Arch Daily: Who Will Design Our Smart Cities? (Hint: Not Architects)

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The New City of Songdo in South Korea. Image Courtesy of Cisco

*Originally published by Metropolis Magazine as "*Big Data, Big Questions*", this article by Alex Marshall examines what is arguably the most important aspect of smart city design: not how they will be created, but who will create them. He finds that, though an apparently new phenomenon, smart cities are just like their forebears in that they are built primarily by political will, not microprocessors.*

Not long ago, I bought a beetle-shaped piece of silicone and metal that slips into my pocket and keeps track of how much I walk. Called a Fitbit One, it's essentially a glorified pedometer. The device's shell is jammed with hard- and software that lets it talk to my computer and iPhone. It sends me *attaboys!* on its tiny screen and, most importantly, the gadget talks with my spouse's Fitbit, which allows us to compete with each other.

The Fitbit is not on anyone's list of smart-city phenomena, but I would argue for including it, because it's changing my relationship with the streets I walk in New York City. It also illustrates the pervasiveness of smart technology, and its limitations. For all its coolness—and it is cool—my device is doing something digitally that had already been done well mechanically, and at a

lower price. A lot of the smart-cities technology is like this—it's changing how we do things, but often not what we do.

Read on for more about the changes brought about – or not brought about – by smart cities after the break

At the Intelligent Operations Center in Rio, workers manage the city from behind a giant wall of screens, which beam them data on how the city is doing— from the level of water in a street following a rainstorm to a recent mugging or a developing traffic jam.. Image Courtesy of IBM

Like its brethren S-words "smart growth" and "sustainability," "smart city" can mean just about anything. I define it as the marrying of the city, in both its urban and suburban forms, to the telecommunications revolution signified by the silicon chip, the Internet, the fiber-optic line, and the wireless network. Because this revolution is so broad, deep and ongoing, it's impossible to list all the present and future ways these technologies can—and will—reshape how and what cities, and their inhabitants, do. It's my Fitbit. It's cameras in plazas; sensors in sewers and water mains; an official in City Hall controlling individual streetlights through a smart grid; cities laying their own fiber-optic lines and creating their own broadband networks, and big companies seeking to stop them through lawsuits and lobbyists. It's New York City using GPS data from taxicabs to do traffic planning; driverless cars; entirely new cities, such as Songdo in South Korea; a smartphone app that alerts you that a train is two minutes away. And it's the related data—the big data—collected from these systems.

"The old city of concrete, glass, and steel now conceals a vast underworld of computers and software," writes Anthony M. Townsend in *Smart Cities: Big Data, Civic Hackers, and the Quest for the New Utopia* (W. W. Norton & Company, 2013), perhaps the best book written

on the phenomenon. “Not since the laying of water mains, sewage pipes, subway tracks, telephone lines, and electrical cables over a century ago have we installed such a vast and versatile new infrastructure for controlling the physical world.”

But as wondrous as these new technologies are, we should remember an old truth: the fiber-optic line and everything else are just tools. Like fire or an axe, they deliver power and possibilities to whomever wields them. A policeman can use street cameras with facial-recognition software to look for a thief; a dictator can use them to hunt for dissidents (and the National Security Agency can use them for God knows what). What’s important about these technologies is what’s always been important: who controls them? So far, different cities even within the same country are answering that question differently. One clear divide is public vs. private, but that’s too simple. There are public/private partnerships with government taking the lead, and the converse.

Many of the smart-city initiatives—whether lighting in a building, trains in a subway, drivers on streets, or airplanes in the sky—revolve around collecting information about the moving parts of a system in real time, to allow a central operator more control. Again, this raises the question: who will have that control? Large companies are involved in many of these efforts, and it bears watching how much control or veto power they end up with as city governments contract with them.

Three companies—IBM, Siemens, and Cisco—are receiving much of the attention, in part because they have initiatives that use the label “smart cities” or some variation of it. These companies have mapped out contrasting, and sometimes competing, roles for themselves. IBM illustrates the change that companies are both weathering and instigating. For years, many Americans, particularly in the corporate world, knew the fabled Big Blue as the maker of the boxes that sat on their desks. Today IBM doesn’t even sell personal computers. Although it still makes mainframe computers, IBM now calls itself a “transformation” company.

Transportation is big part of IBM’s Smarter Cities program, which also handles electricity, energy, water, weather, and most measurable aspects of city life. Although the content is different in each category, the approaches are the same. Data is collected from as many sources as possible, and then analyzed for prescriptive use. With transportation, this means that drivers may be alerted to traffic jams before they happen. With weather, snowplows might be sent out earlier, and to the right places. Water consumption can be fine-tuned. Although the company sells the transportation, water, and other types of Smarter City software separately to different city departments, IBM’s aim is to handle all of them in a coordinated package that it calls its Intelligent Operations Center.

At this center, which can be a physical place or simply interlaced software programs that meet in the cloud, cities receive information from sensors on water mains, weather data, crime reports, citizens’ smartphones, pothole repair crews, and much more. It constructs what computer scientist David Gelernter called “mirror worlds” in his 1991 book of the same name—a simulacrum of the unceasing roar and buzz of city life.

Courtesy of IBM

The flagship example for this approach is Rio de Janeiro, which is preparing for the 2014 World Cup and the 2016 Olympics while recovering from devastating flash floods in 2010. Both Mayor Eduardo Paes and IBM clearly want their new system to be a showcase. In a new glass-skinned cube of a building, called the "Centro de Operações," officials sit in a theater-size room behind personal computer screens, while in front of them a giant screen beams out constant information about the city. It's an impressive, if Orwellian, image that recalls the Big Brother scene in the famous 1984 Apple commercial. (People may forget that the bad guy in this ad was monolithic IBM, not the still-emerging Microsoft.) In its Smarter Cities programs, IBM claims to have worked with more than 2,000 cities worldwide. As the technology is improved and cities grow comfortable with it, the goal is to speed up the cycle of data collection and analysis, and then response. "We don't give them just the data; we give them predictions, and recommendations as to what to do about it," says Laura Wynter, director of IBM's Singapore Research Lab.

According to Townsend, IBM's Smarter Cities initiative comes out of efforts the company made to create an automatic reservation system, called SABRE, for commercial airlines in the 1960s. This, in turn, derived from air-defense work for the U.S. Air Force in the 1950s. And although IBM has usually been associated with business, one of the company's founding branches got its start inventing a better way to collect and analyze population data for the U.S. Census Bureau in the late nineteenth century. So, clearly, big data for the public sector is not a new initiative for Big Blue.

Founded in Germany in 1847, Siemens also got its start in communication and data, developing better equipment for the telegraph, then the dominant means of long-distance communication. The company is now involved in everything from manufacturing high-speed rail cars to cardiac-

care components. (Its long arms reach far enough for President Obama to cite Siemens America in his 2012 State of the Union speech.)

The smart-city work Siemens does is best illustrated by two projects in New York City. In the private sector, the company recently helped transform JPMorgan Chase's 1961 modernist skyscraper on Park Avenue into a LEED Platinum building. Siemens installed an internal control of heating, lighting, and other systems, which allows building management to have centralized control down to individual rooms. (It's the equivalent of IBM's Intelligent Operations Center, on the building scale.) During heat waves and other peak periods, the building uses Siemens' Apogee Building Automation Software to reduce the electrical load. Participation in Con Edison's Demand Response program qualifies the company for a rate reduction.

On the public side, Siemens is working with the Metropolitan Transportation Authority (MTA), which runs the commuter railroads and the New York City subway, to install transponders, radio receivers, and other technologies on the tracks, trains, and in control rooms to create a smarter subway system. Its principal purpose is to allow central control operators to know precisely where subway trains are, in real time, and ultimately control the trains remotely, without drivers. This would have many benefits. It would allow, for example, the 600-plus trains (with more than 6,000 individual cars) on its 24 lines to run closer together. If ten-car trains can run two minutes apart rather than three, the MTA will have effectively doubled a line's capacity. It's an enormous, long-term modernization project that involves working with unions, and will likely take many years. But it's crucial work on the overcrowded system, which has many lines running at capacity now, and whose daily ridership hit an all-time high in 2013.

Cisco, the other big company, comes out of Silicon Valley. It supplies the routers and other networking equipment for smart-city-style programs. A signature project has been the new city of Songdo (master planned by Kohn Pedersen Fox), 40 miles outside Seoul in South Korea in the special Incheon Free Economic Zone, where companies are given tax incentives, among others, to invest. Built over the last ten years and nearing completion, at least physically, Songdo's tall towers and now largely empty streets were built from the ground up to incorporate digital technology and intercommunication between sectors. Classrooms, hospital rooms, and apartments were pre-equipped with video screens and telecommunication lines. Roads, water, and electrical lines were also built with sensors, so traffic, and water and electricity use can be monitored and controlled digitally. It's billed as a $40 billion project. But it's not clear how successful it will be. The big multinational corporations are not flocking here, and they may never. There's also the risk that the city's digital infrastructure, some of it planned in rudimentary form a decade ago, will quickly become outmoded, given the rapid pace of change in the tech world.

In the new city of Songdo outside Seoul, Cisco has spent millions creating wired, intelligent urbanism from the ground up, where roads talk to traffic managers and the electrical grid is digitally adjusted acording to peak demand. “This vision of the future is what Cisco calls the Internet of Everything (IoE),” says Ruthbea Yesner Clarke in the white paper for the company.. Image © H.G. Esch

For cities, what these and other companies offer is a juicy apple promising services and expertise at an affordable cost. But they also may lock cities into proprietary systems that reduce incentives to cultivate in-house expertise. “If you were changing subway operators, you would not want to tear out the tracks,” Townsend says. “These private/public partnerships are the devil’s bargain. Your data may be hosted on a propriety platform, maybe in another country. How will these relationships work? What do you do if you want to move your data?” In other words, can Rio de Janeiro really walk away from IBM’s Intelligent Operations Center now that it’s up and running?

This situation has historic precedents. In the nineteenth century, governments gave private railroad companies too much power and money and too little direction, and were subsequently often left at their mercy. In the twentieth century, the federal government granted AT&T a monopoly on telephone service, but in return got the groundbreaking Bell Labs and dependable service for virtually everyone. But prices were high. There are always trade-offs.

These examples remind us that, for all their potential, new technologies can’t solve what are essentially political questions about power and rights. Sending health-care data from your bedroom directly to a hospital won’t deliver national health care to everyone, nor control the growing power of big hospitals, big pharmaceutical and big insurance companies. Burgeoning technologies may, in fact, make it easier for them to grow larger and exercise even more control. Siemens’ work shortening headways on the subway won’t give the MTA the roughly $2 million

a car it needs to buy, and then run, more trains. Nor will it return full manufacturing capability to the U.S. so that those cars could be made here rather than in Japan, or Germany.

The airlines are an illustrative point here. Smart technology has, without fanfare, transformed how aviation functions. “It was estimated in the late 1990s that 50,000 electronic exchanges of all sorts were required to get a single Boeing 747 off the ground, from booking seats to ordering food and fuel,” Townsend writes in his book. “While it rarely feels so, the air-transportation system is among the smartest infrastructures in our cities.”

But marveling at the wonder of these systems misses a glaring fact: Although it has made flying safer, smart technology has not made air travel better or, arguably, even cheaper for the average flyer. This is because while airlines were upgrading their technology, they were also (with the federal government’s approval) merging. Today four companies control 85 percent of air travel.

Aviation’s next big revolution is the NextGen air traffic control system. Like a larger and more expensive version of the system Siemens is installing on the New York City subway, NextGen will use satellites and digital communication, instead of the largely ground-based existing system, to precisely track the location of planes. This will allow them to fly and land closer together, squeezing more planes into the few big metropolitan areas whose airports are overloaded. The system, which the Federal Aviation Administration is slowly rolling out, is expected to cost about $42 billion, with at least half coming from taxpayers. But NextGen won’t improve service for the midsize city with plenty of capacity that the big airlines are currently ignoring, or deliver cheaper fares to the average passenger.

Bike-Share in St. Paul, Minnesota. Image © Flickr User Taestall; Licensed via Creative Commons

The brightest spots in the smart-cities movement are the municipalities laying fiber-optic cables to create their own broadband networks, as well as provide telephone service, cable television, and smart grids for electricity. Burlington, Vermont, has a citywide fiber-optic network capable of serving 16,000 households and 2,000 businesses, built independently of cable or other private utility companies. Hundreds of other cities—including Clarksville, Tennessee; Spanish Fork, Utah; and Thomasville, Georgia— have similar systems. The smaller size of these cities has kept them—and the war big cable and phone companies are waging against them—off the national radar.

Comcast, Verizon, and other companies are using lawsuits and lobbying at the state level to block this civic movement. Unforgivably, about half of the states now have laws that either prevent or substantially impede cities from setting up their own broadband networks. (It's as if Perrier or Poland Spring had persuaded state legislators to stop cities from creating public water systems.) "Every community should decide for itself what the best solution is, but many state laws take that decision out of their hands," says Christopher Mitchell, who is leading the charge for city-owned broadband networks through the Institute for Local Self-Reliance, in Minneapolis.

We should temper our enthusiasm for smart-city initiatives by remembering that some of the most transformative programs in recent years have been inspired by better thinking: the bike-share programs in Paris, London, and New York; bus rapid transit in Curitiba, Brazil; the livable-streets movement; and market-rate parking strategies, among other things. While all these programs incorporate the latest technologies, they don't stem from them. What made bus rapid transit possible was a eureka moment from Curitiba's former mayor, Jaime Lerner, when he realized that if you cleared a line for buses and had passengers board simultaneously through multiple doors, a once-lumbering bus system could resemble a subway, providing fast service between fixed points. The beauty of the bike-share program is the chutzpah of seeing the bicycles freely distributed and used as transportation (not recreation), and then giving over space in the streets to them.

I first read about bike sharing as an idea back in the early 1970s, reading my older brother's copy of Richard Ballantine's popular *Richard's Bicycle Book*. The cycling guru outlined his vision of free, publicly owned, and labeled bikes distributed around the streets of the Big Apple, with a coinciding reduction in cars. This sounded utopian to me and I thought, "This will never happen." But in May 2013, a few days after Ballantine's death at age 72, Citi Bike began operations. Technology certainly played a key role here. The system lets users see where bikes are available, in real time, on their smartphones. But it wasn't technology that made it happen. It was imagination and political will.

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