

Smart Cities

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■ **THE CITY OF** tomorrow is smart, equipped with sensors that measure the daily movements of its citizens; the pollution of its air water; the quality of its roads, bicycle lanes, and sidewalks. A smart city dynamically regulates its traffic, guides its visitors to interesting events and places, and advises its travelers which public transportation to choose based on real-time information. However, with a wealth of information on its inhabitants and their physical and social environments, a smart city may also feel like Big Brother invading our privacy as it scrutinizes where we go, where we shop, where we eat and drink, and whom we visit.

But what makes a city actually smart? Largely following Caragliu *et al.*,¹ we can state that a city is smart when investments in human and social capital, as well as digital infrastructure, fuel sustainable economic growth and a high quality of life through participatory governance. There are at least three key elements in this definition. The goal is clear: we want to boost economic growth and improve the quality of life. To that end, we need to invest in people and in digital infrastructure. Equally interesting is that Caragliu *et al.* state that we need participatory governance. Putting these key elements together means that a smart city is not defined by the digital technology that we use with the goal of optimizing or replacing many of the present-day processes. Engagement of all stakeholders, including citizens changing—improving—their way of thinking and working, is needed to make a city smart. It is clear that we still have a long way to go.

This need to go beyond technology is becoming increasingly recognized by many scientists and engineers operating in the field of computer science. For example, the Digital Society Institute of the University of Twente has identified three grand challenges in the digitalization of society. The first challenge is that of developing digital technology that we can justifiably rely upon: digital solutions that just work, flawlessly and without requiring special attention by ordinary users. The second challenge involves the adoption of the technology by society. Recognizing that we are increasingly living in a digital environment, it is essential that we learn to deal with that environment, but also that this environment itself learns to deal with varying social contexts. Technology push alone is not a feasible approach, and we need to put serious effort into designing digital solutions that people will actually adopt and willingly make part of their daily lives. Finally, as the third challenge, we need to ensure that people can make the right decisions when being informed by a digitalized information system, whether it is simple car navigation or a digital broker advising you to buy stock. Well-informed decision making, or, more directly put, accountable decision making based on data analysis is what is at stake here.

It is clear that we need to find the right balance between introducing (digital) technology and getting all stakeholders on board. However, there are at least two pitfalls in the process toward smart cities.

The first is that many people have a fairly narrow view about the role of digital technology when making cities smarter. Many of our colleagues from the social sciences may have a

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strong point when they state that digital technology cannot be viewed as a neutral set of instruments. Instead, these technologies often yield implicit social expectations and policy directions. Just think of the disruption in many cities through the introduction of Uber. Likewise, Airbnb has forced many city councils to rethink their policies concerning regulations for overnight stays. In effect, we see that technology giants may have an unforeseen effect on how cities are governed even to the point that some people are wondering who is actually in control. Likewise, by introducing data corporations into the city arena, we are suddenly confronted with the fundamental question of not only who owns the data, but also who has the information to make the right decisions?

This brings us to a second pitfall: does city government, let alone citizens, have sufficient knowledge and expertise to understand the ramifications of deploying digital technology in our cities? When cities are very big, we should expect that there are enough resources to get the digital experts on board who will assist in making the right decisions. But is this also the case for smaller cities for which digital innovations need to be relatively cheap, as so many other urbanization problems have much higher priority? That situation is yet more acute in rural areas. A frequently deployed method to improve the experience in new matters, which operates independently of the size of a city, is to install living labs: the experiment in a restricted, controlled setting with the introduction of new digital solutions for end users. Unfortunately, scaling up a living lab to a real environment continues to be challenging for myriad reasons. In this sense, living labs often illustrate the huge gap that needs to be bridged between the experts in digitalization and those who will eventually have to adopt that technology.

The optimistic view on these developments is that the technologists are actually taking a different path based on what we have learned so far. Scekic *et al.* from the Technical University of Vienna describe a smart-city platform that is explicitly designed to operate properly only if all stakeholders are on board: citizens and companies, as well as local government. Their view is that smart cities need to be democratized by offering citizens the opportunities to create value independently from central authorities and

through digital means. They sketch how a value-driven approach, supported by modern decentralized solutions such as blockchains, can bring citizens into a position where they can make the best use of what a smart city has to offer.

Smart cities are also all about sensing. We generally tend to think that this needs to be done through physical sensors, such as those for measuring environmental conditions or WiFi scanning for pedestrian dynamics. Machado *et al.* take the approach that sensing can also be done by looking at what is going on in social media. Combining social and spatiotemporal characteristics through data analytics provides abundant information on the whereabouts of a city, essentially turning its citizens into a city's sensors. Urban sensing may prove to be necessary in getting a realistic view on smart cities.

There is much to say about both papers, yet they illustrate an important trend in Smart-City research: systematically placing citizens at the core and moving away from the technology-push approaches we have mostly seen so far. There are many new issues to be dealt with, not in the least those related to privacy and the relationship between citizens and local government, but a start has been made.

REFERENCE

1. A.Caragliu, C. Del Bo, and P. Nijkamp, "Smart cities in europe," *J. Urban Technol.*, vol. 18, no. 2, pp. 65–82, 2011.

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