers on the portal. Cities need to look for better ways of using the new data at their disposal to bring greater benefits to their communities.

In fact, many forms of urban civil society activity arise directly from urban challenges people face due to massive urbanization. Urban sustainability challenges such as solid waste management or air pollution could prompt community groups to organize around these issues and pursue actions to address them.

I identify several critical success factors in citizen participation and engagement, especially in the urban context:

- **Awareness:** to participate, citizens need to be informed;
- **Motivation:** citizens want to participate;
- **Accessibility:** citizens have digital tools to access information and participate, and are able to use and afford them;
- **Accountability:** citizens witness improved transparency and accountability as a result of their participation;
- **Efficacy:** citizen participation leads to changes;
- **Sustainability:** citizens have convenient ways of participating and feel the need to do it.

Civil society could leverage a number of smart city technologies that offer greater opportunities for addressing the abovementioned success factors in order to self-organize and engage.

Technological Trends for Development of Civil Society in Smart Cities

Awareness: Data Visualizations and Dashboards

With a vast amount of data accumulated in a city daily, it is hard for citizens to make sense of all this information. Data-driven insights presented in a customized format via city dashboards and visualizations help people understand what is happening in the city in an open and transparent way, and to act on that data.

For example, open budget dashboards are an easy way for citizens to analyze where and how the money is spent in the city. Cities provide visualizations of real-time data on a number of city issues including transportation and environment like in Dublin,[16] for example. Dashboards driven by open data are not the same as open data portals, which provide raw data, but they relate datasets to each other and to a particular issue the citizens are inquiring about.

Geospatial data is considered the foundation for any smart city and underpins nearly all modern smart technology. Maps is just one way of using geo-data through visualization, but there are many more uses of raw geospatial data, and especially in civic activism. Combining several layers of geospatial data with different datasets can provide powerful insights about the city's infrastructure, services and many more, and even predict future patterns. Global Positioning System (GPS) data is collected by different applications from our mobile phones and wearable devices in real-time.

Civil society city initiatives are already taking advantage of that data, including crowdsourced geo-tagged data reports on various issues in their interest areas. Analysis of civic applications for smartphones in Russia demonstrated that mapping data was used to reveal the scale of the problems and as an analytical tool, tagging problems with colors and infographics.[17]

The Krasiviy Peterburg ("Beautiful Petersburg") app, for instance, categorizes problems using geotagging and

marks them as blue (reported), green (solved) or red (dismissed) cases. The same principle is used in other apps.

Maps can empower citizens and help significantly in improving city services. With the emergence of 3-D maps and with adding more geo-layers to city infrastructure (for example, drone routes that will be used to deliver critical urban services in the nearest future), this potential could grow exponentially by providing accurate, comprehensive, and visual information about these services integrated with the fabric of the city and other digital tools.

Sensors penetrate city infrastructure, collect various types of data in real-time, and communicate them to each other through their own networks – Internet of Things (IoT). The simplest smartphone would have over a dozen different sensors such as accelerometer (to measure acceleration forces), barometer (for atmospheric pressure), magnetometer (for sensing magnetic fields), proximity (for detecting nearby objects without physical contact) to name a few. Data generated with these sensors and combined with geospatial layers of the city can provide full analysis of any aspect of the city. For example, projects like Sensor.Community[18] or sensors.Africa[19] offer citizens a chance to receive (and construct!) their own sensors to monitor indicators such as air, water and noise pollution in their communities. Then, these data are visualized on the map. These initiatives promote 'citizen science' and rely on people's participation, data and ability to maintain infrastructure to address urban social and environmental problems.

Dashboards connecting all city data and geo-locations in real-time will provide customized visualizations and raise awareness of critical issues and allow city dwellers to act on these data. Currently available on web and mobile phone applications this technology can embed into the city infrastructure: buildings, windows, public transportation, signage, etc.; and combine more sources of data, including those that are generated by citizens, for better analytics. On the one hand, civil society organizations should take advantage of dashboard technology to communicate such data

to citizens that cover their interest area. On the other hand, it is important to note that the role of civil society will be increasing to ensure proper privacy and security of citizens' personal data when all these data are linked and analyzed.

Motivation: Gamification

Cities are more and more investing in gamification to drive citizens' behaviors. The City Points project in Cascais[20] is a rewards-based app that encourages citizens to adopt certain practices. Users receive points for activities in the areas of environment, citizenship, social responsibility, mobility, etc. Points earned in the app can be used for products and services from local partners. Through such game format, participants engage in taking an active role in transforming the community into a better place to live and have a reward mechanism to stay motivated to continue doing it.

Similarly, the Mobility Urban Values (MUV) project[21] aims at "*promoting a shift towards a more sustainable and healthy mobility choices*" through a mobile app where users can earn points for performing sustainable behaviors.

The project re:publica[22] calls gamification "*an approach for playful urban participation and meaningful civic engagement.*" The approach is very relevant for areas like urban mobility. Car-pooling online solutions like RideAmigos[23] and TravelWise Tracker[24], which serve as a search engine for car-ride companions, use gamification techniques to encourage users to choose greener options for transportation.

When built on the sense of belonging to a community and with the right incentives, these gamification tools allow civil society to drive programs that promote citizens' engagement and participation, while creating a connection with the local community as well. Cities and local businesses can provide services or products in return of behaviors making engagement even more fun and rewarding by linking the virtual gamification scheme to real benefits. Citizens' participation becomes very tangible when the online engagement score becomes exchangeable for local experiences.

Accessibility: Integrated Service Management Systems

Online city platforms allow cities to have a holistic view of all their services and provides them with a single-entry point towards connecting with citizens. City governments are investing more and more in platforms to centralize all data, and in services that are more professional, when it comes to how they communicate and react to their customers.

For example, Deloitte's CitySynergy[25] platform looks across every aspect of a city's operations and uses technology to improve outcomes. Digital infrastructure of a smart city sets the stage for a network of partnerships and connects with citizens, businesses, and civil society organizations. Similarly, the Smart Dubai Platform unifies city services, IoT, cloud services, Big Data and digital identity across all city parameters to construct the most thorough exchange point for federal government and private sector services, providing extraordinary value for the city.

Service management platforms in the future will deliver all services across various sectors in the city and allow tracking public service delivery in real time. Through these systems citizens can gain easy access and demand more control over public organizations and good quality public services. Civil society organizations could use these platforms and data to identify gaps in service provision, for better planning and providing tailored services to their target groups.

Accountability: Blockchain

The term blockchain, referring to a type of Distributed Ledger Technology (DLT) that organizes data in the exchange in 'blocks', has been thrown around a lot, particularly for financial transactions. A technology trend yet to be explored further by cities opens up many opportunities for citizen participation.

In a distributed ledger all entries in the database are decentralized to eliminate the need for a central actor to validate or authenticate transactions. The system operates on the consensus reached by all parties participating. All

data points in the system have a time stamp and unique cryptographic signature. This technology allows one to verify and check all past data entries in the dataset. City programs built on top of blockchain could offer greater social accountability through transparency on reporting of city problems and how the city has addressed them.

Removing the intermediary party and central authority is what makes this technology so attractive to civil society, and it has promised various applications in the city context. Smart cities could employ this technology in various areas from water and energy management systems to business registries and urban planning. Proven useful especially for financial transactions, blockchain significantly decreases operational inefficiencies and creates greater security due to its decentralization. While cities are coming up with their own local currencies for urban gamification tools, they could also think about using cryptocurrencies to increase participation. For example, citizens can earn cryptocurrencies by taking certain actions and use them to support social programs, or choose city investments (i.e., a participatory budget).

Efficacy: Machine Learning and Artificial Intelligence

Governments are starting to invest in machine learning (ML) and artificial intelligence (AI) to be able to analyze contributions of individual citizens in participatory processes. While participation is enormous, they need help to make sense out of the data created by people. ML algorithms allow to analyze large amounts of city data effectively and feed back into the systems, improving city services.

The 311 service, a specialized phone number across the US cities where citizens can report non-emergency issues about their communities, could be improved with ML to easily make sense out of the data reported by citizens. Chatbots often used for citizen feedback provide millions of opportunities to help cities provide better services. In Dar es Salaam, a water utility company

allowing citizens to report a problem through a Facebook Messenger Chatbot, accumulates all response data in a standardized dataset form that can then be analyzed to feed back into the service delivery improvement.

Civil society organizations can adopt similar practices. With AI technology anyone who has access to data can read the inputs provided by people, analyze the image, categorize problems, even aggregate similar reports that might be connected to a single incident and provide response insights for the community.

Sustainability: Data Sharing Economy

Currently we are experiencing the economy, driven by data analytics and the sharing economy, based on peer-to-peer services such as Uber and Airbnb. With better informed citizenship realizing the value of their data, we will get a data sharing economy in which citizens are stakeholders of how their data is being used. The emergence of data sharing platforms can play an essential role in future data economy. The main challenge is to identify incentives to help increase readiness to share data.[26]

Growing data storage capabilities, faster data exchange and rapidly increasing computing power will enable the data sharing economy. This will support new business models and innovative opportunities for civil society to engage citizens in data sharing based on the benefits it creates for their communities locally – while making it more sustainable. The Smart Health Community project,[27] for example, explores where personal data can be used to improve people's well-being. When citizens share these data with local community, the service offer is customized to what the community needs at each moment.

The role of civil society is vital for establishing data sharing economy that will be secure for citizens, as well as for development of data sharing networks among various stakeholders in the city in order to bring long-term benefits.

What do we want to achieve?

The increasing availability of broadband internet and mobile connections is already helping cities to become 'smarter' every day. The ubiquitous rollout of 5G can be a real game-changer for cities. Mobile 5G will make connection practically instantaneous (single millisecond per connection). Anything you can think of in a city will indeed happen in real time, connecting city services, infrastructure and individual users. Transmitting HD/3D videos and other new formats of content that previously was unthinkable will become a reality. It will dramatically enhance the speed of data transmission and opportunities to operationalize IoT and other smart city applications discussed in this chapter in real time, making response time close to nothing.

Ideally, the abovementioned technologies will bring more transparency and greater participation to cities, which will support and enhance civil society. Solutions built on open source technology will help urban civic enthusiasts to address a number of issues in a collaborative way. Catalyzed by 5G connections, these solutions will be available to anyone at their fingertips as quickly as they can think.

The University of Nottingham's Databox project[28] in collaboration with the BBC[29] and other industry partners, is already exploring the development of a platform that can provide such control and accountability of personal data. The Databox is envisioned as a personal data processing ecosystem for managing own-data security and authorizing third parties to access the data to provide authenticated services. The similar principle is described in an article by Stanislav Ronzhin (see also his chapter in this volume, *"Civil Society and the Future of Personal Data"*). This will put civil society in a position where they need to articulate the value proposition to access personal data alongside with the private sector and government actors. Cities will need to reconfigure and adapt to each person based on the amount of data they are willing to share, and so will civil society and urban activists.

What do we want to avoid?

The most common approach to 'third sector' organizations clearly separates civil society and the state, although in some cases, especially in the post-Soviet countries, the line blurs, and it is difficult to identify whether the organization belongs to the civil society or the state. For example, in the Aktivny Grazhdanin ("Active Citizen") initiative[30] and 'vertical crowdsourcing' platforms[31] public participation is facilitated by the government with the goal to support the state agenda.

As the Moscow Smart City strategy suggests, mass implementation of AR applications along with the virtual reality (VR) and mixed reality (MR) is expected in law-enforcement agencies, education, and health care sectors. It will also be used widely in Moscow schools in teaching sciences and implemented in various places of tourist attractions. The flipside of this technology is that it is run and managed by the government, so these technologies will be controlled by the parties that are outside of civil society reach.

One of the biggest concerns associated with such technologies is what happens to the data generated through these technologies and who owns them. Traffic camera feeds, city-wide sensor networks, and local government management systems to name a few are the sources of big data. When used with algorithms, data integration and analytical tools enable real-time city monitoring and surveillance.

While big data is considered useful for understanding cities, its use for urban management and governance has prompted a number of concerns expressed in literature and should be critically evaluated. The data accumulated from numerous sources automatically and streamed into a single "panoptic vantage point" could turn a city into "a Big Brother society" and create tensions between effective urban governance and citizens' right to privacy (Kitchin, 2014).

Discussions around educating a regular user about digital technologies and data, however, place respon-

sibility on users calling for 'smart people' rather than on the developers of the systems that manipulate data. Government and businesses are collecting more and more data whereas the general public remains powerless to do anything even when it comes to using and protecting own data. Issues of data protection are not unique to any particular technology outlined above but are common to all emerging technologies that run on data.

What is likely to happen?

Highlighted data security and privacy concerns are a significant barrier on the way to creating transparent, open, and safe systems for people to participate in smart cities. Fully digitized, smart cities will be able to create an environment where anyone can switch on and off any data sharing that they are engaged in their urban living. Anyone can be as digitally visible and invisible as they wish, without putting their own experience of cities at a disadvantage. The role and possibilities of civil society activities will shift significantly towards ensuring an appropriate use of citizens' data and digital technologies.

Tensions between open source and closed smart city systems are likely to continue. Civil society will need to find forms of engagement that work best in city contexts. As city dwellers become more aware of data privacy and security issues, any technology enabled transactions will need to be more secure in order to be trusted. Open source systems are more prone to hacks and disruptions. Policy and legal frameworks around using open source and data will need to continue to develop. Civil society and community leaders wishing to adopt new technologies will need to team up with developers and legal specialists.

Unmanned Aerial Vehicles (UAVs), commonly known as drones, are developing rapidly. Flying robots are currently sending a weak signal in the context of smart cities, especially due to the array of legal and safety restrictions of

operating over densely populated areas and negative public perception challenges. However, it is expected that these machines will provide nearly all critical services in cities in the nearest future and will help bridge gaps in city infrastructures. This includes monitoring of roads, building conditions, and critical infrastructures; providing ubiquitous connectivity and security; express deliveries including merchandise, documents and medical supplies. Earlier in 2019, a US-based air mobility platform AirXOS together with the University of Maryland performed a delivery of a donor kidney in Baltimore and we can expect to see more such cases. Drones will be responsible for most of the data collection in cities.

Data privacy and security will continue to be a growing concern of smart cities, and trust in digital tools and parties running them using massive amounts of data (private sector, government and civil society organizations) will be the key to ensuring participation and collaboration of city dwellers. Data that is 'dirty,' i.e., biased, incomplete, skewed – used to train AI algorithms, can toss a wild card and undermine people's trust in data-driven tools and city solutions.

Conclusion

Cities have always been hubs of civil society activity. As this chapter suggests, smart city technologies can bring some exciting opportunities for civil society in fast-changing urban environments, but at the same time a number of challenges that could undermine trust and public participation.

The smarter cities become, the bigger role civil society needs to play to ensure that they serve the interests of the people who live and visit them. In the introduction to this chapter I outlined critical factors that civil society will need to address in order to impact future cities: awareness, motivation, accessibility, accountability, efficacy, and sustainability. The technologies described in this chapter could help civil society to address each of those

factors and improve the way people will experience cities in the future. Given the tensions outlined above, cities will need to address some challenges in order to make the use of these technologies truly open and collaborative.

While people are becoming more aware of the impact that generation and sharing of personal data have on their lives, technology and data will continue to develop and support urban living through the use of personal data. Every decision in the city and every service will be based on the data that is available. A future civil society, in the context of a smart city, will be able to analyze vast amounts of data and use them in real time through various tools described in this chapter in order to engage stakeholders, improve services and address city challenges. The data will be produced and transmitted back to the user through various fabrics of city infrastructure.

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Endnotes

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