

# WHAT IS THE IMPACT OF DATA FUSION ON THE SOCIAL AND POLITICAL LIFE OF CITIES?

**TRACEY LAURIAULT INTERVIEWED BY WOLFGANG KOCH AND ANNE-LAURE JOUSSELME BONN, GERMANY, SEPTEMBER 14, 2019**

*Information Fusion has a clear year of birth. Our community was born around 1984 when the Joint Directors of Laboratories (JDL) model of data fusion was created, which is still basic for us.<sup>1</sup> 1984 is George Orwell's very year, Tracey. Are you creating Orwellian surveillance infrastructures for cities that may turn his dystopia into reality?*

I was completely unaware of this, because I don't know your community very well. But this is a pretty interesting coincidence, indeed. My whole work, however, is an attempt to counter the more Orwellian notion of the "surveillance city" or the "watching city". Or even the Frankenstein version of the Smart City that we are starting to see more and more often, where the parts do not interact with each other, where the countless machines, sensors, devices, are going to break down and fall apart, as these have short shelf lives in outdoor environments or frequently used on buildings.

*The pioneers of data fusion seem to have been unaware of it also. You have delivered a most stimulating keynote at the 22nd International Conference on Information Fusion on July 3, 2019 in Ottawa—"Fusion of Data in an Open Smart City Context". Tell us, Tracey, what are "Smart Cities" all about?*

As I am seeing them, and I paraphrase Rob Kitchin's work on networked urbanism, Smart Cities are technologically instrumented and networked systems of systems that are interlinked and integrated. Here, vast troves of big urban data are being generated by sensors and administrative processes that are used to manage and control urban life in real-time. The focus in this kind of Smart City is most often to quantify and manage infrastructure, mobility, business, and online government services. Of course, algorithms for data fusion and resources management play a key role here as strategically placed sensors around the urban landscape monitor the citizens, their behavior in the

<sup>1</sup> The Data Fusion Group of the JDL, a US Department of Defense committee, created the original Data Fusion Model in 1985. This functional model, aimed at facilitating understanding and communication among fusion theoreticians and practitioners, and its "Fusion Levels" have been driving the discussions since then. F. E. White and JDL published "Data Fusion Lexicon" in 1987.

city, and also city assets, resources, services, and many other factors of urban living.

*Who has an interest to realize these complex infrastructures? Building Smart Cities requires big investment.*

Administrators and elected officials are investing in Smart City technologies and data analytical systems to inform how to innovatively, economically, efficiently, and objectively run and manage the city.

This is a good thing, of course, but it needs to be governed in the public interest. In combination with large data bases, such as Geographic Information Systems, and sensor derived real-time data, local authorities use the insights gained to manage the challenges that the city faces in sectors such as crime prevention, traffic management, energy use, or waste reduction.

*Are you aware of any very first lessons learned from Smart City projects in Canada and elsewhere?*

Yes, indeed I am. In our case studies, we have identified the reasons for deploying Smart City initiatives, the beneficiaries, underlying governance models and deployment strategies, citizen engagement, Smart City business models, and so on. Evidently, Smart Cities are new and emerging. This means that the citizens themselves do not generally know what is coming and may not be the drivers of the development or even be involved in expressing guidelines to follow to ensure that the Smart City works for them. In general, I feel there is some sort of technological solutionism in this business, over-engineering. Don't you think it is much more healthy to identify real issues to be resolved with technology first, instead of creating technology first and then looking for issues? We definitely need overarching principles that govern Smart City design. Astonishingly enough, very few people consider sociotechnical and ethical principles for these types of complex systems. A more mature "technology-aware citizenship" is required.

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*While listening to you, it becomes quite clear that Smart Cities are obviously a huge topic for our information fusion community. Why are Smart Cities of so much interest for you personally? What aspects have attracted you as a researcher?*

During the keynote at the Fusion conference in Ottawa, I was asking the question about “How do we govern the data and the technology at the level of the architecture?” Actually, I was talking about “Open Smart Cities” because of my fear of an Orwellian 1984 surveillance Smart City. We therefore have to build Smart Cities with a proper architecture, as Open Smart Cities from the very beginning. I worry that we are going to get into the lock down of information in the context of the Smart City. For quite a while, I started thinking about issues related to open data, open source, open science, open sensors, open architecture, open platforms, in addition to public engagement, public policy, the environment, sustainability, fairness, and accountability. I was thinking about all of those things because of my background as a grassroots activist, many years ago, on environmental issues, social justice issues, and even antinuclear issues in the early ’80s. And how would those issues get mapped onto the Smart City.

*More precisely speaking, what is the difference between a Smart City and an Open Smart City?*

The definition of a Smart City is what we call networked urbanism or connected cities, which I defined earlier, whereas an Open Smart City is defined by the attempt to bring in these other ideas and to understand them in this context. A city is operationalized and managed by a city government. Those who are going to make decisions about Smart Cities are going to be those Smart City officials. Smart City officials manage the blue (the water), the green (the environment), and the gray (the built environment) material of the city to better govern and help people live better in the city. And they may need to rely on data fusion or real-time data to do so.

*Quite frankly speaking and seen from the perspective of Germany, a country that has had a horrible totalitarian experience, why should the idea of Open Smart Cities architectures prevent oppression?*

In my view, “smart” technology is no longer just about operations. It is about governance, governance of the data, the processes, the infrastructure, and the outcomes of processes and decisions, which means the very ways that smart technologies impact citizens, residents, and visitors. Are these technological systems in the public interest and for the public good? This is the key question. And moreover: What are the benefits and the downfalls, not only of each individual part for specific institutions, but for all of those living in a city when these things become interoperable and interconnected?

*Why exactly is the concept of an Open Smart City a promising concept in view of the public interest and the common good? What characterizes its “openness” in view of this?*

Open Smart Cities, as I see them, are about applying socio-technological systems-of-systems thinking towards the creation of a city where residents, civil society, academics, and the private sector collaborate with public officials. The key is to mobilize data and technologies when warranted in an ethical, accountable, and transparent way to govern the city as a fair, viable, and livable commons and balance economic development, social progress, and environmental responsibility. That requires integrated social and technological system thinking and doing.

*Can you please be a bit more precise? What is the impact of these goals on information communication technologies and information fusion?*

Since governance in an Open Smart City is to be ethical, accountable, and transparent, these principles apply to the governance of the social and technical platforms, which include data, algorithms, data fusion processes, skills, infrastructure, and knowledge. The same is true if an Open Smart City is to be participatory, collaborative, and responsive. An informational infrastructure has to be created in such a way that it can technically and organizationally enable meaningful participation of the civil society, the private sector, the

media, academia, and residents in the governance of the city and the social and technical processes that operate the city and this involves shared rights and responsibilities. All this has an effect of the design of data technologies to be developed, whereby they are acquired and deployed in such a way that are fit for purpose and can be re-

paired and queried and governed to mitigate mission creep. Moreover, when it comes to technology, wherever possible, their source codes are open, adhere to open standards, are interoperable, durable, secure, and where possible locally procured and scalable. The information fusion infrastructure of an Open Smart City is used and acquired in such a way as to reduce harm and bias, increase sustainability, and enhance flexibility. It may defer when warranted to automated decision making and therefore the design of these systems makes them legible, responsive, adaptive, and accountable. It is quite clear, of course, that in an Open Smart City, data technologies are not always the solution to many of the systemic issues cities face, nor are there always quick fixes to complex problems, such as homelessness, income inequality, racism, etc. These problems require innovative, sometimes long term, social, organizational, economic, and political processes and solutions.

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**How can you step out of your roles as technical experts and scientists and also be technological citizens, and collaborate with those on the social side of the equation to ensure that what you are building benefits us all, that you make our world more livable, safe, equal, and fair for all?"**

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*By the way, what is your scholarly background that led you to be interested in Smart Cities?*

Oh, I really have done and been interested in many things in my life. But always I had interest in mapping and data. A more direct path to my current interest was cybercartography during my Ph.D. work. It is a multimodal, multisensory, multidimensional, multidisciplinary version of cartography that is interactive and online. I also have an interest in spatial data infrastructures, which are about delivering data, spatial data, over the internet to the Canadian population, that includes Global Positioning Systems, satellites, radar, digital maps, standards, policies, technologies such as sensors, and all kinds of different institutions working together such as agriculture, defense, transportation, or natural resources. It sounds easy, but is very complex to do. If it works well, you don't even know it is happening. But also, on the cybercartography project, I was the student that looked at sensors, in particular the electronic nose and trying to figure out how to do olfactory cartography. Concurrently, outside of the academy, I was becoming very active in the open data movement in Canada.

Another very important step for me was to work with Professor Rob Kitchin in Ireland, an important actor in the critical Smart City area and a very important actor in critical data studies as well. As part of his Programmable City Project, I conducted case studies about city data and technology to better understand their social and material implications.

*Obviously, there is an interest of Big Tech to make cities smarter. How do you think we can counter the concentration of ever more data—equaling more power, not only financially—in the hands of very few companies with a financial strength bigger than that of many countries?*

They are not investing at all. The companies early on offered these technologies as gifts. The company said, "You can test out", and so Dublin, for example, became a laboratory for technology companies. And in a way, the Smart Cities that are being promised are giant laboratories. I work in a university with smart taps, as we want washrooms where you do not touch things, so there are lots of sensors, but now if we want to repair the tap in your bathroom...well, you need an electrician, you need a plumber, you need a software someone, and a sensor expert. Think about it! When your tap breaks here, you only have to call one person or you fix it yourself! Well, in a smart building, you need whoever installed the entire smart system. But these companies come and go. They don't last forever. So,

whom do you call? Who gets the contract for your smart building? Who upgrades the sensors? Who does the maintenance? What happens when you scale that up to a whole city? You suddenly have Frankenstein cities, if you will, with their lack of interoperability, these multiple negotiated experiments, where the companies benefit because they're getting access to people's data.

*Would you say that interoperability is the key for the success of Smart Cities?*

IBM created the first notion of a Smart City. *Ubiquitous computing*, which you know way more than I do, you could call that some sort of early Smart City thinking. It enables a sensing city, a sentient city, an intelligent city, a wise city, an accessible city, a safe city. A safe city would involve policing, emergency preparedness, military...which is also part of a Smart City. Those highly automated, highly technologically informed environments already exist. They are just not interconnected in an all-seeing way. So, if we have all of these separate systems fused and interoperating, would interoperability be our friend or is interoperability our foe? We have to have interoperability, but actually in a Smart City, a lack of interoperability might save us, because we might mitigate the surveillance city scenario that is being witnessed in some countries.

*From your work and your experience, do you think it is possible to prepare procedures in order to create some sort of a certificate that a certain Smart City technology is societally acceptable?*

A certificate would be too strong a word, perhaps, but yes, the question is right: Will a certain technology actually lead to the health and well-being of the society? And in addition, will it bring the environment in balance with the economy? So, let us go to the first part of the definition of an Open Smart City: fair, transparent, and accountable and balancing the social, economic, and environmental needs of the city. The economy and the city as a habitat or as a human commons needs to be sustainable, it needs to not damage the environment, and balance economic benefit.

*So, we will have different criteria than those we usually use, i.e., measurable, quantifiable criteria. You are telling us to consider criteria which are not as easily quantifiable and which comprise environment and human factors.*

That would be really interesting. So, what is the social and technological code of conduct and governance, whatever, the

strategies or principles for data fusion experts? And, I mean, you have such a diverse community doing diverse things. Do no harm, how do you benefit all and marginalize none, how do you reduce racial profiling or other forms of bias, and how do you build with equality and justice in mind, but how does that translate in a large social and technical complex systems of systems like a Smart City? What ethical principles do you need to have in play? What is the decision tree? If this then that...if that then this. It is about the whole and it is about the parts, it is about governing the systems of systems.

*What about the vulnerability of Smart Cities? We Europeans are afraid of already being a target in hybrid warfare. A cyber-attack on a Smart City should be so easy.*

You are asking for a robust Smart City, a defensive Smart City, a city with an electronic bubble around it that makes it impenetrable from a cyber threat? Doesn't this mean we are back to the walled cities of the mediaeval times? Cities of quartz, silicon cities. Is that the direction where we are moving to? Because in a way, information communication technology is perfect for that, isn't it? Actually, I am thinking of something better. I want to know if my city is happy. I want to know from the social media profiles of my citizens if they are feeling blue [depressed]. I want to know from Twitter or whatever is rocking any social media boat at any given time: "How are my people doing?" And how can I measure behavior, sentiment, movement, weather, how they feel during a football match when there is a cool evening summer breeze at the end of a

hot day, and how can I understand how they are moving and behaving from their phones? So, should I model the city and the behavior of the citizens so that it's optimal collectively? So, suddenly you're getting into totalitarian kind of thinking...one that is called social physics, or a kind of technological determinist solutionism. There needs to be a balance, fair, accountable, just, etc.

*Oh, you are describing the older sister of Orwell's Big Brother then.*

No, the scenery is a kind of nudging. But it could be stronger than nudging. But, it's this idea that you can and should mathematically model everything, from sentiment to mobility, and furthermore, that you should live according to the mathematical model that was developed. And it is this false dream of the optimal golden mean, right? There is an optimal equation that should be imposed on the society, and that I could come up with that equation. If only I had all these data! If only I had ubiquitous computing! Should we leave the governing of cities to the big companies and to social physicist who want to design models for us to live by? No, I do not like that kind of Smart City! Smart Cities are vulnerable, not only by an external attack, but also from within, if we do not govern them.

*Are community organizations and nonprofit resident organizations thinking like Saul Alinsky's and his "community organizing" in Chicago, or Jane Jacobs, aware of Smart Cities as a tool to "smartly" transform societies into "Smart Tyrannies"?*



Wolfgang Koch, Tracey Lauriault, and Anne-Laure Joussemle in Bonn, Germany.

That is a good question! It's different, the issues are different and smart technologies are a different type of city actor. In Barcelona, for example, it is the civic technology community that pushes for better decision making with the use of data analytics for specific problem solving. If you look to the Pirate Party [an elected political group] in Iceland—that too is kind of related. In Germany, you have the movement of the Computer Chaos Club that is involved in what I would call technological citizenship. They know their tech, they know their social science, and they know their politics, and they inform government technology policy. You however cannot solely have these groups of people govern but they should be part of the multisectoral and multidisciplinary teams, or a citizen city committee to advise on Smart City technologies. Many civic technology and open data community organizations are also technologically solutionist in their orientation, and often they are idealists, but they may also be libertarian and will miss social justice, equality, intersectional issues, and so on. As technological solutionists, they may not understand social policy. So, don't let them govern on their own, but we need them to be part the discourse, along with antipoverty organizations, childcare advocacy groups, immigration settlement organizations, policy experts, and of course city administrators, right? We need that sophisticated technical thinking, but not only that.

*So, in the end, what is your definition of Smart City?*

There are many actors in the running of a city, but just like the Open Smart City V.1.0 Guide is new and just like the definition is new, and Smart Cities are new but are mostly for the moment disconnected smart intelligent systems. There is no one organization or group that is doing all of this, but everybody is doing a piece of it. The intention of the Guide and the Open Smart City definition was to bring all the pieces together in a way that people could understand, and provides something to aim for, a type of road map if you will, to ensure that our cities remain livable and just for all, and that we govern the technology in our best interest instead of having the big technology companies governing us!

*How did you get in touch with our information fusion community?*

Elisa Shahbazian called me up, as my friend Robert Davidson and colleague whom I serve with on the Multistakeholder Civil Society Advisory Committee to Open Government in Canada recommended me. In the end, I said to her quite frankly, I am a lightweight for you data fusion folks because I don't do the stuff you do. She replied, "We need to hear something different, and I heard your talks and thought you would be a good fit". That's why I chose and wanted to spend time with your community for a couple days, why I stayed as much as I could. I am innately curious and love brand new communities, as each has a culture of its

own. I didn't fully comprehend the sessions I went to, but what I got was an understanding of the community. I got an understanding of the problems that the community is generally working on. Again, I don't comprehend the mechanisms and the algorithms, but I understood that this is a community that works in the deep recesses of infrastructure to ensure that things hum along, that they work, that things work together, and that the things are secure. It is really useful for me as a scholar and as a technological citizen to know about the important work that data fusionists do.

*If you are using a car, you are not interested in how an automatic transmission actually works. You want to have it and to use it. What do you want from us? From the data fusion community?*

Your community is building machines that create the information and that keep systems working. This information is directing autonomous cars or the traffic management system, the airplane, the electrical grid, defense system, weapons, etc. What I wish is that this work gets done with the recognition of some of foundational, ethical, and principles and values. And that that is articulated as part of the system

you are involved with, the social and technical systems that are in our shared world, and these affect us. The sense that I get from you Wolfgang and you Anne-Laure, and the group of people that I met, was that you are so efficient at what you do because you are working at another level. You were already working at that principled level. This means if your good work is plugging into a city all the things that a city infrastructure is doing, and is intersecting with your work, and then your work is feeding it back, city officials have to know how to do their work properly to fit into yours; and in such a way that it doesn't become a surveillance city. In a way, what you are doing is you're creating the underlying infrastructure to do it, for good and for bad. So how to do your work to be on Princess Leia's side and not Darth Vader's?

We are worried about 1984, we see some places very much operating like Orwell's science fiction. We are also witnessing regime changes, and more rigid forms of thinking and power concentration. And you, as data fusion people, are building this big fused technical system that is the prerequisite of Orwell's world. How can your community technically support the socially responsible use of the power of the technologies you are building? How can you step out of your roles as technical experts and scientists and also be technological citizens, and collaborate with those on the social side of the equation to ensure that what you are building benefits us all, that you make our world more livable, safe, equal, and fair for all. I cannot give you an actual algorithm on how to do that, but certainly I see, and sense, based on my couple of days with the data fusion community in Ottawa, and after spending a full day with you two here in Bonn, that there is a willingness to do so, and the intellectual flexibility to do so, and dare I say a spiritual inclination or moral compass that would lead you to do so!