Smart City: Forget About Glossy Technologies, Address Social and Cultural Issues With What We Already Have at Hands

What if cities were already featuring the infrastructure they needed to become smart? What if the challenges were more cultural than technological? Fábio Duarte[1] is an expert in urban planning and mobility, he is, among others, Principal Research Scientist at MIT Senseable City Lab and consultant for the World Bank in transportation and land use. He claims we need to go beyond "glossy" technological projects and make the most of what we already have: this is his "Flintstonian" approach to smart cities. This approach helps him avoid major pitfalls and come up with original projects such as an autonomous boat fleet in Amsterdam's canals or a cheap and scalable way to test millions of American for Covid-19 … through the sewage systems.

To what extent is research at the Senseable City Lab original?

The Senseable City Lab[2] is a particular laboratory at MIT. Although it is part of the MIT Urban Studies and Planning department, among the 35 to 40 people who are working there, approximately one third are computer scientists, mathematicians or physicists, another third are more hands-on engineers that technically create prototypes and the last third are urban designers and data designers (for data visualization). For 20 years we have embedded always more sensors in cities, and only now are we understanding the potential of the tools developed to make more sense of this massive amount of data. Our goal at the lab is to understand how it might change the way cities look like, and also, how it will shape how people live and interact.

However, we want to avoid the mistakes of too many smart city projects that partly explain the failure Sidewalks Lab faced in Toronto. Most smart city experts share this mindset: "We need another technological layer and it must be shiny." They develop glossy solutions but forget to address major questions: it is shiny, but does it help us tap new useful information? Do we really need another technological layer in the cities, when a lot of existing infrastructure remain underexplored?

A counterexample of this faulty approach is our Underworlds[3] project. We looked into a 150-year-old infrastructure everyone takes for granted: the sewage systems. And we wondered how our current technologies could help reveal its unexplored potential. We designed very simple robots that collect samples and analyze used waters and thus contribute to tapping this vast reservoir of information on human health and behaviour. For instance, at the present time, only 1% of the U.S. population is being tested for coronavirus. A spin-off company Biobot Analytics, is able to detect the virus in sewage and test areas that amount to 10% of the U.S. population. Because the technology is so simple and so cheap, we can easily scale it.

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[1] https://dusp.mit.edu/faculty/fabio-duarte
[2] http://senseable.mit.edu/
[3] http://underworlds.mit.edu/

The Jetstons
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The Flintstones
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I like to use this comparison between these two approaches to smart cities, and the two cartoons invented by Hanna Barbera in the '40s. On the one hand, you have the Jetsons, who live in the space age surrounded by fantastic technologies, where each family consists of a husband (the only one who works), a wife, two children and a (robot) maid. A society where glossy technologies coexist with rigid social and cultural standards, a world deprived of the imagination to invent the next technologies. On the other, you have the Flintstones. They are cavemen living in a Stone Age-like world, with prehistorical cars and showers, and even dinosaurs. A resourceful society where they use their simple technologies to reinvent their world (for example, a peacock's bill can help play records).
I clearly prefer "Flintstonian" smart cities[4]. Otherwise we are doing glossy superficial stuff without addressing social and cultural issues.

Is that what you had in mind when implementing the five-year Roboat research project?
Undeniably, canals are also good examples of underexplored infrastructure in many cities such as Venezia, Amsterdam and Tokyo. This is at the core of the Roboat project which aims to deploy a fleet of autonomous boats in Amsterdam's canals.
First of all, the road race has progressively replaced the water race in Amsterdam. As a result, more than 30% of the canals' surface has been replenished with roads. Secondly, MIT had been involved in autonomous road vehicles experiments in a Singapore neighbourhood. We were wondering: what is missing? We thus looked for other types of autonomous techniques and came across aquatic autonomous technologies. You can imagine with the numerous overseas travels that the technologies are already quite mature in open sea environments, but not in urban areas and their inherently restless interactions. Nowadays, cities around the world are investing in autonomous vehicles, or are actively thinking on the necessary adaptions for this new technology. Working closely with Amsterdam's officials, we thought: on the one hand, Amsterdam is suffering with increasing road traffic, on the other hand, the city has an extensive and yet underutilized canal infrastructure. Developing autonomous boats could be a unique opportunity to rethink a centuries-old urban infrastructure and at the same time put Amsterdam at the forefront of autonomous technologies.
In a nutshell, we are developing these cutting-edge technologies in an attempt to help solve pressing urban problems by regaining the dismissed functions canals previously fulfilled.

During this exploration, what kinds of challenges did you encounter?

[4] https://tedxbeaconstreet.com/videos/flintstonian-smart-cities/

The main challenge, that we had clearly foreseen, is that there is no benchmark for the technology we are developing. The autonomous technologies for the open sea, and others with basic autonomous technologies (like the ferry, which always follow the same path) have to be adapted to a busy canal context and our Roboats would need to be fully autonomous. Though the technological challenge was huge, we are going to solve it: the Roboats are ready to be tested … when the pandemic allows it.

Another big challenge, which is less clearly defined, is the legal aspect: cities are not yet prepared to receive autonomous technology. This is something we've been working with the city as well. A simple example is that we cannot call a Roboat a boat because legally, a boat requires a captain. But since it is designed to be autonomous, it will have no captain. This is not just anecdotal, it encapsulates all the legal challenges we might encounter. These challenges are all too familiar with autonomous cars: without drivers, who would be responsible in case of an accident? I think in the end we will encode all the legal aspects into the digital layer. A simple example would be an autonomous car system that knows this portion of the road is restricted to a 30 km/h speed limit and GPS can sense the car is approaching this portion can thus make the car adjust to what is embedded in the physical environment. And when laws change, the code can be modified and instantaneously be updated directly in all vehicles.

To what extent do experimental research projects with interdisciplinary teams constitute a paradigm shift in urban planning?
Only the collaboration between MIT, the AMS Institute, the city of Amsterdam and private partners has made the project possible. Roboat involves robotics and computer science, urban design and policy, environmental engineering and logistics. Such complex project is the very nature of how urban planning project will need to be addressed in the future in which technology is embedded in the fabric of the city.[5]

Interview by Lauriane Gorce, Scientific Director of the Institut de la technologie pour l'humain—Montréal

[5] http://senseable.mit.edu/papers/pdf/20200416_Duarte-etal_Roboat_RoutledgeSmartCities.pdf