

This white paper
was produced by
Microsoft and the
Smart Cities Council

October, 2016

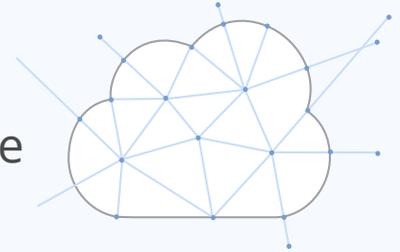


5 ways IoT improves customer service and benefits your citizens



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5 ways IoT improves customer service and benefits your citizens



When you consider some of the amazing advances in technology in the last half century – microprocessors, software, the World Wide Web, ATMs, smartphones, wearables, Facebook, Skype and Uber among them – it’s clear we’ve been on a connectivity roll.

And it won’t end anytime soon.

As we wade further into the Internet of Things (IoT) era, there will be no limit to how people will connect to each other, how people will connect to things and how things will connect to other things.

For cities and other public sector agencies, this enhanced connectivity creates new and compelling opportunities to improve how they engage with and deliver services to citizens, and how they collaborate with each other.

As you’ll read in the examples that follow, the benefits of IoT get exponentially greater when cities combine mobile technologies with fast wireless connectivity, cloud computing, real-time analytics and predictive analytics. The result: increased efficiencies and remarkable insights from the data that low-cost sensors and other Internet of Things devices provide.



Want to know how IoT can deliver value in your neighborhoods and downtowns? We’ll focus on five specific ways cities around the world are leveraging IoT right now to improve customer service and benefit their citizens. Then we’ll briefly discuss why governments need an IoT action plan and what it should include.

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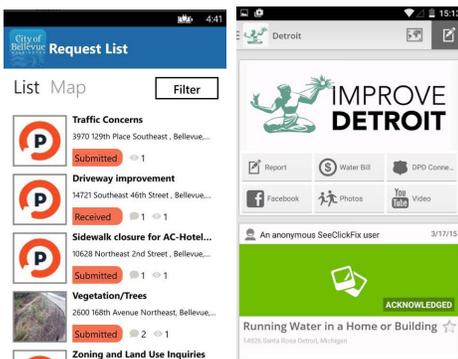
1 IoT enables better citizen engagement

We live in a *right now* world. People expect instant gratification 24/7 – whether it’s a pizza delivery, a ride to the airport or a response from city hall about when a crew will be out to fix a pothole.

The move to one-stop citizen portals designed with user needs in mind has been a step in the right direction. The convenience of going online to pay a parking fine, apply for a marriage license or respond to a poll on a hot civic issue contributes to a more satisfied and engaged citizenry.

Same is true with the proliferation of smartphone apps focused on citizen services. Today residents can report in real time with a simple text message where, for example, a streetlight is out or an illegal dumping has occurred – and hear back when the repair or cleanup is complete.

Right:
Citizen reporting apps allow residents to report issues in real time with a simple text message.



But it’s time for public sector organizations to take the next step. By embracing the enormous potential of the Internet of Things, they can super-size citizen engagement by enabling citizens to be active participants in building better communities. Consider how some cities are already doing that:

- **Amsterdam:** By purchasing low-cost sensors, residents are helping crowdsource data on air pollution and noise levels around the city.



Since they are engaged in sharing information and more people are aware of their city’s sustainability challenges, [Future Cities reports](#) there has been an increase in people riding their bikes and taking public transportation in Amsterdam.

Above:
The Internet of Things can super-size citizen engagement by enabling citizens to participate in building better communities.

- **Dubai:** In its quest to be the happiest city on earth, Dubai has a live, citywide sentiment capture engine it calls the [Happiness Meter](#). At Happiness Meter touch points located in customer service centers as well as on government websites, citizens rate their customer experiences. The results help improve services for everyone.

It’s not only big cities that are wired for action.

- **New Bedford:** Known in the 19th century as the epicenter of the whaling industry and today as one of the top commercial fishing ports in the U.S., the Port of New Bedford, Massachusetts uses IoT-enabled sensors mounted on a lighthouse to help compensate for a blind spot that prevents operators from seeing all incoming activity. As [NetworkWorld points out](#), the blind spot creates both a security issue and a revenue issue for the port. But motion sensors on the lighthouse trigger an “optical curtain” in front of the blind spot and video cameras record the boats coming in, providing security for the fish houses and ensuring the port collects fees it is due.

2 IoT improves quality of life

It's easy to understand why a city's adoption of IoT programs and services will be welcomed by tech-savvy residents already accustomed to hyper-connected lifestyles.

But the real value of government innovation is when there's inclusivity baked in; when the benefits are equitably distributed community-wide so that opportunities for better health, safety and greater prosperity are available to all citizens.

In that respect, IoT is an enabler. IoT enables public agencies to analyze data collected from all manner of connected things – and from connected people – to gain insights that may point to inequities or special challenges faced by vulnerable populations.

A city fitness tracker: In a major IoT initiative, the city of Chicago and the University of Chicago – with help from the National Science Foundation and Argonne National Laboratory – are installing 500 outdoor sensor boxes that will allow the city and public to instantly obtain block-specific data on air quality, noise levels and traffic. The idea is that the real-time open data gathered from Chicago's "Array of Things" will help the city reduce air pollution, improve traffic safety and more. One team is working on a mobile app that will alert asthma sufferers about poor air quality based on real-time measurements taken on their own block.

Accessing clean water: People living in rural Africa commonly use handpumps to access safe water, yet an estimated one in three aren't functional. Mobile-enabled *SweetSense* sensors inside the pump-heads send information to the cloud when a pump stops working. The performance data can be viewed on an online dashboard. The technology also sends alerts to maintenance staff via text message or email so they can make repairs, reducing the average time a village spends without safe water by 131 days.

Sensors on seniors: In Dusseldorf, Germany, an *e-health pilot* utilizes passive digital monitoring of the behavior and movements of elderly people using sensors. Relatives, friends or caregivers will receive information via an app several times a day and a status message if everything is in order or if something is abnormal. "Digitization is not just a slogan for us," said Dr. Andreas Meyer-Falcke, Dusseldorf's Health Councillor. "On the basis of this pilot project, we want to show that digital solutions are to the benefit of all and can be used to contribute to tangible improvements in living conditions and in particular healthcare."

Governments today are already awash in data and the Internet of Things will induce a data tsunami. But that's actually a good thing. As we've seen, data has the power to change lives.

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Left: In Chicago, a team will use data from environmental sensors to create an app that alerts asthma sufferers about poor air quality in their neighborhoods.

Governments are already awash in data and the Internet of Things will induce a data tsunami. But with the advent of cloud computing to securely store it and advanced analytics to wring insights from it, that's actually a good thing. As we've seen, data has the power to change lives.



An IoT assist from the private sector

The Internet of Things enables social entrepreneurs to play a role in improving the quality of life for underserved populations and, as in the case of one South African company, assisting the public sector at the same time.

Several years back three major fires displaced thousands of people from Cape Town's poorest neighborhoods, also called informal settlements. Francois Petousis was an engineering student at the University of Cape Town at the time, and was actually working on a thesis about low-cost, sensor-based fire detection.

Petousis was alarmed by the fires, and as a [post on a Cisco blog](#) explains, he gathered a small team to commercialize his concept.

Today their company, [Lumkani](#), sells an easy-to-install heat detection monitor that can communicate with other nearby monitors to warn residents if there's a fire in their home or one nearby.

Because these informal settlements are densely populated and residents typically cook with open flames, fires can spread quickly. A central device that serves 100 households can send out text alerts to the community with GPS coordinates – and also to emergency responders – when a problem is detected.

Lumkani reports a big decrease in deaths where the technology is being used and says the company intends to make its product available in more markets.

3 IoT enhances the urban lifestyle

If there's a single sector that best showcases Internet of Things in action in today's urban centers, it would have to be mobility. Just consider some of the changes we've witnessed in the last decade.

Waiting for the bus

It used to be you'd wait and wait and wait without knowing if your bus was late because it broke down or because the hill it has to climb was too icy or because you didn't happen to hear about route changes announced the previous week.

Today there are apps for that, of course. One example is **NextBus**, which uses GPS technology and a proprietary algorithm to track transit vehicles and predict their arrival time. By taking into account the actual position of vehicles, their intended stops and typical traffic patterns, NextBus gives riders up-to-the-minute information about when their bus or train will arrive via mobile devices and LED signs found at bus stops and transit stations. In San Francisco, for instance, NextBus provides real-time transit information on over 900 LED signs at bus shelters across the city and through 311 and 511 systems.

Below:
Los Angeles wants to make waiting for the bus an opportunity, not a chore.

Meanwhile in Los Angeles, some smart bus stops not only provide screens with real-time bus arrival information, but also free Wi-Fi and USB ports for phone charging. Others offer



solar-powered smart benches that are Wi-Fi hotspots and also enable phone charging. As **Mayor Eric Garcetti put it**, the goal was to upgrade LA bus shelters and benches “to make waiting for the bus an opportunity, not a chore.”

Above:
In and around Paris, an electric car-sharing program is cutting congestion, reducing pollution and saving former car owners lots of money.

Sharing a ride

Once upon a time, owning a car was how you went out on dates, got to work, picked up groceries and took granny to the doctor. Same story with biking to school or work; much easier if you owned your own. When traveling, it was pretty standard practice to rent a car at the airport to make getting around a new city easier.

Thanks to the sharing economy, living in urban areas today doesn't require owning so many things. For example, Autolib is an **electric car-sharing program** established by the city of Paris and 46 surrounding municipalities to relieve traffic congestion, reduce noise and air pollution and provide people with more flexible transit options. The intelligent system provides connectivity between the in-car system, registration and rental kiosks, charging stations and a central management system. By using Autolib, former car owners in France have cut their transportation costs by approximately 90% annually.

Top Government IoT sectors in the next 5 years

American City & County's online [Internet of Things poll](#) suggests the following government sectors will be affected the most by IoT in the next five years:

- Public Safety
- Traffic/Parking Management
- Public Transportation
- IT/Network Security
- Fleet Management
- Water

Similarly, bike-sharing apps enable users to unlock a bike and a helmet from a rack on a city street and ride away after paying via their mobile phones.

The proliferation of ride-buying services is a convenient alternative to standing on a busy street corner trying to hail a taxi. On-demand services like Uber and Lyft are well-established in many cities around the world today.

These are just a few examples of how IoT is taking urban mobility and urban lifestyles to new levels. There are also smart parking apps that help drivers find and pay for spots; others that sort parking by location and price; still others that point to free public parking. There are transit payment apps that negate the need to stand in line to buy tickets or tokens; in some cities the same payment app works for all modes of public transport. There's an app to track ferry comings and goings in Seattle and an app in New York City that vibrates so subway nappers don't miss their stop.

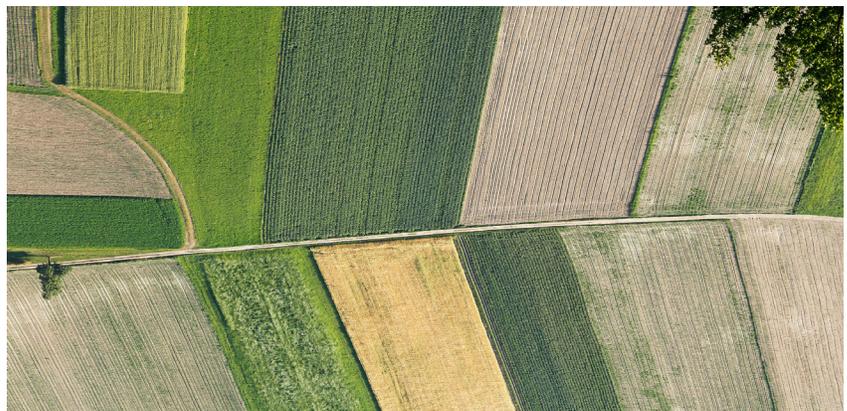
Mobility, of course, is just one aspect of urban living enhanced by the profusion of IoT devices all around us. Briefly consider a few more.

IoT and the future of food

As urban populations swell, ensuring enough food and safe, healthy food will challenge civic leaders. Montgomery County, Maryland, in partnership with Microsoft CityNext, is using [sensors planted in farm fields](#) to demonstrate how IoT technology can help farmers use data to become more productive and more profitable. Meanwhile in China, grocery shoppers concerned about food safety can use their smartphone to [scan a code](#) on a piece of fruit to check its journey from vine to supermarket bin – and determine any contamination that may have been introduced along the way.

Right:

Sensors planted in farm fields demonstrate how Internet of Things technology can help farmers use data to become more productive.



Feeling safer

There are numerous ways that IoT connectivity can enhance public safety. Smart streetlight networks are a great example. Smart sensors mounted on light poles can detect gunshots and alert authorities to the triangulated location. Police officers responding to suspicious activity can flash or brighten streetlights from laptops in their patrol cars. In high crime areas, communities can create “safety zones” where lighting levels are increased to deter criminals.

The city of Eindhoven in the Netherlands, working with Atos, Intel and others, launched a data-driven pilot dubbed [CityPulse](#) to manage a long, vibrant street in the city’s clubbing district that attracts as many as 20,000 visitors every weekend.

As Atos explains the project: “Capturing data from a range of existing sources including visitor numbers and sound levels, this ‘on the ground’ information is combined with data gathered from social media sources to create a powerful picture of the street and help authorities better forecast and react to situations and de-escalate them before they develop.”



Right: Sensors along Stratumseind, Eindhoven’s popular clubbing district, give authorities the ability to forecast and react to situations.



Cutting energy costs

After rent or mortgage payments, energy is often the second most costly expense for many households and businesses. Yet thanks to smart, connected devices – from smart thermostats to smart electric meters to building energy management systems – it’s also one area where people can monitor and control their energy usage.

In an effort to deliver the most cost-effective and environmentally friendly way to meet its growing energy needs, the city of Seattle worked with Microsoft, Accenture, its local electric utility and a local nonprofit to create a [High Performance Building Program](#) that aims to reduce power usage in downtown commercial buildings by up to 25%. It relies on software and cloud services to gain deeper insight from data generated by building management systems, sensors, controls and meters.

At just about every juncture in modern urban life, there’s an IoT scenario that enhances it – or there will be soon. For cities to thrive, leaders cannot ignore the impact IoT can have.

Above: Seattle’s High Performance Building Program aims to reduce power usage in downtown commercial buildings by up to 25%.

4 IoT provides insights that improve service delivery and planning for the future

There was a time when not taking action was a result of not having enough good information to make an informed decision. Say goodbye to that excuse! The Internet of Things opens the door to business intelligence previous generations never imagined, triggering better ways to deliver services today and to plan for tomorrow.

Anytime, anywhere service delivery: Today it is essential that government workforces have the tools they need to be productive no matter where they are – in the office, at a project site, a home visit or responding to a disaster. IoT devices and cloud-based applications make that not only possible, but incredibly efficient.



Right:
Agencies are applying IoT-based approaches to monitor and manage flooding.

Department of Homeland Security is developing low-cost sensor technologies through its [Flood Apex Program](#) and applying IoT-based approaches to facilitate evacuations, flood monitoring and resilience of critical infrastructure. For example, collaborating with the Lower Colorado River Authority, FEMA and the National Weather Service in flood-prone areas of Texas, the program will share real-time data so first responders and local officials can respond more rapidly when a flood hits and increase their ability to save lives and protect infrastructure.

Another example is a public health nurse checking on a homebound, chronically ill patient by remotely monitoring readings provided by her patient's wearable device and comparing them to other relevant patient data stored in the cloud. The wearable IoT device enables the nurse to save time on routine check-ins, reduce

pollution by driving less and to cost efficiently manage the care of even more patients. At the same time, the wearable provides peace of mind to the patient and family members.

Data-based planning: IoT enables data collection from virtually any Internet-connected device, resulting in data stores that grow to incredibly large levels. Savvy governments don't just sit on this data; they gain insights from it utilizing big data and analytics.



Left:
As IoT devices, today's smart parking meters generate valuable insights on parking patterns.

Parking meters are a great example. No longer are people digging for change that has to be collected and counted and hauled to the bank. With a swipe of a credit card or a smartphone, the payment processing is automated. Some smart parking meters even have smart pricing, with parking fees going higher or lower based on demand, time of day and use of other parking spots in the area. Because these advanced meters are IoT devices, the data they generate provides insights on parking patterns – highest use, frequency, ticketing trends, etc. That's good intelligence for urban planners and potentially increased revenue for municipalities.

Parking meters aren't the only assets that can provide useful insights. Think about the planning data that smart traffic lights generate or how sensors that monitor trash bin levels can guide more efficient waste management operations.

IoT devices have a lot to tell public officials – but they have to be listening.

5 IoT streamlines government operations; brings cost efficiencies and better collaboration

Leaders struggling to do more with less should not ignore the benefits the Internet of Things brings to internal government operations. Cost efficiencies and better collaboration between agency departments and between agencies are chief among them. And in the end, it is the citizens who benefit when government works better.

Let's look at just two of the many ways governments can leverage the power of IoT to operate more efficiently:

Citizen services

Imagine a streetlight network that self-reports when a light is broken and needs to be replaced. Or sensors on the electric grid that alert utility operators when a neighborhood loses power.

With the infrastructure connectivity available today, operators don't have to wait for citizens to report broken streetlights or power outages. They can monitor a cloud-based dashboard that shows where streetlights are out or homes are dark. Better yet, by analyzing historical data, they can see which streetlights or transformers are likely to fail next.

Water safety and security is another top-of-mind issue for citizens today. And again, IoT can play an important role as these examples demonstrate:

- **Philadelphia** worked with CH2M to implement a Surveillance and Response System [demonstration project](#) under the U.S. Environmental Protection Agency's Water Security Initiative. The objective? To integrate multiple forms of surveillance and data streams through information and communication technologies to promote early and quick detection of water supply contamination.
- **Queensland, Australia's** utility was able to utilize IoT devices and cloud-based solutions to reduce the amount of time it took operators to identify and repair expensive water line leaks and blockages. As a result, the utility was able to save \$1.9 million and [increase water availability](#) by 20%.

Given the proliferation of data from IoT devices and the increasingly large and disparate data



Left:

With the smart infrastructure available today, operators don't have to wait for citizens to report broken streetlights or power outages.

sets that result, it's essential that governments utilize big data analytics to get real value in the way of actionable insights that optimize operations.

And those insights don't just benefit one jurisdiction; intelligent analytics can also enable more effective inter-agency collaboration and decision-making. Data housed in a properly secured and managed collaborative cloud application makes that possible – even preferable.

Clearly, sharing data via the cloud is efficient, it's cost effective and it's smart public policy. But it's not without challenges. We'll discuss in the next section why you need very specific guidelines in place to safeguard the security and privacy of your data before you get started.



Right:
Intelligent analytics can enable more effective inter-agency collaboration and decision-making.

Clearly, sharing data via the cloud is efficient, it's cost effective and it's smart public policy.

Why governments need an IoT strategy

It is exciting to contemplate how data generated by IoT can improve lives and communities and government operations. But public agencies must develop ground rules to ensure, among other things, that data is managed securely and individual privacy is protected. They must also learn what data is important and how to interpret that data.

Transparency is the priority. To [earn the public's trust](#), officials must be open and honest about the data they are collecting, including:

- How IoT data is managed and secured against internal and external cyber threats
- How IoT data is shared and with whom
- How cloud privacy safeguards protect personally identifiable information

All of this should be clearly detailed in a written policy that anyone can easily access.

As agencies begin to develop their IoT strategy, they should invite citizens, the private sector, academia and nonprofits to the conversation. Like the Internet of Things – the more voices connecting, the more powerful the results will be.

Internet of Things Public Sector Resources

Your Questions Answered: The Internet of Things in Government

– *GovLoop*

The Benefits, Challenges, and Potential Roles for the Government in Fostering the Advancement of the Internet of Things

– *Future of Privacy Forum*

Earning Public Trust in the Age of Cyber-threats

– *Microsoft CityNext*

Fostering Investment and Innovation in Smart Cities and the Internet of Things (IoT)

– *Commerce.gov*

How the Internet of Things Could Transform Public Services

– *Governing*

5 Key Themes to Consider When Implementing Internet of Things Initiatives

– *Data-Smart City Solutions*

Hurry; your IoT clock is ticking

When you are considering your priorities – the problems you most want to address in your community – put solutions enabled by data and IoT to work for you. Leaders who engage in a strategy that include these solutions will help to guide their communities in achieving the outcomes they are striving for:

- Communities that engage citizens in meaningful ways and provide the modern, efficient services they want.
- Streamlined operations that make government workers more successful and taxpayers more confident.
- Attracting new business and industry because they provide the state-of-the-art connectivity that enables companies to grow and prosper.
- Ability to woo young, skilled professionals who want to live and work and play in future-forward urban centers.

And by embracing the solutions enabled by data and IoT, public officials can expect to foster a culture of innovation that leads to stronger, smarter and healthier communities – inclusive communities that promote opportunity for all.

Include solutions that are enabled by data and the Internet of Things when you are looking for solutions that improve the lives of your citizens and make it a priority item – before it's too late.

This white paper was produced by Microsoft and the Smart Cities Council | October, 2016

Microsoft for government

- [Microsoft CityNext](#) empowers cities and citizens to unlock their potential by delivering innovative digital services that can help them lead safer and healthier lives, enriched by high-quality education.
- [AvePoint Citizens Services](#) offers modern solutions to meet today's demands, providing communities with a centralized portal to easily submit citizen service requests from anywhere, anytime, on any device.
- [Microsoft IoT](#) cloud solutions are about making your data come together in new ways. Tap into data with IoT dashboards. Uncover actionable intelligence. And modernize your organization to meet today's needs.

Smart Cities Council

- Launched in 2012, the Smart Cities Council is the author of the internationally recognized [Smart Cities Readiness Guide](#), which provides guiding principles and best practices for an integrated, cross-cutting smart city.
- The Council is comprised of more than 45 partners – including Microsoft – plus dozens of advisors. Its [website](#) offers case studies, news articles, videos and a series of guides to help cities along their smart city journey.

