Bond Case Briefs

Municipal Finance Law Since 1971

The Soft Infrastructure of Smart Cities.

Cities serve as crucibles of civilization. Throughout history they've provided defining images of our advances in engineering and design but also reflections of our worst industrial and technological imperfections. Cities have been characterized in many ways. Only recently, however, have we begun to call them "smart."

In fact, "smart" is getting applied to all manner of infrastructure, from buildings and lighting to transportation and even electrical grids. One concept unifies all these diverse subjects under the "smart" label: the ability to send and receive information across connected systems.

To better describe these connections, researchers, designers and planners are drawing parallels between them and living organisms, using terminology like "urban metabolism" (the dynamics of community resource flows) to "living buildings" and "connective tissue." "Intelligent" buildings are "occupant-aware" with adaptive control systems to adjust lighting, heating and cooling to match use patterns. More broadly, as the era of Big Data and the Internet of Things progresses, so will engineered systems with real-time and even predictive abilities. These systems will help us solve problems on the fly based on prevailing conditions.

There are, however, vast differences between smart cities and nature's infrastructure. While natural infrastructure abounds in connections, flows and feedback loops, it doesn't have centralized management or data centers, and it most certainly doesn't have a system of governance to direct its activities. Even more fundamentally, natural infrastructure doesn't run on ideas. So what one might call "soft" infrastructure — purposes, insights, designs, policies, regulations, education — is a defining element of any man-made system.

Governing columnist Alex Marshall, in his book *Beneath the Metropolis: The Secret Lives of Cities*, brings this point home when he writes that while cities "are often thought of as self-operating organisms" that "seem to have just happened," in reality "the complex water, sewer and transportation systems that public officials control and operate are always the result of specific choices, usually by government."

As much as technology promises to automate our world, "soft" infrastructure will remain the domain of humans and civic leaders. Anthony Townsend writes in his book Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia of an emerging contest over design control of these smart cities.

That contest pivots on the question of whether the design will be guided by a top-down, engineered approach or a bottom-up, organic one. On the top-down side, Townsend cites the effort of Songdo, South Korea, to scale building automation up to an entire city. He describes Songdo as the "world's largest experiment in urban automation with millions of sensors deployed in its roads, electrical grids, water and waste systems to precisely track, respond to and even predict the flow of people and material."

Just how functional, inviting and livable such a fully networked and automated city will be remains to be seen, and Townsend suggests that the purposes and uses of these connections — the soft

infrastructure — ought to be turned over to residents and their civic leaders rather than to the engineers who build the system.

Reflecting the bottom-up approach to soft infrastructure, perhaps it is most fitting that San Francisco, with its links to Silicon Valley and "Big Data" companies, should be among the cities that are breaking new ground as incubators of civic-focused entrepreneurship. The city's [Entrepreneurship-in-Residence program](), says Mayor Ed Lee, "brings together government and startups to explore ways we can use technology to make government more accountable, efficient and responsive."

A city's soft infrastructure is "owned" by its residents and its civic leaders, and it's heartening to see San Franciscans engaging in such an innovative approach to the design and function of their city. After all, the "smarts" of any community will be judged in large part by how well its citizens use technology to make their city a better place to live. The evolution of the smart city will be fascinating to watch.

[Bob Graves]() | Associate Director of the Governing Institute

---

[bgraves@governing.com]() |