



# Smart Cities: A Gateway to Digital Life

Ramez Shehadi  
Dr. Raymond Khoury  
Danny Karam  
Jad Rahbani

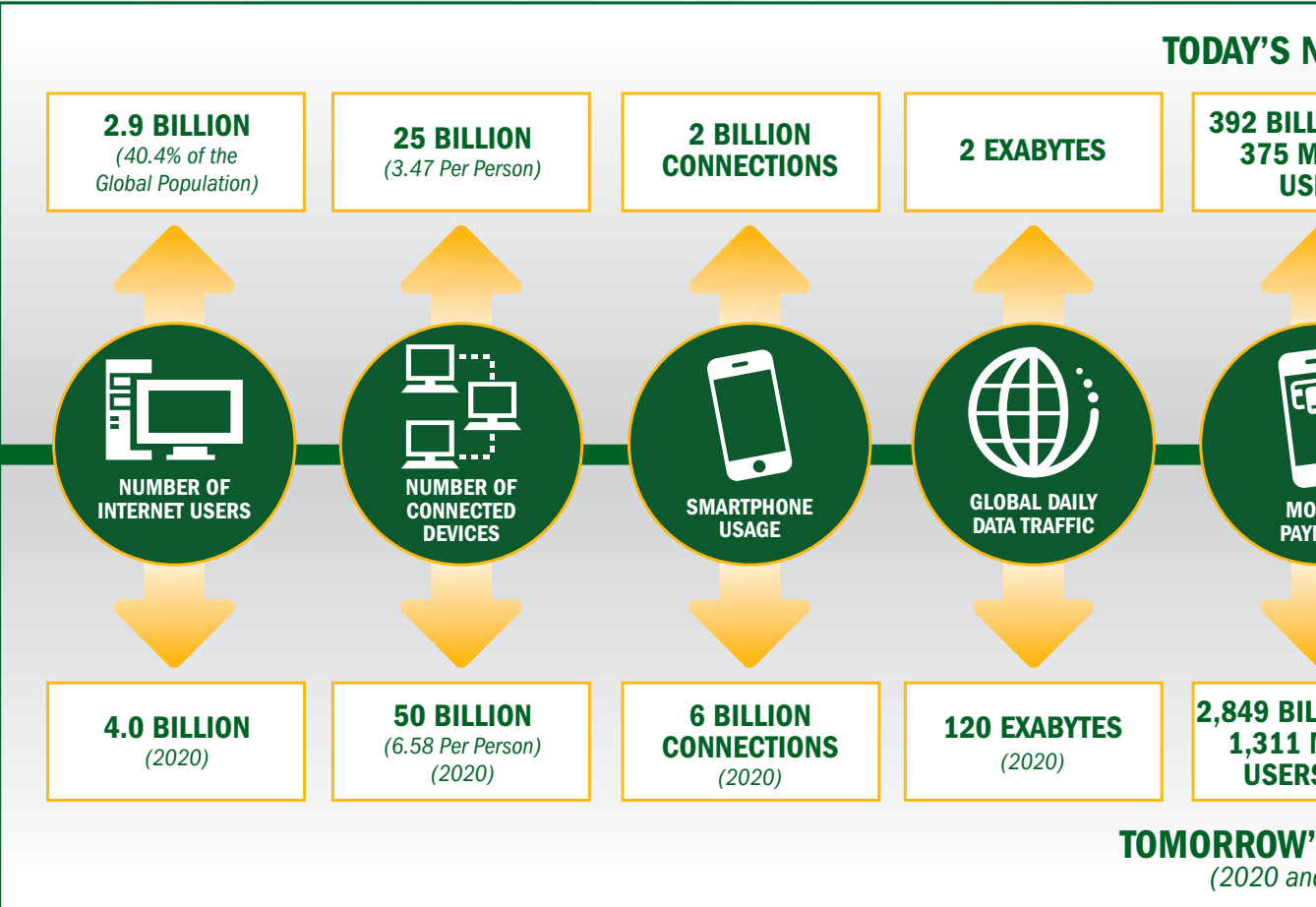
Booz | Allen | Hamilton

---

delivering results that endure



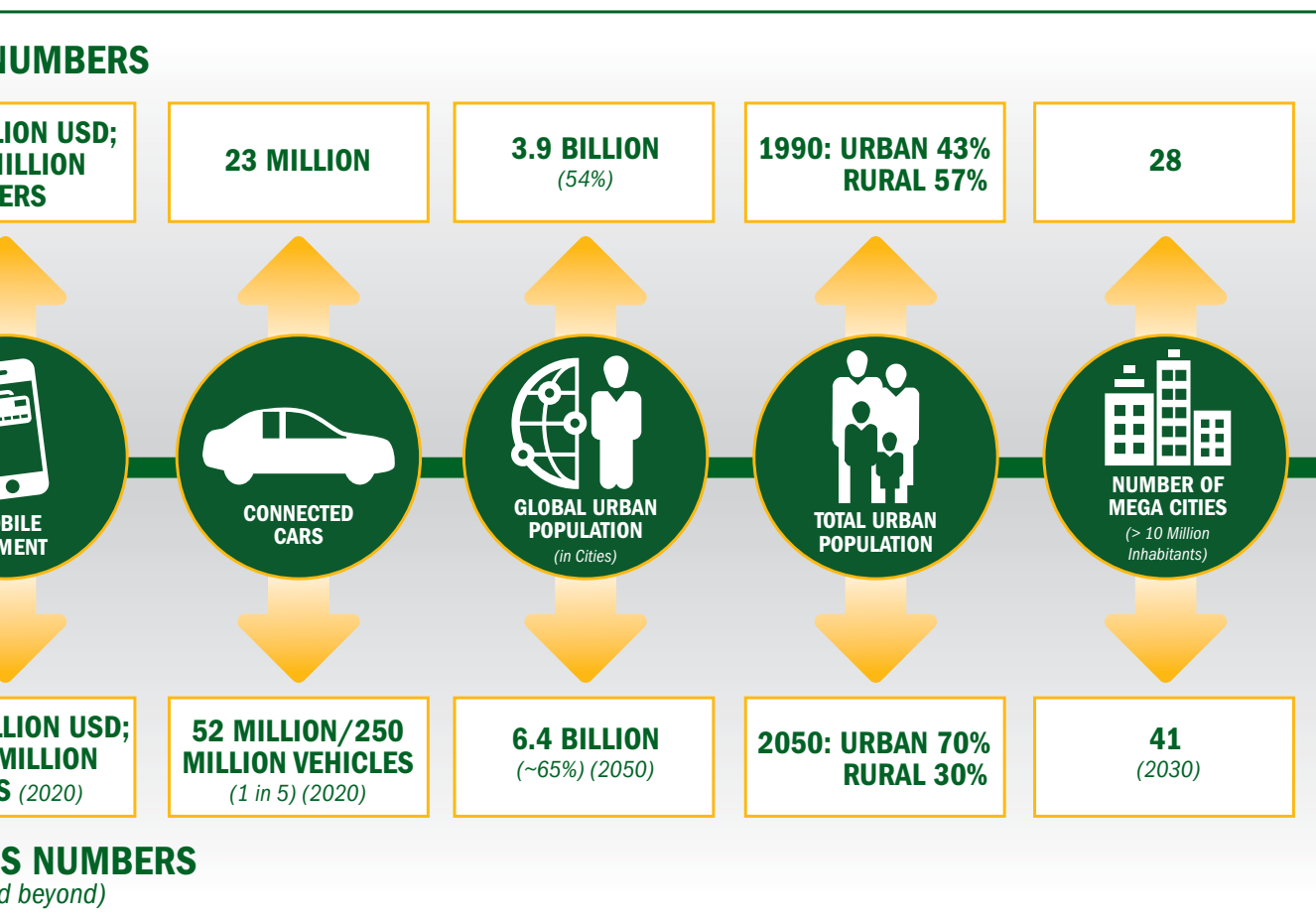
Exhibit 1 | Digitization: Today Versus Tomorrow



Sources: ITU & UNESCO, Microsoft®, Cisco®, GSMA®, EMC, BusinessWire® (FMI), Forbes®, Gartner®, UN – 1 of the 2 people in the world today lives in urban areas, UN.

As the embrace of technology changes how people perceive and experience life, digitization presents a powerful opportunity to enhance how they live within cities. As a result, governments and city officials are building “Smart Cities” by leveraging latest technologies supported by next-generation city-wide infrastructure to better engage with their citizens. Success in Smart City development, however, demands a phased, holistic, citizen-centric approach

Think of the following series of events in the day and life of people. A mother and homemaker starts her day. In the morning, she uses her mobile phone to check traffic routes to school, schedule an appointment at the public clinic, and secure a parking spot in front of the clinic before she arrives there. In the afternoon, she uses that same mobile phone to register her children in a government-sponsored book club and pay for petrol at the gas station, and before bed, she checks her daughter’s electronic medical records for her last vaccination date. Meanwhile, her neighbor, a middle-aged marketing professional, uses apps on his phone to locate the nearest pharmacy, pay his monthly municipality fees, order a toll road pass, and check on the progress of a postal delivery.



All around us, people are living increasingly digital lives. Information and communications technology (ICT) consumption has grown at an unprecedented rate. By 2020, the number of mobile-cellular subscriptions will be nearly equal to the number of people on our planet, and two of three of these will be smartphones subscriptions.

Many people are experiencing digital life in cities, and these cities are growing at a rapid pace. In fact, urbanization is one of the most important demographic forces affecting municipal governments. Today, roughly 50 percent of the world's population lives in an urban environment. By 2050, this percentage is expected to increase to 70 percent. This, in itself, spurs budget-constrained governments to grapple with challenges such as stagnant job and industry growth, suboptimal resident services, high crime, resource overconsumption and scarcity, pollution, and administrative inefficiencies—to name a few.

## Harnessing Digitization's Power

By facilitating the creation of Smart Cities, which use advanced infrastructure and digital solutions to deliver services, technology can help policymakers address the economic, social, and environmental challenges of urbanization.

Smart Cities make digital technology, networks, and apps a central part of operations and constituent interactions. Such projects are moving ahead around the world. In the Netherlands, for example, data analysis is helping to predict floods, avoid water shortages, and reduce water management costs by 15 percent. In India, real-time adaptive traffic control systems are resulting in a 12-percent reduction in average traffic time. And in Songdo, South Korea, smart technologies are enabling waste management, remote healthcare, and interactive learning as an initial slate of services.

Smart Cities such as Songdo, as well as Lusail City in Qatar and Masdar City in the United Arab Emirates, don't evolve in one giant leap from basic Internet connectivity to integrated next-generation digital infrastructure capabilities. That said, municipal governments and ICT service providers must first overcome formidable challenges, such as the need to modernize existing infrastructure and retrofit that which is available in existing buildings. Furthermore, the definition of a smart service is still elusive, with cities having different definitions of “smartness” for their services. Publishing a service on a website or transposing it into a mobile app, while useful, does not make it a “smart” service. A truly smart service is one that not only predicts the city resident's services needs before he or she personally asks for them, but also personalizes the services fulfillment to fit that resident's preferences.

A framework to define the degrees of “Smartness” is needed to serve as a guide to city officials to effectively and consistently gauge where their cities are on the “Smartness” scale, and adjust their enabling service transformation strategies accordingly.



## Exhibit 2 | Four Degrees of Smartness

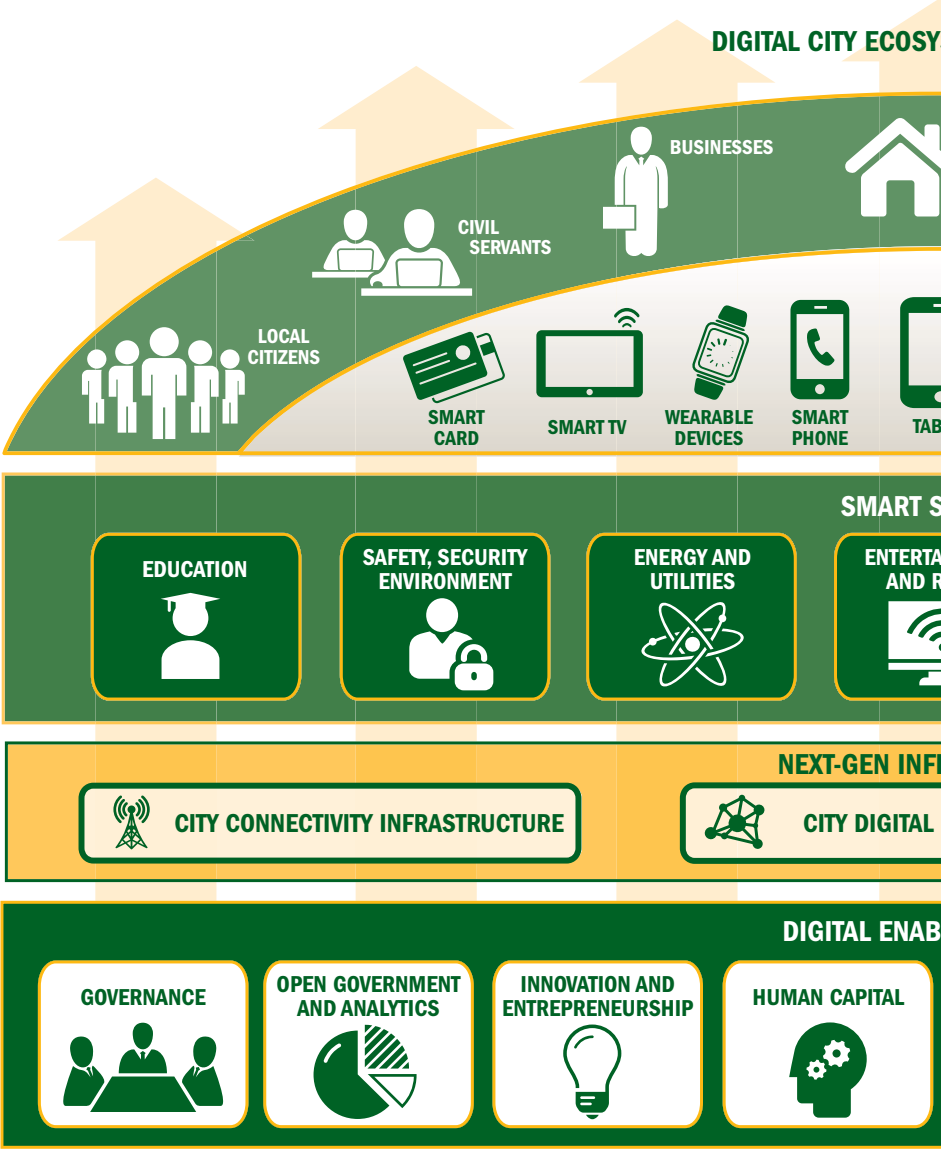


- **Degree 1—Connected:** An agency makes its services and information accessible online at any time, from anywhere. Imagine a website or app for a city's transportation system with real-time updates.
- **Degree 2—Integrated:** Operations that were in silos are now connected to a centralized command and control center, with communications and information flowing seamlessly across the system. This makes possible multi-agency efforts, such as emergency notification and dispatch services via departments of health, transportation, and safety.
- **Degree 3—Personalized:** Here's where the Smart City gets personal—imagine, for example, a customized traffic congestion alert service. Citizens can express preferences for specific locations and delivery methods, such as receiving congestion updates for their specific frequent routes via text. Agencies can prioritize users, such as emergency vehicles.
- **Degree 4—Predictive:** In this most advanced degree of “smartness,” sophisticated data collection and analytics enable agencies to turn hard field intelligence into predictive insights—and anticipatory action. This could involve an analytics program that evaluates current road and transit patterns to predict future usage, guiding informed decisions for maintenance and expansion projects to city officials.

Transforming a city service into a “Smart” service requires five imperatives:

1. **Smart Interfaces:** Maintain intuitive personalized interfaces. Accessing services intuitively, and receiving personalized responses through a simplified user interface, puts a smart service truly at the fingertips of a resident and makes the resident ever more drawn to always use the service.
2. **Smart Applications:** Build smarter back-end applications. Smart applications should leverage big data and predictive analytics to maximize services personalization, which greatly enhances their grade of smartness.
3. **Smart Analytics:** Harness the power of big data. Allowing for open government/open data is crucial for enabling predictive analytics, which permits the creation of smarter services.
4. **Smart Infrastructure:** Enable convergence. Smart services cannot be built in silos. The more these services are integrated with other government entities over a dynamic digital infrastructure, the smarter they become. A government convergence platform is essential for advancing services on the “Smartness” journey.
5. **Smart Security:** Protect the perimeter. A Smart City's digital infrastructure is not only constrained by the data that reside in the city's data center, but it also extends to residents' devices, home appliances, cars, telephones, tablets, PCs, etc. A smart service security plan should extend to fully cover all smart services used by a city, taking into account all perimeter access points to ensure proper controls and privacy are maintained.

Exhibit 3 | Smart City Framework



Assembling the Essential Elements

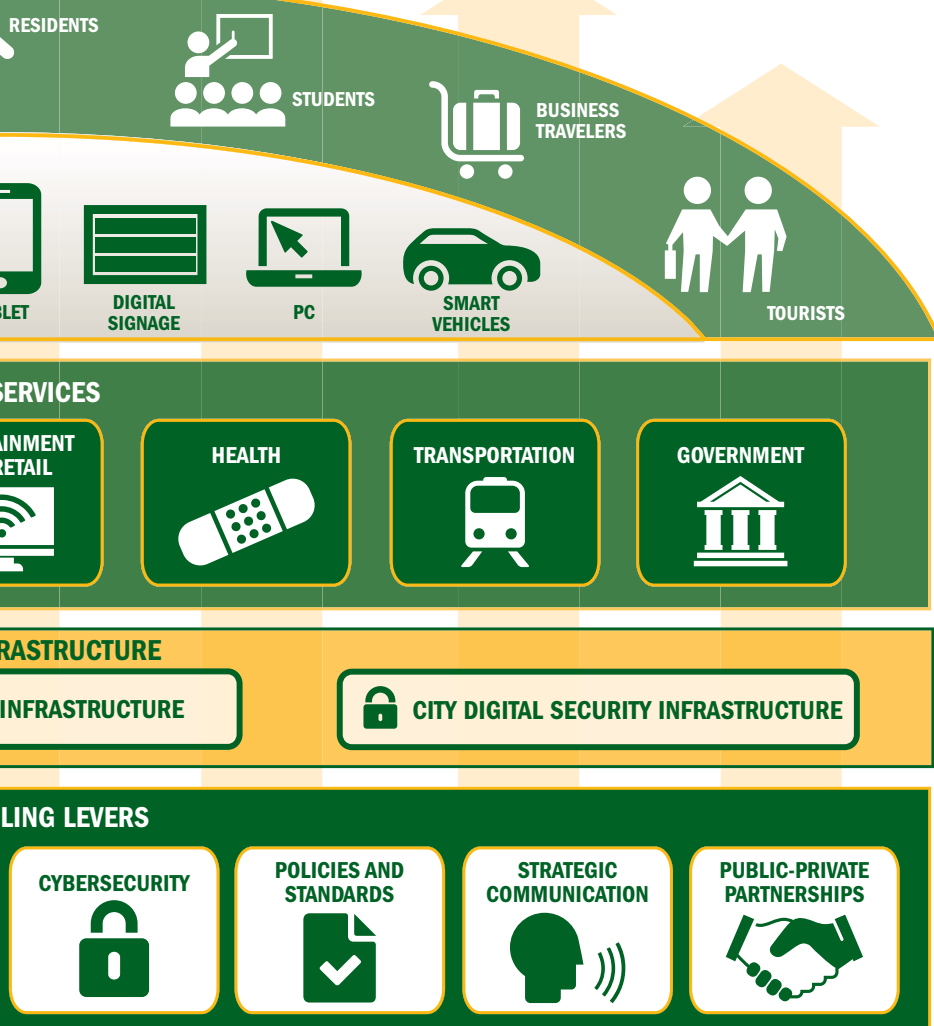
Successful Smart Cities require four essential elements: empowered citizens, smart services, next-generation infrastructure, and a cohesive enabling environment.

**Empowered citizens:** Smart Cities engage residents through multiple channels: TVs, smartphones, tablets, wearable devices, and future technologies and access points yet to be imagined and developed. For these channels to be effective, people need to be aware of services and comfortable using the technology. Some services, such as digital signage, may require little explanation. Others, such as smart thermostats for utility consumption and energy efficiency, may demand more education.

**Smart services:** Apps and programs that improve the daily life of residents and visitors, and help businesses and government work more efficiently are the visible returns on investment (ROI)—and core—of a Smart City’s offerings. These services are often arranged in verticals by function and target population, and encompass all aspects of the digital life. Examples include:



## SYSTEM COMPONENTS



- **Smart Education:** An e-learning portal gives students 24/7 access to multimedia content and collaboration—and their parents the power to keep track of progress, evaluate and purchase materials, and submit feedback.
- **Smart Transportation:** Through an in-car telematics system, a taxi driver follows the least-congested route to the target destination, and central dispatch tracks every kilometer of progress. Taxi passengers, a family with a small child, watch an Internet-enabled entertainment screen and pay via an in-vehicle reader. After they arrive at their destination, the mother uses her smartphone to enter positive feedback about the experience. This rating is later viewed by the taxi driver's next potential customer who initiates his request through an automated interactive voice response (IVR) ordering system.
- **Smart Health:** A digital wristband notifies a hospital about its wearer's early heart attack symptoms. The emergency vehicle, guided by real-time data on traffic congestion, arrives at the home and takes the patient

to the hospital in record time. Before the patient even arrives at the emergency room, the care team has access to all of his pertinent health details, thanks to electronic medical records, and has readied the necessary first aid as a minimum.

- **Public Safety and Security:** A digital surveillance system collects data from video cameras installed in public spaces throughout the city. This growing repository of big data is first used by public safety officials to identify areas with high levels of crime and suspicious behavior. It is then used—with the aid of predictive analytics—to forecast where resources will be needed in the future.
- **Entertainment and Retail:** In a Smart City mall, a shopper's experience can be enhanced from arrival—as a Global Positioning System (GPS) powered app shows available parking spaces—to checkout, with the collection of purchase data that guides future targeted promotions and in-store customized assistance.
- **Smart Utilities:** Smart meters and grids offer providers and users alike the opportunity to track and optimize through dynamic load balancing that measures the usage of electricity, gas, and water. Meanwhile, apps let customers receive notifications, log requests, and pay their bills on the go.
- **Smart Government Services:** In a digitally enabled Smart City, a resident or visitor reports a pothole, pays parking fees, checks wait times at a government office, and submits feedback right from his or her smartphone screen. When he or she posts about that experience on social media, that individual receives points from the city loyalty program.

**Next-generation infrastructure:** ICT service providers are the essential partners in the Smart City journey. Bringing every digital service to life—from smart metering to underground facility management to proactive surveillance analysis—is sophisticated ICT infrastructure, connected by the central convergent layer of the service delivery platform.

Consider the intricate system of sensors, analytics, security, storage, computing, and connectivity powering the following scenario: At 8 a.m., a health ministry analyst receives an alert about an unusual patient case from the national health records. Fortunately, the ministry has years of anonymized electronic medical record data, securely stored in the cloud and easy to access by authorized personnel. With a sophisticated data analytics tool, the analyst narrows the possible causes to water toxicity.

Information from the national utility's database—a trove of big data collected by sensors in the city's water infrastructure—helps the analyst pinpoint the toxic area. The analyst's work guides the swift development of a containment plan that is sent out to all healthcare facilities by noon and to the public later that day.

Digitization is reshaping business models in other sectors as well. For example, retailers are using big data applications to optimize store locations and target advertising, transport agencies to pinpoint congestion points, and sports teams to optimize player performance.

**A cohesive enabling environment:** These are the levers essential to making Smart City plans a reality:

- **A robust governance structure** in which stakeholder positions and roles, responsibilities, and authority are clearly delineated is key for building a cohesive environment. The continued momentum of smart cities is bringing new digital leadership positions to the fore. According to Gartner, Inc., governments are appointing Chief Data Officers and Chief Digital Officers. These positions are emerging in response to the increasing implementation of citywide digital solutions. These newly created roles are responsible for developing and implementing smart cities and big/open data strategies that ensure effective citizen engagements and cross-government collaboration.
- **Big data openness** to mine the information collected in areas such as transactions, traffic patterns, resource usage, and health demographics for decision-making, monetization, and optimizing operations. Beyond business efficiency, big data—when properly understood—offers cities the opportunity to branch out into new service areas, develop new revenue streams, and even explore across industries.





- **Innovation and entrepreneurship ecosystem** and culture through incubators, accelerators, innovation camps, tech parks, angel investment forums and entrepreneurship funding will unleash a culture of innovation triggering job creation, digital SME support and development, and innovative services
- **Mass human capital literacy.** Some countries such as Sweden, Finland and Singapore have promoted ICT early on in their education system to develop future generations of technology adopters and developers. These societies consistently score very high on virtually every indicator in ICT, and consequently have maximized the uptake and impact of (smart) technology services on their societies.
- **Resilient security controls** to keep networks, infrastructure, and residents safe; critical operations up and running; and sensitive data safeguarded. In response to the increasingly interconnected smart cities, governments are continuously facing new sets of security concerns. Governments need to explore a more “active-defense” approach to cyber security while preparing for threats to an entirely new set of data-related sources such as medical data, connected vehicles, mobile payments, the “Internet of things,” as well as emerging technologies such as “wearables.” Data security becomes a priority for all governments, forcing them to adopt a model that enables them to use real-time intelligence and threat assessment data generated by the various components of a smart city to shape decision-making, safeguard national critical infrastructure, and preempt emerging threats.
- **Policies and standards** that facilitate collaboration, standardization, and innovation— particularly important for dealing with legacy systems and creating a unique citizen experience. Some organizations use “hackathon” competitions to generate innovation when rigid corporate structures present IT, security, privacy, or cultural challenges.
- **Savvy strategic communications** to facilitate citizen awareness and usage of services. Targeting communication campaigns to different categories of residents, driven to a large extent by their work and personal lifestyles, goes a long way in increasing smart services uptake and facilitating forums for continuous resident engagement in services improvement.
- **Private sector participation** to ease the investment burden and support an ecosystem of innovation and entrepreneurship—essential for serving residents with a steady stream of smart services. Other partners in such an ecosystem include laboratories for ideation, incubators and accelerators, funders such as venture capital and private equity firms, and academic institutions—a smart network of Private–Public Partnerships (PPP).

## Increasing the Odds for Success

Even with a well-articulated strategy supported by a solid framework and phased implementation, many things can still go wrong when building a citywide smart ecosystem. Funding might fall short, progress might stall at the planning stage, departments working in silos might cause redundancies and gaps, infrastructure

deployment might be hindered by zoning regulations, and services might be created that go unused because the services are driven by legacy systems rather than citizen needs.

To increase the odds for a successful Smart City implementation, city officials must:

1. **Build a solid business case.** Facilitate buy-in, manage expectations, and ensure adequate budget allocations by accurately quantifying the ROIs, socioeconomic benefits, and financial ramifications of the Smart City plan.
2. **Plan holistically, for the long term.** For best results, couple a big-picture strategic vision with a comprehensive roadmap for on-the-ground implementation, all managed using a clear governance model.
3. **Design robust foundational enablers.** A true Smart City will only achieve its desired objectives if robust foundational enablers are appropriately designed and in place. These include governance, innovation and entrepreneurship ecosystem, human capital literacy, policies and standards, strategic communications, and private sector participation.
4. **Explore innovative funding mechanisms.** Subsidies, grants, seed capital—all of these and more may be possibilities for a Smart City program. PPPs can be especially powerful for ensuring long-term financial sustainability, offloading dependency on budget-strained cities' financials.
5. **Enable and Promote open data.** Enable the provision of open government data and incentivize both public and private sectors to publish and share data. This is the fuel for unleashing innovation and creating superior smart city services.
6. **Design citizen-centric strategies—and refresh them when needed.** A Smart City is all about the citizens it serves, be they residents or visitors, so engage them as soon possible, from the initial planning phase through periodic reviews, to ensure timely response to new requirements brings value add and sustainability to the target plan.
7. **Foster intergovernmental collaboration.** Working together will be key to interoperability and efficient resource use, so define the operating model—including roles, responsibilities, capabilities, priorities, and interactions—that will make it happen.
8. **Think big and start small, with pilots that expand.** Pilot programs are excellent ways to test concepts, collect feedback, and adjust applications as needed before a full-scale rollout. Pilots typically take the form of quick-wins and tend to steer momentum and early adoption of the merits of this undertaking.
9. **Build the right ecosystem of partners.** Leverage the capabilities of research and development laboratories, academic institutions, leading technology vendors, and other strategic partners to maximize resources and efforts—not to mention introduce disruptive innovations—in a timely manner.
10. **Design infrastructure that's robust, scalable, and secure.** Mechanisms for data collection, architecture, and management need to work seamlessly together, integrate with existing solutions, accommodate growing volumes of data, and incorporate new technologies. To mitigate breaches and alleviate security concerns, infrastructure should include regulations and standards in areas such as data privacy and non-repudiation or authenticity.

## Innovating for the Future

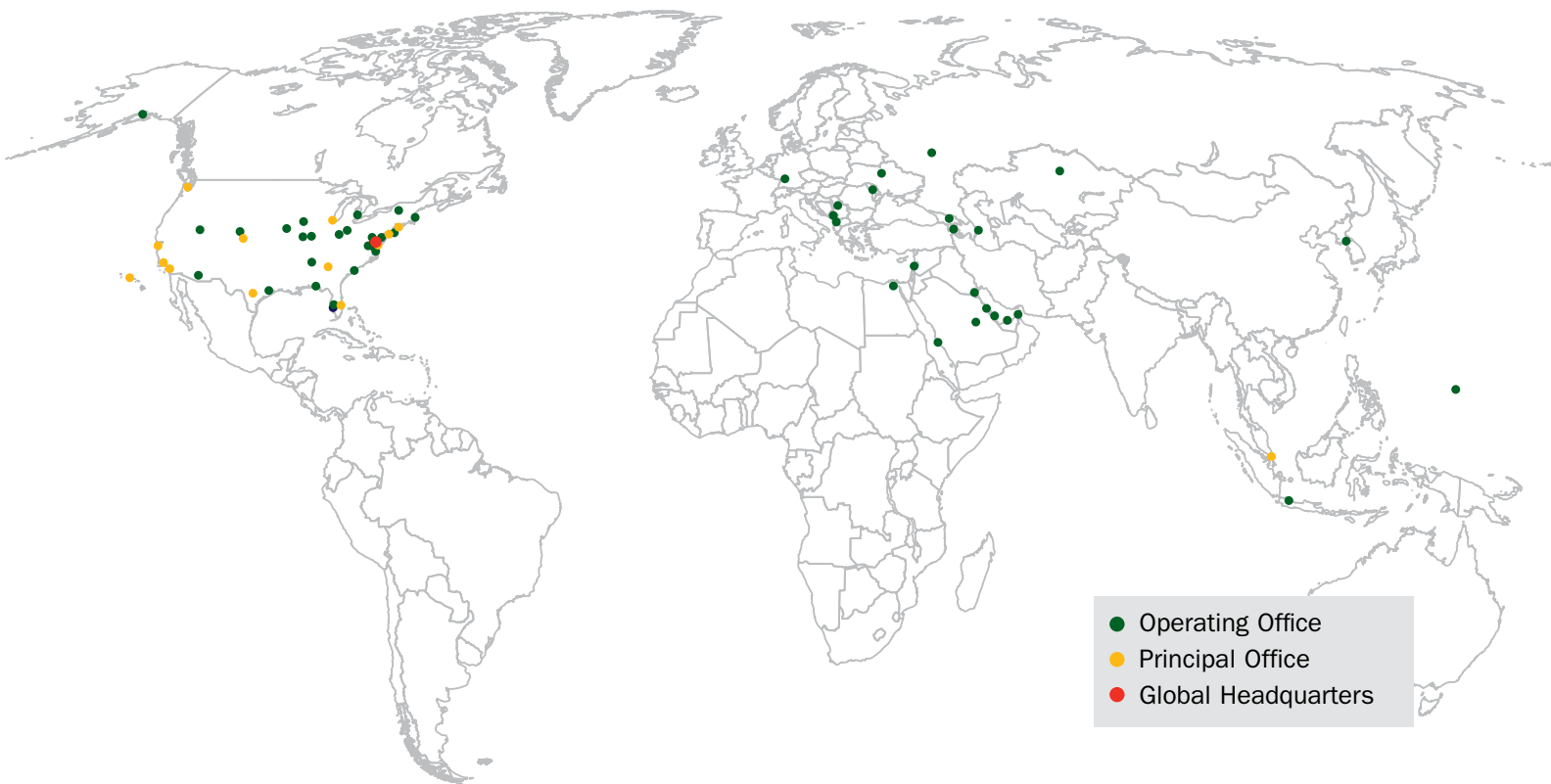
The higher a city's services move on the “smartness” barometer, the smarter the city becomes. Smart schools, utilities, commerce, healthcare, transport, and security are just the beginning of what's possible.

Smart Cities offer great potential for addressing the economic, social, and environmental challenges of urbanization and supporting sustainable growth. By taking a holistic, citizen-centric approach to their development, and charting the course of transforming their services into truly “smart” services, city officials can realize the promise of healthier living, greater productivity, enhanced business innovation, and a more inspired quality of life for all generations.





## International Presence



## About Booz Allen Hamilton

Booz Allen Hamilton is a leading provider of management and technology consulting and engineering services to governments in the civil, defense and security sectors, as well as to global corporations in all primary sectors. In the Middle East and North Africa (MENA) region, Booz Allen builds on six decades of consulting experience to partner with private and public sector clients to solve their most difficult challenges through a combination of business strategy, digital innovation, data analytics, cybersecurity and resilience, operations, supply chain, organization and culture, engineering and life-cycle project management expertise. Booz Allen operates out of six regional offices located in Abu Dhabi, Beirut, Cairo, Doha, Dubai and Riyadh.

Headquartered in McLean, Virginia, the firm employs more than 22,000 people globally, and had revenues of \$5.27 billion for the 12 months ending March 31, 2015, Booz Allen celebrated its 100th anniversary. To learn more, visit [boozallen.com](http://boozallen.com). (NYSE: BAH).

### For more information contact

**Ramez Shehadi**

Executive Vice President &  
Managing Director  
[shehadi\\_ramez@bah.com](mailto:shehadi_ramez@bah.com)  
+971 50 445 6751

**Dr. Raymond Khoury**

Executive Vice President  
[Khoury\\_Raymond@bah.com](mailto:Khoury_Raymond@bah.com)  
+971 50 811 9341

**Danny Karam**

Vice President  
[Karam\\_Danny@bah.com](mailto:Karam_Danny@bah.com)  
+971 50 668 0520

**Jad Rahbani**

Senior Associate  
[Rahbani\\_Jad@bah.com](mailto:Rahbani_Jad@bah.com)  
+971 56 417 3188

To learn more about the firm and to download digital versions of this article and other Booz Allen Hamilton publications, visit [www.boozallen.com](http://www.boozallen.com).