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Most of us encounter public spaces in our daily lives: whether it's physical space (a sidewalk, a bench, or a road), a visual element (a panorama, a cityscape) or a mode of transport (bus, train or bike share). But over the past two decades, digital technologies such as smart phones and the internet of things are adding extra layers of information to our public spaces, and transforming the urban environment.

Traditionally, public spaces have been carefully designed by urban planners and architects, and managed by private companies or public bodies. The theory goes that people's attention and behaviour in public spaces can be guided by the way that architects plan the built environment. Take, for example, Leicester Square in London: the layout of green areas, pathways and benches makes it clear where people are supposed to walk, sit down and look at the natural elements. The public space is a given, which people receive and use within the terms and guidelines provided.

While these ideas are still relevant today, information is now another key material in public spaces. It changes the way that people experience the city. Uber shows us the position of its closest drivers, even when they're out of sight; route-finding apps such as Google Maps helps us to navigate through unfamiliar territory; Pokemon Go places otherworldly creatures on the pavement right before our eyes.

A virtual world. https://paintimpact.com/ (Flickr)., CC BY

But we're not just receiving information – we're also generating it. Whether you're "liking" something on Facebook, searching Google, shopping online, or even exchanging an email address for Wi-Fi access; all of the data created by these actions are collected, stored, managed, analysed and brokered to generate monetary value.

## Data deluge

But as well as creating profits for private companies, these data provide accurate and continuous updates of how society is evolving, which can be used by governments and designers to manage and design public spaces.

Before big data, the architects designed spaces based on mere assumptions about how people were likely to use them. Success was measured by "small", localised data methods, such as post-occupancy evaluations, where built projects are observed during their use and assessed against the designers' original intentions, as well as fitness for purpose and performance. For the most part, the people who used public spaces did not have a say in how they were designed or managed.

Now, public space is becoming increasingly dynamic. Information about consumption is being used to shape production, in a hybrid process called "prosumption". One example of this is TV competitions where viewers have an active role in deciding who is going to remain or leave the show. In an urban context, there's the TfL Open Data system, where all data produced by Oyster Card holders are made available for people to raise awareness, develop new programmes, visualise data or analyse statistics.

## Digital cities

And this is just the beginning. A growing number of projects are demonstrating the potential impacts of big data on our experience of public spaces. For instance, engineering firm Arup came up with a "net" of public data which allows individuals to see their direct impact on urban data in real time. And

designer Keiichi Matsuda offers a strong visualisation of possible future scenarios, where the digital and physical aspects of space are synthesised.

If it is true that cities are increasingly becoming spatial social networks of interaction, we are all in front of a crossroad: then we can either continue to unthinkingly produce a deluge of data that will result in the space we live within, or we can start taking control of it. If we all use the power and potentiality of big data and ubiquitous computing in a clever way, we can actively contribute to the making of the public realm, by inputting data and generating information consciously.

By being aware of, say, the wider impact of our Twitter feeds, Facebook responses or personal information sharing, we can make data analysts and brokers go in one specific direction or another. For instance, the code-animated graphics on the giant LCD screens in Times Square respond to the time of the day, the amount of people in the square and the events happening in a specific time. People in the square can change the configuration of the backdrop by moving around the different parts of the public space.

If members of the public are aware that their (data-producing) actions are listened to, collected and used to shape decisions, then they can become an active part of that process. Projects such as Live Singapore! – which provides a platform for the collection, elaboration and distribution of real-time data about what's going on in the city – show how people can use the urban data they help to create, to better understand their city and inform their actions.

We still are quite far from the day when public spaces are shaped as the people desire, in real time, with a high level of customisability. Becoming more conscious of how individual actions can shape public spaces is just the first step.

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