A FIELD GUIDE TO

Smarter Communities

A strategic, incremental approach to digital, connected and people-centric government
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THE PROMISE OF SMARTER CITIES
Perched on 1,500 acres of reclaimed marshland on South Korea’s west coast, Songdo was built from scratch to be one of the world’s most digitized, connected and sustainable cities.

Smart floors in the city’s high-rise apartment buildings record shifts in weight and can automatically summon emergency services if they detect someone has fallen. Sensors throughout the community gather information on traffic flow, water consumption and energy use. Teleconferencing screens let Songdo residents take remote classes, interact with doctors or chat with each other. And an automated garbage collection system enables just a handful of employees to serve the entire city’s sanitation needs.

The technology is impressive. But in May 2016, the Los Angeles Times reported Songdo was home to just 100,000 residents, about half of the population it’s designed to hold. Others have criticized the city’s sterile atmosphere, calling it “surprisingly mundane,” despite the designers’ efforts to incorporate celebrated details from numerous world-class municipalities.

The story of Songdo provides insight into the art of the possible, while also demonstrating that without careful planning, some investments may not be widely accepted among residents and communities. Being “smart” may not mean applying all the latest technology available, but implementing technologies designed to bring growth and prosperity to a community.

Simple pronouncement of intent or well-intentioned edict is not enough. Careful consideration and implementation of well-fit technologies must be a part of the plan, making it vital for governments of all sizes to build a clear vision of what smart means to its specific pool of stakeholders.

A New Take on Smart

The initial smart city concept — with its ubiquitous sensor networks, centralized big data and wall-to-wall automation — is too bold, too brash and too expensive for most jurisdictions to embrace. However, the idea of using smart and connected technologies
to make communities work better for their residents isn’t wrong; it simply needs to be approached in a different, more practical and inclusive way. In recent years, city managers, administrators and mayors have flocked to smart city conferences around the globe to help stimulate ideas to bring connected technologies to their communities. But the question of realistic execution for most remains unanswered.

Cities in the U.S. aren’t green-field, test-tube experiments. They’re vibrant communities with existing, often aging infrastructure; complex, siloed relationships with other governments (county, state and federal); diverse stakeholders; organizational imperfections; and limited budgets.

These cities demand a “smarter” strategy, where emerging and digital technologies are added incrementally according to a people-centric vision or framework developed collaboratively by the city and its residents. In other words, they’ll get smarter piece by piece. Anthony Townsend — author of “Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia” — compares this approach to web versus mainframe computing.

“Model smart cities are like mainframes where everything’s going to a central place. There’s one suite of software that dictates how everything works and can be very carefully engineered,” said Townsend in an interview with Atlantic Cities. “But our ‘smart’ cities are going to look much more like the web, where there’s going to be a lot of things deployed by individual decision, talking to each other through open standards in very ad hoc, loosely knit ways.”³

What’s the Plan?

Research conducted for this guide indicates that in some ways, an incremental move toward smarter is under-way. CGI and the Governing Institute surveyed nearly 200 city and county officials and found 75 percent of respondents expect their transition to smarter will be incremental.

Today, these activities often sprout up in the form of public safety or transportation applications. Police cameras, sensors for real-time data monitoring, controllable traffic lights and electric vehicle charging stations were the deployments mentioned most frequently (see graphic on page 11).

What’s less clear is whether this incremental activity is being guided by an overarching vision. Just 13 percent of respondents to the CGI-Governing Institute survey say they’re following a plan. And 49 percent describe their activities as reactive — although almost one-third have talks underway to start the planning process.

It’s also unclear how inclusively jurisdictions are thinking as they form their vision for building smarter communities. Thirty-eight percent of survey respondents say they consider factors such as age, diversity, income, gender and disability in planning for a smarter community. But 18 percent say they do not, and another 44 percent don’t know.
Our ‘smart’ cities are going to look much more like the web, where there’s going to be a lot of things deployed by individual decision, talking to each other through open standards in very ad hoc, loosely knit ways.

Anthony Townsend, Author, “Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia”

The Way Forward

Ultimately, failure to create a clear, collaborative vision that directly ties to the jurisdiction’s strategic priorities, heritage and characteristics will be a significant barrier to effective use of smarter community concepts, as well as the funding for these projects. The path toward smarter is incremental — but these activities can’t be a random collection of tech deployments. They need to fit into a framework that reflects specific community needs and desires. Smarter community strategies need to provide a clear value proposition for all residents; therefore, they must consider factors such as age, diversity, income, gender and disabilities in thoughtful new ways.

This guide offers a roadmap for creating a shared vision for smarter — one that can form a framework to guide practical, incremental and effective use of digital technologies and automation to protect and enrich your community.
WHAT SMART LOOKS LIKE NOW
The big-bang, technology-centric approach may be fizzling, but the need to leverage connected and digital technologies and data-driven, transparent decision-making is climbing higher into the consciousness of government leaders.

The 2016 National League of Cities “State of the Cities Report” examined the top 10 issues mayors and city officials were talking about in their annual speeches and found that 20 percent included significant coverage of data and technology issues, with many emphasizing the use of technology to make their city smarter. Two years ago, the topic of smart technology didn’t show up at all in the top 10 list of issues mentioned in mayors’ state of the city speeches.

In a series of interviews conducted for this guide, local government leaders told us discrete projects with clear ROI can be the doorway into smarter initiatives, especially as these projects are woven together to present a value proposition to their stakeholders.

In Schenectady, N.Y., for example, a money-saving upgrade to LED streetlights was integrated with an existing camera network for public safety. Although the LED upgrade alone was projected
As I looked at the emerging technologies, it just seemed foolish not to look at the big picture to see how we could deploy an integrated strategy and make the delivery of our services more cost effective and more responsive.

Gary McCarthy, Mayor, City of Schenectady, N.Y.

“In our efforts to cut city lighting costs in half, integrating the lights and cameras delivered even more value. Now the cameras can monitor the level of activity on the street and adjust lighting accordingly. When no one is on the street, the lights dim, saving more energy. When there’s more activity, the lights brighten, improving safety and security.”

“As I looked at the emerging technologies, it just seemed foolish not to look at the big picture to see how we could deploy an integrated strategy and make the delivery of our services more cost effective and more responsive,” says Mayor Gary McCarthy.

Based on initial results, McCarthy says Schenectady is considering citywide expansion of intelligent LED lighting and cameras. Furthermore, the same sensors and cameras deployed for the lighting initiative could be used to gather data for traffic analysis and to monitor pavement conditions.

Behind the scenes, application programming interfaces (APIs) — standardized connectors that let one application talk to another...
Transition to Smarter

CGI and the Governing Institute asked nearly 200 city and county officials about their transition to smarter communities and their adoption of connected technologies to accelerate this transition. These are the technologies shaping their environments today:
Jonathan Reichental, CIO for the city of Palo Alto, Calif., says standard or “open” APIs offer a simplified method for exchanging data among smart community applications or between these new platforms and legacy systems. For instance, Palo Alto used APIs to share utility data from the city’s enterprise resource planning (ERP) system and a third-party meter-reading application with a new hosted platform that lets residents compare their energy consumption with others in their neighborhood.

“How did we integrate those three disparate things? They all support standard APIs. So that gives us a doorway to move data between applications,” says Reichental. “And 99.99 percent of vendors now provide them, so it’s not like it’s a surprise.”

Along with growing availability of open APIs, cities also can choose from an expanding selection of hosted services, allowing them to roll out smart applications without the upfront cost of buying computer hardware and developing software. Palo Alto’s energy consumption app, for example, runs in the cloud and is operated by a third-party provider.

Although smarter community initiatives are far from mature, early adopters are seeing results. For example, Schenectady expects to cut energy costs by more than 50 percent when it switches to smart streetlights. And Los Angeles used traffic sensors to reduce travel time in certain corridors by 12 percent while increasing vehicle speeds by 16 percent.

As for indirect ROI, smarter community initiatives can play a positive role in economic development. But growth doesn’t always affect all residents and businesses in the same positive way. That’s why more cities are envisioning these projects for their societal value as well, especially in alleviating the “digital divide.”

“We want to be sure that when it comes to smart cities that it is inclusive to all of the residents of the city of Austin,” says Austin CIO Stephen Elkins. “Whatever smart city initiatives are out there, they shouldn’t just benefit the affluent.”

The potential value of smarter community projects, along with technological advances that are making them easier to deploy and integrate, will continue to drive activity. But to realize the promise of these initiatives, communities must
develop a vision that weaves individual deployments into a comprehensive strategy.

Government officials interviewed for this guide say they’re turning more attention to planning activities that will create a larger framework for smart city projects.

“What we are starting to work toward, sort of a Smart City 2.0, is to connect various smart city initiatives together, so we can provide citizens with a more holistic solution,” says Ted Ross, CIO for the city of Los Angeles. “Just because police and transportation are separate departments doesn’t mean their initiatives don’t affect the same citizen and that they shouldn’t be combined or integrated.”

States Can Be Smarter Too

Although much of the smarter communities discussion to date revolves around cities, there also is growing activity at higher levels of government and across other public sector agencies, including school districts. States in particular may play several roles in the movement toward smarter government, including:

Regional coordinator for local efforts

Many smart government efforts will be more impactful if they’re approached from a regional perspective. For instance, achieving goals such as relieving traffic congestion or improving water conservation may require coordinated approaches that involve multiple jurisdictions. States may be in a position to help organize these regional efforts.

Dave Fletcher, chief technology officer (CTO) for the state of Utah, is thinking about how combining water data from state and local sensor networks can give planners a clearer picture of water use across the state.

“We have sensors throughout the state that track snow levels, and they report on those snow levels in real time,” he told Government Technology. “And then we also have sensors that track stream flows so we know how much water is coming down, and how much is going to be available.”

As cities create their own sensor networks to track water supplies and consumption, that data can be added to existing state data to improve resource management statewide.

Technology enabler for local efforts

More states are becoming cloud service providers for local governments, offering low-risk “government cloud” hosting environments for new services and legacy modernization. For instance, CalCloud, operated by the California Department of Technology, offers local governments cloud hosting on secure, state-controlled servers, which can help lower the barriers to smart technology projects. State contracts or multi-state contracts — such as the NASPO ValuePoint cooperative contracts — also can make it easier for cities and counties to acquire the technology they need.

Defining a Smarter Vision for Themselves

At least one state is developing its own smart state strategy. Illinois state CIO Hardik Bhatt intends to make his state the “smartest in the U.S.” within three years.

Part of the vision includes consolidating multiple state operations and data silos to boost efficiency. Bhatt’s also looking at how smarter technologies can be used to manage state vehicle fleets and ultimately to enable use of autonomous vehicles.

And he expects data analytics to help Illinois improve social services programs. “It’s very tough to know — who are those 20 percent of Illinois citizens who are using 80 percent of our health and human services ... and how can we serve them more efficiently?” Bhatt told Government Technology.
The city of Palo Alto has more than 20 initiatives underway that can be defined as smart city related. They range from digitally controlled traffic signals and public dashboards for sustainability metrics to fiber-to-the-home and citywide wireless projects and a virtual public library.

One standout smart initiative in Los Angeles is Vision Zero, which Mayor Eric Garcetti has championed to end traffic fatalities by 2025. The project involves multiple initiatives, data sets and partnerships, including work with the University of Southern California and Google Waze to change driver behavior and reduce traffic accidents.

Kansas City has a multi-pronged, smarter community approach to reinvigorating its downtown district. The city is launching interactive information kiosks and Wi-Fi around its new streetcar line, and using smart streetlights and sensors.

San Diego’s LED lighting initiative will upgrade approximately 14,000 streetlights, almost half of which will be equipped with sensors and cameras. The new lighting will lay the foundation for other smart city projects.

Cities across the U.S. are launching smart technology initiatives, largely focusing on more efficient transportation, improved quality of life and better public services.
Chicago

The city of Chicago, the University of Chicago and the Argonne National Laboratory launched a sensor project known as the Array of Things, which will eventually consist of 500 nodes on city streets that will collect open data on air quality, traffic, climate and more. The project will transform the city into a testbed for smart, sustainable strategies.

Columbus

The winner of the U.S. Department of Transportation’s Smart Cities Challenge, Columbus plans to deploy electric, connected, self-driving vehicles; set up a “smart corridor” where vehicles connect with infrastructure and other vehicles to support bus rapid transit; craft incentives to build more electric vehicle charging stations; create applications to help truck drivers efficiently navigate the city; and more.

New York City

In New York City, the mixed-use neighborhood being built over a Long Island Railroad yard on the far West Side of Manhattan, known as Hudson Yards, is about to become the first “quantified community” in the country. New York University and other organizations will collect information on pedestrian traffic, air quality, energy production and consumption, and even the health and activity levels of workers and residents.
What’s holding back many communities from investing in smart city projects are a range of problems that may sound familiar.

**Cost**

State and local governments spend a significant percentage of their IT budget on maintaining legacy systems. Funding for new endeavors involving advanced technologies such as sensors, wireless networks, analytics and artificial intelligence can be hard to come by. Linked to the funding issue is the lack of data on ROI. Experts have dubbed smarter city initiatives “demonstrations of the possible,” which consist heavily of pilot projects that lack hard numbers for outcomes and payback.

Not surprisingly, 85% of local government leaders cite lack of funding as a barrier to developing a smarter community.

**Jurisdictional and coordination issues**

Well-designed smarter community projects can involve more than one department and don’t necessarily stop at the boundary line. Projects that deliver more bang for the buck likely get priority when it comes to funding, but they can be difficult to pull off because of the level of coordination involved.

**Short-term priorities**

Short election cycles and one-term administrations can change the tenor of what is considered a priority project. Elected officials shy away from projects that may not be in production by the time they finish their term.

**Procurement**

Purchasing the digital technology for smart projects can get complicated. For example, many solutions involve cloud technology, but cloud solutions are often subscription- or rent-based. This is an operational expense that might not fit existing procurement practices for technology. Another complication related to the procurement of cloud technology is the negotiation of contractual terms and conditions related to data security and the liabilities associated with a data breach.
Privacy and data security

Sensors that collect data that might create personally identifiable information when integrated with other data make people nervous. Cameras on city streets can also cause discomfort. Smart city projects based on digital technologies collect a lot of information that involves people in one way or another. The issues of privacy and data security can be addressed and mitigated when managed in the right way, but it can kill a project if these issues aren’t managed and communicated effectively.

Integration with existing systems

For many cities, existing computer systems are in silos for a reason: they use old technology, making integration an expensive, time-consuming proposition. For that reason, some CIOs prefer to keep smart technology separate from existing systems.

Nearly one-third of local government leaders say integrating digital technology with current systems is a challenge for them.

But 44% say integrating government platforms and activities with current systems is a driver to move toward a smarter community.

Shortage of IT talent

Government agencies must confront an aging workforce close to retirement, and figure out how to attract new, skilled talent in a highly competitive job market. As governments deploy smarter technologies and strategies, public sector workforces will need to add new skills in data science, contract management, cybersecurity and agile development. For many jurisdictions — especially mid-tier and small cities, some of which may not even have a CIO — finding talent in these areas can be especially difficult.

55% of local government leaders say staff resources are a barrier to implementing smarter technologies.

All research noted is from the CGI-Governing Institute survey of nearly 200 city and county officials in 2016.
THE RIGHT STEPS TO SMARTER
Barriers to entry and less-than-realistic goals laid out with the first generation of large-scale smart city initiatives prompted local leaders to revise how they embrace the smarter movement. Afraid the projects would go nowhere, or lacking adequate funding, many government leaders put discussions and plans on hold as they grappled with numerous questions about the goals, plans and outcomes of smarter initiatives.

But the fact remains that smarter communities deliver value and efficiency while providing benefits to a broad swath of the population. To realize this potential, government leaders can follow these recommendations that will help to turn the idea of a smarter community into reality.
Critical components of your digital strategy or roadmap:

- **Determine your priorities and define your vision.**
  What problems does your community want to solve? What do you want to do?

- **Take an incremental approach.**
  Incrementalism allows cities to experiment, pilot or develop a proof of concept without straining their budget.

- **Look for synergies.**
  Seek out opportunities to take an enterprise approach to what might initially be a project with only tactical outcomes.

- **Identify and involve stakeholders.**
  Define roles and responsibilities for government leaders; understand the potential involvement for non-profits and industry partners; and remember that residents and businesses are the ultimate stakeholders.

- **Establish processes for data capture, evaluation and interpretation.**
  Data volumes will increase dramatically. Without a plan, you’ll be buried in a mountain of information you can’t use.

- **Pay attention to data security and privacy.**
  Smarter initiatives involve new types of data and increased data sharing — both of which will change your risk profile.

- **Leverage legacy technologies and rethink policies.**
  Becoming smarter may mean finding creative ways to integrate with legacy systems (like open APIs) and modernizing HR policies to attract and retain digital technology experts.

- **Find the money and look for ROI.**
  Consider multiple funding sources, including savings generated by more efficient technologies and grants from non-profits. Keep in mind that smart city initiatives can bring ROI in the form of cost savings, but also help achieve larger goals such as increased safety and improved economic development.

- **Don’t leave people out.**
  Gender, age, race, income and other demographics are important factors to take into account as smarter strategies take shape.

- **Establish relationships with the vendor community.**
  Some cities have used industry partnerships to support smarter initiatives, including transformational outsourcing projects that free up resources for innovation.

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**Determine Your Priorities and Define Your Vision**

Building smarter cities is not just about setting a goal or providing a deadline for when your city will be “smart.” Instead, it’s an iterative process that is more journey than destination, focused on continuous improvement with no end game.

“We don’t think of a smart city as a project or set of projects,” says Palo Alto’s Reichental. “We consider the smart city idea to be a framework by which we can talk about and use a common language to describe the work that reinvents, rethinks or creates new value for our community.”

Still, it’s important to determine your priorities and lay out a vision for where you want your city to go.

“The first step is building the strategy,” says Bob Bennett, chief innovation officer for Kansas City, Mo. “One of the first things Kansas City did in the very early days of Mayor Sly James was to establish a digital blueprint. This included what we wanted to do and how to make sure the city’s departments internally were being most efficient in providing services to the city.”

Both Washington, D.C., and Palo Alto have established working groups composed of city department leaders to help determine priorities. These aren’t specific technology implementations, but rather
Take an Incremental Approach

As we interviewed city leaders on what it means to be a smarter community, the concept of incremental deployment was hard to miss. Incrementalism allows cities to experiment, pilot or develop a proof of concept without straining the budget.

Our approach is incremental. In my view, it’s ridiculous to even think about a 5- or 10-year grand plan that’s very specific.

Stephen Elkins, Chief Information Officer, City of Austin

Your strategy has to be incremental — that’s the only way you’re going to be able to pay for it.

Bob Bennett, Chief Innovation Officer, Kansas City

Can you imagine a grand IT plan for a smart city that didn’t anticipate the iPhone? You would have completely missed a huge shift in technology.

Ted Lehr, Information Data Architect, City of Austin
Whether you call it a “digital blueprint,” a “framework” or something else, crafting a strategy based on the priorities of city departments is the first step in your city’s evolution to smarter.

With priorities in hand, technology departments can look at what tools they have and what they need to obtain to go in the right direction.

It may seem obvious, but it’s important to note that not every city is the same and priorities will largely differ. “My advice is don’t go with a one-size-fits-all approach when you’re building out the strategy,” says Vemulapalli. “If you look at big cities and mid-sized cities, and then small cities, everyone has different issues and challenges.”

In addition to their size, cities’ priorities will be driven by other factors such as population demographics, climate or current economics. For Kansas City, the priority is to drive new businesses and people into key city corridors. Google fiber opened one door. The city’s new streetcar line opens another. Both are serving as foundations on which the city is pushing its plans.

For Palo Alto — a relatively built city with little open space — transportation is a key priority. “We see more cars and the constant lack of parking, congestion and quality of life being interrupted,” says Reichental. “A big part of our immediate focus for smart city efforts is related to those challenges.”

Take an Incremental Approach

With your vision in place, forget the big bang. Instead, work toward it incrementally. Grand plans take too long anyway, says Ted Lehr, information data architect for the city of Austin. “Can you imagine a grand IT plan for a smart city that didn’t anticipate the iPhone? You would have completely missed a huge shift in technology.”

Incrementalism allows cities to experiment, pilot or develop a proof of concept without straining the budget. Lehr recommends using “agile,” a software development methodology that allows developers and users to build chunks of a new system, test repeatedly and then move on. Problems are often identified before too much investment has taken place, allowing for course corrections, which improve the chances of success.

Look for Synergies

Being smarter is also about working smarter, and that means breaking down silos and not reinventing the proverbial wheel. Government has been criticized for making decisions in a vacuum, leading to inefficiencies across the enterprise.

For example, if a city’s department of public works wants to replace streetlights with LEDs, it makes sense to talk with the department of transportation to see if their needs might include sensors that can monitor traffic, while police might want to mount cameras in corridors where crime is a problem.

“You want to look at piggybacking different operations on infrastructure,” says Vemulapalli. “This way, one investment could help the project for three agencies succeed.”

The idea is to look for opportunities that can take an enterprise approach to what might initially be a project with just tactical outcomes. By bringing together different departments for bi-weekly meetings to determine priorities and define a vision, Vemulapalli’s team can more easily identify synergies that get everyone what they want with less effort.

Smarter may also mean working across jurisdictional
To be successful, smart communities need to convene relevant stakeholders. This may take some time as you build an incremental approach to smarter, but the relationships and input will pay off in the long run.

**Community Players**
- Neighborhood Groups and Associations
- Community Activists and Organizers
- Academic Institutions, Non-Profits, Foundations and Think Tanks
- Regional Governments
- K-12 and Community College Districts
- Hospitals
- Military Bases
- State and Federal Government

**Enterprise Players**
- The C-suite of Public Technologists
  - CIO, CTO, CISO, CINO
- City Planners
- Policy Champions
- Managerial Champions
- Budget and Finance
- Procurement
- Public Utilities
- Public Works
- Transportation
- Economic Development
- Public Safety
- Offices of Education
- Hospitals
- Vendors

**Infrastructure Players**
- Private Utilities
- Telecom/Broadband
- Electrical
- Water
- Wastewater
- Waste Management
- Transportation Authorities
- Architects/Engineers
- Housing Authorities
- Developers/Home Builders

boundaries. This is particularly true in areas such as transportation, where regional solutions will deliver the greatest value and impact. For example, the city of Los Angeles partners with the Los Angeles County Metropolitan Transportation Authority — which provides public transit across 88 cities in sprawling Los Angeles County — to offer a mobile trip-planning application that lets residents compare transportation options throughout the region.

Participation in intergovernmental forums and councils may help local government leaders forge these regional partnerships, as well as expose them to smart ideas from neighboring communities.

Identify and Involve Stakeholders

When Kansas City began its application for the U.S. Department of Transportation’s Smart City Challenge, Bennett says the strategy team consisted of approximately 15 people — including city staff and individuals from the transit authority and engineering firms, as well as a few subject matter and technology experts. But city leaders soon realized they needed to expand their circle to ensure the initiative was going to work for the community.

“What we ended up with was a planning committee team of 154 people,” Bennett says.
This included economic developers based on our east side, who were absolutely critical players in helping us determine the optimal location for technology and identifying the business and community leaders we needed to engage with and who would then take this technology and work to give opportunities to people who live there.

Ross in L.A. says when identifying stakeholders, it’s important for leaders to keep going back to why a community wants to be smarter in the first place — and that should be to substantially better the lives of residents and improve the environment in which businesses can thrive. For Los Angeles, the ultimate stakeholders are its residents, and those are people often overlooked in technology conversations.

“IT may seem simple, but when projects get big and complex, sometimes the most important customer gets lost in the shuffle,” Ross says.

“Establishing processes for data capture, evaluation and interpretation

Smarter communities are driven by data. The use of sensors, cameras and other devices capable of scooping up vast amounts of data represent a sea change in how organizations will provide increasingly sophisticated and responsive public-facing services. For example, the Tampa Housing Authority is embarking on an analytics project that will layer socio-economic factors over its legacy data to generate heat maps. This will help city leaders analyze the effectiveness of housing policies and further expand affordable housing opportunities to low-income families.

Most cities will be dealing with terabytes of data, which raises important data management questions that can be answered by good governance practices and sound data policies. Governance will help sort out issues around data ownership and data access. Just as important is having a grasp of what data is actually useful to the purpose of the project.

“If you don’t have a plan, you are soon going to see an insane amount of data that you won’t know what to do with.”

Archana Vemulapalli, CTO, District of Columbia

“If your North Star isn’t the people, then sometimes that smart city initiative will lose its bearing. You may end up realizing an efficiency that’s related to government, but it might have a minimal impact on the citizens themselves.”

DAVID KIDD
an insane amount of data that you won’t know what to do with,” says Vemulapalli.

Looking to the future, after cities are effectively using data analytics to evaluate and manage services smartly, imagine what could be done with new advanced analytic methods such as prescriptive analytics for planning and optimizing city services.

### Pay Attention to Data Security and Privacy

Data security should be dealt with up front, say CIOs who are familiar with the relatively weak security controls built into sensors.

Smarter city projects typically involve new and beneficial data-sharing relationships, as well as more network-connected devices — all of which change a jurisdiction’s risk profile.

To ensure smarter initiatives don’t create new security vulnerabilities, communities must practice sound, risk management-based cybersecurity techniques. This approach constantly re-evaluates a jurisdiction’s security posture with a feedback loop for adaptation and improvement.

As agencies ramp up data-driven and IoT-driven activities, government cybersecurity strategies will need to be tightly integrated into existing risk management and business continuity processes. Adopting the NIST Cybersecurity Framework is a good place to start. The framework is a risk-based, best practice-focused model that can be customized according to business needs.

#### Protecting Data in the Era of Smarter Government

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<tr>
<th>Step</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Ensure security is integrated into your overall risk management strategy, and adopt the NIST Cybersecurity Framework. Require all departments to participate in ongoing planning and management activities, as well as the risk management process.</td>
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<td>2</td>
<td>Use the NIST Framework to measure the maturity of your existing cybersecurity program. Assess risk by taking inventory of your most critical digital assets, information and systems. Work with security pros to prioritize data and protect each data set.</td>
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<td>3</td>
<td>Adopt tools and technologies that provide constant measurement of capabilities such as the Department of Homeland Security’s (DHS) Continuous Diagnostic and Mitigation (CDM) program or software applications that communicate security posture via data analytics-based dashboards.</td>
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<td>4</td>
<td>Develop and maintain a strong cybersecurity team, starting with the CIO and CISO. Support IT and security leaders by empowering them with clear authority and responsibility for cybersecurity planning and management.</td>
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<td>5</td>
<td>Propose budgets that prioritize cybersecurity programs. Use a risk-based cybersecurity planning process to identify top priorities.</td>
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<td>6</td>
<td>Promote a security culture by requiring regular cyber-awareness training for employees. Sharing relevant risks, threats and challenges gives employees an active stake in protecting the jurisdiction.</td>
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<td>7</td>
<td>Ensure business continuity plans encompass cyber incidents. Many jurisdictions are wrapping cybersecurity into their disaster recovery plans.</td>
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<td>8</td>
<td>Create an incident response team and have a response plan ready in the event of an attack. Your plan should define roles and responsibilities, outline how to recover systems, identify where data is backed up and include a communication strategy.</td>
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<tr>
<td>9</td>
<td>Work with the private sector to create a secure, technology-friendly culture. Support remote risk-based cybersecurity management among private sector partners, and collaborate to improve security across the jurisdiction.</td>
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<tr>
<td>10</td>
<td>Review procurement processes. The emergence of cloud and “as-a-service” solutions change where data is stored, and how it is accessed and protected.</td>
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risk tolerance, and available funding and resources. Unlike traditional compliance-based cybersecurity strategies, the risk-based approach is dynamic, which enables communities to evolve their security posture in response to changing risk profiles and threat vectors.

Just as important as reducing security risks is setting good privacy policies. Managing the sensitivity people have about cities collecting data and images that might end up as personally identifiable information requires transparency, engagement and good policy. Don’t just talk to people who have an opinion, says Vemulapalli, but reach out to those who haven’t expressed them yet.

“We ask them about the impact [of the project]; we go to the agencies with the strictest privacy concerns to understand why they care about what they care about,” she says.

In Chicago — where the city is developing a project known as the Array of Things, involving the installation of hundreds of sensors by 2018 — the privacy issue is a top priority, says Charles Catlett, director of the Urban Center of Computation and Data. His way of handling it was to make the project and the data it collected as transparent as possible, involving lots of public engagement.

“We had a hunch that we should start talking about the project well before we started putting anything up on poles,” Catlett says.

The move to be open about what was going on turned out to be a good thing as far as letting the project progress. “The transparent approach is a lesson for other projects,” he says. “For the most part, transparency isn’t really necessary if you are doing measurements around weather or air quality. But once you start to collect data that might have to do with individuals, there’s a sensitivity. Without trust from the residents living near the sensors, the project would be dead in the water.”

Leverage Legacy Technologies and Rethink Policies

Implementing smarter technologies does not mean you need to give up existing systems. In fact, you’ll get more value from smart initiatives by integrating
key data from systems of record. Jurisdictions are using open APIs to simplify integration between important legacy systems and new platforms and services. Cities such as Palo Alto have rewritten procurement policies to require that IT vendors support open APIs to simplify data sharing among systems. These innovative and low-overhead integration strategies will help communities extend the life of legacy technology as they assess their upgrade path.

Ultimately, the move toward smarter government will be one of the drivers for legacy modernization. But even these projects will be done differently as governments move toward agile and modular techniques to deploy major systems.

Agile deployment, along with growing availability of cloud-hosted options, will lower the barrier for modernizing back-end systems to support new functions and public-facing services. This smarter approach to legacy modernization may

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**Edinburgh**

Scotland’s capital city launched a transformational outsourcing initiative that creates new digital services, increases government efficiency and boosts the local economy.

**Efficiency**

A new ERP system will automate and integrate back-office processes, reducing administrative costs and increasing capacity.

**Digital Services**

A digital services platform will let citizens and businesses conduct a wide range of electronic transactions with the city government. The new digital services integrate with the modernized ERP to provide a better citizen experience at lower cost.

**Economic Development**

Edinburgh’s private sector outsourcing partner is committed to creating 200 jobs and 60 apprenticeships in the region. The outsourcing partner also is developing a joint innovation fund with the Edinburgh council to stimulate local companies to provide digital and social media services.

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**Helsinki**

Finland’s largest city is using data and new digital services to become smarter and more sustainable.

**Transportation & Sustainability**

Smart data is being used to improve Helsinki’s bus system. The city analyzed a large amount of information to design smoother and more efficient routes, resulting in better passenger satisfaction and environmental benefits.

**Health Care**

A mobile workforce solution helps home care workers provide better and more efficient medical care to senior citizens and others. These workers make more than 17,000 home visits annually. The mobile solution lets workers spend more time with patients and less time in the office. The solution also improves the accuracy and security of patient data.

**Public Safety**

Real-time fleet tracking enables the city rescue department to cut response time for emergency crews. And a mobile first aid information system supports extensive documentation of a patient’s treatment. Physicians can monitor treatment remotely as the patient is transported to the hospital.
also drive jurisdictions to rethink legacy policies. For instance, government leaders may need to update purchasing laws to support the acquisition of cloud-based services, enable agile procurement strategies and allow for public-private partnerships. They also may need to develop new workforce skills around agile deployment methodologies and support closer collaboration between system development and operations staff.

Find the Money and Look for ROI

When it comes to funding a smarter community initiative, there’s no single script on how it gets done. Some cities will use their innovation fund (if they have one) to test the pilot, then turn to the RFP process to draw competitive bids and use the procurement process to purchase what’s needed, usually from a government’s general funds.

Implementing a well-thought-out pilot project that tests new technologies on a small scale doesn’t have to come with a hefty price tag. “Devices and sensors are not that expensive individually or in small numbers, but the benefit can be huge,” says Vemulapalli. “By doing a small-scale version of a project, it helps decision-makers visualize what the technology can do before you line up the funding for it.”

That’s important because people who have a say in funding a smarter project can have trouble visualizing what it could look like or what kind of information will come out of it. “Pilots help you do that,” says Vemulapalli. “They also let you see whether the technology will work or not, or if the results are worth investing in.”

Still, funding a comprehensive smart city initiative can be daunting. Grant programs can help. In 2015 the U.S. Department of Transportation launched its Smart Cities Challenge program, which now provides nearly $65 million in grants to support smart transportation programs. And organizations including the Knight Foundation and Bloomberg Philanthropies award grants to cities for innovative data projects and other initiatives. Figuring out the best way to proceed can involve hybrid approaches that include grants, paybacks through cost savings and public-private partnerships.

The city of Schenectady budgeted $123,000 for the pilot portion of its conversion to LED lighting. With a lifespan of 10 years, compared to 2 to 3 years for the city’s old HID lights, Schenectady expects to significantly reduce maintenance costs. But the real savings will come from lower energy costs that could save the city $3.5 million per year.

Kansas City funded its smart city project with a public-private partnership. The project, which places kiosks along the city’s new streetcar route and implements a public Wi-Fi network, was heavily funded by private sector partners to the tune of $15.7 million, says Bennett. The city invested $3.8 million. Revenue to pay for the project will be generated by advertising sales on the kiosks.

Other jurisdictions have used transformational outsourcing to reduce the cost of core operations so they can invest in new smarter citizen services. For instance, outsourcing application development and maintenance at the city of San Diego saved millions of dollars and led to widespread modernization of city services.
Managed Services Enable Innovation in San Diego

Managed services are helping the city of San Diego’s IT department spend more time innovating and less time maintaining core services. That shift in focus enabled the city to launch a series of smarter initiatives, including a new mobile app to report problems like graffiti or potholes and LED street lamps that will both save money and enable other new services.

In 2012, San Diego awarded outsourcing contracts for application development and maintenance, data center services, voice and data networks, and desktop support. The move saved millions of dollars for local taxpayers and gave the city access to modern technology infrastructure. For instance, outsourcing application development and maintenance delivered more than $8 million in savings to the city and cut annual maintenance costs by 11 percent. At the same time, 91 applications have been modernized, including migration to digital and mobile technologies.

The managed services strategy also allows San Diego’s relatively small IT staff to focus on transformative new projects, says San Diego CIO Jonathan Behnke. “It takes the conversations away from all of the daily operational things that come up in providing those core baseline services. That really just lets us focus most of our time more on the strategic side.”

For instance, the city recently launched the “Get It Done” mobile app, which lets citizens snap pictures of roads that need maintenance, graffiti that needs cleaning or other issues and send them to the city. Users are notified once the issue is resolved. “I think it’s a better way for the city to engage with citizens,” Behnke says.

The LED lighting initiative will upgrade some 14,000 streetlights, almost half of which will be equipped with sensors and cameras. Besides dramatically cutting energy consumption, the new lighting also lays the foundation for other smarter city initiatives.

“As we build in these cameras and sensors, we have opportunities to make improvements in how people find parking, and we can leverage data on traffic patterns,” Behnke says. “There are a lot of ways the city can benefit.”
Don’t Leave People Out

In the late 1990s, a study out of the city of Vienna, Austria, found that after the age of 9, the number of girls using public parks dropped off dramatically while the number of boys remained steady. The reason? The girls were less assertive than boys and when they competed for the same park space, the girls lost out. Soon after, Vienna took action, redesigning two parks. The city added footpaths to make the parks more accessible and included more activities, like volleyball and badminton. Trees and bushes divided some of the open areas into smaller spaces. Girls came back to the parks almost immediately.

Taking gender into account in public policy and planning — or gender mainstreaming — has been on the radar of some European countries for several decades, impacting public transit, urban planning, health care, education and more. It’s a definitive move away from the default of assuming everyone who uses public infrastructure is a white, middle-aged, able-bodied man — because they aren’t — and what works for them will be equally as beneficial to all — because it won’t.

Gender, age, race, income and other demographics are important factors to take into account as smarter strategies take shape.

Establish Relationships with the Vendor Community

Another strategy that communities can follow is to develop relationships, as well as eventual partnerships, with the vendor community. Kansas City relied heavily on key corporate partners to help fund and build aspects of its smart city projects. Once city leaders figured out what their goals were, they developed partnerships with tech firms willing to help them meet those goals.

For smaller cities, such relationships can be crucial, given that they often lack the resources and skills to which larger cities have access. Schenectady Mayor Gary McCarthy describes his city’s relationship with its technology partners as somewhat symbiotic.

“Technology companies have a good general knowledge of what the city does. What they don’t have is detailed, specific knowledge that would make them more effective in terms of linking their technology with our needs,” he says. “On the other side, our city staff is adept at handling the array of city services we need to deliver, but they don’t necessarily understand where the emerging technologies are headed.”

By bringing the two groups together, Schenectady leaders can spot where their technical gaps are and match skilled technologists from vendors with city staff. This allows them to collectively figure out how best to implement the new technologies for the city.

So far, these kinds of partnerships are the exception. The CGI-Governing Institute survey conducted for this guide found that few state and local respondents have fashioned the kind of relationships that Kansas City and Schenectady have developed, creating an opportunity for government and private sector partners to work strategically to craft innovative funding models to pay for smart city projects.
Checklist:

If You’re an Elected Official …

☑ Set a vision that addresses not just short-term needs, but also long-term concerns such as social inclusion, quality of life and economic development.

☑ Avoid going for solutions that you hope will brand your city as smart. Market branding and city rankings do little to address real needs that can be addressed first by the right agenda and then by technology.

☑ Once you’ve set the vision for your city, bring the right stakeholders into the conversation and use your leadership to craft a practical, incremental approach to the project.

☑ Reach out to the business community and potential IT partners. Tech firms know where emerging technologies are headed and can help you become aware of the possibilities — once you’ve set the vision and direction.

If You’re a CIO …

☑ Be incremental with the planning process. Steer clear of big-shot strategies and replace them with a process that relies on proof of concept or pilots.

☑ Establish effective working relationships and synergies with peer leaders, including chief officers for innovation, data, security, sustainability and resiliency, as well as your organization’s business leaders.

☑ Implement good IT governance frameworks and practices regarding cloud deployment, cybersecurity, data access and data ownership. This is critical for providing the necessary strategic oversight and governance across innovation projects/pilots.

☑ Work with internal agencies, private sector partners and outside community groups to create privacy policies that meet public expectations without stifling smart city innovation.

☑ Build an agile-friendly culture that accelerates innovation with sufficient controls to mitigate risk.

☑ Evaluate where and when to integrate legacy systems with smart city applications. Some new systems might operate better without the cost and time involved with integrating with a legacy program, but be sure to define a roadmap for integration down the road.
Remote control functionalities allow the city to dim lights as needed, such as when traffic levels are low.

The city equips lights with Wi-Fi, creating a citywide Wi-Fi network and providing free Wi-Fi to residents.

A city upgrades to LED bulbs, reducing energy costs and maintenance needs while brightening streets to increase safety.

VISION/PRIORITY: Lower costs and conserve energy

Smart streetlights can often be a gateway to a smarter community. Many cities are replacing traditional bulbs with LED lighting as a way to lower costs and reduce energy use. During the planning process, leaders should think about other departments’ goals that might also be achieved with smarter streetlights.
Streetlights are equipped with sensors that record data. Examples include:
- identifying available parking spaces
- reporting environmental conditions
- alerting authorities to traffic offenses or even detecting gunshots

Streetlights include surveillance cameras to aid in public safety. (Note: It’s important to hear from citizens in the community to learn about privacy concerns.)

Collaboration opportunities/identifying synergies:

As you begin to think about the possibilities for smart streetlights, it becomes clear that they can also be used to increase safety in your community and improve residents’ health, among other benefits.
Becoming smarter isn’t about branding or even about technology. It’s about understanding the real priorities of your community; establishing a collaborative governance structure; enabling civic transparency; and then thoughtfully applying digital tools, technologies and strategies to achieve those goals. The first-generation, big-bang vision for smart cities may have been flawed — but not the idea that communities can become safer, healthier and more prosperous through the purposeful use of connected, intelligent and data-driven technologies. It’s just that getting there will be an incremental, collaborative and iterative process.

This undertaking is more of a journey than a destination. You don’t become a smart community in isolation from other government jurisdictions. Instead, you’re continually becoming a smarter, people-centric, digitally connected and transparent community. Think of it as the ultimate agile development project. Stakeholders are engaged. Solutions are developed, user tested, incrementally improved and scaled. Individual components aren’t conceived independently; they’re interconnected building blocks within the framework of a shared vision. Each step is both an achievement and preparation for the next.

“We’ll never actually finish,” says Palo Alto’s Reichental. “The idea that you would build something and then put away your toolbox and say ‘we’re done’ doesn’t reflect how cities have evolved throughout history. We will innovate and improve. We should be talking about how our cities will become smarter and smarter as time goes by.”
Endnotes

2. www.newtowninstitute.org/spip.php?article1078
6. Ibid.
The Governing Institute advances better government by focusing on improved outcomes through research, decision support and executive education to help public-sector leaders govern more effectively. With an emphasis on state and local government performance, innovation, leadership and citizen engagement, the Institute oversees Governing’s research efforts, the Governing Public Official of the Year Program, and a wide range of events to further advance the goals of good governance.

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