McGRAW HILL FINANCIAL | Global Institute

Smart Cities

How to Build Sustainable and Resilient Environments In an Increasingly Urbanized World

By:

Paul Doherty, AIA
President and CEO
the digit group, inc.

June 7, 2013

Smart Cities:
How to Build Sustainable and Resilient Environments In an Increasingly Urbanized World

Introduction

The rapid urbanization of our world, along with the weaving of existing and new buildings into the urban fabric of smart city initiatives, are among the great challenges facing urban planners and policymakers today. As a result, the phrase "smart cities" has reached what writer Malcolm Gladwell calls "the tipping point" in today's marketplace, generating numerous definitions and marketing campaigns to explain and promote the concept.

Often lost in the noise is the challenge of understanding why the movement is so very important, and what might be at stake if we fail to do it right.

This white paper will provide a framework for understanding the definitions, market indicators, key metrics and value propositions smart cities hold for numerous industries. The emergence of smart cities as the receptacle for ideas, thoughts, policies and strategies about the future of the world's cities is an important milestone because it comes amid rapid innovation, convergence and a redefinition of what it means to live and work in an urban environment in the 21st century.

Smart Cities

Urbanization

Before diving into the many definitions of a smart city, it is important to understand the underlying forces driving this movement from ideas and concepts into actionable projects and programs. A unique timing of market conditions, technology innovation, social wants, government needs, and increased global migration to urban environments is driving the interest in smart cities. Cities are exploring options on all levels due to a variety of factors, chief among them being the growing competitive pressure to attract and retain top talent and businesses, while at the same time provide quality public service and balance tight budgets.

In 2008, the number of people living in urban areas worldwide rose above 50% for the first time, and will rise to 70% by 2050, according to the United Nations. Using these estimates, the world's urban population will reach 5 billion by 2030. Using only 2% of the entire planet's land mass, cities today are using 75% of the world's natural resources and account for approximately 80% of the planet's greenhouse gas emissions. Worldwide, 476 cities have more than one million people living in them today. But by 2030, China alone will have 221 such cities, while the U.S. will still have just nine cities with a one million-plus population.

The world's cities are embracing a smart city agenda -- not because they want to -- but because they have to.

There are numerous emerging definitions of what it means to be a "smart city," and this flexibility provides cities the opportunity to define their own programs, policies and procedures, responding to their own unique priorities and needs. Smart city definition frameworks are being designed and marketed by academics, private companies, and urban associations, which are then reported in the media. Most of these frameworks comprise projects and programs that feature smart grids, smart buildings, clean technology and smart governance. Through these frameworks, a foundation has emerged that helps define areas of smart city interest, action and measures. Most frameworks use the word SMART as an acronym that stands for specific, measurable, achievable, relevant and time-based goals.

The majority of today's cities run on independent, multiple departments associated with operating systems designed to optimize a specific service in an expert system manner. The goal is to provide conduits for how these different Departments/Operating Systems can work and learn together, sometimes through integration and collaboration and other times through interoperability. The 10 common areas/departments/operating systems seen as leading indicators of smart cities include:

- Transportation
- Infrastructure
- Energy
- Water
- Waste
- Public Safety
- Education
- Healthcare
- Green/Smart Buildings
- Citizen Services

As cities evolve into smart cities, it helps to consider the manner in which cities will need to address social, economic, engineering and environmental challenges. Among the more interesting aspects of smart city initiatives is the closely integrated way that seemingly disparate elements can work together. Many cities are finding that what ties these elements together is the identification and usage of authenticated data.

Sustainability and Resilience

Having proper data about a city's buildings and infrastructure is essential to implementing projects and programs focused on sustainability and resiliency. The sustainability movement of the recent past was always a curious endeavor, as many customers were confused about the message. Shouldn't it be common practice to design, build and manage buildings in a sustainable manner?

This poor messaging of sustainability as a separate process is thankfully not translating into the smart cities movement; sustainability is an expected process, one that is integral and transparent to the overall procedure. What is resonating is the resilience of cities, rather than the sustainability, as witnessed by events like Hurricane Katrina, the Sichuan earthquake in China, Superstorm Sandy and most recently, the Boston Marathon bombing. In each case, a community's response was exposed for best practices and lessons learned on how quickly and properly the community might absorb the blow but not collapse. The community's resilience was tested and recovered in all cases. The measure of resiliency in the framework of smart cities is going through its first generation of analysis and reporting. An overriding result of this analysis is that while we can't prevent natural or manmade disasters, with knowledge and access to technology we can better protect our infrastructures, both physical and organizational. Densely populated cities are particularly vulnerable to natural hazards. For example, Superstorm Sandy (October 2012) caused damages of $50 billion, mostly in the New York metropolitan area. Co-op City in the Bronx, a residential "city within New York City" with 14,000 apartments and an independent power grid, has a proactive, resilient infrastructure that proved its worth during Superstorm Sandy. Power for Co-op City is generated by an on-site, 40-megawatt combined heat and power plant. When Sandy hit, Co-op City was not affected by the power cuts that affected many other areas in New York City.

The goal of sustainability is to put our world back in balance, while the goal of resiliency is to look for ways to manage in a continuously unbalanced world. A resilient city government assumes the future is uncertain; anything that can happen, might happen. Some of the most resilient smart city programs focus on learning from the resilience of nature when it comes to managing continuous change. Some of the urban technologies implemented on the basis of this strategy include wireless "mesh networks" that provide connectivity for communication from device to device, thereby creating an interwoven, self-repairing network on the fly. This type of network is the ultimate backup method to communicate in a dense urban environment when the primary networks fail.

The recent move by cities to work with their energy departments and vendors to create self-resilient micro grids to compensate for an aging energy infrastructure is taking hold as a best practice for a smart city. Micro grids can be best described as a move from a linear eco-system of equipment, systems and processes to a circular eco-system for energy production and distribution. The current linear model means that energy flows into a city from outside power stations, while circular models have cities producing most of their energy from local, renewable sources, such as capturing energy from municipal waste and sewage. The advantages of resilient infrastructure able to withstand natural and manmade hazards and disasters are:

- Resilient, smart cities are better prepared to recover quickly during and after a crisis.
- Robust infrastructures are generally more resource-efficient, powerful and reliable.
- Resilient technologies stabilize the operation of critical systems, especially during a crisis.

A smart city's ability to bounce back from natural and manmade events is a highly valued measure of resilient planning. The focus of a resilient strategy should be on the performance of a city's infrastructure during crisis. The result is a city that is more secure, efficient and reliable.

New Cities and Existing Cities

Although most of the early marketing and thought leadership of smart cities focused on the development of new cities in emerging markets, more recent smart city concepts and implementations have shifted to include existing cities, widening an already large market. Both

new and existing cities can be measured on the basis of the 10 leading indicators mentioned earlier, but there are different priorities and needs. Every city must see the idea of a smart city as an aspirational concept, like a framework, that responds to its own unique needs, priorities and environment.

New cities have the luxury of not having to deal with existing conditions like aging infrastructure, processes that are habitual and resistant to change, or "sacred cows" – buildings or systems beloved of either citizens or entrenched interests and therefore immune to change. Cities built from scratch under the marketing umbrella of "sustainable", "green", "zero carbon," like Masdar City in the United Arab Emirates, Lusail City in Qatar and King Abdullah Economic City in Saudi Arabia, are all enjoying the experience of doing it correctly from the start. The issues of slipping schedules, cost overruns and poor quality that plagues many of these smart city implementations revolve around new materials, means, methods and new building types that the local construction professionals and workers in the field have not experienced before. Combine this with a lack of data for the systems meant to manage the process, including trying to use Building Information Modeling (BIM) in an environment that is not fully prepared for it, and one can see that the new cities have issues existing cities may not have.

Most existing cities are taking a pragmatic approach to becoming smart cities, sometimes due to lack of resources and sometimes to careful planning. Cities, like San Francisco, are creating eco-districts as an approach to effecting bite-sized innovations with measureable results. Kansas City is using its award of being Google's first gig fiber network to enable a host of programs and projects, engendering an entrepreneurial spirit not seen in this community before. And in Boston, the city government has created an innovation lab that assists city departments with developing and testing innovations, providing relief from budget constraints and risk for each department. This move allows Boston to innovate faster and with more impact than working and developing innovations in a silo.

At the core of existing cities' moves to become a smart city is their most important asset: data. The data in most existing cities are in various forms of quality, structure and availability. From building departments that may only have paper as their form of data to zoning boards that may

have geographic information system (GIS) maps or computer-aided design (CAD) drawings in formats no longer supported, the task is daunting when it comes to gathering data from existing cities. Setting lines in the sand regarding what data to capture, where these data reside, who is going to perform the task and how long this process will take are all considerations when undertaking a data acquisition plan. But once enabled, existing cities can see immediate results of how their data, when brought into a smart city environment, can begin providing better information for making sound decisions. This strategy of using existing data as the foundation for enabling a smart city is a best practice and should not be ignored.

Information Communication Technology (ICT)

The Intersection of Policy and New Information Technologies

Some of the more engaging developments arising out of both new and existing smart city projects and programs reside at the intersection of policy, Information Communication Technology (ICT) and design. Cities must develop strategies to become smarter on many levels. Proper technology solutions, when backed by solid government policies and implemented in well-designed places, can bring enormous value to cities. But most cities do not have the resources, capabilities or capacities to implement technical, financial or human solutions. This means that cities are finding new models to engage internal and external resources, creating lasting collaborative relationships through new business models. This fundamental use of collaborative strategies as a path to finding the proper balance between public and private organizations is key to prioritizing smart city initiatives. Each city will discover that the collaboration method of identifying the right mix of government policies, ICT solutions and inspiring design will raise the bar for that city's measure as a competitive, innovative and exciting place to live and work.

Machine to Machine (M2M) and the Internet of Things (IoT)

Information Communication Technology (ICT) is being used to better comprehend the connections between people and places in urban environments. From GPS-enabled school buses sharing locations with a parent's smartphone to sensors that monitor and report on building conditions, smart cities and their systems are becoming increasingly connected with their

inhabitants with a promise of urban intelligence and resiliency like never before. This network of connections is known in the market today as the Internet of Things (IoT), sometimes called machine-to-machine (M2M) communication, where objects communicate with the ability to transmit and receive data. Connectivity is the key ingredient of how M2M and the IoT will grow and fulfill the vision of a truly interconnected world. There are nine existing methods of how M2M/IoT communicates:

1. Radio Frequency Identification (RFID)
2. Sensor Nodes
3. Gateways
4. Cloud Management
5. Near Field Communications (NFC)
6. Complex Event Processing (CEP)
7. Supervisory Control And Data Acquisition (SCADA)
8. Zigbee
9. Information and Discovery Services (IDS).

In March 2013, the *EE Times* estimated that as many as 50 billion devices will be connected to the Internet by 2020, creating a $14.4 trillion market. The M2M/IoT communication market in 2011 was worth $44 billion, and is expected to grow to $290 billion by 2017 (MarketsAndMarkets).

The Cloud

Cloud products use the Internet to remotely access software and store data. Smart city cloud products enable the migration, integration and interoperability of complex city data. This is of high value to cities because their organizational structures were never designed to share. Each department had an expert system that operated in a silo. This situation led to an accumulation of existing city information in various formats and states of quality across a city government. Smart city solutions promise to dive into these silos, identify and acquire sought-after data and share it with data in other silos to provide solutions that used to be too resource-intensive to

implement. Cloud-based products for smart cities are catching the wave faster than incumbent technology products due to low cost, easy scalability and the big data functions of these products. Cloud solutions lower the barrier to entry by being inexpensive compared to traditional software offerings, have little to no additional technology infrastructure that is required and are very secure. Planning for the cloud for a smart city involves a higher-resource allocation to connectivity than in the past. Having higher bandwidth provides a better experience for cloud-based solutions. Extensible markup language (XML) protocols also assist in tagging and managing city data by making it easier to find, manage and distribute city information from silos to platforms. As the cloud's many attributes become more mainstream to city government operations, expect a plethora of cloud solutions to emerge.

Platform and Apps

Some initial smart city efforts focused on the city-as-a-platform approach, which was copied from large scale IT programs. Platforms are software systems, usually proprietary, that force users to use their methods of software management, development and distribution based on strict licenses. Platforms can be cloud-based or located within a secure, on-premise network. Traditional software platforms usually require a proprietary application programming interface (API) to create unique views of data or functions to manipulate this data. Although at first very intriguing, most smart cities are now shying away from these centrally-controlled uber system designs and embracing an open, online platform approach, leveraging the concept perfected by Apple of developing apps that can be downloaded from iTunes or Apple's app store.

Within the context of smart cities, the emergence of apps to assist citizens in having two-way communications with their governments is proving to be an important first step for many mayors who wish to develop smart cities. Simple apps that allow a citizen to take a photo of a pothole, report it to the city and then track the process until the pothole is fixed is one example of how smart city apps are breaking down the communication walls between city stakeholders. Citizen engagement is an important function that cities are implementing in order to lay the groundwork for improved trust between elected officials and city workers and between the city government and its urban inhabitants.

A breakthrough in citizen engagement has come in the form of crowdsourcing. Crowdsourcing is obtaining needed services, ideas and/or content by soliciting contributions from a large group of online and connected people, usually developed and managed by apps and blogs. By inexpensively and quickly being able to start a movement, activists and traditionally inactive citizens can participate in discussion and discourse with a city and provide suggested solutions that can streamline decisions. Proper crowdsourcing in a smart city enables bottom-up community building with top-down empowerment from city government. The value of crowdsourcing is in not just using M2M/IoT technologies and solutions as the only data points to make informed decisions, but to introduce the wisdom of many human users. The proper balance of technology and human interaction provides a strong foundation for a smart city.

Mobile Communications and Devices

Our current generation of ICT tools and solutions are having the most impact on the average urban citizen in the form of mobile communications and devices. The world of smartphones, tablets, apps and a series of protocols and standards have been embraced by the market in meaningful and important ways.

Urban citizens want to be connected and have immediate, accurate and accessible information. Free access to Wi-Fi connections, map apps and mobile payments is the bar that has been set for cities attempting to become “smart.”

The emerging standard of near field communication (NFC) is one area that is fast enabling an urban connected life to emerge as a standard way of life in a smart city. NFC is a set of standards for mobile devices that establishes communication between devices by either touching them together of having them in close proximity to each other. Having NFC-enabled environments allows citizens using mobile devices to conduct contactless transactions for payments and access seamless data exchange. It also creates the opportunity to access the cloud as a temporary, wireless, mesh-style network during emergency situations. The instant network feature of NFC environments brings a host of opportunity for new style apps to be used by urban citizens in a smart city.

Authenticated Big Data

Due to the implementation of vast information technology (IT) solutions over the past few decades by cities, the world has created varied and large data caches in both digital and paper formats. These data enable an enormous amount of tasks to be conducted more effectively and efficiently. The issue is not if the city has the proper data to become a smart city; the issue is how.

The focus on big data and a city's behavior toward data management is a critical element towards becoming a smart city. A smart, efficient city would encompass aspects of intelligent transportation, security, energy management, CO2 emissions, and implement a big data strategic plan to enable decision makers and authorities to perform their jobs more effectively.

Some cities have taken an open data approach to assist in making data available to the general public. This has spawned an emerging market for the development and sale of apps to enable open data. Some cities have also started programs to leverage existing data of the built environment found in their building departments, zoning departments and utilities. Programs like smart permitting (called Corenet in Singapore) and quick response (QR) tagging of building permits in New York City and smart metering Wi-Fi in Santa Clara, Calif., are leading their citizens into the next generation of their relationship with their municipalities.

Smart Buildings

For over 20 years, many buildings have moved toward automating facility management processes to provide a quality environment, streamline tasks, and become more efficient with resources. In fact, the sophistication of certain building systems like lighting, heating, ventilation and air conditioning (HVAC), conveyance systems (elevators, escalators) and security has created robust solutions, but has also created deep silos of operation. The challenge for many building operators is to try and integrate these systems so their buildings become smarter by having operational data systems "talk" to each other to find greater gains in efficiency. It is a daunting task, as there is massive complexity inside the world's buildings of both proprietary and open protocols. Efforts to make these disparate systems communicate with each other can be expensive and time-consuming.

Integrated solutions allowing disparate building systems to communicate and work together have matured in recent years—breaking down this resource intensive task into more affordable solutions. Equipment management control companies like Siemens, Johnson Controls and Schneider Electric have provided the market with innovative building automation systems (BAS) in many configurations that are creating the framework and environment for the emergence of truly smart buildings.

Buildings as Servers, Cities as Networks

Think of a city as a network, with each building acting as a server. When individual building data is connected to the city network, likely through an open data policy or as an ordinance, interesting things begin to happen. The data that a city captures through this process or already possesses becomes the digital DNA of smart cities.

In a similar way that there is latent valuable data in each building, cities possess an amazing amount of data in various forms, sizes and accessibility. The magic of utilizing valuable data to make better decisions depends upon identifying, locating and then turning latent data into actionable data. With advances in ICT, like cloud-based technologies, there has been great improvement in a city's ability to gather vast amounts of data regarding city infrastructure in a cost effective manner. ICT advances becoming commonplace in cities today include:

- Ubiquitous sensors enabling authenticated data collection
- Low-cost communications protocols and systems to simplify and reduce costs
- Pervasive video devices that assist in public safety programs
- Real-time management systems for traffic, water, sanitation and public transportation that automate control and optimize performance
- 3D visualization analytic tools that translate all of this data into actionable intelligence

With both new and existing cities, this data intelligence process begins with a proactive approach of identifying, capturing and managing a city's digital DNA. Because the outcome is to enable city stakeholders with tools to make better decisions, 3D visualization analytic tools are emerging as the preferred method, due to the ability to take highly complex amounts of data and show results in context with the actual city.

3D visualization tools need accurate, authenticated data to "build" a 3D view of the city. These data reside in an array of city departments; any department, in fact, where there is collection and management of vast amounts of data, which, when viewed as a whole, create the virtual representation of a physical city. The building blocks to effectively and efficiently use this city data will ultimately reside in a city's ability to repurpose its existing data and documents associated with the built environment, which is the authenticated digital DNA of all cities. The accuracy, authentication and integration of this city data are the keys to a proactive approach towards becoming a smart city. Without a proper digital DNA structure and management, performance will be inhibited, and it will be impossible to evolve to a smart city.

Market Indicators

Infrastructure

A key market indicator of a city making the transformation into a smart city is its projects and programs regarding infrastructure. A city's physical infrastructure of roadways, walkways, bridges, tunnels, mass transit and other public areas like parks are not just economic indicators of progress, but a visual indicator. When people are visually and physically affected by a smart city, it triggers an emotional response. Quality of life issues are more intense in an urban environment due to the volume of people in a finite amount of space and the effects of having inconsistent power, dirty water, polluted air and not having your trash picked up in a timely manner. The effects of the quality of energy, water, air and waste disposal are key indicators for all cities today, not just green, eco-cities. Availability to these city services is a factor in a city's ability for growth.

A leading infrastructure indicator is the development of smart grids for power, gas and water. In California, Pacific Gas and Electric (PG&E), has installed 9.5 million power and gas Smart Meters in 6 million households, taking 90 billion meter reading intervals per year since 2007. This enormous amount of big data needs to be analyzed and acted upon to become a valuable resource. With the development of visual analytic tools that can affordably be deployed over the cloud, PG&E can use this data to make better-informed decisions and develop a framework for having its power grid become a smart grid. A smart grid for power and gas enables real-time,

two-way management of electricity, gas and information. Innovative technologies allow for better integration of renewable energies and more efficient power and gas transmission across the entire grid. Smart grids are laying the foundation in the context of how buildings can communicate with a city's Intelligent Operations Center (ICO) or with each other, an example of a true "city as a network". For a city to plan and manage its smart grid strategy there are functional goals and characteristics to meet that include:

- Self-healing from power disturbance events
- Enabling active participation by consumers in demand response
- Operating resiliently against physical and cyber attacks
- Providing power quality for 21st century needs
- Accommodating all generation and storage options
- Enabling new products, services, and markets
- Optimizing assets and operating efficiently

Power and gas smart grids rely on data from meters and sensors to meet these functional goals. This captured data is designed to assist in creating smart grid solutions for substation automation, demand response, distribution automation, supervisory control and data acquisition (SCADA), energy management systems, wireless mesh networks, power-line carrier communications and fiber optics. Enabling this data to flow bi-directionally between the source and a smart grid management system allows for real-time control, information and data exchange to optimize system reliability, asset utilization and security.

Like power and gas smart grids, smart water grids are emerging as the new quality standard for smart cities today. Leveraging the use of captured sensor and water meter data, technology that was developed for the power grid make the transmission and processing of water-based data possible. New solutions are being installed to retrofit older water systems and new systems alike, which will monitor factors like vibrations or water flow. Thousands of sensors inform municipal water authorities about events such as leaks, or transmit data about storm water overflows. It will also provide households with information about water usage or possible health threats. The implementation of these smart-water initiatives is usually tied into larger scale projects, like the numerous combined sewer overflow (CSO) projects being performed in U.S. cities today though EPA consent decrees.

Transportation

Another major leading indicator of cities in growth mode and positioned to become a smart city are airports, both new and renovated. Some examples include:

- Masdar City, a sustainable, zero-carbon, zero-waste, car-free city in the UAE is adjacent to the ever-growing Abu Dhabi International Airport.
- Guangzhou Knowledge City, an eco-city of 42 square kilometers between the new Guangzhou International Airport and the Central Business District (CBD) of Guangzhou.
- Shanghai recently expanded its predominately domestic airport into a transportation hub called Hongqiao International Airport, which, in addition to new terminals and runways, includes a bullet train terminal, subway terminal and plans for a central business district.
- King Abdullah Economic City, a new smart city just north of Jeddah, Saudi Arabia, recently had its closest airport expand with new terminals and transportation distribution centers at Jeddah International Airport.
- Singapore, a model of a modern urban environment, recently completed its renovations to its terminals to accommodate the newer aircraft from Airbus and Boeing at Changi International Airport.
- New York, the international gateway to millions of visitors to the U.S., recently completed renovations to all its terminals and has a new connection to rail transportation at John F. Kennedy International Airport.
- San Francisco recently completed renovations to Terminal 2 and has a new International Terminal that seamlessly connects to rail transportation at San Francisco International Airport.

As a gateway, airports indicate that a city is creating the environment for an exchange of ideas, trade and people. As a hub, airports anchor multimodal transportation centers that allow people to efficiently get from one place to another. As a symbol, airports provide people an opportunity to first experience the city, setting the tone for the rest of their journey. And as an indicator, early smart city spending currently centers on spurring multimodal transportation policies, mostly because it's easier for cities to control investments in projects like airports. These transportation policies are usually associated with smart transportation solutions. According to Pike Research, spending on smart transportation solutions, such as infrastructure that links

electric vehicle charging infrastructure with other transit options or intelligent traffic management systems like congestion pricing and traffic flow sensors, is estimated to reach $5.5 billion annually by 2020. This represents a compounded growth rate of about 20% between now and 2020.

Smart transportation programs and projects can include:

- Public Transit Management
- Smart Parking Meters
- Smart Parking Locator
- Traffic Congestion Management
- Vehicle Information and Communication System (VICS)
- Advanced Cruise-Assist Highway System
- Contactless Smart Transit Passes/Tickets
- Fixed Road Sensors
- Mobile Data Probes
- Driverless Cars (Google Cars)

Summary

Smart cities are being created due to a perfect storm of economic conditions, the next generation of ICT tools, and urban migration that require new and existing cities to respond with powerful new programs, solutions and relationships between people, places and things. It requires not just smart technologies and systems but smart thinking.

This white paper was developed to raise awareness of the aspiration of smart cities and their market effect on different industries. The basic goal of smart cities is to improve the quality of life and the well-being of citizens. Human capital far outweighs any other measure of a successful urban environment.

As smart cities emerge as a primary objective across the globe, it is vital that smart cities and their processes be understood by other stakeholders. Smart city initiatives run the real possibility of not achieving optimal results. There are three keys for a smart city strategy to succeed:

1. **Holistic view**: Smart city strategies and solutions must be considered with the context of a city's entire operations infrastructure processes and workflows. This eco-system view will assist in identifying isolated projects with limited impact. Cloud-based solutions are proving to be successful in telling this vital story.
2. **Citizen engagement**: Gaining public support and trust in new processes and tools such as crowdsourcing, mobile apps and report tracking is a primary objective of many cities on the path to becoming a smart city.
3. **Collaboration**: ICT technology breakthroughs, insightful policies and urban designs that delight are intersecting in a manner that calls for collaboration at a rate that we have not been accustomed to before. These points of intersection are fertile ground for innovation within organizations and between organizations.

Both large and small smart city solutions have the opportunity to assist in creating an urban environment for people to prosper in a welcoming, inclusive and open manner. Living a connected life is becoming an interconnected life for people residing in today's urban places. When people and places begin to seamlessly and transparently communicate, interesting things begin to happen. This is the promise of smart cities.

Getting smart cities right is our generation's greatest challenge, and the best legacy we can leave to our children.

About the Author

Paul Doherty, AIA, is the president and CEO of the digit group, inc., (www.thedigitgroupinc.com) a market leading Cloud software incubator for AEC/FM products. He is an author, educator, analyst and advisor to Fortune 500 organizations, global government agencies, prominent institutions and architectural, engineering and contracting firms. He is a frequent guest writer for numerous publications and has authored or edited nine books. Widely quoted in the media, Paul is a licensed architect who brings a global industry perspective and is a highly rated speaker at numerous industry events around the world each year.