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Smart City | Smart Nation

Providing the keys to unlock your city's potential

Contents

Smart Environment

For a Smart City to live up to its name, using technology to foster sustainable growth is essential. This means leveraging technology to maximize the efficient use of precious resources and encourage sound choices by all players. This includes not only city-owned buildings, but businesses, universities, hospitals and non-profits and individual citizens. This means likely leveraging sensor technology, behavioral economics, and gamification to alter not only physical infrastructure, but to encourage positive resourcing decisions.

Trends

Smart metering

Smart meters record electricity consumption in intervals of one hour or less and communicate this data to the utility company. This allows utilities to introduce dynamic pricing based on the season and the time of day and encourages citizens of smart cities to reduce their energy consumption, especially when demand is at peak level. Smart meters also provide data that helps utilities better monitor the health of the electric grid, restore service faster during outages, communicate information to customers such as high usage alerts, and integrate distributed energy resources.

Source (p 59): Smart Cities How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Distributed energy resources

Traditionally, electricity has been generated by large scale conventional plants based on fossil fuels or nuclear power. A proportion of this will likely be displaced by distributed generation based on renewable energy sources such as solar panels or wind mills. Contrary to the current situation (few plants with very high capacity), this should lead to a situation where electricity is generated by a large number of nodes, of which many have a relatively small capacity. In a truly smart city, a new class of smart citizens becomes prosumers, citizens who use homes and offices to generate electricity and consume the same. Buildings, increasingly covered with solar material and paper batteries, would transform the construction industry and create millions of new micro-sources of power.

Source: Smart Cities How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Responsive devices

Responsive, or "smart," devices and appliances (e.g. air conditioners, hot water heaters, refrigerators, and clothes washers and dryers) can temporarily reduce energy consumption during peak energy demand periods. This "demand response" may be triggered by a signal from the utility during a peak demand event, or by intraday price increases in areas where local utilities provide dynamic, "time of use" pricing. Customers control home energy usage automatically through devices like the Nest Learning

Thermostat, which studies the habits and patterns of consumers to find the most optimal use of energy.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)
Source: Intelligent Automation

Lower usage through gamification

The data generated by smart meters can be used to create detailed insight into energy usage patterns. This data can be used by smart apps that use concepts like gamification to make consumers more aware of their energy usage and influence them to change their behavior to decrease their energy consumption.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Self-healing grid

Electric utilities are adding "internet of things" technologies such as sensors and automated controls, and linking them to advanced communications and analytic software. The software monitors distribution system data in real time and is able to detect and isolate faults and reconfigure the system to minimize impact on customers, with limited human intervention. The grid can "heal" itself through a combination of automated switching, dispatch of distributed energy resources, coordinated demand response and management without intervention by operators in the control room.

Source: The power is on: How IoT technology is driving energy innovation
Source: Government 2020

Hyper-localized environmental enforcement

Aided by embedded sensor networks and intelligent algorithms that provide data to human analysts, governments gain the capability to enforce regulations at a hyper-local level, driving greater compliance with environmental laws. They also leverage predictive models as a kind of force multiplier, using data to profile regulated organizations and identify which are most likely to be negligent. Third parties also often get into environmental monitoring. Efforts are made to integrate data from environmental advocates and third parties with government data to create a more holistic view of the current state of the environment.

Source: Government 2020

Embedded environmental sensors

Embedded sensors of various types are used for everything from pollution monitoring to land management, supplementing or replacing on-site inspections. Energy agencies rely on these sensors for continuous environmental monitoring and automatic intervention. These technologies help agencies execute their missions, but also raise issues concerning the definition and resolution of violations in a real-time monitoring environment. Embedded sensors in "smart cities" enable

continuous monitoring of weather conditions, air quality and home energy consumption.

Source: Government 2020
Source: A Sensor-Enabled World

Pollution detection

Sensors can be used to measure the quality of surface water in real time mode. Traditionally, water quality monitoring required manual actions for sampling and analyzing, causing a lag between the emergence of pollution and the detection of it. Real time water quality monitoring, with a network of sensors covering surface water, contribute to sustainability of city resources.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Leakage detection

Water loss management is becoming increasingly important due to population growth and water scarcity. Experience shows that the amount of non-revenue water (water produced but lost due to theft, metering inaccuracies, and supply chain leakages) can be up to 25%.To minimize this loss, water providers can equip the distribution network with sensors to provide real time insight on pressure, flows, and quality. By analyzing this data, especially the flows during night when normal consumption is minimal, leakages can be detected.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Automating water for agriculture and municipal use

The greatest savings in water consumption can come from automating agricultural and municipal use: More than 70 percent of water consumption today is for agricultural use, and 60 percent of the remainder goes to urban landscape maintenance. In both instances, agribusiness companies often irrigate regardless of current conditions, risking overwatering rather than drought. Sensors with advanced algorithms can help address both problems, aggregating measurements of soil moisture, heat, humidity, and slope to analyze how much water plants need.

Source: Anticipate, sense, and respond: Connected government and the Internet of Things

Just in time waste collection

Most cities use some type of waste container to collect the waste produced by households. Traditionally, these garbage trucks operated on fixed routes, e.g. visiting each container once a

week. As a consequence, some containers are emptied when they are only half full and some are emptied days after they became full. The 'smart solution' is to equip the waste containers with sensors that detect the volume of the waste in the container. This data is used to optimize the number of garbage trucks and their routes, skipping containers that are not yet full and making an early stop at containers that are close to reaching their limit. This results in a cheaper process (fewer stops required) and elimination of full waste containers (which could lead to people dumping their waste on the street next to the container).

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Zero waste

Through better design and life-cycle thinking, consumption and production become closed loops, producing no outputs as waste throughout their life cycle. As such, the concept of waste disappears, as all by-products retain an intrinsic value to feed into other systems. Even food spoilage and waste could be reduced to zero and turned into biofuels, compost or animal feed.

Source: A roadmap for sustainable consumption

Case Studies

Gamifying energy consumption

Alex Laskey and Dan Yates created a company, Opower, with a single goal in mind: to use the power of behavioral economics to motivate people to save energy. They created a customer engagement platform designed to help electric utilities deliver more energy efficiency programs to their customers. Opower's primary products are home energy reports based on user data and behavioral science principles. The company uses a mix of utilities data on user consumption patterns as well as crowdsourced data from energy users themselves. Its online scoreboard encourages friends to discuss and compare their household electricity use.

Opower then gamifies the experience by allowing energy users to complete challenges, participate in groups, and earn points and badges tied to reduced

energy use. Using data from these interactions, Opower constantly tweaks its processes to keep energy users engaged. The company now partners with more than 100 utilities and claims that its model generates energy savings of 2 to 4 percent, translating into hundreds of millions of kilowatt-hours saved.

Source: A billion to one

GRACE for efficient water use

Gravity Recovery and Climate Experiment (GRACE) mission, launched in 2002, uses two spacecraft to map variations in the Earth's gravity field. The gravitational research is, in part, collecting relevant agricultural data on factors such as groundwater availability and stress as they relate to global agricultural production areas. Maps developed using the GRACE data are able to identify the difference between climate-related drought conditions and the depletion of aquifers through groundwater extraction that exceeds recharge. However, currently, this information is typically only available in specialized scientific journals. By making this information more available to farmers, the IoT, drawing on GRACE as a sensor, could help farmers make more efficient and effective use of water resources.

Source: From dirt to data: The second green revolution and the Internet of Things

Copenhagen's smart lighting

Copenhagen has installed a growing network of wireless streetlamps and sensors. LED streetlamps brighten when vehicles approach but dim after they

pass. The city aims to be the first carbon-neutral capital city by 2025. The sensor-enabled light fixtures will also serve as a means of capturing data and coordinating services. For instance, the same sensors will alert the sanitation department to empty trash cans. Further, sensors can sense a bicyclist coming and shed extra light for safety as the cyclist transverses road.

Source: Government 2020

The East Bay's water conservation campaign

IoT applications promise to make conservation campaigns even easier and more effective by tracking progress and offering—or even automating—new ways to conserve. Simply giving consumers more insight into when or where they use water and how they compare to neighbors can encourage conservation, as the Municipal Water Department in East Bay (California) recently demonstrated. Partnering with WaterSmart, the department saved 5 percent in water consumption by giving 10,000 customers access to a Web portal that showed how each stacked up against families of comparable size, as well as by providing ideas for improving water conservation.

Source: Anticipate, sense, and respond: Connected government and the Internet of Things

Recycle for rewards

Recyclebank has turned recycling into a game: by recycling, households can earn points that can be redeemed for real prizes, such as vacations and discounts on products from hundreds of companies. The number of points earned by each household is calculated by radio- frequency identification device (RFID) sensors on recycling bins. The sensors record how much waste each household recycles. The more you recycle, the more points you get. The company rewards with additional points if households complete interactives, slideshows and quizzes related to recycling hosted on the company's website. In just a few short years, Recyclebank has gone from an interesting idea to a company operating in hundreds of cities, with a membership of more than four million households.

Source: Solution Revolution

Smart Education

Education enabled by virtual learning, digitization and augmented reality transforms the way we learn. Unbundled, personalized, and blended education is becoming more prevalent. Augmented by rich data and analytics the next-generation teachers can adapt their learning and counselling to maximize student success. The focus shifts from digital content in the classroom to real-world experiential learning where students, teachers, and real-world experts connect—paving the way for lifelong learning.

Trends

Blended learning

The Center for Digital Education reports that blended education models improve comprehension and test scores for 84 percent of students. These models blend elements of "brick-and-mortar" in-person instruction with asynchronous, self-paced online learning.

Stanford University, for instance, in partnership with the online learning platform Khan Academy, piloted a blended learning "flipped classroom" biochemistry course. Students watched video lectures online at home and then spent class time solving problems, maximizing the time students spend with professors. This partnership was extended into the medical school, allowing Stanford medical students to watch core curriculum videos online, and freeing up class time for students to practice lessons alongside their peers and professors and to explore their passion areas early in their schooling.

Source: Reimagining higher education

Digitization and unbundling of education

Digital technology changes the way education is provided to students. Thousands of Massive Open Online Courses (MOOC's), provided by world class universities, are already functional and the number is steadily increasing. These MOOC's can also be used to support blended learning: a mix of online education and in-classroom education.

Digitization of education allows units of learning to be offered as an independent service. This includes being able to use and reuse digital content in many settings and bundled to support different learning outcomes. It might also involve a teacher, for instance, hired to teach human anatomy to eighth graders, rather than general biology to all middle-school grades. These freelance "teacherpreneurs" rotate between multiple schools. The unbundled education system could provide greater room for creativity, taking the basic elements of education and reassembling them in a way better suited to the evolving needs of learners.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)
Source: Government 2020

Personalizing education

The availability of online courses, combined with the augmented supply of learning resources, both online and offline, due to unbundling of education services, allows a further personalization of education. Students are able to combine education services from different education providers to form a learning path tailored to their personal preferences, interests and talents.

Such personalization gives rise to alternative methods of assessment for learning, beyond the traditional degree, with students maintaining a portfolio of credentials spread across skills. This in turn sees new services evolving that make clear connections between skills, courses, and jobs for students and employers. For example, Degreed, assigns scores to the full range of educational opportunities available, from MOOCs and immersives to college degrees and corporate training.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)
Source: Reimagining higher education

Lifelong learning

App developers, data scientists, and user-experience designers represent just a few of the professions that didn't exist a short time ago. Given the pace of change, the emergence of entirely new categories of jobs will likely become more common. To keep pace with the ever-quicker cycle of creative destruction, lifelong learning becomes a permanent part of our professional lives. This, in turn, is prompting innovators to develop new credentialing infrastructure to support lifelong learning.

Source: Reimagining higher education

Peer-to-peer learning

Students learn from each other through project-based learning and collaboration. Students who test well for personality compatibility, but have varied cognitive strengths, are paired together to support one another during the year, maintaining a constant connection amid changing peer relationships. Thanks to technology, such collaboration is no longer limited to peers in a single class, school, city or even country. For example, the Center for Distance Learning at SUNY Empire State College has a peer tutoring program that provides students assistance on content, skill development and use of software tools.

Source: Government 2020

Classroom of the future

The traditional concept of a classroom could be replaced by a combination of classroom and playroom where students learn through playing, building and discovery. Education technology mashups such as robotics, 3D printing, and programming results in big changes in education. For instance, Wonder Workshop's two robot products—Dot and Dash—make computer programming accessible and fun for children. The objective is to make kids the creators and directors, not just the consumers, of technology.

On the other hand, heavy, expensive, and quickly outdated textbooks could be replaced by cheap, easy-to-update, interactive, digital "flexbooks". Augmented reality (AR) applications can transform a static learning experience into something immersive and dynamic. For instance, PBS released an augmented reality application for its math series Cyberchase. The Cyberchase Shape Quest mobile application helps children develop their geometry, spatial reasoning, and problem solving through math-based games in an augmented reality environment.

Source: Government 2020

Adaptive learning & counseling

The digitization of education creates valuable data that can be analyzed to create insights into the personal profile of individual students. Faculty, for example, receive data through audio-visual enabled classrooms like student's spoken English proficiency or ability to persevere in the face of distractions. Equipped with these insights, schools and universities can adapt education and counseling approaches to better meet student needs.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Rise of the hybrid teacher

A 2013 MetLife survey found that 25 percent of teachers were interested in a role combining teaching and some sort of leadership position. In smart cities of the future, teachers may increasingly serve in hybrid roles, teaching in the classroom half the time and devoting the rest of the day to activities such as researching teaching methods, coaching teacher candidates, or working with district administrators on community outreach programs.

Acknowledging the need for alternate career paths for teachers some schools and education related organizations are responding by creating a "teacher leadership" career path. The National Academy of Advanced Teacher Education (NAATE), for instance, has created a program for teachers to develop their skills and also keep them in the classroom. The program has a 60:40 split, by focusing 60 percent of the time on instructional practice and 40 percent on work outside the classroom with colleagues.

Source: Government 2020

School-business collaboration

Schools and local businesses co-produce programs that teach job-specific skills, integrating formal education and employment. Education also blends adult retraining and youth education — some companies send employees who need retraining back to school with kids learning the skills for the first time. Co-learning can foster the exchange of practical wisdom and fresh ways of thinking between both groups.

Source: Government 2020

Rethinking career pathways

Until recently, most college-bound students focused on getting accepted to a "good" college and maintaining a high GPA throughout their college career, seeing the diploma as their ticket to a good job. College rankings, campus visits, marketing materials, and advice from family, friends, and guidance counselors have served as the main sources of information to guide students' college search. But Smart cities make it possible for students to employ a more data-driven approach to college decision-making process and rethink outcomes associated with different educational pathways. With greater transparency, students will be able to assess college value in terms of access, affordability, and outcomes, including average tuition costs, loan debt, graduation rates, and graduate earning.

Source: Reimagining higher education

Case Studies

Co-creating educational software at NYC iZone

In order to create effective educational software, ed tech companies seek to bridge the gap between their products and the millions of students who stand to benefit from them. One such attempt to close this gap was initiated by the Office of Innovation at the New York City Department of Education, which created an educational innovation zone, or iZone. At least six states and 300 schools became a part of this program. Its "Gap App Challenge" initiative incentivized vendors to develop relationships directly with educators by competing to produce programs that might close a performance gap in middle school math.

After the success of the first Gap App challenge, iZone initiated the Short-Cycle Evaluation Challenge (SCEC) to evaluate the products created during the challenge based on three key criteria: for whom does the product work, when, and under what circumstances.

Source: Delivering On Digital

Connected learning at High tech high charter schools

High Tech High (HTH) operates 12 charter schools in San Diego and Chula Vista counties, including three elementary schools, four middle schools, and five high schools. The first charter school was founded in 1998 to address the skills gap in science, technology, engineering, and math.

HTH schools bring together students, teachers, administrators, and parents through practical hands-on training and experiential learning, coupled with traditional academic education to prepare students for college in both technical fields and the liberal arts. Each student is paired with a faculty advisor who regularly interacts with them, monitors their academic progress, and facilitates career planning. To maximize connectivity, HTH employs PowerSchool, a web-based portal that allows teachers to record attendance and grades while providing parents and students with access to real-time learning and performance information, a channel for communication with teachers, and the ability to track assignments. Administrators use PowerSchool to deal with structural constraints such as room capacity, teacher preparation periods, and student scheduling priority.

HTH's connected learning initiatives showed positive results in student performance. HTH students have completed more than 1,000 experiential learning projects in over 300 organizations, including Qualcomm and Fox News. Of HTH's high school graduates, 98 percent attended college, of which 30 percent entered science or math fields.

Source: Digital education 2.0: From Content to Connections

Learning by doing at the MET

Big Picture Learning (BPL) envisions redesigning K-12 and adult education in the United States through the use of personalized learning. The Metropolitan Regional Career and Technical Center (MET), the first BPL school, opened in 1996 in Rhode Island. They were given a mandate to design a 'school for the 21st century' that would impact the community

by producing skilled graduates, lifelong learners, and responsible citizens.

Since its inception, MET students engage in learning outside of the classroom with a mentor who is an expert in the students' field of interest. Through this Learning Through Interest (LTI) program, Advisors meet with students and mentors at the LTI site to help students develop real-world projects and build long-term personal relationships with their mentors—paving the way for lifelong learning. With LTI, the MET gives academic credit for technology use, both inside and outside the classroom. Students can develop deeper understanding by actually doing and making things and applying their knowledge rather than just gathering information online. The LTI-driven personalized and connected learning approach has equipped MET's students to transition from school to a career. The school has maintained a 98 percent college acceptance rate.

Source: Digital education 2.0: From Content to Connections

Personalized learning at AltSchool

At AltSchool, students help personalize their learning plans and adapt them to meet their changing needs, while providing and receiving constant feedback regarding their progress. Students are assessed regularly through computerized tests that are adjusted based on individual skills. Parents are asked for frequent feedback to help inform the redesign of student learning plans. "We are trying to actually advance a new model of a school," says AltSchool CEO Max Ventila. "Rethinking school starts with rethinking curriculum, and we've reimagined how students should be spending their time in and outside the classroom."

At the start of each week, students and teachers create highly personalized curriculum called "playlists" — a set of goals that a student has to complete that week. AltSchool's future vision for the classroom involves using sensors and audio-visual equipment to assess student language skills automatically, eliminating the need for formal assessments.

AltSchool is still in its infancy, but it shows how traditional value chains can be disrupted. From learning design, planning, and execution to even how assessments are carried out, AltSchool is redesigning the way education is imparted. As more such models emerge, school systems will likely face increasing pressure to rethink the most basic elements of teaching and student engagement.

Source: A billion to one: The crowd gets personal

LearnDC in Washington D.C.

LearnDC is a website that hosts information and resources on all the public and charter K-12 schools in Washington DC. By providing side-by-side comparisons of schools and information on how DC schools compare to national standards, parents can make informed decisions on where to send their children to school.

As a collaborative effort led by the Office of the State Superintendent of Education (OSSE), LearnDC is the product of partnerships with several local agencies and organizations dedicated to providing transparent and easily assessable information on education. Furthermore, all the data on LearnDC is available in an API format for others to analyze, add to, and develop more advanced applications. From OSSE's perspective, LearnDC has bolstered agency capabilities, driven new conversations with local leaders and community members, and demonstrated the value of public-private collaborations with open source data.

Source: Reimagining higher education

Aligning business needs with higher education

Corporate enterprises and academic institutions can produce powerful results when they collaborate to deliver academic initiatives grounded in practical applications. Take, for example, the collaboration between Clemson University and BMW, and that between North Carolina State University and Red Hat.

The Clemson University International Center for Automotive Research in Greenville, South Carolina, forms a bridge between academic research and practical applications in the automotive industry. It connects university researchers with work performed by companies involved in the automotive industry so that all testing can be done in one place. BMW and the university worked together to develop the center's curriculum.

NC State, a leading land-grant university, and Red Hat, the world's largest open-source software company have maintained a symbolic relationship, sharing resources and creating "a robust ecosystem" between the company and the university.

Shifting four-year college programs toward knowledge-creation centers of this sort can benefit companies seeking fresh, highly skilled talent while encouraging healthy competition.

Source: Brawn from Brains

Smart Security

As crime becomes smarter and high-tech, public safety and security agencies match-up. Law enforcement officers on the ground often use drones, wearable computing, facial-recognition, and predictive video to fight crime and protect public safety. Data plays an increasingly important role in crime prevention as agencies try to preempt crime by tapping into all streams of data including social and crowdsourced data.

Trends

Smart street lighting

Smart street lighting incorporates movement sensors to increase both the safety of citizens as well as energy efficiency. Street lights become brighter when movement is detected, making it clear when traffic is approaching or where pedestrians are located. In addition, movement sensors could also showcase the types or priority of traffic, for instance showing different colored lights or blinking when an emergency vehicle is approaching.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Crowdsourcing and emergency apps

Real-time crowdsourcing of data on crime (incidence, degree and nature) helps create large databases that can be used to identify areas meriting greater security. For instance, citizens can access apps that allow them to send an alert or request assistance during emergency situations. The app can automatically detect the person's location and could trigger audio or video recordings to better track the situation on the ground. The app notifies the nearest safety guard, police officers or stations, and/or medical personnel to provide immediate assistance.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Electronic monitoring

Smart cities look beyond traditional incarceration methods to manage low-risk offenders. Electronic monitoring, often in the form of ankle or wrist bracelets, track a person's location via GPS or radio frequency identification. These devices utilize continuous signaling, ensuring that authorities are aware in real-time of any location changes. Electronic monitoring not only provides what some believe is an appropriate response to low-risk offenders, it also can lower costs by shifting such convicts outside traditional jails.

Source: Beyond the bars

Drones for risk assessment

Minimizing risk for police officers or fire rescue workers in uncertain or dangerous situations is critical in a smart city environment. Drone or unmanned aerial vehicle (UAV) technology can pull together images to assess situations or possible dangers before sending in human beings. Drones can also help find fires, identify and prevent police ambushes, quickly search accident and crime scenes, and even detect heat from threats that may be concealed. Hence, drones can act as first responders before human intervention can take place.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Identifying gunshots

By installing a city-wide network of acoustic sensors on building rooftops, law enforcement agencies are able to accurately detect gunfire as soon as it's fired. These sensors work in tandem, pinpointing the exact location of the gun shot and removing dependency on bystander reporting. Medical and law enforcement personnel can be deployed immediately, helping to resolve the situation and provide rapid medical care.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Augmented security screening

Security screenings at airports and in transits are often the first line of security for higher risk locations such as airports and public transit. Augmented reality technology could play a significant role in reducing risks and errors associated with them. For example, contextual checklists overlaid over security officers' vision could standardize operations. Facial and behavioral recognition algorithms can help reduce the number of false positives, confirm travelers' identities in real time, and identify travelers exhibiting potentially threatening behaviors.

Source: Augmented Government

Data-based crime prevention and predictive policing

Big data analysis helps determine the most likely causes of new or emerging crime trends in different areas of the city. For instance, data analytics combined with real-time facial recognition, CCTV video linkages, and license plate scanning; analyze where a crime is most likely to take place on a specific date and time. Law enforcement agencies can use these insights to monitor specific neighborhoods showing increased crime, identify causes that have been determined to affect crime rates, identify individuals that have a higher risk of recidivism and increase officer patrols in areas with a higher likelihood of crime.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)
Source: Government 2020

Smart cybersecurity

Government cybersecurity poses a challenge due to the volume of threats that agencies face on a daily basis. As cities acquire and store large amounts of data, a significant portion of which will be sensitive in nature, protecting the data from cyber-attacks become paramount. Smart cybersecurity uses secure data platforms, clear data governance, and smart access protocols such as electronic finger printing to protect data.

Source: Smart Cities: How rapid advances in technology are reshaping our economy and society
Source: Government's cyber challenge: Protecting sensitive data for the public good

Case Studies

Crowdsourced convictions in London

The 2011 riots in London were an incredibly chaotic time. There were more than 20,000 emergency calls to police, a 400 percent increase from a normal day; and almost 2,200 calls to the London Fire Brigade, which is 15 times the normal amount.

To help catch those involved, the London Metropolitan Police crowdsourced the identities of 2,880 suspects using a smartphone application. The police asked citizens to download the Face Watch ID app and help identify the persons through images taken from CCTV footage. If an image was known to them, citizens entered the name or address of the person, which was sent to the police immediately and confidentially. This enabled the police to effectively apprehend suspects and led to charges being filed against 1,000 perpetrators.

Source: Government 2020

Secure data in Australia

Australia's Cyber Security Centre (ACSC) tries to ensure that Australian networks are among the world's most secure. Australia's program combines threat data from multiple entities to strengthen collective intelligence between private sector, state and territory governments, academia and international partners. The results of intrusion attempts are uploaded to the cloud, giving analysts from multiple agencies a larger pool of attack data to scan for patterns.

This collective intelligence revealed its value during the 2001 fight against the Lion worm, which exploited a vulnerability in computer connections. A few analysts noticed a spike in probes to port 53, which supports the Domain Name Service, the system for naming computers and network servers organized around domains. They warned international colleagues, who collaborated on a response. Soon, a system administrator in the Netherlands collected a sample of the worm, which allowed other experts to examine it in a "sandbox", a protected testing environment. A global community of security practitioners then identified the worm's underlying structure and built a program to detect it. In just 14 hours, they publicized their findings widely enough to defend computers worldwide.

Source: Government's cyber challenge: Protecting sensitive data for the public good

Smart surveillance in Albuquerque

In Albuquerque, New Mexico, summertime is accompanied by a rise in violent crimes such as

shootings, stabbings, and burglaries. To help cut down on the summer crime increase, the Albuquerque Police Department set-up mobile surveillance cameras in parks around the city. But these weren't your average surveillance cameras. Police officers could access their cameras from their mobile devices to view live images and remotely control the cameras, employing them during time-sensitive, critical situations such as negotiations with hostage-takers or other Special Weapons and Tactics (SWAT) emergencies.

In less urgent situations, the cameras come with a 4G wireless signal, sending images and videos back to the Real Time Crime Center for further analysis, and combining their footage with the over 100 traffic cameras and 300 private cameras positioned throughout the city. The surveillance units were also equipped with flood lights and a public address system, enabling the police to interact in real-time with any would-be troublemakers and prevent crime virtually. Along with the new technology came clear governance around camera usage, which has led to strong public support and privacy protections for citizens.

Source: The mobile government worker

Predicting and preventing crime in Los Angeles

In a city of over four million, and with a crime rate that rose in all categories in 2015, the Los Angeles Police Department knew that it needed to take action. To help tackle crime, Los Angeles piloted a new tool incorporating some of the top Smart Security thinking: PredPol. The mission of PredPol is simple: place officers at the right time and location to give them the best chance of preventing crime.

The tool, which has been piloted in the Los Angeles and Santa Cruz police departments, uses three data points – past type, place, and time of crime – to predict criminal behavior. These data points are fed into a unique algorithm, which incorporates criminal behavior patterns. Law enforcement then receive customized crime predictions, automatically generated for each shift in their jurisdiction. These predictions are highly specific and lay out the places, mapped to 500 by 500 feet squares, and times where crimes are most likely to occur. While still only a pilot, PredPol has already brought down property crimes by 13 percent in one of the divisions.

Source: Government 2020
Source: About PredPol
Source: Crime in Los Angeles rose in all categories in 2015, LAPD says

Promoting security through apps in India

Hyderabad is one of the IT centers of India, employing tens of thousands of IT engineers and experts across hundreds of companies. But rising security concerns, especially for the women working in the IT corridor, concerned city administrators. In 2015, to address these concerns, they launched "SheShuttle", a transport system for women in the IT corridor of the city.

The basis of the service is a set of buses running through the main roads of the IT corridor, but "SheShuttle" also leverages smart technology to connect the bus, its passengers, and law enforcement. Passengers can track, in real-time, the location of the buses via mobile apps, coordinating their exit from work to the bus's exact arrival. Each app also comes equipped with a panic mode, which can be activated at any time and is monitored 24/7 by the Central Control Room at the Cyberabad Police Commiserate.

Source: 'SheShuttles' launched for women in IT belt
Source: SheShuttles to branch out to Hyderabad outskirts

Geo-based targeted interventions in New York City

The targeted intervention concept is gaining steam in the human services field. For more than a decade, New York City's Justice Mapping Center has used computer mapping and other graphical depictions of quantitative data to identify hidden patterns and trends, and direct social interventions based on those findings. By using geospatial analytics to direct human services, the Center maximizes program effectiveness.

For instance, in one of its programs, the Center tracks the residential addresses of inmates in various prison systems—the address that they gave when they went into prison. The center found that offenders often are concentrated in particular census blocks, some of them costing state and local governments more than $1 million a year in incarceration costs alone. Such findings are spurring cities to design re-entry initiatives for specific neighborhoods, with services such as transitional housing and job training for ex-offenders. By targeting these services towards high risk areas, they can provide more tailored services more efficiently.

Source: Rethinking human services delivery

National Institute of Criminal Justice's RAST

Risk Assessment and Sentencing Tool or RAST is a sophisticated data analytics engine that helps classify offenders as low-, medium-, and high-risk and makes targeted sentencing recommendations based on a host of case-specific factors. The RAST canvasses large data repositories across multiple states and jurisdictions, accounting for both static and dynamic factors. Static factors are unchangeable circumstances related to crimes and offenders, such as offense type, current age, criminal history, and age at first arrest. Dynamic factors, sometimes called criminogenic factors, can be mediated by interventions and include attitude, associates, substance use, and antisocial personality patterns.

The RAST is more advanced and more useful to judges, juries, and parole boards in three specific ways. First, since the Department of Justice's National Institute of Justice administers it at the federal level, it relies on an exceptionally large, nationwide data set. Second, the data is continually reassessed for its predictive validity: It is reviewed annually to determine how often RAST correctly classifies offenders, accounts for static and dynamic factors, and makes effective sentencing decisions as measured by the rate of recidivism. Finally, RAST differs from traditional risk assessment tools because it takes into account more than answers to questionnaires. Static and dynamic factors are used in combination with specific, real-time data such as an offender's behavior and location.

Source: Beyond the bars

Predictive police in Chicago

Chicago's Chief Data Officer Brett Goldstein is attempting to prevent violent crimes in the city before they happen. Goldstein's predictive analytics unit runs spatial algorithms on 911 call data to identify where and when violent crimes or robberies are most likely to happen. As Goldstein puts it, "Different parts of the city behave in predictable ways — beyond a city of neighborhoods, Chicago is a city of blocks, and these blocks are part of an ecosystem. We can create mathematical models with this ecosystem that are statistically significant, and give us leading indicators for when an expected level of a given behavior is likely to happen."

Source: The power of zoom

Smart Mobility

Mobility becomes as much about bits and bytes as it is about the physical infrastructure we walk, bike, drive and ride on in a smart city. Sensor-powered dynamic pricing, mobile-enabled collaborative transport models like ridesharing, and social transport apps help tackle traffic congestion in major urban corridors. Mobility emerges as a service which relies on a digital platform that integrates end-to-end trip planning, booking, electronic ticketing, and payment services across all modes of transportation, public or private.

Trends

On-demand car services and carpooling

On-demand car services tap into the potential of unused vehicles and uses digital platforms and smart apps to allow individuals to sell rides to people requiring transportation. Typical examples are Uber and Lyft, which have grown exponentially through their mastery of digital dispatching platforms. These solutions contribute to convenience and may have an effect on congestion, though the evidence is far from conclusive.

But why include a middleman at all? Carpooling allows people to share their personal cars for commuting at their own convenience. More and more apps are helping broker this sharing. Carpooling lowers commuting costs for individuals, and improves congestion while continuing to provide the convenience of point-to-point transportation. Increasingly, the ecosystem of on-demand car services and carpooling offers options for non-drivers such as seniors, low-income families, and minors without licenses.

Source: Smart mobility: Reducing congestion and fostering faster, greener, and cheaper transportation options

Multimodal transportation planning solutions

Technology and data can be used to provide real-time and fully personalized transportation guidance. Smart solutions typically use a combination of time tables and IoT data of public transport to find the optimal way of traveling from point A to point B. Location-aware apps calculate the distance and walking time to the train, bus, or metro station, to advise the user on the best time to start walking. If the user is not familiar with the route, real - time navigation instructions are provided on the app.

Source: Smart mobility: Reducing congestion and fostering faster, greener, and cheaper transportation options

Universal travel accounts

Travel cards or smartphones enabled with near-field communication (NFC) provide an integrated payment solution for transportation users. Account-based payment systems integrate all forms of transit payments such as bus fares, metro, parking, tolling, car and bike rentals, etc., reducing transaction costs.

Source: Government 2020

Self-driving connected cars

Modern cars are already equipped with many computerized systems to increase convenience and safety. Some of these systems even automate manual actions like parking the car. As truly autonomous vehicles finally start traveling on US roadways, connected car technology strives to help in maintaining smooth traffic, reducing safety distances between cars which ultimately increases the capacity of the road.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Shared self-driving cars

Another shared mobility solution which driverless cars will enable is the shared autonomous vehicle fleet. This business model will combine the use of self-driving vehicles with the principles of the sharing economy to establish a large reduction in the total number of cars and parking spaces in the city. Fleet members would not own a car but instead will have a subscription to transportation services. If they need transport, they would use a location-aware app to arrange for it. An intelligent system would allocate the nearest available self-driving car to the user and pick up the user. If the demand for transportation is low, the cars would automatically park in parking spaces outside the city. This promises to free up parking spaces in the city for other drivers.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Consumption-based dynamic taxes

Transportation revenues are tied to today's reality of individually owned and operated vehicles—for instance, the need for parking diminishes with the rise of autonomous-drive shared mobility. Agencies may need to evaluate alternatives—e.g., taxing "movement" versus ownership. For instance, to protect their revenue base, governments might consider introducing innovations such as mileage-based user fees (MBUFs), charges based on how much one drives rather than how much gasoline is purchased. Monetization for road usage in the future may be based on time of day, market demand, routes traveled, distance, and even vehicle form, aligning the use of public assets more directly to usage than today's system.

Source: The future of mobility
Source: Government 2020

Dynamic pricing

With the rise of mobile technology and the Internet of Things, new dynamic pricing mechanisms that would have been inconceivable just a decade ago are now possible—enabling pricing based on variables as time of day, road congestion, speed, occupancy, and even fuel efficiency and carbon emissions. Such pricing models are based on two key values: users begin paying a direct portion of the actual cost, and prices respond to demand. By pricing different stretches of road or transit routes differently—based on up-to-the-minute conditions—cities can divert drivers and passengers to cheaper routes, as well as collect payment for what it actually costs to maintain a roadway or system.

Source: Digital age transportation
Source: Government 2020

Usage based car insurance

Auto insurers can track the driving behavior of their customers through GPS devices and use the insights for actuarial pricing and segmentation. Such data also can be meshed with insights from behavioral economics to offer customers useful products such as personalized progress reports or

performance comparisons with a peer group, encouraging better driving.

Source: A billion to One

Smart parking

Finding a free parking space in a large city is often difficult. Smart solutions can be used to optimize the use of parking spaces. More and more cities are installing smart parking solutions to accomplish this goal. Each parking space is equipped with a sensor that detects whether a car is parked on it or not. The data is used to provide drivers with real time information on the nearest free parking spaces and their price (alternatives). Smart parking eliminates the need for driving around looking for a free parking space, which reduces traffic. Furthermore, if there is no free parking space at all, drivers can decide to change their plans and look for other options.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Smart traffic control

Computers have been used for years to monitor road conditions, but advances in sensors and the internet of things are now offering a major leap in monitoring technology. Real-time information optimizes traffic flows. Traffic data collected through sensors coupled with commuter GPS and Bluetooth allow for instantaneous reporting of traffic conditions. Fine-grained traffic flow data created by sensors in infrastructure and vehicles allow intelligent systems to optimize traffic flow by adjusting traffic lights and other signals. These traffic control systems can also be used to guide emergency services like ambulances smoothly through traffic by finding the fastest route, keeping bridges closed and adjusting traffic lights.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)
Source: Government 2020

Experience enablers

Content providers, in-vehicle service providers, data and analytics companies, advertisers, entertainment equipment providers, and social media companies—will likely all clamor to make the in-transit experience whatever we want it to be: relaxing, productive, or entertaining. We are already seeing signs of the imminent war for travelers' attention. Volvo announced a partnership with Netflix in January 2016 to enable livestreaming while in commute. Several automakers have struck deals with content providers to stream audio to vehicles, which could readily extend to video, Web browsing, and other even more advanced content.

Source: The future of mobility: What's next?

Case Studies

Mobility-as-a-service in Helsinki

Finland's capital, Helsinki, aims to make it unnecessary for any city resident to own a private car by 2025. Starting in 2016, Helsinki residents can use an app called Whim to plan and pay for all modes of public and private transportation within the city—be it by train, taxi, bus, carshare or bike share. Anyone with the app can enter their destination, select their preferred mode(s) of getting there—and, in cases where no single mode covers their door-to-door journey, a combination thereof—and go. The user can either pre-pay for the service as part of a monthly mobility subscription, or they can pay as they go using a payment account linked to the service.

Helsinki's vision represents the next revolution in mobility: mobility as a service (MaaS). At its core, MaaS relies on a digital platform that integrates end-to-end trip planning, booking, electronic ticketing, and payment services across all modes of transportation, public or private. It's a marked departure from where most cities are today, and how mobility has been delivered until now.

Rather than having to locate, book, and pay for each mode of transportation separately, MaaS platforms let users plan and book door-to-door trips using a single app. By answering the question of how best to get individual users where they're going based on real-time conditions throughout the network, taking account of all the possible options and each user's own preferences (for example, time and convenience vs. cost), and facilitating seamless mobile payment, MaaS starts to move us toward a more user-centered mobility paradigm.

Source: The rise of mobility as a service: Reshaping how urbanites get around

Mileage-based user fees (MBUF) in Minnesota

As fuel consumption drops, the reliability of gasoline tax as a funding source for infrastructure is expected to reduce even further in the near future. Spurred by this harsh reality, states are interested in finding ways of charging drivers for miles driven. Minnesota's Department of Transportation, working with Battelle, is testing a mileage-based user fee that relies on smartphones programmed with a GPS application that allows motorists to submit information. The idea is to keep the strategy as simple as possible and demonstrate that a mileage-based user fee could be successfully deployed using infrastructure that's available right now.

Since consumers already carry smartphones in their vehicles, there's no need for a state to deploy a million-dollar system to do this. The Minnesota effort, which began in 2011, is aimed at finding ways to reduce the state's reliance on

the shrinking proceeds from the gasoline tax as a way to fund roads and highways.

Source: Digital age transportation

Project SUNSET in Europe

In Europe, Project SUNSET explored the impact that incentives and gamification might have on transportation choices. The project was spearheaded by players and firms in the information realm, including providers of location-based services, mobile-phone operators, local and national governments and university research centers. The project connected urban mobility managers with users—and users with one another—through smartphone apps, allowing users to receive information tailored to their particular travel behavior. SUNSET also linked with existing roadside sensors to provide real-time traffic information. Users were able to share information about their own experiences on roads or transit, and track their progress in meeting particular goals.

To influence travelling behavior, a smartphone application called Tripzoom was developed featuring challenges and rewards to move smarter. Personalized incentives were offered on the basis of actual travel behavior of the Smartphone user. This is a personalized and multimodal coaching approach to traffic and mobility management, with suitable rewards for good behavior. The ultimate aim was to encourage people to travel sustainably, reduce congestion, increase safety, and protect the environment.

Source: Digital Age Transportation

Tranquilien helps find vacant seats

Tranquilien, a sort of Waze for rail transit users, helps passengers find vacant seats in Paris' crowded subways. Its algorithms are based on multiple data sources, most prominently real-time, crowdsourced data. As with Waze, users input their routes and then use the app to plan their travel.

Source: A billion to one

Carpooling using Carma app

Extending the employee pre-tax benefits currently available for parking, transit passes, and vanpool costs to ridesharing could increase its appeal to commuters. New technology that verifies vehicle occupancy could aid the implementation of the benefit from this proposal. Carma's new ridesharing app, for example, was tested in Austin, Texas in 2014. This app verifies the presence of two passengers in an automobile, which qualifies the automobile for an automatically applied 50 percent toll discount; with three or more passengers, the auto is eligible for a 100 percent rebate.

A mid-year interim report in 2014 showed 322 new carpools encouraged by the program and approximately 250 daily carpool trips in the fourth quarter of 2014. The estimated cost of constructing new lanes to provide the same capacity would be between $5.8 million and $17.4 million.

Source: Smart Mobility

Cognitive technologies to improve subway system in Hong Kong

The Hong Kong subway system uses cognitive technologies for automation to improve quality and efficiency. The performance of the system overall is impressive. It carries over 5 million passengers daily and boasts a 99.9 percent on-time record. In a typical week 10,000 workers carry out some 2,600 engineering activities across the system to keep it running smoothly. The operator of the Hong Kong subway system implemented cognitive technologies to automate

and optimize the planning of these engineering works.

The planning system encodes rules of thumb learned by experts over years of experience plus constraints such as schedules and regulations about maximum noise levels allowed at night. It employs a "genetic algorithm" that pits many solutions to the same problem against each other to find the best one, producing an optimal engineering schedule automatically and saving two days of planning work per week. Though it automates the work of experts, it doesn't replace them. As Andy Chun, CIO for the City University of Hong Kong and the designer of the system said, the human planners "are rare experts in the field. Their time is never enough." The system "helps relieve them of the scheduling task so that they can focus on tougher issues that require human interactions and negotiations."

Source: Cognitive technologies: The real opportunities for business

Smart Economy

The smart economy of the future is both seamless and dynamic. The growing ubiquity of digital and exponential growth in other technologies sees government regulatory machinery becoming nimble and responsive. While advances in technology help smart cities can streamline government procedures like permitting and licensing providing a seamless experience to businesses.

Trends

Exponential innovation creates regulatory challenges

The exponential change of technology presents a unique timing challenge for regulatory agencies: Regulate too early and you risk stymieing innovators; wait too long and you risk losing the opportunity to regulate a technology or service before it becomes widespread, potentially harming consumers or markets in the interim.

This becomes increasingly true in the smart city context as cities start experimenting with new and often unregulated technologies. For instance, a handful of years ago, the microchips needed to enable data collection and wireless communication were cost-prohibitive. Now, these microchips are more cost-effective and are commonly used in connected devices—which often presents a privacy and security challenge for regulators.

Source: Regulator of Tomorrow

Outcome-based regulation

Digitization and big data analytics improve city regulators' ability to track performance and outcomes, enabling them to shift from a concentration on processes to the achievement of specific targets. This allows those regulated to modify and adapt their approaches without possibly falling on the wrong side of the law, while giving regulators a clearer view of the ultimate outcomes.

Source: Government 2020

Citizen regulators

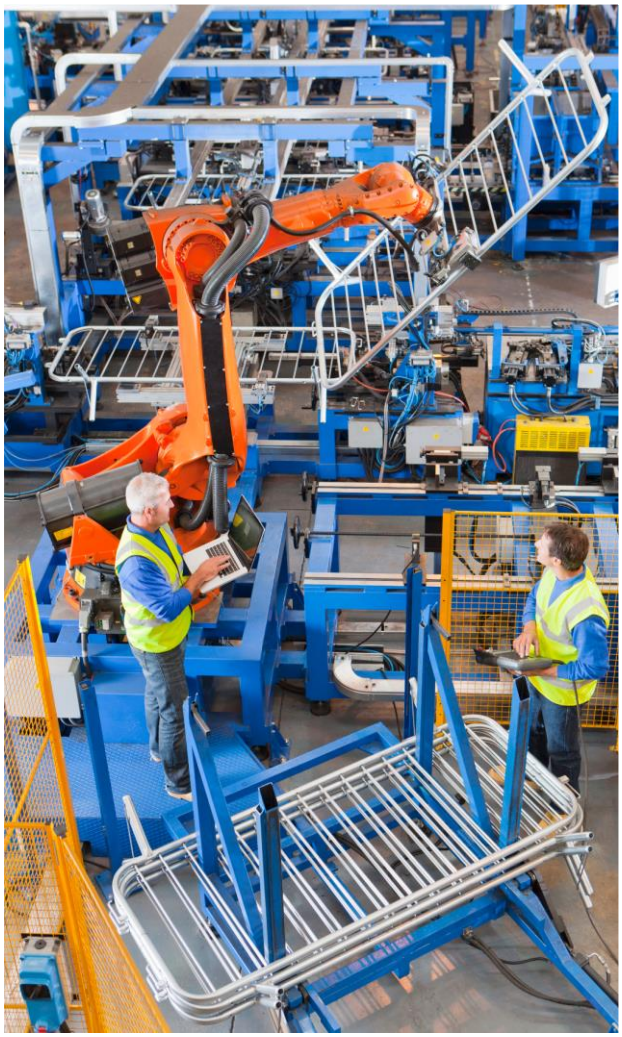
In an era of budgetary constraints and limited resources, regulators may find it difficult to collect all the data they need. However, regulators have a valuable new data source to tap into—data from citizens. But this goes beyond just data collection, niche groups of citizens with increasingly powerful tools, social and otherwise, become formidable civic crusaders. These "activists by night" undertake distributed monitoring and protection of the environment, organizing through websites such as witness.org. They also participate indirectly, opening up the sensors in their mobile devices and homes for use in large-scale monitoring programs.

Source: Government 2020

Streamlining licensing

Governments require businesses to obtain permits for thousands of different activities, from renovating an office to transporting nuclear waste. City agencies use digital technologies to create tools or apps to streamline licensing. These digital permitting systems explain which permits a project would need, let users apply for those permits, help them track those applications, and create an e-license which is valid across the jurisdiction. Streamlining licenses can not only reduce the burden on businesses but also increase regulatory compliance.

Source: Compliance without tears



Human-machine combination

Technology will likely continue to play a bigger role in the workplace. Some commentators worry that this presents us with a binary choice: human or robots. But the reality is more nuanced. While technology can indeed wholly automate certain routine manual tasks, other occupations could benefit most from the partial integration of technology. The resulting human-machine combination augments total intelligence and can significantly raise both productivity and quality. The smart cities of the future will be the hotbed for such integration and experimentation with applications in almost all aspects of the city life.

Source: From Brawn to Brains: The impact of technology on jobs in the UK

The open talent economy

Rapid globalization, technology advances, geographical mobility and innovation in education are transforming the concept of work. This often compels city administrators to focus on programs that help build the next-generation workforce. Companies can expand their talent networks to include "partnership talent" (employees who are parts of joint ventures), "borrowed talent" (employees of contractors), "freelance talent" (independent, individual contractors) and "open-source talent" (people who don't work for you at all, but are part of your value chain and services).

Source: The open talent economy: People and work in a borderless workplace

Matching training to skills required

The existing education and training system is going through a transformation. Many smart cities are observing the rise of alternative training providers. These providers offer an accelerated path for acquiring in-demand skills sought by employers and jobs in demand. This can lead to much shorter training periods, reduce the existing skill gap, and potentially create jobs.

Source: Government 2020

The rise of business ecosystems

Business ecosystems have been described as dynamic and co-evolving communities of diverse actors who create and capture new value through both collaboration and competition. These tightly integrated networks of organizations are a shift from the siloed and self-contained corporations of the past. Smart cities see the rise of such thriving business ecosystems around key areas such as health care, transportation, and education. A central aspect of this transition to dynamic and collaborative networks is that firms can begin to "deploy and activate assets they neither own nor control" and engage larger numbers of ecosystem participants.

Source: Business ecosystems coming of age

Treating businesses as customers

Businesses subject to city regulations aren't customers in the traditional sense. They don't have a choice. However, treating businesses as customers could create a lot of economic and public value. By adopting a "customer experience (CX) mind-set," city governments can make business compliance much easier, boosting accurate, voluntary compliance rates. By adopting a human-centered design approach cities design systems with businesses existing behavior in mind, rather than requiring businesses to adapt their behaviors to use a new system.

Source: Compliance without tears

Open data to facilitate business

A city government collects, stores, and makes available enormous amounts of data. But too often, it's siloed, difficult to access, and hard to understand. The open data platforms with easy visualizations can be of immense value to businesses. Such platforms help business select the right location based on economic, demographic and societal factors of their customers. The platforms can also provide data on availability of talent, their skills and education levels around vicinity.

Source: DataUSA
Source: Compliance without tears

Innovation labs for experimenting new opportunities

Innovation labs devise products and solutions to societal and public problems while providing a "safe" space for innovation, collaboration, learning, and incremental experiments to take place. These "city-labs" rely on open data to create service and applications relevant for citizens - bringing the ecosystem element to the siloed government.

Source: Delivering on Digital

Maker Economy

"Making"—the next generation of inventing and do-it-yourself—is creeping into everyday discourse, with the emerging maker movement referenced in connection with topics ranging from the rebirth of manufacturing to job skills development to smart cities. In a smart city, the maker economy makes

small production more economical and viable which leads to sustainable jobs and economy.

Source: A movement in the making

Case Studies

Building inspections in city of New York

New York used data science to boost the efficiency of safety inspections. The city was getting 25,000 complaints of illegal conversions of buildings each year with only 200 inspectors to cover the workload. Filtering the complaints using predictive analytics, the city was able to improve inspection efficiency. Without analytics only 13% of inspections found dire conditions, however with predictive analytics, more than 70% of inspections resulted in a vacate order – an impressive improvement that was achieved without additional inspectors.

Source: Delivering on Digital

Permitting reform in Boston

Boston had made streamlined permitting a top priority. The quest began with the HubHacks Permitting Challenge, a hackathon co-hosted by the Department of Innovation and Technology (DoIT) and the Mayor's Office of New Urban Mechanics (MONUM). Over two days, experts attempted to reinvent the city's permitting.

The hackathon's prototypes included a Find My Address tool to identify the address of record, an app that explains which permits a project needs, and a program to track applications through the permitting process. Boston also revealed a beta version of a new online permitting system that allows users to apply for multiple permits at once, organize permits by project, and include multiple people—say, a contractor and a homeowner—on the account

The effort to create a better customer experience has yielded significant results. The Inspection Services issued 12,500 more permits in the first year of reform than in the previous year. The average review time for long-form permits was cut by five days, or 20 percent. Permits are now issued on time 75 percent of the time. And the building complaint backlog shrunk from 3,500 to 212.

Source: Compliance without tears

Business Atlas service for small businesses in New York City

One of the questions that small and medium businesses face is where to locate the business within a city. Most small businesses often choose their locations based on little more than gut instinct. According to one survey, 72 percent of small and mid-size businesses make decisions that way, and 90 percent say that data-based decisions are the sole preserve of big companies, due to the costs involved. To address this issue New York City

created a tool called "Business Atlas" to help businesses research the economic conditions of neighborhoods where they might set up shop.

The free, online portal shows a map with interactive data on demographics, density of restaurants, income, and even foot traffic. This helps businesses determine what type of shop would thrive in a particular area, or which area might best nurture a new idea. The Business Atlas can help entrepreneurs gain crucial knowledge before making a costly investment.

Source: Compliance without tears

Creating new growth engines for Rhode Island

Rhode Island faced a sluggish economy in recent decades, challenged by low economic growth and high unemployment. Taking office in early 2015 amid this challenge, Governor Gina Raimondo made economic growth and job creation priorities for her administration. There was an urgent need to define priority growth engines, and high-impact activities that would help drive Rhode Island's economic development.

Strong industry clusters acting as leading drivers of innovation were identified by the state. Rhode Island's dominant clusters reflect historic strengths in naval defense, education, manufacturing, and corporate offices, with naval defense and corporate offices showing the most recent share growth. Emphasis was placed on the growth of submarines and underwater related technologies that could act as a growth catalyst through the value chain. By becoming a hub for such emerging technologies, RI could bolster and diversify the private sector and drive growth in the STEM and Small and Mid-sized Enterprise (SME) ecosystem. High quality, fast cycle, higher margin manufacturing were also identified as potential new growth engines. Targeted opportunities in these sectors can lead to sizeable job growth. This influx of talent will likely, in turn, start, attract, retain, and grow companies.

Source: Interview with Rhode Island project team, November 15, 2016

Preventing fire fatalities in New Orleans

The city of New Orleans used data science to formulate a preventive approach to firefighting. As part of its Targeted Smoke Alarm Outreach Program, the city developed a predictive model to identify areas at the highest risk of fires and fire fatalities. The data fed into the model came from open sources such as the Census American Housing Survey and American Community Survey, as well as the fire department's own data. Taking into account factors such as poverty, building age, location, previous fire history, and the likelihood of dwellings having fire alarms, the project turned once-siloed data into actionable insights.

Officials created a heat map of the city to pinpoint areas for a door-to-door campaign. For instance, since the analysis revealed that those under 5 and over 60 were most susceptible to fire fatalities, authorities distributed and installed fire alarms in areas with concentrations of these age groups. New Orleans distributed more than 7,500 alarms by the end of 2015. Analytics, cross-agency collaboration, and data integration helped the city optimize its resources to protect its most vulnerable residents.

Source: Delivering on Digital

Smart Living

A truly Smart City will advance the concept of Smart Living, a variety of approaches that leverage technology to enhance the daily living of residents. Cities can help promote tools and technologies that help citizens monitor their health, wire their homes to improve energy use, or deliver more tailored human services. Coupled with new data approaches such as predictive analytics and insights from the field of behavioral economics, Smart Living encourages citizens to make better choices in their own lives.

Trends

Quantified self for citizens

For patients to be truly empowered around their health outcomes, they need to first understand their current health. The "Quantified self" uses sensor technology innovation, embedded in wearables and mobile devices, to revolutionize self-tracking and allows individuals to monitor their physical conditions, from blood pressure to heart rate to blood glucose levels, and adjust their behavior in real-time to make better health decisions. Self-tracking data may make individuals more receptive to behavioral nudges and can be used by policymakers to reward healthy lifestyles.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Wearable devices prevent substance abuse

Drug use and prevention can have a major impact on cities. For those with a history of substance abuse, wearable mobile health devices can detect changes in indicators such as body motions, skin temperature, and heart rate to predict when the wearer is likely to engage in risky behaviors. This can trigger the delivery of personalized drug prevention interventions in real time, and alert caseworkers when an in-person intervention may be required.

Source: Government 2020

Geospatial analytics and hot-spotting

Using geospatial analysis, city administrators can examine complex data through the lens of place, giving them an intuitive way to target and prioritize specific neighborhoods in the city. Such an approach can be used to focus on multitude of challenges ranging from child abuse and neglect, drug abuse, unemployment, and health issues. This allows administrators to ask meaningful questions about factors that drive these specific challenges, and to focus resources on the neighborhoods — or even particular housing developments — where they are needed most.

Source: Government 2020

Predictive analytics in the community

Predictive analytics enables city administrators to use data to understand which social program

interventions have a higher rate of success depending on a client situation, and which mix of services could most help each client. This, in turn, allows caseworkers to adjust their approaches as circumstances warrant, making the safety net more responsive and flexible to client needs.

Source: Rethinking human services delivery

Smart homes for seniors

Sensor-equipped smart homes can improve long-term care options for senior citizens, allowing them to live safely in their own homes and maintain independence. These homes recognize and analyze behavior patterns (eating, sleeping, and movement), physical indicators (breathing and heart rate), and report signs of illness or cognitive degeneration to caretakers and physicians. These "senior smart homes" increase quality of life for seniors and reduce total cost of their long-term care.

Source: Government 2020

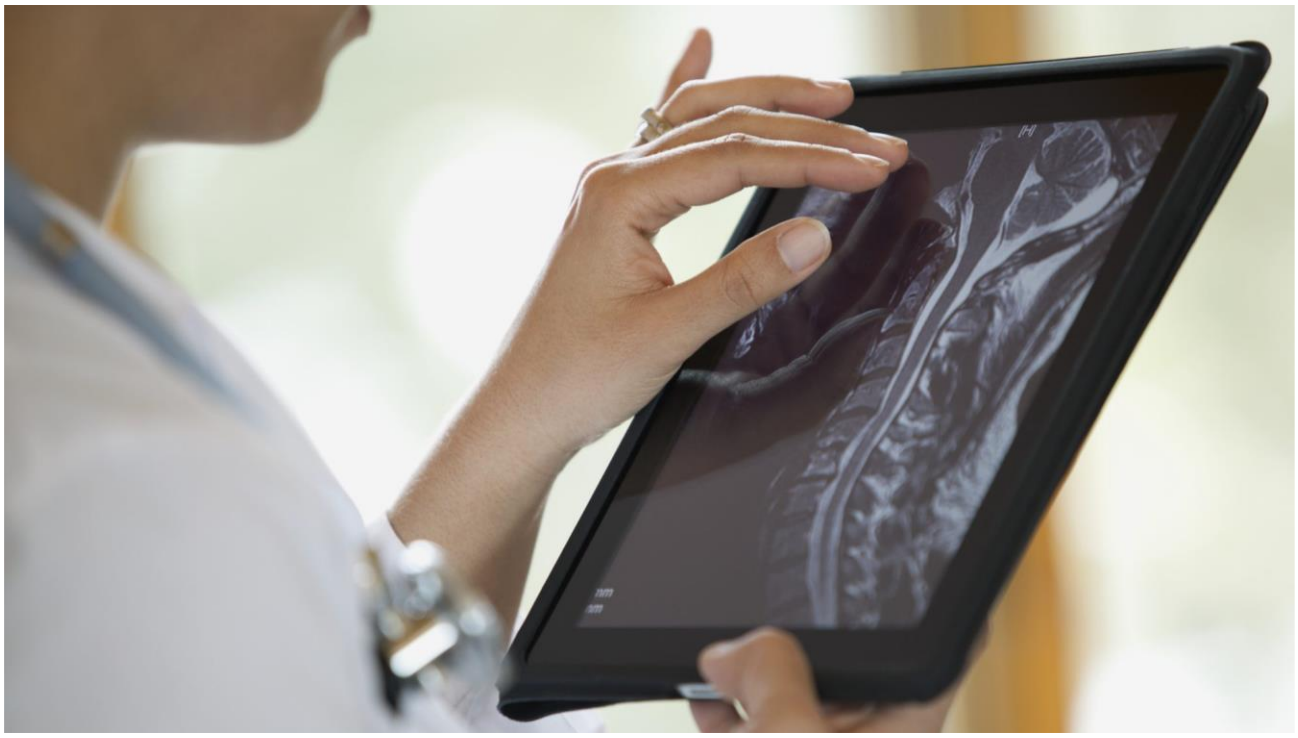
Match energy use to occupancy

Smart homes are a critical piece of the city's network, and their use of energy will ripple throughout the Smart City. Smart homes use sensors to record real-time data about the home's environment and conditions, such as temperatures, humidity, light, and air quality. This data can helps optimize 'home automation' systems such as cooling, ventilation, and lighting, reducing costs, and increasing comfort and efficiency.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Homes Operated by Electronic Devices

Smart homes can provide a stable foundation for Smart Living. Smart homes are connected with electronic devices such as smartphones, tablets, and laptops, enabling real-time monitoring of a home's appliance use, security, and efficiency. Lights, heating, the television, and other everyday appliances can be operated with an electronic device, and home access (from windows, to doors, to driveways) can be



monitored virtually to increase the home's security.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Intelligent feedback

Intelligent feedback provides aspirational services in next generation smart homes. 'Home automation' can monitor and analyze a homeowners' habits and routines, and uses the information to better support their daily life. For instance, a smart home's freezer may be able to register its contents, recommend recipes, track expiration dates, and order replacements as food is consumed.

Source: Smart cities: How rapid advances in technology are reshaping our economy and society (Gov Lab, NL)

Case Studies

Digitizing city health services in Ekurhuleni, South Africa

The Ekurhuleni Metropolitan Municipality (EMM) faced challenges that included a 37 percent youth unemployment rate, rapid urbanization, a population using 14 languages, and an internet access rate of less than 60 percent.

To tackle these problems head-on, EMM created a Unified Command and Control Center (UCCC), connecting government departments and regulatory programs, and creating a platform to enable digital solutions development. The UCCC produced a number of digital enhancements for citizens, from access to eHealth solutions (including a single patient record to facilitate better medical care), to increased interconnectivity providing 2,000 hotspots over 250 sites. Given their progress, the EMM seems well on its way to achieving an ambitious goal: transitioning to a fully digital city by 2055.

Source: Unified Command Centre: Conceptualizing a safe digital city

Next-gen connected homes in Portland

Real estate developer Capstone Partners has teamed up with Internet of Things startup IOTAS to offer smart home environments for renters at the Grant Park Village apartments in Portland, Oregon. Each apartment has various sensors, smart outlets, and switches installed in every room, enabling renters to monitor different aspects of their apartments such as temperature, humidity, lights, motion, and water flow. These systems also track the habits and preferences of the dwellers, and enable renters to create rules to

customize their home environment from anywhere and at any time through a mobile app. For instance, renters could set rules such as:

- If the renter walks into his bedroom after 10PM, all other apartment lights should automatically turn off and the temperature in the apartment should drop three degrees.
- If the renter's boss texts her, the living room lights should blink three times and the television should turn off.

While still exploratory, this type of connectivity could vastly enhance the renter's convenience and comfort, while also saving energy and reducing costs.

Source: Smart buildings: How IoT technology aims to add value for real estate companies

Redesigning human resources programs in the District of Columbia

In 2011, the District of Columbia (DC) piloted a redesigned Temporary Assistance for Needy Families (TANF) program to customize service delivery based on its assessment of specific client needs. This assessment included an analysis of each individual client's circumstances and abilities, considering everything from family and work histories, to individual interests, to substance abuse or mental health issues. The assessment is "solution-focused," with each question designed to solicit information about what has and hasn't worked for the client in the past.

The assessment helps in creating a customized profile for each client and categorizes them into one of four segments, each of which align to a tailored suite of services. The process incorporates other partner agencies and is high-touch, with outputs such as individual responsibility plans, service referrals, and more. The goal is not just to administer a benefits program, but to help families and individuals climb out of poverty; enable greater levels of self-sufficiency; and help clients to prepare for, find, and keep employment that provides a livable income. While the full rollout of the redesigned program is still in its early days, an evaluation of the initial pilot showed a tenfold increase in work activity among TANF recipients.

Source: Rethinking human services delivery

Supporting care at home

National Health Service Ayrshire and Arran, one of the fourteen regions of the NHS in Scotland, provided patients of Chronic Obstructive Pulmonary Disease (COPD) a HomePod (touch screen tablet), paired to a medical device (such as blood pressure monitor, pulse oximeter and weighing scales). This initiative was developed to improve wellbeing of patients with COPD, reduce unplanned hospital admissions, and reduce pressure on general practitioner appointments and out-of-hours service. Data is transmitted in real-time to a clinician who reviews and responds as required. The service began in 2011 and is now used by 150 patients. A cost effectiveness analysis concluded:

- Savings of 40 percent compared to "usual care" (equating to £100,000 a year)
- 26 percent reduction in general practitioner appointments
- 70 percent reduction in emergency admissions to hospital
- 86 percent reduction to local out of hours service

Feedback from patients shows satisfaction with the technology, an increased sense of security at being monitored, and reduced stress due to reductions in doctor's visits or hospital check-ups. Feedback from the care team indicates that patients are much more aware of their condition and able to manage it better.

Source: Connected Health: How digital technology is transforming health and social care

Using data to redefine the business model in Washington and Florida

Washington and Florida are two state governments using advanced analytics to shift practices from reactive to proactive. The state of Washington, for instance, has developed a web-based analytics tool called the Predictive Risk Intelligence System (PRISM) to support interventions for high-risk Medicaid patients. This tool integrates information from state medical, social service, behavioral health, and long-term care data systems to provide case managers with a risk score identifying those Medicaid clients most likely to need a comprehensive care approach. The tool tracks data including demographics, latest medical and dental appointments, hospital stays, health conditions, and prescriptions to paint a detailed picture of each client's unique circumstances.

Similarly, Florida's Department of Juvenile Justice uses predictive analytics to identify which juvenile offenders are most likely to commit new crimes. The aim is to reduce recidivism by using predictors such as past offense history, home-life environment, gang affiliation, and peer associations to place offenders in the best-fit rehabilitation programs.

Source: Rethinking human services delivery

Tracking medical equipment at Texas Health Harris Methodist Hospital Alliance

Texas Health uses RFID tags to track high-value assets like medical equipment, lower-value items like pillows, and even patients. RFID tags help save time by allowing nurses to determine if a piece of medical equipment is being used, cleaned, or available, and to locate needed equipment quickly. Texas Health also uses RFID to determine if patients or staff come into contact with serious, contagious infections.

Source: SMAC in Healthcare

Predictive analytics at University of Michigan Health System (UMHS)

"Analytics changes the way data and technology are viewed. It breaks down traditional barriers that have limited IT and addresses the movement and use of data," says Dr. Andrew Rosenberg, Chief Medical Information Officer of the University of Michigan's Heath System. UMHS includes three hospitals, 40 outpatient locations, extensive home care services, research, and education centers. UMHS was one of only two Accountable Care Organizations in the Medicare ACO Pioneer program, which improved both outcomes and margins.

One of the factors cited for the program's success was UMHS's consistent use of analytics to drive clinical decision-making and population health management. UMHS created comprehensive registries for population health and used them to generate predictive analytics that focused predominantly on chronic diseases. Through enterprise-level data governance and information management, UMHS aims to leverage analytic insights to improve the effectiveness of existing programs and enable new innovations such as public health genomics, pathology informatics, cancer research, and perioperative analytics — all of which may help to improve quality processes and, ultimately, outcomes for additional populations. These initiatives will likely support innovations in care delivery, research, medical education, and administrative functions.

Source: Health system analytics: The missing key to unlock value-based care

Deloitte.