INTERACTIVE SESSION: ORGANIZATIONS

BIG DATA MAKES CITIES SMARTER

New York City wants very much to be a "smart city." In the fall of 2013, New York University, with support from city government, opened the Center for Urban Science and Progress under the direction of Steven E. Koonin, a former Obama administration undersecretary for science in the Department of Energy. Koonin foresees work on a broad range of quality of life and urban efficiency projects ranging from traffic management to reducing water and electricity consumption by 30 to 50 percent in ten years' time.

The first target for a ten-member team of graduate students, music professors, and computer scientists is noise pollution. Starting with data from 311 (the non-emergency line for citizen complaints on a range of issues including noise disturbances), the researchers will gather additional data from wireless sensors on windows and buildings and noise meters on traffic lights and street corners. A smartphone app may also be employed in a crowd-sourcing effort to encourage citizen participation and gather even more comprehensive statistics. One possible outcome foreseen by Koonin is a noise limit ordinance for vehicles. Using a combination of incentives and violation fees, citizens will be persuaded to replace or repair malfunctioning mufflers. Computer simulations will inform decision-makers about the optimum combination of enforcement mechanisms and sequence of steps to maximize compliance.

Zoning, building classification, and traffic flow data along with Department of Sanitation routes and pickup times will be used to optimize garbage collection. The goal will be to service as many commercial districts as possible in the middle of the night when traffic is lightest and the fewest residents will be disturbed. Next up is a plan to assemble thermal images of buildings across the city that will serve as the basis for energy use studies.

A terabyte of information (equivalent to 143 million printed pages) flows daily to New York's Office of Policy and Strategic Initiatives from every corner of the city, from death certificates to minutiae such as the type of boilers and sprinklers installed in the city's 900,000 buildings. The Office was tasked with reducing the number of illegal conversions—the creation of additional dwelling units in buildings that lack legally required infrastructure such as adequate means of egress and electrical wiring. The team combined data from 19 agencies and created a model to optimize building inspections. Building age, repair permits, foreclosure notices, late tax payments, and other similar data fed a program that fueled an increase from 13 percent to 70 percent of building inspections identifying a hazardous dwelling. Previously, the city's 200 building inspectors had futilely attempted to respond to the more than 20,000 annual complaints based solely on sketchy grievance descriptions.

Michael Flowers is the Analytics Director for the Office. When the Department of Environmental Protection wanted to improve its efficiency in locating restaurants that illegally dump cooking oil into sewers—the primary cause of clogged city pipes—it turned to Flowers's team. Using the restaurant location, geospatial sewer location, and certificates on file with the Business Integrity Commission, a data sifting program easily pinpointed restaurants that had not contracted with a grease-hauling service and their nearest storm drain. Health department inspectors sent to these locations registered a stunning 95% success rate in catching culprits.

Participants in a Big Apps competition, begun in 2009, use the more than 1,000 data sets now publicly available on the NYC Open Data Portal as their primary resource. In the 2013 Best Jobs and Economic Mobility category, the ChildCareDesk app garnered first place. Maps, Yelp reviews, and detailed reports from various city accreditation agencies assist parental decision-making, and an alert system notifies them when a vacancy has arisen. Other winning apps in previous years provide the locations of public restrooms and the safest routes for bicyclists.

Flowers sees even more data that can be mined—the hundreds of thousands of daily posts to Twitter, Facebook and other social media sites. Complaints that do not make it to city agencies concerning unhygienic restaurants, uncollected garbage, and unsafe streets can be gleaned from these sources to further the cause of enhancing a New Yorker's quality of life.

This may be a bridge too far for privacy advocates who have been watching the Big Data/Smart City movement with a wary eye. While recognizing the Smart Cities potential for improving services and helping citizens, groups such as the New York Civil Liberties Union worry about possible abuses. Safeguards, including removing names and tax identification numbers and installing employee keystroke logs, have proven vulnerable to reverse identification and tampering. Undoubtedly, the release

of public data, even absent any surveillance intent, must include safeguards.

Ford is working on safety systems that will inform drivers of both internal (V2I: vehicle-to-infrastructure) and external (V2V: vehicle-to-vehicle) threats. The V2V system warns you if a car is speeding up to run a red light, for example. Ford has also developed an upgrade for stoplights to create "smart intersections" that monitor digital maps, GPS data, and traffic signal status and transmit that data to onboard computers. Drivers are then both visually and aurally alerted to potential hazards.

Intel research scientists foresee smart cities with drivers who not only know the velocity of the car in front of them, but can simultaneously see three cars to the right, left, and behind. What's more, cameras can detect if surrounding drivers are looking up, down, or forward, and if one of them is balancing a cup along with the steering wheel. These "driver states" will feed predictive modeling programs to calculate the odds of an accident occurring and which vehicles are best-positioned to avert calamity. Decreased collision rates and their attendant injuries and fatalities are no doubt a societal good, but many questions arise with this level of data-sharing. Will law enforcement have access to velocity information that could result in automatic speeding tickets? If you turn around to give a pacifier to the baby in the car seat, will the increase in accident probability garner you an automatic moving violation? While we might all want the information about the careless drivers around us, are we willing to share our own driving foibles?

Sources: Jeff Bertolucci, "Big Data: When Cars Can Talk," *Information Week*, June 11, 2013; Alan Feuer, "The Mayor's Geek Squad" *New York Times*, March 23, 2013; John Foley, "New York City Builds on Its Technology Base," *Information Week*, April 23, 2013; Steve Lohr, "SimCity, for Real: Measuring an Untidy Metropolis," *New York Times*, February 23, 2013; "Smarter, More Competitive Cities: Forward-thinking Cities Are Investing in Insight Today," IBM, January 2012.

CASE STUDY QUESTIONS

1. What technologies is New York employing to improve the quality of life of its citizens?
2. What are the people, organization, and technology issues that should be addressed by "smart city" initiatives?
3. What problems are solved by "smart cities?" What are the drawbacks?
4. Give examples of four decisions that would be improved in a "smart city."

strings produced from mating pairs of strings, and tests their fitness. The process continues until a solution is reached.

Genetic algorithms are used to solve problems that are very dynamic and complex, involving hundreds or thousands of variables or formulas. The problem must be one where the range of possible solutions can be represented genetically and criteria can be established for evaluating fitness. Genetic algorithms expedite the solution because they are able to evaluate many solution alternatives quickly to find the best one. For example, General Electric engineers used genetic algorithms to help optimize the design for jet turbine aircraft engines, where each design change required changes in up to 100 variables. The supply