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What impact will Smart Cities have on the future of mobile commerce?

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We are connected to the Future

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Connections

A smart city is a place where traditional networks and services are made more efficient with the use of Information Communication Technologies, for the benefit of its inhabitants and businesses.

The smart city concept goes beyond the use of ICT for better resource use and less emissions. It means smarter urban transport networks, upgraded water supply and waste disposal facilities, and more efficient ways to light and heat buildings. In many ways, everything becomes more efficiently connected. And it also encompasses a more interactive and responsive city administration, safer public spaces and meeting the needs of an ageing population. The benefits of the future smart city are significant and as more creative uses are made of resources, they are probably only limited by our imagination.

Sectors that have been developing smart city technology include: Communication companies, government services, transport and traffic management, energy, health care, water and waste. Smart city applications are developed with the goal of improving the management of urban flows and allowing for real time responses to challenges. A smart city may therefore be more prepared to respond to challenges than one with a simple 'transactional' relationship with its citizens. Other terms that have been used for similar concepts include 'cyberville, 'digital city'', 'electronic communities', 'flexicity', 'information city', 'intelligent city', 'knowledge-based city, 'MESH city', 'telecity, 'teletopia'', 'Ubiquitous city', 'wired city'.

Major technological, economic and environmental changes have generated interest in smart cities, including climate change, economic restructuring, the move to online retail and entertainment, ageing populations, and pressures on public finances. Notable examples include: The European Union (EU) has devoted constant efforts to devising a strategy for achieving 'smart' urban growth for its metropolitan city-regions. The EU has developed a range of programmes under 'Europe's Digital Agenda". In 2010, it highlighted its focus on strengthening innovation and investment in ICT services for the purpose of improving public services and quality of life. Some estimate that the global market for smart urban services will be US$400 billion per annum by 2020. Examples of Smart City technologies and programs that have been implemented include: Southampton, Amsterdam, Barcelona and Stockholm.

Other key examples include Dubai - United Arab Emirates (UAE). The Emirate is targeting 20 million visitors by 2020 - double the number it currently receives. Experts believe that Dubai's plans to create a "smart city" could produce one of the world's most-connected and sustainable urban centres. Also, Masdar City in UAE is a smart city project in the capital Abu Dhabi. Its core is being built by Masdar, a subsidiary of Mubadala Development Company, with the majority of seed capital provided by the Government of Abu Dhabi. Designed by the British architectural firm Foster and Partners, the city relies on solar energy and other renewable energy sources. Masdar City is being constructed 17 kilometres (11 miles) east-south-east of the city of Abu Dhabi, beside Abu Dhabi International Airport.

Fredric J. Morris
Editor-in-Chief,
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Yamal-300K' Eastern Campaign

by Gazprom Space Systems

Two and a half years ago the Russian operator Gazprom Space Systems replenished its orbital constellation with a new satellite Yamal-300K.

The satellite was launched from the Baikonur cosmodrome and put into the 90'E slot on the geostationary orbit. After the successful launch of Yamal-401 satellite into the same orbit slot, and moving all the customers from Yamal-300K to the new satellite, Yamal 300K started planed relocation into the other orbit slot 1835'E. this position is located over the Pacific Ocean, and enables coverage over the Russian Far East, Korea, Japan and other South East Asian territories; and as far as Alaska. These regions have good market prospects and, because of this, Gazprom Space Systems made a decision to extend its business eastwards and arranged this "Eastern Campaign".

The satellite in its new designation is interesting for the Russian as well as international customers. Gazprom Space Systems experienced it already at the stage of preliminary sales. One of the Yamal-300K beams perfectly covers the Russian Far East and attraction the attention of, for example, Russian mobile operators concerned about the creation of backhaul infrastructure for their cellular networks in the region.

The steerable beam of the satellite is ready to serve any region of the South East Asia, Australia, New Zeeland and the waterlocked states of the Pacific Ocean. However, the most attractive coverage, in our opinion, is provided by the wide shaped beam of Yamal-300K that covers the north of the Pacific Ocean with its intensive aeronautic and maritime traffic and the big transport hubs on the coast.

Recently, Gazprom Space Systems essentially renewed and extended its satellite assets. Launch of the three high power satellites results in the 3.5 time growth of the satellite capacity amount in 2015 in comparison to 2012. Nowadays satellite flit of the company is rather young (the average satellite age is less than three years).

The company markets 30% of Yamal satellites capacity outside Russia. In particular, one of the new satellites Yama-402 55'E has achieved prominence on the markets of Africa and the Middle East, and Yamal-202 49'E has already been successfully working for Asian markets for more than ten years.

In Russia, Gazprom Space Systems is not only a satellite operator but also a service provider and system integrator. The key element of the company's ground infrastructure is the Telecommunication Centre in Stchelkovo near Moscow, from where the satellite constellation is controlled, and where the main ground assets to provide services are concentrated (hub, up-links, NOC and so on). From this place the company also controls wide scale satellite communication earth stations network placed in the Russian regions.

Concerning further business development, along with the plans to create new own satellites, Gazprom Space Systems also searches for new business models. The company relies on cooperation with the other satellite operators to build and use orbital assets. Joint efforts with the other operators help to resolves increasingly frequent collisions connected with the overcrowding of the GEO.

Cooperation allows us to share the risk of financing capital-intensive satellite projects. The idea to create joint satellites, or hosted payloads, has become ever more popular. During those periods when our large investments are impeded, similar solutions provide operators with the opportunity to gain business traction.

While similar business ideas are waiting for their implementation, the business project "Yamal-300K' Eastern Campaign" has already started.

What Does a Smart City Look Like?

by Nidal Abou-Ltaif, President & Jean Turgeon, VP & Chief Technologist Software Defined Architecture, Avaya International

The city of Dubai for example: Dubai is built on sand. Without the proper foundation, it would not still be standing. But with the proper foundation, they've built a world-class city with skyscrapers—and the world's tallest skyscraper to boot. The building blocks for a Smart City are similar: it requires a strong foundation of partnerships, all aligned in building a next generation infrastructure that will evolve and deliver best-in-class services. These partnerships form a multi-faceted infrastructure approach, combining public safety, smart healthcare, smart education, smart retail, and smart banking and make it all accessible to citizens.

Nidal Abou-Ltaif currently leads a combined operational region that generates more than half of Avaya's global revenue. With an unmatched record of success, Nidal helps governments and businesses make a real difference to people's lives in today's digital world.
Since joining Avaya as the regional sales leader for the Middle East in 2003, Nidal has rewired the business by building a winning team and go-to-market strategy from scratch. He has been instrumental in transforming Avaya from a niche voice/IP telephony player into a specialist business communications powerhouse, with a complete portfolio of software and services and the integrated networking platform to meet underlying needs. Today, Avaya's client-tailored and outcomes-focused digital and smart services are helping businesses across the region accelerate their digital transformation journeys.

Jean Turgeon (well known in the industry as 'JT') is vice president and Chief Technologist of Software Defined Architecture within the Worldwide Sales organization at Avaya. Turgeon is responsible for driving and delivering the strategy for Software Defined Architecture, and accelerating adoption of Fabric Networking solutions in the Enterprise and Midmarket. He also leads the strategic solutions initiative for Public Safety.
In his current role at Avaya, Turgeon leads a global team of Networking Sales specialists, and is the lead Networking evangelist. His team works closely with customers to advocate and drive strategic sales investments and initiatives promoting an end-to-end Fabric-based architecture solution that delivers business value.

The city of the future is a Smart City, emboldened by technology that folds in government, industry, and consumers. For this to happen, it needs a strong foundation – an infrastructure that can withstand heavy traffic, particularly during times of crisis.

The right foundation means a stronger city

Take the city of Dubai for example: Dubai is built on sand. Without the proper foundation, it would not still be standing. But with the proper foundation, they've built a world-class city with skyscrapers—and the world's tallest skyscraper to boot. The building blocks for a Smart City are similar: it requires a strong foundation of partnerships, all aligned in building a next generation infrastructure that will evolve and deliver best-in-class services. These partnerships form a multi-faceted infrastructure approach, combining public safety, smart healthcare, smart education, smart retail, and smart banking and make it all accessible to citizens.

Communications and networking infrastructure need to be automated to simplify deployment, particularly as the Smart City expands to include all the consumer devices that will connect wearables and IoT applications including smart appliances. Taking a creative approach to building a foundation with infrastructure will help mitigate cybersecurity threats and gain agility, while lowering capital and operating expenses.

To build this kind of Smart City foundation, it requires a strong network infrastructure that combines contact center, unified communications, customer engagement tools with Artificial Intelligence (AI) and strong network security. This will ensure the systems and services operating within the Smart City can keep pace with the demands of citizens, the government and industry alike for mobile, social, and cloud-based services.

The future of the Smart City means convenience - and safety

As cities of the future continue to move forward with Smart City platforms, the goal must be to provide a consistently good experience for users with a holistic approach to turnkey virtual networks and applications. Vendors and service providers must have the ability to deliver across various verticals and provide the opportunity to implement smart buildings, allowing consumers to experience it live, not just as a demo or prototype. That means going live to allow all who are working, living, shopping, and playing within the Smart City to experience its power firsthand.

And it's not just for play. The Smart City of the future can have life-saving implications. For example, in a crisis situation such as an auto accident, it can integrate a 911 call with other components, like electronic road signs to warn of hazards and SMS alerts to citizens. It can gain control over city cameras to feed data to the emergency response team – or even allow the caller to cede control over their phone camera to provide a video feed. The outcome of this is a safer city: when you dial the emergency number, the smart device provides the exact location to first responders. Meanwhile, the dispatch center can push video on how to perform CPR, for example. It brings systems together for the safety of citizens and uses the power of analytics to suggest alternate routes to travelers who have installed the application, using an API from a mapping application.

Ultimately, it will provide a completely different digital experience than what consumers are getting today. Whether it's for play, work, living, or an emergency situation, the Smart City of the future will attend to citizens' needs while ensuring their information is secure and providing uptime that means they can use the applications regardless of what is happening around them.

Jean Turgeon Vice President and Chief Technologist Software Defined Architecture, Avaya

Additional commentary from Nidal Abou-Ltaif, President, Avaya International

Cities and nations today are going through a similar cycle of transformation as enterprises: their citizens and visitors expect best-in-class services, while businesses are looking for the right platform and infrastructure to drive their own transformation. The objectives behind Smart Cities are to diversify economies, deliver employment opportunities, achieve citizen happiness and provide better living and working standards for all.

Just like organizational digital transformation, this requires collaborative effort – it can't be done by governments alone. Smart City transformation requires an ecosystem of stakeholders to make it happen and more importantly, it requires vision and leadership to drive change. While the digital strategies to create Smart Cities need to come from government, they need the support of businesses to execute and buy into their vision.

Accordingly, when a city is aligning with partners from a technology, funding or research standpoint, they need to consider the leadership within those partner organizations. They need to have willing participation from businesses and public leaders because collaboration, economic viability and ROIs are key for demonstrating the ability to replicate and scale the model elsewhere which is important for attracting future partners/investors.

To encourage the economies of scale in innovation and development that will attract other large and small businesses and funding, a city needs to create a hub of innovation both virtually and physically. It's similar to the Silicon Valley effect – technology companies flock there to be surrounded by the latest tech innovations and developments. If cities create such a hub for smart-systems, then other businesses and governmental grants will flock there to be a part of it.

And Smart City transformation requires considerable agility - complex procurement rules that prevent companies from bidding on projects, for instance, or a rigid budgetary structure can hinder development. So governments need to create the right frameworks that enable Smart City development and encourage innovation.

Looking for the Real Smarts in Smart Cities? Hint: Start with the Network

by Ed Ogonek, CEO, CENX

Smart Cities rely on a vast array of networking technologies, as well as communications service providers (CSPs). Many devices, such as those on highways, contain embedded cellular data transceivers, connected to one of the usual mobile operators. Of course, consumers using smartphone apps will be on their own cellular connection, or using WiFi at home, at work, in a hotel, in an expo center, or in a coffee shop. For enterprises, there are wired Ethernet-based Local Area Networks (LANs) within buildings, or Wide Area Networks (WANs) between buildings. There is WiFi within buildings or public spaces, like an urban park; that WiFi might be managed by the city or hosted by a CSP.

Ed is a successful senior executive and entrepreneur with a 30-year track record of building high-growth businesses in fast-paced global telecom markets. His leadership experience spans President/CEO roles at innovative, early-stage companies, and General Manager positions for large multi-national divisions at technology leaders including Alcatel, Newbridge Networks, and British Telecom. Prior to CENX, as President and CEO of Bridgewater Systems, Ed led the company's transformation into a global market leader for mobile data software solutions, ultimately acquired by leading customer experience vendor Amdocs in 2011.

Ed has been a Board Director in various public and private technology companies with an emphasis on company strategy, business planning, and business development. He currently serves on the Board of Directors for Canada's National Ballet School and True Context Corporation (TSXV: TMN). Most recently, Ed was nominated as a finalist for the EY Entrepreneur of the Year Award as his work at CENX helps to drive the transformation to SDN and NFV.

While everyone focuses on the sensors, applications and end-user experience, the real smarts in Smart Cities is largely hidden from the public, and from the media too: The intelligence is in the network, and in the software that keeps that network humming. Make no mistake: The sensors being designed and installed for Smart Cities are amazing. The cloud-based applications are incredibly powerful, and offer the potential to make a real difference in peoples' lives. Big Data and software automation are beginning to offer city administrators the opportunity to cut costs while improving services.

There's a soft boundary between the Internet of Things (IoT) and Smart Cities. Perhaps there's no boundary at all. Automobile owners benefit from smart parking apps that make it easier and quicker to navigate city streets – while reducing fuel consumption, traffic and pollution at the same time. Real-time information on highways informs consumers and transit authorities of bus, light rail, and train delays. Intelligent climate-control systems in public buildings detect when buildings aren't in use and adapt automatically. Watering systems for public parks are savvy enough to monitor ground moisture and only turn on sprinkler heads when needed, instead of working off a fixed timer that waters during a rainstorm. . Monitoring of produce moisture and refrigeration also employs similar smart detection systems.

That's only the beginning. My own home is rapidly becoming a smart, efficient home. My company's offices are becoming smart, efficient offices. My city is following suit. Smart cities, however, have the challenge of connecting all the IoT devices to back-end services, whether in the cloud, in the city's own data center, or in a third-party contractor's data center.

IoT connectivity is a huge challenge on multiple fronts. Firstly, the sheer explosion of the number of endpoints means that there are that many more connections nnections – analysts forecast that the number of devices will grow five-fold from 2015 to 2020 reaching

over 25 billion! Also, these data connections often only live for a very short period of time, to provide concise location or status updates. Connections get created, torn-down, and recreated. That creates an incredible volume of signaling activity.

In addition, the service requirements for each of these connections varies greatly. A GPS location transmission requires minimal data bandwidth and latency isn't much of an issue. Contrast that with home video monitoring or surgery room live feeds. Those latter type of applications require high bandwidth, and have stringent latency and jitter requirements in order to guarantee high video quality. Now, add in the need to prioritize services and applications, and you get an idea of the complexity of operating IoT networks. If networks are under-performing, devices can't talk to the back-end servers that are hosting those applications. Telemetry can't be gathered from remote sensors. Video gets so distorted that the remote physician cannot make an accurate diagnosis. Big Data-centered applications won't have the data they need to make real-time decisions and carry out real-time actions.

Eye on Communications Service Providers

Smart Cities rely on a vast array of networking technologies, as well as communications service providers (CSPs). Many devices, such as those on highways, contain embedded cellular data transceivers, connected to one of the usual mobile operators. Of course, consumers using smartphone apps will be on their own cellular connection, or using WiFi at home, at work, in a hotel, in an expo center, or in a coffee shop. For enterprises, there are wired Ethernet-based Local Area Networks (LANs) within buildings, or Wide Area Networks (WANs) between buildings. There is WiFi within buildings or public spaces, like an urban park; that WiFi might be managed by the city or hosted by a CSP.

As local governments look to their Smart Cities initiatives, they must consider the magnitude of endpoints, variety of services, and scalability of all segments of data networks. Capacity planning is key to ensuring that the city's own networking infrastructure is robust enough to handle increased data traffic – but that's not enough. Most cities have extensive contracts with Tier 1 or Tier 2 CSPs to provide WAN services to link city sites, and to connect the city network to the Internet and to cloud-based Software-as-a-Service (SaaS) applications.

City planners must work with the service providers to make sure their systems are also sufficiently robust. Contracts should be studied, in particular for service-level guarantees regarding downtime, bandwidth, elasticity, latency, jitter, and delay: Many of the new Smart Cities applications may be more sensitive to network performance than traditional municipal software – especially when so much traffic is going to and from IoT devices on the network edge.

Smart Service Provider Networks

To get ready for Smart Cities projects, CSPs are already being proactive in evolving their networks for IoT requirements– and not waiting for RFPs from city planners. After all, while some Smart Cities projects will start at the top at City Hall and work down, many others will begin as quiet, unassuming initiatives driving by various municipal departments, like transportation, parks and recreation, public safety, water and sewer, and so on. In fact, some city managers may be running Smart Cities projects and not even realize it, or understand the benefits and limitations of data networks.

To accommodate the "let a thousand flowers bloom" bottom-up approach to IoT and Smart Cities projects, CSPs are beginning to instrument their own networks to be more intelligent, more robust, and more data-driven. Given that many Smart Cities and IoT projects span multiple networks, a consistent approach to orchestration of intra-network and inter-network services is a must, in order to meet the varying service requirements of Smart Cities applications at scale – remember, there are billions of connections from IoT devices to city data centers, third-party data centers, and the cloud. In addition, increasingly, these networks will be comprised of hybrid physical and virtual network functions, using new technologies like Software-Defined Networking (SDN) and Network Functions Virtualization (NFV).

The smartest tool in the intelligent service provider network will be orchestrated service assurance and management, driven by real-time Big Data network analytics. This advanced intelligence will help carriers optimize their physical and virtual networks to be more elastic – better able to accommodate unexpected data traffic bursts – and better able to ensure a high quality of experience for all the billions of things, irrespective of what type of application is being executed.

With orchestrated service assurance, CSPs will also be able to identify and isolate network faults, and route traffic over alternate paths until the fault can be repaired. In city-size networks, after all, faults are going to occur, whether they are caused by fiber cuts, hardware failure, power outages, configuration errors, or excess traffic degrading real-time performance.

Finally, orchestrated service assurance can help service providers meet their customers' service level guarantees, while simplifying end-to-end management across all the data networks used by Smart Cities, including cellular 3G/4G/5G, WiFi, LANs, and Carrier Ethernet WANs. When the Smart City project needs bandwidth, coverage or specific levels of network performance, it simply must be there.

Thanks to the convergence of the Internet of Things, cloud computing, mobile computing and Big Data, cities are turning into Smart Cities. The public is excited by the possibilities, as are city governments. Thanks to technologies like real-time network analytics and orchestrated service assurance and management, network service providers have the advanced intelligence to be the real enablers of Smart Cities. Those technologies are making a difference in peoples' lives every day, even if nobody knows it.

Unlimited Possibilities for Smart City Development

by Anne Berner, Minister of Transport and Communications, Finland

The development of cities must be based on the needs of the individual. In the digital era, this provides great opportunities in city environments for the provision of useful data, which, at the same time, would create new business and entirely new types of markets. The role of the state is to act as the opener of new digital markets and as the accelerator of development.

Anne Berner, Member of Parliament, is the Minister of Transport and Communications, Finland, from 29 May 2015 to the present.

Ms. Bernier is also Entrepreneur at Vallila Interior; and Chair of the New Children's Hospital 2017

Ms. Bernier hold a Master of Science in Economics and Business Administration.

A Smart City is based on the idea of improving people's life in cities with the help of efficient telecommunications and digital services. For example Mobility as a Service will be a big change and a new way to think: instead of single trips, mobility will be a package of integrated services – which are even anticipatory – that help the user make smart transport choices

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Traffic Lab is an experimental project launched by the Finnish Ministry of Transport and Communications to promote a market in intelligent transport services. Experiments conducted under the Traffic Lab will give direct feedback on the functionality of the various applications and solutions.

Smart cities can be developed by means of legislation. Advances in transport automation in cities call for favourable conditions for the development but also encouraging legislative measures. Regulation on transport markets will be brought under one act, the Transport Code. Legal provisions are used to create incentives and promote new service models.

Smart Cities can also be seen as the growth environment for digital business. Private services can be linked with public services; and with the new approach cities do not need to do everything by themselves. . One of the best means to further this is through the availability of public data. For example public transport data has been made available in Finland for years, and today there are several route and scheduling services in common use. One of these is a route guide application BlindSquare that functions with voice instructions. It has proved a very popular navigation service in city environments especially for visually impaired people. Now global development of the application, on the basis of on open data, is underway.

Another example of intelligent utilisation of public data is winter maintenance. The Public Works Department of the City of Helsinki has made the location data of snow removal publicly available.Based on this, services have been created to allow real-time monitoring of street

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conditions. This provides innumerable ways to visualise the data and combine it with other open interfaces, for example with weather data.

Progress data on the process of clearing the streets of sand after the winter maintenance season is also publicly available in real time. The development of smart city can thus expand to benefit our health: real-time data from various sources can be combined and help, for example, prevent asthma attacks. A person could receive information about his or her physiological state via a monitoring device, while data would come in from the health care authorities and, as mentioned above, about real-time pollution levels and street maintenance. Because an individual cannot process all the required data, a need would arise for useful applications. In Finland, we are developing a so-called Mydata operation model, which aims at opening new opportunities for companies to develop personal data-based services that take privacy protection and information security into consideration.

Thus the development of cities must be based on the needs of the individual. In the digital era, this provides great opportunities in city environments for the provision of useful data, which, at the same time, would create new business and entirely new types of markets. The role of the state is to act as the opener of new digital markets and as the accelerator of development.

The city has always been the meeting place for trading, culture and entertainment. A high level of services, including transport, promotes customer visits, which builds wealth and entrepreneurship. Thus the smart city should also include smart customer guidance, contactless payments and digital shopping bags. Mobile data attracts special attention: information concerning the mobility habits of a great number of people could offer development potential for example in the location of services. A city has also means to make mobility smoother and more efficient by encouraging people to travel at off-peak times by providing discounts in ticket prices and by offering traffic status updates through digital channels.

The opportunities for technological applications from the perspective of city planning are very interesting right now. For example, 3D-modelling of city landscapes, which makes new type of visual space planning and smart construction possible, is already underway in many Finnish cities. With the help of three-dimensional modelling, it is easier for planners, city residents and land owners, for example, to understand the plans and perceive space. From an economic perspective, more accurate plans make such issues as land use more efficient and changes cheaper. It could also be possible to familiarise oneself with a city as a travel destination already beforehand in the virtual world. Aided by a concrete three-dimensional image, the user could also follow the movements of any vehicle in the public transport system. And a potential buyer of a house could virtually walk into buildings that interest him or her, get to know the views or view the whole residential area and its services, such as local schools. With the help of virtual reality modelling, there will be interesting openings in the publication of city information, such as the 3D map service of the MAPGETS portal. Compared with today's map services, three-dimensionality will bring with it environmental interactivity in a new way which could be applied in innumerable ways to new service functions.

A well-functioning information and transport infrastructure is the framework that supports the smart city. As the investments required by networks are sizeable, it makes sense to seek solutions for the building costs of high-speed broadband networks through cooperation between the network operators. In Finland, joint construction and use of communications and power network infrastructures are promoted by legislation. The law will oblige those involved with communications,
power, water supply or transport networks to joint use or construction of the networks and also to provide data and plans related to the networks through a commonly available information system. Therefore, the smart city is, to a greatest possible degree, also a means for finding cost-efficient solutions for social planning.

The smart city, in spite of its technological nature, is an organic whole which develops in layers just like the physical city landscape. The smart city is also closely related to the gradually developing Internet of Things in that it will consist of devices and sensors connected to each other. A good example of the Internet of Things in a smart city are traffic lights that can automatically change to green when an ambulance or a fire engine called for an emergency is approaching. Identification of vehicles is based on satellite positioning and wireless data transfer. A system like that has been developed in the City of Oulu, which is known for its expertise in mobile technology, and it has attracted international interest. Control of traffic lights has speeded up the arrival of help and minimised disadvantages to traffic. These are just a few examples of how new technologies can increase the efficiency of a city and, at the same time, increase people's sense of safety.

Behind all of the smart city's functions are data and its utilisation. Free availability of data is thus the precondition for cities' service development. For instance, within the framework of the Helsinki Region Infoshare project, over 1,000 datasets have been opened up and several hackathon events have been organised. In these events, new applications, solutions and services are developed for the use of city residents, companies and authorities. The Finnish government has committed itself to increasing the availability of data as open data. Several offices and institutions have carried out long-term work to develop open interfaces and portability of information in order to make the re-use of open data as effortless as possible.

Data utilisation offers immense possibilities for the building of the smart city. Data can be made good use of for example in creating profiles for the use of service provision. Currently a so-called mobile profile for traffic is under development: a person could define his/her own mobile behaviour according to the route guide and his or her calendar notes. It is estimated that 80% of a person's daily movements can be easily predicted because he/she follows, to a large extent, the same routes.

A city can also be defined as one that has its own administration and management. Continuous development of cities is an essential task from the viewpoint of

economic sustainability of public administration. The use of data has made the conditions for this better than ever because, with the help of analytics, there's more accurate and diverse information to support decision making. As even smaller city units are continuously producing data, planning and daily services can be better optimised by identifying certain models of the data material. It is estimated that the utilisation of big data could save EUR 150-300 billion in administrations of EU countries.

Finland has earned its spurs for its smart city work. According to a report by the UK's Nesta innovation charity, by the "innovation friendly" index Helsinki is rated 4th together with London, Barcelona and Amsterdam, right after New York. These four European cities indicate that Europe has something to contribute to the world as far as digital approach to city environments is concerned.

Earlier, cities were constructed behind city walls. Now they are expanding and opening up. International trade has always made cities flourish. From the perspective of data utilisation, walled garden type solutions must be replaced by open platforms and interfaces to enable the development of services and new markets for the benefit of society.

Work on smart cities can also be carried out across borders, in very concrete terms. An example of this is the Smart Twin City cooperation project between Helsinki and Tallinn. The aim is to provide the companies and research institutes in the area with a fast and easy access to develop, experiment and market cross-border Smart City products and services in the fields of Smart Environment, Smart Mobility and Smart Living. Digital internal markets can be created step by step, in the spirit of free flow of data.

The promise of the smart city is to save time, money and the environment for all. The goals also include new business, competition in the markets and new jobs. Cities will compete as digital environments environments in experimentation and as digital ecosystems that attract international operators to establish, invest and innovate smart services. Within the framework of smart city, it is thus possible to develop export products and success stories. Only by joint action and creative use of information and communications technology can public and private sectors create new services that will bring growth, employment and well-being to society. The experience of the city dwellers is just as important. Such goals as smoother traffic, easily accessible services, minimisation of waiting times, clean environment and safety will significantly improve the residents' comfort. The residents' satisfaction, in turn, will increase entrepreneurship, improve community life and increase migratory flow and tax income, which will create a virtuous cycle in the development of cities.

All the themes presented above are key projects of the Finnish Government; Mobility as a Service, automation and robotics, Internet of Things, Big data and information security. In these sectors, we want to make Finland a good environment for digital services and business models.

Smart is not an option – it's the only way

by Kristen Michal, Minister of Economic Affairs and Communications of Estonia

Estonia is known as a highly advanced e-society with mobile-IDs, e-residency and home for many digital services. As e-governance is an important part of Smart Cities, this will be the first example of the steps we have taken towards doing things more cleverly.

Kristen Michal was appointed as the Minister of Economic Affairs and Communications of Estonia in April last year. Previously he was the Minister of Justice from 2011-2012 and since 2004 he has been a member of the Parliament for different periods. He has taken a bold and innovative approach for the country's business environment by promoting Estonia's e-residency programme, supporting the legalization of ride-sharing services like Uber and considers the multibillion euro tunnel connecting two capitals Tallinn and Helsinki "an idea worth studying".

Jarmo Eskelinen, CEO of Forum Virium Helsinki, one of the partner organizations of Estonian Ministry of Economic Affairs and Communications, said in his presentation in Tallinn last September that we should not be talking about "smart" cities, we should be talking about cities as such, since talking about "un-smart" cities is not an option anymore.

Many countries in Europe are facing similar challenges, which cannot be changed with traditional means, take the much debated Uber for example or some other shared economy services, who have revolutionized their industry's core concepts. There is no going back; there is only the question whether governments are insightful to act as the drivers of innovation. But Smart Cities are much more than just ICT platforms – the center of focus is shifting more and more to the mindset of sustainability, through which the communities benefit and from what economic growth will spur from. It could concentrate on shared economy, smart-grids, intelligent transport etc. – these solutions are primarily driven by a goal to improve our daily lives through smarter solutions.

When talking about Smart Cities in the European context, the focus is on gradually investing in and developing our cities, legislation, institutions and platforms to become smarter. This means there is a lot of legacy to be dealt with, which is a very time consuming process. When each member state is developing their cities and their connected infrastructure in isolation from others, it is difficult to later integrate cross-border services with one-another (both legislation and ICT systems), which may hinder the economy and just be an inconvenience to our citizens. Estonian President Mr. Toomas Hendrik Ilves addressed the European Parliament in February and used the issue with one of our e-government marvels, e-prescriptions, as an example. In Estonia we could get our prescribed medicals from any drug store in the country just by presenting a smart-card based ID, but that is a convenience only in Estonia. In this case it has very little

to do with the “impossibility” to change ICT systems, but more with the legislative legacy, that hinders our innovations. Many European companies nowadays need a bigger market than a single state economy, but are having difficulties in exporting their products due to various compatibility issues with legacy. This means not only does the companies’ profits suffer, but also the state and their citizens are left empty handed – without the latest and most innovative solutions. It is clear, that these processes would go a lot smoother, when our systems would be developed in-sync from the get-go, which would mean in practice a more widespread and deeper partnership between EU member states in our smart city developments.

Estonia is known as a highly advanced e-society with mobile-IDs, e-residency and home for many digital services. As e-governance is an important part of Smart Cities, this will be the first example of the steps we have taken towards doing things more cleverly.

We have successfully implemented e-Tax, which means that over 95% of tax declarations are filled online, taking only five minutes. e-Cabinet, e-Customs, e-Registers and Internet voting, where during last Parliamentary elections over 30% of votes were cast over the internet from 116 different countries. Digitalization has revolutionized accessibility and quality of government services for Estonians and many services are available for e-residents outside Estonia by a state-issued secure digital identity for foreigners that allows digital authentication and digital signing of documents. From the launch of the program in December 2014, there are already over 8800 e-residents and more than 800 companies (about 400 of them new) in Estonia where e-residents are engaged.

Estonia is also renowned for the initiatives in the field of Smart Mobility. The Government has purchased more than 500 electric cars for social workers at the municipalities and electric cars have significantly influenced the rental and carpooling market in Estonia. From the infrastructure side, Estonia is the first country in the world that has been covered with a fast charging network of 163 stations.

On the local level, Tartu, the second-largest city in Estonia with population a bit over 100 000 for instance is planning to start using buses that run on biogas and a startup named Jiffi is planning to pilot their mobile phone based public transport ticketing and validation system. In addition, Tartu is working on a large-scale project SmartEnCity to reconstruct an existing city into a Smart City. In Tartu’s case, to renovate 900 Khrushchev-era apartment buildings from 1950 and 1960s, into smart buildings - turning khrushchyovkas into smartovkas.

2015 was the first year Estonia was represented in the Barcelona Smart City Expo World Congress with a joint stand with some of the many Estonian Smart City companies represented: Gridens Tehcnologies (Smart Grid, lighting solutions), Eliko (IoT, smart lighting), Ülemiste City (business property, supporting services), Tallinn Science Park Tehnopol (ICT, start-up incubator), Reach-U (spatial data), Mobi Lab (mobile applications) and Jiffi (smart ticketing system).

As I have outlined, there are already a number of projects at work, many of which are joint projects with our Finnish colleagues. Co-operation with Finland is crucial since the two capitals, Helsinki and Tallinn, are located right on the opposite sides of the narrow Gulf of Finland with over 10 million annual travelers between the cities. This provides us with a huge opportunity to further develop the region.

One of these joint ventures is setting up a joint research and innovation platform - "FINEST Twins Center of Excellence" (Horizion 2020). FINEST Twins will be designed to address public issues on the basis of a multi-stakeholder, municipally based partnership. The idea of FINEST Twins is to translate digital technology solutions into better public services for citizens, better use of land, resources and less impact on the environment. It combines the success stories of Helsinki Smart City research & innovation actors with the Estonian e-Government initiatives and ambitions.

Other joint projects are e.g. Smart Port, Mobility as a Service - MaaS - starting from this year, which brings every kind of transport together into a single mobile app and handles everything from travel planning to payments. When working in full capacity, this kind of a solution could offer real solutions to the problems our modern urbanized environment is facing (e.g. traffic congestion, pollution). The FinEst Link project, which aims to improve transport links between Helsinki and Tallinn, in order to deepen the economic co-operation between the two cities as well as investigate the economic preconditions and impact of the proposed Helsinki–Tallinn railway tunnel.

All of the aforementioned projects, policies and reforms play a crucial role in making our daily dealings more convenient, efficient and for the public services to be more accessible, quick and easy to use. Estonia already has some great services in the field on smart technologies, as do many other European countries. Successful implementations of smarter solutions shouldn’t end at a country’s border, therefore to improve all of them, better cooperation, sharing of know-how and experiences is needed, and hopefully everyone will join us on this “smartifying” track.

A smarter world begins with smarter technology

by Ryuichi Otsuki, CEO & Tony Field, Senior Director, Social Innovation and IOT (Asia Pacific) Hitachi Data Systems

Ryuichi Otsuki leads a worldwide executive team responsible for all facets of Hitachi Data Systems' (HDS) global operations to deliver timely, competitive and innovative solutions for the global market.
Otsuki was appointed to his current role at Hitachi Data Systems in 2016. He has been an HDS board member since 2009, providing key support of the company's long-term strategy to expand its portfolio in infrastructure, content and analytics, and to link to Hitachi's Social Innovation vision. In addition to these responsibilities, Otsuki serves as vice president and executive officer for Hitachi, Ltd.
Prior to becoming CEO of HDS, Otsuki was vice president and executive officer, general manager of the Hitachi Social Innovation Promotion Division, following a number of roles as chief strategy officer, chief operating officer, and general manager within Hitachi Information & Telecommunication Systems Company. He earlier held various positions in mergers and acquisitions, business planning, and alliances in the Hitachi Global Business Planning & Operations Division.
Otsuki began his career with Hitachi at the company's Kanagawa mainframe factory. His responsibilities have included assignments in London, San Francisco and Japan. He currently resides in the San Francisco Bay Area.
Otsuki earned a Bachelor of Arts degree from Nagoya University, School of Law.

Tony Field is the Senior Director, Social Innovation and IoT of Hitachi Data Systems Asia Pacific (APAC). He is responsible for the Social Innovation Business in Asia Pacific, which combines the expertise in Hitachi's vertical industries in Healthcare and Public Safety and deliver with HDS IT capabilities and solutions that integrate big data, analytics, and industry expertise.
He was previously the Director of Partner Enablement of Hitachi Data Systems Asia Pacific (APAC), where he was responsible for the strategic partner enablement strategy and programs within APAC. These include strategic guidance and partner development support to the APAC channel management teams and channel partners. He was also the interface between APAC Channels and the Global Partner Development Team, the APAC Deal Operation Centre, Hitachi Data Systems Academy and the APAC Solution and Services Group.
Tony has worked in the IT industry for over 20 years with 12 of those years focused on storage. During that time Tony has worked in a variety of disciplines including direct sales, channel management, channel operations, channel development and as a system consultant. He has a deep understanding of all facets of the storage business including marketing, education, break/fix services and professional services.
Tony has been with Hitachi Data Systems for more than ten years and prior to Hitachi was with StorageTek for 5 years.

If Asia Pacific is on track to becoming the world's most powerful economic region, its cities are also on their way to becoming some of the planet's smartest.

A recent report estimated global unit shipments of smart city devices to increase from 115.4 million in 2015 to 1.2 billion in 2025, with more than half of these devices destined for Asia-Pacific. This is unsurprising given many countries in the region are already exploring relevant Smart City options – from new approaches to public safety, through to updating healthcare systems and looking at smarter ways to manage power distribution. The burden has been on technology providers to keep up with the demands and aspirations that the ideal of smart cities has created, but the industry has responded, and brought to life some of the innovations needed to improve our urban environments.

Smarter safety

City services and personnel can be fragmented. As a result there are overlaps and gaps within services and security. Generally, police, public transport and private organisations will have their own security systems and considerable effort is required to share information. Cities are generally 'blind' to break-ins, gate accesses, accidents, road upgrades, development compliance, etc. This leads to a general problem of lack of overall situational awareness.

Consolidation and optimisation of back-office technology services is crucial to the enablement of front-line services in a Smart City environment. Customer relationship management and logistic systems are ideally integrated with real-time understanding of the deployment of resources. Disparate technology infrastructure can result in higher cost of services and make it difficult to realise transformational opportunities.

A successfully digitally transformed city should benefit its citizens by providing situational awareness to the entire city to enhance public safety. Governments and public bodies are now embracing the next generation of visualization tools,

designed to intelligently collect, share and analyze information from a variety of sources. The capability to realise the major benefits of a 'whole of city' IOT platform that can efficiently aggregate events and alarms is paramount.

Smarter healthcare

With Asia's aging population expected to greatly impact public services over the next 40 years, healthcare is another area that may hope will be transformed by smart cities. Things are already changing rapidly in the sector, with healthcare professionals struggle to deal with vast quantities of data from different sources, departments and equipment. With the right tools, this data can be used in an unimaginable number of ways to benefit patients and enable healthcare institutions to operate as efficiently as possible.

This is no simple task however, with a single hospital department using medical equipment from a variety of supplier, each one producing data in a different format. This then has to be combined with data from other sources – such as blood work, past and present medication, family history and doctor and nurses' notes – in order to tell an accurate story. This is why the focus for many institutions has been on integration and digitization.

One of Hong Kong's leading private hospitals is using a cloud solution to consolidate all patient-relevant radiology images into a single platform, giving Visiting Medical Officers (VMOs) access to patient results in real-time, any location, regardless of origin or data format. It is also integrating all Picture Archiving and Communication Systems (PACS) into a single repository and enabling mobile access to patient records by VMOs and other healthcare professionals anytime, anywhere. The hospital then plans to use analytics to look at opportunities to establish wellness campaigns and improve the delivery of patient care. This seemingly simple step forward in data integration is actually having a huge impact on medical care.

The ultimate goal for any city – smart or otherwise – is to create an environment where people can live in comfort without worrying about safety or availability of resources. The secret to creating smarter and safer cities is to stop looking at each safe city component in isolation. To be truly effective, smart city components need to be brought together in a holistic approach, allowing each piece of the smart city puzzle to support the others.

Smarter Energy

With cities representing three quarters of energy consumption and 80% of CO2 emissions worldwide, smart cities also promise to deliver greater efficiency, fewer emissions, and a more sustainable environment. Advances in energy technology are certainly proving to be popular, with recent findings from RnR Market Research forecasting the global smart energy market to grow at a CAGR of 14.91% in terms of revenue between 2016 and 2020.

The convergence of digital technology and the world of energy has created a wealth of new services designed to reduce energy consumption and improve efficiency. This has required many energy companies to reexamine their infrastructure and ensure it delivers the necessary levels of management and protection to increase the availability of resources. This in turn accelerates the availability of energy products and services, speeding up time to market.

Power network providers in Australia are improving the ways they monitor pole stability, arcing, storms and accidents across vast coverage to prevent delay in incidents responses. By combining visualization solutions with IoT sensors, they are able to monitor entire pole networks in real-time, reducing the risk of outages, fires and the need for manual inspections.

G.fast: racing into the future

Swisscom's business is shaped by people. It's the way they communicate and how they collect and share information. This development is gathering pace noticeably right now, prompting telecommunication companies to be innovative time and again. Swisscom has always faced such challenges, modernising its network and providing a wide range of technologies for the benefit of consumers in Switzerland. Swisscom puts its infrastructure, innovative services and know-how at the disposal of people and companies alike. By introducing Fibre to the Street (FTTS) and Fibre to the Building (FTTB), combined with the new G.fast transmission standard, Swisscom is taking the next step into the future of telecommunication.

Switzerland enjoys a positive investment climate with regard to communications infrastructure. Swisscom alone invests more than EUR 1.5 billion a year in its IT and network infrastructure. That's about EUR 200 per head of the population and puts Switzerland ant the top of the world's investment league table. Aside from classic telecommunication companies, other players are also contributing to the country's high-quality broadband coverage., including 250 cable network operators and about 20 power utility companies. With about 99% coverage at 30Mbps, Switzerland is already close to achieving the broadband objectives of the EU's Digital Agenda 2020. And all without any state subsidies whatsoever.

Living competition promotes innovation

The good investment climate also encourages market players to be more innovative and drives competition between infrastructure providers. Cable network operators, for example, are upgrading their infrastructure with DOCSIS 3.0, thus providing bandwidths of up to 500mbps in selected locations. Swisscom is focusing on a mixture of technologies to provide widespread ultra-fast broadband as soon as possible. In major urban areas, it is currently driving forward the expansion of Fibre to the Homes (FTTH), mostly in cooperation with local power utility companies. More than 921,000 homes and businesses – about a third of all households - can already benefit from the bandwidth of up to 1 Gbps. At the same time, the universal service obligation mandate obliges Swisscom to ensure that rural and marginal areas aren't left behind.

As mentioned above, Swisscom is using a broad and innovative combination of technologies to meet the growing demand for bandwidth, not only through FTTH. For example, the introduction of VDSL2 vectoring in the existing Fibre to the Curb (FTTC) network architecture will be completed in 2015. In parallel to this, Swisscom is preparing its network architecture for the introduction of G.fast by bringing fibre-optic cabling closer to its customers. Therefore it has been expanding its FTTS and FTTB networks in many communities since 2014. In so doing, Swisscom is shortening the length of copper cabling to its customers' homes and businesses to just 200 metres and creating the conditions necessary to introduce the new G.fast transmission standard.

Huawei and Swisscom: a partnership for the future

G.fast, the successor of VDSL2, uses a wide range of frequencies (up to 106 MHz) on existing copper lines for data transmission. This allows transfer speeds of up to 800 Mbps over short distances under ideal conditions. One novel aspect of this technology is the use of separate time slots for upstream and downstream communication instead of dedicated frequency bands (Time Division Duplexing). The higher frequencies used by G.fast cause strong cross-talk between the individual copper pairs of a cable, requiring improved vectoring algorithms.

This new transmittion technology arose out of a European research project that eventually led to standardisation efforts. Swisscom and its technology partner Huawei promoted the standardisation of G.fast from very early on, adding Swisscom's own requirement for G.fast. The International Telecommunication Union (ITU) approved G.9701, the G.fast standard, at the end of 2014. This is a decisive factor for G.fast's success because it defines how network elements and end-user devices must interoperate to exchange data. Together with Huawei, Swisscom ran through various development scenarios which resulted in requirements for the technology and lead to the development of initial prototypes of G.fast-capable Micro-CANs. These final generation prototypes are still being tested and prototype G.fast Micro-CANs are planned to be deployed in field tests by the middle of the year. The aim is to serve several homes in a pilot community with G.fast before the end of 2015. This makes Swisscom a leading telecom provider in the development and us of G.fast.

Come and meet us at the Broadband World Forum
Want to find out more about our experiences with G.fast? The come and meet our partner Huawei at the Broadband World Forum 2015 in London.

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Does the British Public Understand Smart Cities?

by Nigel Fine, Chief Executive, Institution of Engineering and Technology (IET)

By using new technologies, a smart city can manage its resources to improve efficiency and meet residents' everyday needs for everything from travel to healthcare – they are the new era for digital living. But let's make sure the public understands their benefits and has a say in their future development.

Nigel Fine was appointed Chief Executive and Secretary of the Institution of Engineering and Technology (IET) in June 2009.

His professional career has been with Experian Plc where he was a member of the Global Operating Board and Managing Director for all operations in EMEA and Asia Pacific. Before joining Experian, he was an Associate Partner at Andersen Consulting (Accenture), responsible for setting up and running BPO operations in Procurement and Logistics. His early career was spent with John Laing and International Paint.

Nigel is a Board Member and Chair of the Audit Committee of EngineeringUK. He chairs the Professional Plenary Forum of the Chief Executives of all 36 licensed professional engineering institutions and represents the IET on the Technician Council.

Smart cities are set to transform the way we live and work. They have benefitted from considerable investment from UK governments, local authorities and businesses in recent years – and yet our new report, 'Smart Cities – Time to involve the People', has revealed a basic lack of awareness among the British public about what a smart city is, does and its potential to improve people's quality of life. These findings suggest we have a significant challenge ahead of us to engage people in the very real benefits of smart cities.

The report is based on research which found that only 18 per cent of the British public has heard of a 'smart city', while there is also a lack of consumer consensus on the relevance of technologies typically associated with smart cities.

Awareness of 'smart cities 'is lowest amongst those aged over 65 (six per cent) and highest among those aged 18-34 (37 per cent) with one third of respondents being unable to select the correct definition of a smart city from a list of options. Eight per cent of respondents opted for "a city that has a higher than average proportion of universities and colleges and aims to attract the most intellectual", and a further five per cent saw it as "a city that has a strict cleaning regime for its buildings, roads and public places".

But why is public awareness so low? Perhaps the biggest reason is because cities' adoption of new technologies has traditionally involved little consultation with consumers – so has been done without sufficient insight into what people actually want them to deliver.

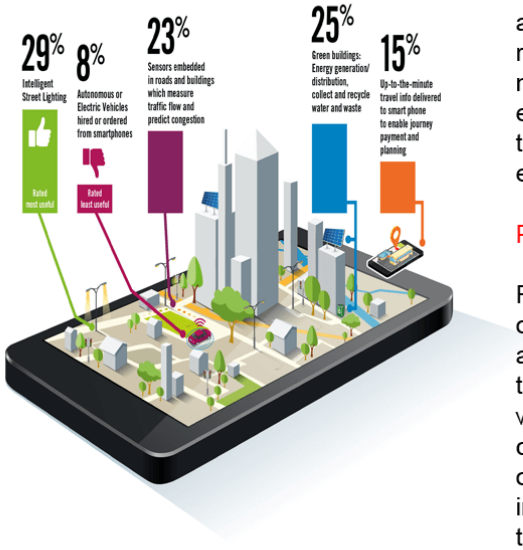
As a result, the report suggests that the public has yet to buy into the idea of smart cities – and be convinced of the value and benefits that technology, delivered on a city-scale, could bring to their daily lives.

Of course, new disruptive technologies and applications such as Uber (on-demand taxi services) and airBNB (online accommodation service) may

help to change hearts and minds, but the findings suggest there is still some way to go.

No consensus on smart city technologies

When we asked people for their views on five smart city technologies and how useful they might be if they were introduced in their local area, there was no clear consensus about which would be the most useful to them: 29 per cent of respondents felt that 'intelligent' streetlights activated by movement to improve safety, deter crime and save energy would be most useful, whereas eight per cent saw most value in being able to order driverless or electric transport from their smart phone.



Demonstrating the benefits

If we want people to understand the benefits of smart cities, we need to get much better at offering people tangible examples of how they will improve their lives.

The Government has actively promoted smart technologies in UK cities through a series of funded pilots. One example is the Future Cities Demonstrators. Held over a three-year period, projects in Glasgow, Peterborough, Bristol and London actively incorporated several citizen-centred applications and provided some excellent examples of how technology can improve the quality of life for residents, workers and visitors alike.

Glasgow's Community Mapping project is a case in point. Engaging citizens, capturing invaluable insights and mapping their local communities, the project created an open and easy-to-use toolkit which is now being used by communities and visitors to explore and discover more about the city through a series of walking tours, cycle routes and points of interest maps available via mobile phone apps and websites.

The Glasgow Demonstrator also delivered a series of initiatives around community safety, intelligent street lighting, social transport and energy efficiency. Among Glasgow's five energy demonstrators seeking to cut emissions, reduce overheads and address fuel poverty, was a project involving the City Council, the University of Strathclyde and local housing associations. Sensors installed in retrofitted homes across the City monitored the performance of the energy efficiency measures introduced, checking these did not create any adverse side effects such as condensation.

Putting people first

For smart cities to truly achieve their objectives, public authorities, businesses and service providers must understand the innovations and issues that people want to see in smart cities and communities – and put greater emphasis on the human and societal benefits of their initiatives. Putting people first, rather than technology, is essential if we are to improve quality of life and create livable, connected and sustainable cities and communities in which to live, work and invest.

Digital transformation is driving major changes to the way councils, public authorities and businesses shape and deliver their services to citizens and communities, but there is a critical need for all those involved in developing and delivering technology-enabled cities to fully engage with citizens and communities. Without this, we risk developing technology-enabled cities and communities that people neither recognise or value.

Engaging the people

Ideally, we need a UK-wide public engagement programme about the positive role technology can play in helping to improve UK cities and communities. The IET is independent and impartial and works with industry, academia and public services – and we need all of these on board to engage with the public.

Promoting 'lessons learned' from pilots such as the Future Cities Demonstrators will help to show more local authorities and communities how technologies can improve the quality of the daily lives of their citizens. This should be supported by industry providing help, support and guidance to make the take-up of the latest technologies as easy as possible for people.

Embracing new ways of engaging the public will enable a more citizen and community-centred approach. Cities will need to ensure they have the skills and resources to harvest their data. Gaining a deeper understanding of how people want to live their lives will provide invaluable insight into how technology-enabled cities and communities can best serve the public. Increased collaboration and a holistic, cross-sectoral, multi-disciplinary approach involving the full range of stakeholders is required. This includes city leaders, engineers and other professionals working together to 'listen to' and 'act on' the issues and innovations people wish to see embraced in their cities and communities. This will enable them to champion opportunities and provide the solutions that can genuinely benefit society.

Engineers and innovators will play a vital role in regenerating our cities, developing new urban communities and delivering new, disruptive services that benefit our lives. But understanding what residents, workers and visitors want must help to inform our activities to deliver, operate and measure the success of our smart cities across areas as diverse as healthcare, energy and transport.

Smart Cities 4.0—The undiscovered generation

by Michael Lake, President & CEO, Leading Cities

Smart Cities 3.0 emerged with the addition of entrepreneurs and the incorporation of citizens into both the problem identification and solution development functions of Smart City processes. As experts and city leaders are still adjusting to this latest generation of Smart Cities evolution, they have hardly had a chance to notice the launch of Smart Cities 4.0.

Michael is the President and CEO of the international non-profit, Leading Cities, an organization that establishes and develops relationships with municipal governments and universities around the world, creating a global network of partner cities dedicated to improving city livability through the use of Smart Cities solutions and best practices. Michael is also a partner of Haynes & Associates where he specializes in business development and deployment of Smart Cities Technologies. Michael's career in public service spans from serving three United States Presidents as Special Assistant for White House Operations and Presidential Advance to serving the former Prime Minister of Ireland as a policy research analyst.

Michael graduated from Northeastern University studying a record-breaking five majors: Finance, Political Science, Communications, Entrepreneurship and Management Information Systems.

The evolution of Smart Cities is moving at the pace of the new generations of iPhones or the latest Windows operating system—just as you get used to one version, you are already two generations behind. Experts and city officials around the globe are still discussing Smart Cities 2.0, yet we are already seeing the burgeoning of version 4.0 and it is happening faster than anyone expected.

The advent of Smart Cities 1.0 occurred with large technology providers selling "out of the box" solutions to cities. Because these solutions were one-size fits all, city leaders realized they were biting off more than they needed to chew This revelation led to a demand response system where cities began demanding. customized solutions from large multi-national technology companies. Once the marketplace of Smart Cities 2.0 solutions was established, it quickly became a more sophisticated, more complex and more open arena. Smart Cities 3.0 emerged with the addition of entrepreneurs and the incorporation of citizens into both the problem identification and solution development functions of Smart City processes. As experts and city leaders are still adjusting to this latest generation of Smart Cities evolution, they have hardly had a chance to notice the launch of Smart Cities 4.0. Smart Cities 4.0 represents the best of the past—the technology disruption of generation 1.0, the customization of 2.0, and the engagement of 3.0—but adds to it the inclusion of two critical success factors: taking a holistic approach and also challenging the inclusiveness of solutions. The holistic approach seeks to integrate not just new technologies with old, but new technologies with technologies that may not have been developed yet. In addition, successful city leaders understand the opportunities and limitations of emerging technologies and appreciate the impact Smart Cities technologies can provide their community, while also becoming aware that those positive impacts may not be experienced equally by all members of the community.

The holistic approach establishes the platform for future growth allowing Smart

Cities 4.0 to become the solid foundation that the Smart Cities movement needs. Furthermore, understanding the inclusivity and equity aspects of Smart Cities will allow for this more solid foundation to be more quickly built upon. Smart Cities 4.0 is the first generation that will support its own growth by simultaneously expanding its market, engaging its consumers and providers, challenging its previously accepted assumptions and setting itself up for not just what may be next, but for what may be after that as well. This is particularly true in communications technology—the platforms that are being built today, if designed using Smart Cities 4.0 approach, will serve as both a foundational and transformational backbone for 21st century communications technologies.

The advancement of Smart Cities technologies has so far brought society such solutions as autonomous vehicles, intelligent parking applications, digitally connected trash bins and smart grid street lighting. A decade ago these developments would have been hard to predict, yet some of these technologies are as commonplace as traffic signals and stop signs. Age-old tools have been improved, enhanced and now make promises of a more effective and efficient system for businesses and municipal governments alike. Each of these solutions bring value to users, and consumers. Solution providers make a profit while often times saving buyers money. This developing marketplace seems to have all the right ingredients for a long and prosperous future. The marketplace is growing stronger and more sophisticated each day and with each evolving generation.

Smart Cities 4.0 will require a newer, more deliberate approach to city leadership. Citizens will increasingly demand more elected officials who embody the virtues of Smart Cities 4.0—visionary, inclusive, empowering and innovative. In turn, city systems will need to be updated to allow for such inclusion and innovation. Cities worldwide have already experienced the road blocks that current procurement systems can create. For instance in the United States, these existing systems make it difficult, if not impossible, for innovative solutions to be implemented in our cities. In some communities procurement systems prohibit solutions that have not already been deployed in other cities—the antithesis of innovation. Yet in other communities, procurement procedures lead to the lowest bidder rather than the highest value. Shifting focus from cost to value will be one of the revolutionary changes in the public procurement system that will unlock ingenuity and ability to implement the best solutions for a city, not just the cheapest.

The second major challenge that city leaders will face is the hiring, training and empowering of staff who themselves can bend and flex with this ever-changing technology environment. The procurement of city solutions is just the first step. Properly managing the implementation and maintenance of Smart Cities solutions will determine its effectiveness and longevity. City staff must become aware of the distinct differences, both obvious and not-so-obvious, that exist between deploying a Smart City solution as compared to solutions of the past.

Interconnectivity of city assets to achieve maximum value will be among the differences that will need to be considered in order to maximize the value of a Smart City solution. For example, trash bins can become smarter by detecting and communicating the extent to which it is full. This resolves a challenge of wasted resources picking up mostly empty bins while others may be overflowing. However, adding another new technology of solar-powered trash compaction can further diminish the frequency of trash collection. These are two separate technologies that are maximized when combined. Yet there is still another technology that can be added to this solution. Using the energy provided by the solar panel, additional sensors can be added to the same trash bin. These sensors can range from gunshot detection to pollution measurement. Trash bins can be integrated into a network of public assets that blanket a city with free Wi-Fi hotspots. The options seem limitless, however, the most significant restriction exists not in the technology, but rather in the ability to remove silos within cities so that the public health department concerned with pollution, the police concerned with gunshots and the department of public works concerned with trash collection are all working together to optimize the value of a single trash bin.

The fourth generation of Smart Cities evolution is upon us. The opportunities it will provide cities around the world are limitless. The impact it can have for all citizens will be invaluable. The leaders we need to make it a reality must be ready. Our fellow citizens should be engaged and empowered. The antiquated government systems that exist today should be updated. And the silos that exist within cities must be removed. The question that ultimately remains is "what makes a Smart City smart?" The answer will not be found in any new technologies, but rather in the city's approach to problem solving in the 21st century.

Why smart cities are vital for the growth of urban migration

by Regina Moran, CEO, Fujitsu UK & Ireland

Fujitsu is collaborating with the Saudi Industrial Property Authority to transform industrial estates into smart cities. This project includes building an environmental improvement system and a cloud system, in order to support environmentally friendly eco-cities.

Regina Moran is CEO of Fujitsu UK and Ireland. Regina began her career as an Electronics Engineer with Amdahl where she was co-founder of the services and consulting group. In 1997, Regina co-founded DMR Consulting Ireland where she held the role of Director of Operations responsible for Project Delivery. From there, she moved to DMR Consulting, which became Fujitsu Consulting and subsequently merged with Fujitsu Services in April 2004 and Fujitsu Siemens in April 2009. Regina was appointed COO of Fujitsu Services Ireland in August 2006 and MD of Fujitsu Ireland in May 2009.

According to the UN, more and more people are moving to cities worldwide. However, traditional cities are unable to cope with the scale of this urban migration while maintaining good quality of life for their citizens. Technology will be vital in supporting these rising populations, and luckily much of the IT needed for the smart city already exists. In this article, Regina Moran explores how cities are already using technology to more intelligently respond to the needs of their citizens and the benefits that this approach can bring in the future.

A tale of more cities

The proportion of the world's population living in cities is continuing to grow. Today, about half of us live in urban areas; by 2050, this will increase to 66% with an additional 2.5 billion city dwellers, according to the United Nations' World Urbanization Prospects report. Asia and Africa are likely to account for nearly 90% of this increase. Currently, the world hosts 28 megacities, defined as urban settlements with over ten million people. By 2030, this is expected to increase to 41.

Urbanisation has long been a source of widening prosperity. By concentrating populations in smaller areas, the standard of living can be driven up through greater economies of scale. Public services can be delivered to all residents at a lower price per person. For example, providing piped water costs US$0.70 - US$0.80 per cubic meter in urban areas, but US$2 in sparsely populated areas . Similarly, schooling and healthcare can be delivered in dense environments, close to people's homes. Cities also act as centres for prosperity, driving significantly higher employment opportunities as skilled workers are concentrated in a close area. As a result, more than 80% of global economic activity is located in cities.

However, rapid urbanisation presents significant challenges, particularly if the city's infrastructure and services don't keep pace. This was seen in the 19th century, when for example the city of Chicago doubled in size every three

years during the 1850s. That wave of industrialisation did create growth, but it was accompanied by social disruption and widespread poor health due to the lack of capable infrastructure.

To this day, rapid industrialisation alongside urbanisation can lead to environmental issues such as contaminated water supplies, with vehicle exhaust and rubbish incineration contributing to smog and acid rain. Inadequate infrastructure and lack of health awareness can quickly lead to overstretched sanitation and care systems. If investment in infrastructure and services doesn't keep pace with the flow of people into the city, then social, economic and environmental conditions decline and slums emerge.

Ultimately, as more people become urbanised, traditional cities will be unable to meet their needs. In the age of the fourth industrial revolution, we must use technology intelligently to help us to deal with this growth and improve the quality of life for all citizens. IT can be used to develop cities that work for all their inhabitants, safeguard the environment, optimise investment and drive sustainable growth.

What makes a smart city smart?

A smart city is a city with an intelligent infrastructure. The city can be conceptualised as an ecosystem containing specialist capabilities covering transport, energy, healthcare, water, waste – ultimately any service set that can be shared widely while meeting individual needs. What is crucial about the smart city is the proliferation of sensors, tags and digital telecoms networks, that enable the collection of data, and the use of analytics to learn more about these services and how they can be improved. This system allows ongoing adjustment and improvement of systems, for a city that evolves intelligently from minute to minute as services are delivered.

The technologies which underpin the smart city are already well advanced. IT capabilities enable the connection large areas with cable and wireless networks. It is possible to serve, process and store vast amounts of data economically and safely, while the ever growing analytical capabilities of computers enables providers to learn more about the environment and respond faster. This process is being further facilitated by the next generation of connected devices, or the Internet of Things (IoT), which can provide ubiquitous, low-cost information collection and intelligence everywhere from the home to the street.

The emergence of the smart city

One example of the principles of the smart city in action may be seen in the way that many cities control traffic flow through intelligent traffic light systems. These systems smooth traffic flow according to the current weight on the roads, leading to more predictable journey times and reducing driver frustration. Some cities also already employ connected real-time parking systems, enabling better use of spaces and less stressful parking experiences, as well as improved public revenues.

Many cities are extending the principles of the smart city to other areas, making use of the latest developments in connectivity and analytics. For example, Fujitsu is collaborating with utility provider Metawater to provide an on-demand cloud service to support the water and sewer operations of local governments in Japan. Metawater can now provide regional monitoring, asset management and remote support services; this enables local governments and their partners to share information and communication infrastructure, to deliver superior flexibility at a low cost. This business cloud is forecast to cut lifecycle costs, including system deployment and running costs, by 30% compared to in-house systems.

Fujitsu is also collaborating with the Saudi Industrial Property Authority to transform industrial estates into smart cities. This project includes building an environmental improvement system and a cloud system, in order to support environmentally friendly eco-cities.

The potential of the smart city

Going smart offers a number of advantages. Firstly, costs can be reduced as resources are targeted more intelligently. Energy consumption can be better controlled and services provided at the required time, resulting in reduced waste and redundancy. Secondly, smart cities can be more responsive to the changing needs of citizens, as the demographic changes and grows. Citizens can also exercise more direct control over their environments, for example, through the operation of street lighting on demand through smartphones. Intelligent control systems can also deliver minimised pollution, active waste management and creative energy usage, resulting in a healthier physical environment.

Advances in smart technologies can benefit not only the individual city, but urban areas worldwide. Cities will be able to collaborate to develop systems and costs that can be replicated in different areas. This will enable development costs to be shared, while ensuring differentiation for individual cities. For example, open data standards for transportation systems could be made available for adoption by any city, reducing the development effort for individual locations while enabling a global industry in these systems.

Conclusion

As time moves forward, urbanisation will only continue, resulting in more, larger cities. IT has an important role to play in ensuring that these cities meet the needs of all their citizens, by delivering efficiency, flexibility and personalisation. Smart functionality will enable cities to make the best use if physical infrastructure and services, to support a strong economic, social and cultural environment.

Ultimately, the embedded intelligence of a city will become a major selling point for industries. Just as access to ports once drove business, factors such as intelligent infrastructure and actively managed environments will attract investment. Increasing urban habitation will present both new challenges and new opportunities, and only through smart technologies can cities thrive.

Turning the challenges of future cities into opportunities

by Klaus Dieter Rennert, CEO for EMEA & CIS; Corporate Officer, & Chairman of the Board of Directors, Hitachi, Ltd.

Klaus-Dieter Rennert discusses how intelligent technology within 'smart cities' will bring real benefits to its citizens.

Klaus Dieter Rennert is the CEO for EMEA, CIS, Corporate Officer; and Chairman of the Board of Directors, Hitachi, Ltd.

His previous career is as follows: 1973–1978: Ruhruniversität Bochum, Mechanical Engineering, Energy Conversion Technologies, 1978–1999: L & C Steinmüller GmbHr, 1996–1999: managing director, 1999–2002: Babcock Borsig Group, Babcock Borsig Power GmbH — member of the management board; BBP Energy GmbH — chairman of the management board. Since May 2003: Babcock-Hitachi Europe GmbH, Chief Operating Officer; deputy chairman of the management board

Since April 2006: Hitachi Power Europe GmbH (after renaming), , Chief Operating Officer; deputy chairman of the management board. Since April 2008: CEO; Chairman of the management board
Since September 2013: Hitachi Europe Limited.

Our way of life has become unsustainable. We are facing serious challenges such as increasing urbanisation, an unprecedented rate of population growth and, according to a survey of 750 experts conducted by the World Economic Forum in 2016, a disaster caused by climate change is currently the biggest potential threat to the global economy. We desperately need solutions to confront these challenges and to make our existence on this planet less harmful.

Yet cities are growing at an alarming rate. It is predicted that 56% of the world's population will be living in urban areas by 2020. This presents significant challenges for the infrastructure of current and future cities, which need to be able to accommodate this influx of people as well as meeting their rising demand for energy, transport, water and healthcare. Therefore, the way we shape and develop our growing cities will be critical to ensuring a sustainable future. At the same time, we need to make sure these cities of the future are about more than finding solutions to the environmental and demographical challenges of today. The focus should be on how smart technology and the power of big data will allow us to bring real benefits to society and positively impact people's lives.

The issues facing society today require existing, ageing infrastructure to be transitioned into the 'smart era'. The introduction of smart, intuitive technology to all elements of infrastructure, capable of autonomously reporting on and responding to its surroundings, will allow the value of real time data to be realised. Cities will gradually take the form of 'smart cities' as they become able to react to all of the data being generated within them. However, real innovation is required to make 'smart cities' a reality and in order for this to be achieved, governments, businesses and individuals must collaborate to deliver real change.

Smart is the new green

Global energy demand is set to increase by 55% by 2040. Cities consume 75% of

global energy and are responsible for the emission of 50-60% of the world's greenhouse gases. Therefore, with cities set to only expand, the energy industry is faced with the serious dilemma of how to meet this spiralling demand for energy whilst adhering to concerns about both the environmental impact of the production and consumption of energy. Clean energy can help solve this problem, whilst also offering huge opportunities for both governments and businesses to develop and invest in smart technology to make the generation, distribution, consumption and management of energy more sustainable.

However, existing infrastructure and ageing power grids are not innately equipped with the technology capable of integrating this new renewable energy. The digital intelligence involved in 'smart' technology is paving the way for renewable energy to enter the mainstream, whilst also enabling it to be consumed and distributed more efficiently. Smart grids, for example, are powered by demand response models which allow real time analysis of customer demand trends. This enables the grid to autonomously respond to the energy demand and control energy distribution to where it is most needed and when. Smart solutions enabled by the introduction of 'smart' products and big data will allow the ever-increasing energy demand to be satisfied whilst simultaneously minimising the impact of the environment.

Travelling in the IoT era

With 65.7 million road accidents a year and 7 million deaths from air population worldwide, there is an urgent need to overhaul transport. This is even more pertinent given the projected substantial population growth within urban areas. The opportunity here lies in the interaction between transport and the cities itself. With over 80 million connected devices expected by 2020, the Internet of Things era is set to make a positive impact on all aspects of transport networks. Vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication provides huge opportunities to improve not just road safety and congestion, but passenger comfort. Collectively this communication is known as V2X. V2X will allow vehicles to exploit real time data and connect to transport related infrastructure such as traffic lights and public transport timetables, making travel for city residents more seamless.

At the same time, intelligent solutions to crippling congestion in cities will come in the form of connected traffic signalling systems which can enable dynamic re-routing if necessary, by using probe based and crowd sourced data from road users to create an overview of live traffic conditions. Apps such as CityMapper are currently providing people with up-to-minute updates on the arrival of public transport, reducing waiting times and making travel more convenient. Additionally, with 12.6 million electric vehicles predicted by 2025, we are well on our way to reducing air pollution levels in urban areas. In the future, as more and more are introduced, this will make smart cities healthier places to live.

Harnessing the power of big data in Copenhagen

Cities are brimming with data and the opportunity is now open to harness the power of this data to create effective solutions to tackle the challenges faced by cities. Hitachi, for example, is collaborating with the City of Copenhagen to create the City Data Exchange (CDE), a big data platform which allows public and private entities to share and then access data for new purposes. For example, public entities are able to share congestion data and transport companies can therefore provide up to date timings on train arrivals whilst shops can predict the day's footfall. This will make travel and business as seamless as possible for the public. Crime statistic data can also be shared on the exchange to support predictive policing technology, making cities safer as well as smarter. To date the CDE has provided a substantial 1,750,569,067 bytes of data and will continue to enable a host of smart solutions to tackle urban challenges.

Hitachi Insight Group is currently developing two smart phones apps which will enable all citizens to partake in the benefits of the CDE. A Journey Insight app will provide users with information about time spent, calories burned and CO2 emissions related to the forms of transport they use every day. This app will then allow people to compare their transport patterns and CO2 footprint with other residents in the city, inspiring them to proactively improve. At the same time, a similar app will enable people to track their energy usage and compare this with the usage of others. With behavioural science suggesting that people are more likely to reduce their energy usage if data shows they are more wasteful than their neighbours, this demonstrates the positive impact that data sharing can have on an individual, as well as a collective level.

Smart cities will change the way people interact with their immediate environment, as their smart-enhanced surroundings become more interactive and capable of responding to their needs. Smart cities are not just a concept; they will make a tangible contribution to society whilst mitigating the challenges we are currently facing.

The Rising C's of our Urban Future

by Roger Tondeur, Founder, Chairman and President of MCI

At MCI we are working with associations, cities, start-ups and industrial groups across the globe to create Smart Cities. On this journey we have been witnessing the impact, challenges and opportunities created by the digital transformation of our urban environment. Based on the analysis of these trends, I have identified 7 key insights – what I would like to call the "Rising C's" of our urban future.

Roger Tondeur is Founder, Chairman and President of MCI. Roger founded MCI with his wife, Ursula Wigert, in Geneva, Switzerland, in 1987. The company grew in size and reputation to become the leading event management company in Geneva, and a second office opened in Zurich in 1999. Further expansion has been swift, with MCI now boasting a turnover of €280 million and 60 offices in 31 countries across Europe, Asia-Pacific, the Americas and the Middle East and Africa.
Despite rapid growth, MCI remains a family company and in 2010 Roger handed over the reins to his son, Sébastien Tondeur, who now leads the company as CEO. Today, as Chairman, President and member of the Executive Committee, Roger continues to play a key role in the strategic direction of the group.

Over the course of his career, Roger has played an influential role in many industry associations. He is a member and Past President of the Society of Incentive Travel Executives (SITE) and a member of Meetings Professional International (MPI), the International Congress and Convention Association (ICCA) and the International Special Events Society (ISES). A partner of INCON (Global Partnership in Conferences & Events), Roger also sits on several committees for convention centre development and incentive business planning. In 2007, Roger was inducted into the prestigious CIC Hall of Leaders, an honour for influential leaders who have shaped the industry over a lifetime of accomplishment.

1. Climate Change

The UN World Meteorological Organisation latest figures show that 2016 will very likely be the hottest year on record and a new high for the third year in a row. It also means 16 of the 17 hottest years on record will have been this century. UN estimates suggest that cities are responsible for 75 percent of global CO2 emissions, with transport and buildings being among the largest contributors. This means that cities are and will increasingly be at the front of the battle against climate change.

2. Crowded

By 2050, 70 percent of the world's population will be urban. There will be over six billion of us living in cities - that's more than the global population in 2000. How all those people live, and what their lives are like, will depend on important choices leaders made today and in the coming years. As such, municipalities around the world will be radically increasing their focus on smart city initiatives. Countries will also be following the leadership of their cities, and I expect that we will be seeing an increase in national smart city strategies. Take India for example with its US$15 billion mission to develop 100 smart cities.

3. Competitiveness

The race is on! Cities across the world are ramping up their programs and marketing to become leaders in the Smart City Race. It has become a key part of their place making stratergy - and a driver at their cities the most desirable place to work, play, study and invest in.

At the Smart City Expo in Barcelona this year, there was a 100% growth in the number of cities who had a booth and were dynamically promoting their strategies, solutions and providers. While there are clear leaders such as Barcelona, Copenhagen and Singapore – other cities such as Dubai, London and New York are on their heels – while LATAM giants like Bogota, Buenos Aires and Santiago are rapidly boosting the focus on smart urban development.

To enhance their competitiveness - we see our city clients developing an improved strategy of policy, institutions, resources and processes with a clear goal to enhance their brand, attract investment and talent, and increase the sustainability of their metropolis.

4. Cents and Sensibility

Few cities around the world have actually grown into truly "smart" cities — most are still in the early phases of implementing new technologies. However I do have strong indications that this is changing. With the increase in viable solutions and experienced providers, I do expect an explosion in the implementation of IoT devices like sensors, smart lights, and smart meters to gather data that can be analysed to gain new insights regarding their infrastructure, population, and public services.

One of the most iconic examples of a Smart City along these lines is the city of Rio de Janeiro, Brazil, with its Rio Operations Centre. In this centre, the city analyses data collected by sensors scattered throughout the urban area, and views images collected by over 1,000 cameras. The centre, built in 2010, works 24 hours a day and brings together 500 employees.

These solutions will reduce the carbon emissions of cities and make the infrastructure more resilient in the face of extreme weather events like hurricanes and tropical storms. It will also have a significant effect of the bottom line of cities, as can be seen by cities such as Dubai who have saved $1.09B between 2003 and 2015 through the adoption of similar smart initiatives.

Figure 2: Smart management of the City of Rio de Janeiro

Like many good innovations, the solutions don't have to be so complex. By collecting and analysing data from waste containers across a city, companies such as Enevo are helping to reduce waste collection by up to 80%. Pilot cities such as Rotterdam and Edinburgh now know when collections are done and where operations can be further streamlined. They can track their waste generation and get detailed information on how much they are diverting from the landfill by recycling. This results into significant savings on time, fuel, service costs and emissions.

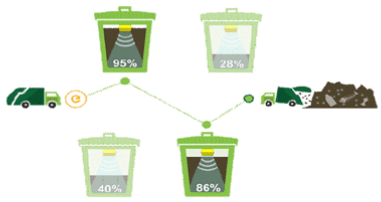


Figure 3: Enevo helps operators follow the fill levels of their waste containers with advanced wireless sensors and learn when collections are needed, done and where waste management operations can be further streamlined.

5. Citizen Involvement

The Smart City agenda until recently has been very technology-driven. Little attention has been paid to the citizen – the actual user of the city. But this is changing and this is happening fast.

In the new Barcelona Smart City strategy the focus is now on "making life better for people", and has four key components to make Barcelona a more open, democratic, creative and circular city. The pioneering Barcelona Digital City plan is the city's bold roadmap to drive technological sovereignty for citizens. It promotes a more diverse digital economy and a new urban innovation model by focusing on the transformation and digital innovation of the public sector through the greater involvement of companies, administrations, academia, communities and citizens.

Figure 4: Barcelona is a great example of how Smart City strategies are evolving to include citizen involvement and open democracy, whilst promoting a shift to a more circular and creative economy

The InterAmerican Development Band in their new guidebook "The Road to Smart Cities" - state that people play a very important role as beneficiaries of and participants in city transformstions. Their inclusion and engagement is key in the transition from traditional management models to a Smart City management model.

6. Collaboration

Smart city development faces many barriers around the world including tight municipal budgets, sluggish public procurement guidelines, privacy and cybersecurity concerns, and a pressing need for more IT talent at municipal agencies. Taking the time to deploy new, futuristic technologies can also be a luxury that many cities charged with the day-to-day running of a metropolis can't afford. To disrupt and to accelerate the development of our urban eco-systems will require collaboration on a scale never seen before. The silos need to be broken and private-public-people partnerships will need to be developed and mainstreamed to co-create and implement the technology that can make our cities smart.

In partnership with leading organisation such as the Smart City Council, we are increasingly working on solutions to share information between cities and how they can support each other to grow. In this way, I expect to see more aggregation of needs, joint development projects and multi-city purchasing of solutions.

7. Compassion

All over the world, smart technologies are increasingly transforming cities -- reducing congestion, cutting crime, modernizing the electric grid. Yet far too often, these benefits do not extend to those most in need -- the poor, the disabled, the homeless and those without Internet access.

"Cities and towns have an immense role to play in ending poverty and building inclusive societies that promote participation by all," UN Secretary-General Ban Ki-moon said at the Habitat III conference in Quito, Colombia that focused on sustainable urban development. Together with the increased focus by cities, businesses and NGOs on the UN 2030 Sustainable Development Goals, I expect that we will increasingly see technology and a spirit of compassion focused on making a difference to those in need.

For example, in Nairobi, Kenya, an estimated 2.5 million people live in slums, and over a third do not have access to clean water. For them water is a precious resource and often they would have to hunt around and wait in long lines to find water they could buy. More often than not the water supply points do not work, mainly due to lack of funds and capacity for operations and maintenance. Enter Vodafone, Ericsson and Grundfos who in a collaborative project are enabling Kenyans to use their mobile phones and the M-Pesa mobile money services to make payments for water. Now the people can pay for clean water by sending a text that unlocks a water pump. As a result of this guaranteed payment the local water companies are willing to connect a growing number of neighbourhoods to their systems.

Building Smart Cities on a wireless foundation

by Shrikant Shenwai, CEO, Wireless Broadband Alliance

Wireless connectivity, in both licensed and unlicensed variants, is providing the foundation upon which Smart Cities and the Internet of Things are being built. Delivering ubiquitous high quality wireless coverage and capacity is central to creating robust networks, capable of connecting huge numbers of devices at once. The networks this creates will add intelligence to everyday service infrastructure that will exist to do everything from reporting on transport networks to controlling parking allocations. The stark reality is that no single technology will be exclusively used, but rather a complimentary mesh of different radio technologies will evolve, including both traditional cellular and Wi-Fi.

Shrikant Shenwai is the CEO and one of the founders of Wireless Broadband Alliance (WBA). The WBA members include leading wireless broadband operators and ecosystem partners from around the world who are strategically focusing on enabling seamless Wi-Fi experience across technologies, devices and networks.
Prior to WBA, Mr. Shenwai was the Head of Strategic Business Development at StarHub Ltd, a leading Singapore based quad-play operator, where he led several new product development and strategic corporate initiatives.
During his 25 years in the ICT industry, Shrikant Shenwai has held several management and leadership roles in telecom, internet, IT and multimedia businesses while working with StarHub, SingTel group, HP and an entrepreneurial venture. He has extensive experience in successfully building and managing global partnerships and alliances. He has a proven track record in creating and building new initiatives and ventures from concept to operation, and is an Electronics & Communication Engineer by training.

In the digital age, towns and cities are beginning to recognize the importance of reliable broadband connectivity. In realizing the potential afforded by Smart City technology, cities are coming to understand that they can drive citizen engagement through simpler and easier access to services, education, training and opportunities. These are technologies that can improve the quality of citizen's lives by enhancing situational awareness, providing real-time collaboration and decision-making, and allowing planning and operations to be optimized. Smart Cities bring with them huge potential for social transformation, enabling cities to solve their most crucial problems on a shared and intelligent network structure. From providing quality public Wi-Fi to services such as Smart Traffic, Utilities, Safety and Environmental Monitoring, the potential of the Smart City is limited only by our imaginations. But this can only be achieved if the network structure on which it is built is fit for purpose; and fundamental to that is the viability and durability of the city's connectivity.

Smart Cities have grown to become an important topic in recent years, but there are many different elements to their deployment, of which the most critical is widespread wireless connectivity. To power the vision for Smart Cities, cities around the world are deploying city-wide Wi-Fi and integrating unlicensed and licensed spectrum-based services and business models for managing connectivity, Internet of Things, Big Data and converged services based opportunities for city residents, visitors and businesses. Examples of this can be seen in public spaces, airports, shopping malls and stadia as public-private partnerships are testing the waters in providing a secure, cellular-like experience to users.

The bottom line is that there is not enough exclusively licensed spectrum to meet the rapidly rising demand for wireless data to sustain an ongoing and reliable public service, especially when additional demands are added to the existing capacity. Consequently, the ecosystem is shifting steadily towards a

combination of licensed and unlicensed infrastructure in order to meet the escalating customer demand for data. Integrating unlicensed and licensed spectrum-based services and business models will be vital for managing connectivity, Internet of Things, Big Data and converged service-based opportunities for city residents, visitors and businesses. Major city CIOs and CTOs are realizing that in order to deliver a truly connected city, they must leverage relationships with major mobile carriers and other service providers to deliver a stronger overall network infrastructure that can deliver on the vision of smart cities.

However, instead of trying to build entirely new networks, cities, supported by internet service providers and mobile carriers, could be better served by leveraging already existing networks; for example, the private residential and community Wi-Fi networks that are currently spread throughout areas. Unlicensed spectrum is an enabling resource and combining this in the form of traditional private home and carrier networks as Wi-Fi hotspots with operators' existing networks will be the solution to widespread ubiquity.

From a consumer perspective, the traditional distinction between wireline and wireless networks will increasingly blur. Devices are mobile, but consumers are increasingly using data-intensive applications within Wi-Fi range of a wireline connection that is cheaper, faster and fairly soon will connect and hand off seamlessly and, just as importantly, securely. That said, the challenge then becomes controlling congestion or bandwidth hogging data on particular hotspots or networks. It will be key for service providers to assure quality of service on residential networks for a consistent service for the customer without placing excessive restrictions on public Wi-Fi services. Just as it will be important for mobile operators to maintain the same on mobile networks for seamless secure service continuity.

In 2015, the Wireless Broadband Alliance founded the Connected City Advisory Board, comprised exclusively of CIOs and CTOs from leading cities around the globe including Barcelona, London, New York, San Francisco, San Jose, Delhi and Singapore among others. It focuses on the development of Connected City plans and blueprints, the creation of public-private ecosystems, and collaborative mechanisms for resource contributions. Combining input from the Board with the WBA's strong heritage in bringing together licensed and unlicensed technologies, and creating best practices/de facto industry standards for a diverse ecosystem, this initiative will provide a unique insight into how industry experts are optimizing technology to deliver societal benefits.

The board has already released findings suggesting that Wi-Fi activity by cities is at an unprecedented level as they seek expert assistance to deploy the technology on behalf of themselves and their citizens. These findings underline the key role that wireless connectivity will play in underpinning the architecture of the Smart City. The WBA's own industry survey supports these findings; with the perception of Wi-Fi as being overwhelmingly reliable, cost-effective and easily deployable, cities are seeing it as a means to improve productivity. Key challenges facing cities include the need to address the lack of expertise in developing and deploying City-wide Wi-Fi, how to manage public expectations and user experience, and the choice of technology to use. The dominant business model is providing free access in combination with 3rd party sponsorships; however, cities are actively exploring new business and partnership models to deploy other city services using public Wi-Fi services.

I would also like to take this opportunity to discuss the WBA's launch of the inaugural World Wi-Fi Day. Taking place on 20th June, and with the full backing of the Connected City Advisory Board, World Wi-Fi Day will focus industry, policy and public attention on addressing the divide between connected and unconnected societies. The Wireless Broadband Alliance is encouraging cities, government bodies, fixed and mobile operators, technology vendors, Internet giants and service providers, as well as retailers, to come together to deliver connectivity to everyone, everywhere.

Change of ideas: How mesh networks create smarter cities

by Robert J. Schena, Chairman, CEO & Cofounder, Rajant Corporation

Reliable communication networks can make city services more intelligent, including water and power supply.

In 2002, Robert Schena co-founded Rajant Corporation, the pioneer of Kinetic Mesh Networks and a Finalist for PACT's Emerging Technology Company of the Year.

In 1999, Robert Schena co-founded Airclic, Inc., a wireless application and scanning company and raised $15 million from a group led by Goldman Sachs and Blue Capital Management. Motorola and Symbol Technologies forged a partnership to acquire Airclic and closed a $287 million financial round as well as the contribution of intellectual property in excess of $162 million. Also in 1999, Mr. Schena participated in the founding of World Wide Packets, a Gigabit Ethernet company.

In 1996, Mr. Schena successfully obtained for his company an FCC license to provide an Open Video System, becoming the first one to do so. In 2004, he was successful in changing U.S. telecommunications regulations, resulting in obtaining the first FCC license for broadband services delivered in the U.S. from a Canadian satellite.
In 1992, Schena founded FutureVision of America (FVA), forging a partnership with Bell Atlantic to commercially launch the first video dial tone and digital TV over television. FVA was successfully sold to Bell Atlantic.

Prior to founding FVA, Schena served as the CFO, Treasurer, Vice President of Finance and Vice President of Marketing for Harron Communications. Mr. Schena was appointed to the State of Pennsylvania's Ben Franklin Technology Board by Governor Ridge in 2001 and reappointed by Governor Rendell in 2004 and 2008. He serves on the Board of the Methodist Home for Children. In late 2010, Mr. Schena was named to Governor Corbett's Marcellus Shale Transition Team.

Mr. Schena earned a BA in Business Administration from Temple University and an MBA from the Wharton School of the University of Pennsylvania. He has lectured extensively on broadband communications to professional and corporate organizations.

As our technologies grow ever more advanced in a push to overcome new challenges and keep up with society's demands and high expectations, municipalities around the globe are morphing into fully connected, highly integrated entities known as smart cities.

A smart city aims to improve quality of life for its citizens by harnessing technology to connect infrastructures, resources and services, and make the municipality safer and more sustainable, livable, workable and competitive. A 2016 President's Council of Advisors on Science and Technology report states, "Information and communication technologies, the proliferation of sensors through the Internet of Things, and converging data standards are also combining to provide new possibilities for the physical management and the socioeconomic development of cities … Digital and mobile technologies are making the connections between service providers and users tighter, faster, more personal and more comprehensive."

To facilitate these connections, an important aspect of any smart city is its communication network, which should allow real-time monitoring of utilities, buildings and infrastructure as well as remote operations that automatically adjust for environmental factors. The Smart Cities Council states, "Super-fast, high-capacity broadband networks are considered essential to economic gowth, job creation and competitiveness." Without a mobile, scalable, reliable wireless network that allows real-time data transfer, many parts of a city may be running on outdated data or no data at all.

There are multiple ways that a reliable communication network can benefit a city and make it smarter. For example, deploying a wireless network to create integrated, more efficient power and water utilities can help cities become more resilient in the face of manmade and natural disasters and provide better services to its citizens – enhancing its overall livability.

Making power and water smarter

A city that owns and maintains its own water and electric utilities can find value in installing a communication platform that allows constant access to real-time data with no downtime.

A common challenge for power utilities is ensuring there is enough power on a grid to support the energy draw. Outages are almost always unplanned, and an outage-to-restoration process can involve several steps with long lead times, including multiple field visits to identify, locate and fix the problem. For example, an inspection crew would go track down the problem, then return to headquarters and report findings to a service crew, which would then go out to repair the issue.

Furthermore, the operations center may be unable to provide much assistance since it would be working off outdated information collected and compiled from multiple sources at different points in the process, so analyses would be limited. This communication breakdown drags out repair times, creating longer outages for residents.

A utility grid connected to a wireless network that never experiences downtime is a much smarter way to deal with outages. Vehicles are equipped with mesh or Wi-Fi-enabled laptops and handheld monitoring devices. The in-vehicle computing platform and vehicle network can be used to store field maps, detailed engineering diagrams or schematics, and best practices and procedures. Field technicians can connect through their devices, pull up the most current data, and send their own findings back to the operations center or other field technicians through the mesh while on site.

Everyone connected to the network can give and receive real-time information, enabling an end-to-end view of the detailed outage process and allowing timely analysis and decision-making. Dispatchers can take into account location and terrain-specific information, outage type, traffic times and closest available crew, optimizing dispatch decisions.

If a city does not have an intelligent water system – one that integrates water treatment systems with information and control systems using real-time data – response times will be slower, information may be inaccurate, and water quality and quantity may suffer.

Real-time data via a reliable communication network will make water utilities more intelligent. Smart water technology covering key elements of plants and distribution systems will provide the capability to more efficiently manage system infrastructure and extend resources. Installing real-time meters will make it easier for utilities and their customers to track and manage usage.

The integration of real-time data to make smarter short-term and long-term operating decisions will be particularly relevant for systems that deal with both drought and flood conditions. Smart water systems can incorporate features to adapt to changes in demand and supply patterns. Monitoring water supplies using analytics will allow a utility to track and anticipate challenging flow conditions.

In the case of low water flow, utilities could preemptively introduce alternate sources of supply. Greater accessibility to data can likewise facilitate collaborative planning on a regional scale between stakeholders to effectively plan and manage storm/flood conditions.

All of these applications would require other sensors and software, but the one thing they have in common is the need for a reliable wireless communication network.

Finding the Right Type of Network

One communication network that is helping to make cities smarter is Kinetic Mesh, which employs multiple radio frequencies and any-node-to-any-node capabilities to instantaneously route data via the best available traffic path and frequency. Each node serves as singular infrastructure, which enables all devices and the network itself to be mobile – meaning it can move around a city with no loss of connectivity.

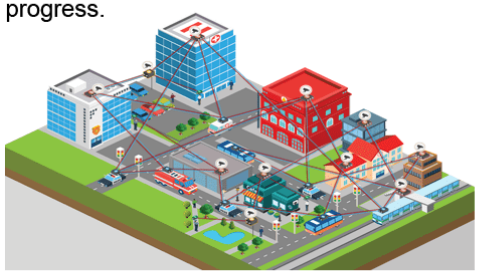
The network enables the nodes to manage interference and reduce network capacity constraints. Wireless nodes work in concert with networking software to deliver data via the fastest available path; routes are evaluated on a packet-by-packet basis, with no need for input from the network administrator. The nodes seamlessly integrate with each other as well as cellular data/LTE networks and third-party satellite.

If one path becomes unavailable for any reason – such as power loss – the network routes around it, eliminating any downtime. It is not uncommon for a node to have several hundred peer connections, giving it the ability to use any link at any time. Kinetic Mesh is highly scalable; the more nodes in a network, the better the performance.

Kinetic Mesh has been battle-tested in military, mining and disaster recovery operations and now can bring its capabilities to cities across the globe to allow transmission of real-time data for mission-critical services such as power and water supply. Despite the immense amounts of data now at our fingertips, we'll never be able to truly predict the future, but in a non-hierarchical communication network such as Kinetic Mesh, there is an exponentially higher chance that the vast majority of the network will still function in times of natural or manmade disaster, even if one or more links in the chain break.

Making Connections

A reliable communication network is an essential part of a fully integrated, truly connected smart city that is safe, sustainable, livable, competitive and resilient. The move toward smarter cities will help us meet current and future challenges head on and will in turn allow the development of new innovations and technologies, creating a continuous cycle of progress.



A smart city aims to improve quality of life for its citizens by harnessing technology to connect infrastructures, resources and services, and make the municipality safer and more sustainable."

"An important aspect of any smart city is its communication network, which should allow real-time monitoring of utilities, buildings and infrastructure as well as remote operations."

G.hn – the backbone of home networking

by Donna Yasay, President, HomeGrid Forum

The beauty of G.hn lies in its simplicity. Defined by service providers, for service providers, G.hn is an ITU-T international standard for high speed home networks. Its unique feature is that it can run over any existing home wiring: powerline, coax, phone lines or (POF) plastic optical fibre. G.hn resolves the issues service providers really care about; reliable interoperability between products from different vendors; high, consistent bandwidth at any location in the home; and simultaneous support of video, data, voice, and high speed internet

Donna Yasay, President of HomeGrid Forum

Donna Yasay joined the board of HomeGrid Forum and was elected president in March 2015. She is Business Development Director at Marvell Semiconductor.

Donna has over 20 years' experience in the telecoms industry working in engineering, sales and business development roles in both operator and vendor organizations, including AT&T, D-Link and Ikanos.

She began her career as a systems engineer at AT&T and Internet Connect before going into technical sales at D-Link and gradually moving into business development roles at Netopia, Tzero Technologies and Asoka USA Corporation and now her current position at Marvell. Her previous roles in engineering, sales, network services and business development, means Donna brings a knowledgeable, broad vision to her role as leader for HomeGrid Forum.

Her past experience in home networking in both LAN and WAN domains, fuels her desire to provide the consumer community with the right technology to enable a better quality of experience in their homes.

Home networks are changing. Ever higher broadband speeds can carry multiple HD video streams into the home, but these then need to be distributed to a variety of devices in a reliable, trouble-free fashion. But it is not just about videos and bandwidth. The vision of Smart Homes and Smart Cities is to have numerous household devices all working together, sharing data, and all on the same network. End users buy a wide range of products, from a Samsung fridge to a Panasonic television and an LG laptop and expect seamless connectivity between them all. However consider what needs needs to happen behind the scenes to make this a reality - the unsung hero underpinning this connectivity is G.hn.

G.hn solves the home network problem – and it just works!

Although many devices are connected wirelessly, wired networks still have a major role to play in the home. This ranges from interconnecting fixed devices by means of an embedded interface over the home's cabling, to providing a robust, high speed backbone for wireless access points so as to greatly improve wireless coverage within the home.

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When purchasing networked products for entertainment and the smart home, consumers expect them to connect, straight out of the box, with no need for expert knowledge or configuration. G.hn is the embodiment of 'plug and play'; not only is it easy to self-install, but it includes both QoS and in-built security. On top of this, G.hn can be remotely configured and managed using the Broadband

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Forum's management system (TR-069) so in the unlikely event of a problem, their service provider can diagnose and dynamically re-configure the devices remotely. This can all be done without entering the customer's home, installing any new wires or worrying about service limitations or conflicts with existing equipment.

Smart Home applications involve a wide variety of simple devices. The need for a reliable plug and play operation is even greater here, and brings new challenges with regard to the security and privacy of communications. Applications range from energy management to home improvements and security, and even wearable devices.

With its ability to extend existing wireless networks in any home, G.hn is an obvious choice for service providers to deliver emerging and converged future services and applications, such as Ultra-HD and home automation, while continuing to support existing services.

The hub of entertainment

Smart TVs are now starting to come with an embedded G.hn powerline interface as standard. This allows the TV to automatically connect over the home's powerlines – eliminating the need for new cables and providing instant Internet access on the TV. There are other devices which can benefit from this type of technology, including Blu-ray players and stereo systems.

The possibilities are endless for delivering extensive in-home information services, including assisted living, education, healthcare, shopping, games and entertainment.

Seamless access to home automation

With the 'plug and play' ease which G.hn provides, home automation has never been simpler. While many home automation devices are simple, battery powered, wireless connected devices, G.hn can provide the IP communication backbone which allows these smart home Internet of Things devices to speak to the cloud and allow for reliable remote home control. Fixed devices which are home powered can also benefit from an embedded G.hn powerline interface, opening up new possibilities in the areas of energy management, lighting control and security systems.

G.hn can also act as the wired backbone to connect a home server to many devices, ranging from a high performance PC (via G.hn to an Ethernet adapter) to multiple laptops or tablets via a G.hn to WiFi extender.

Legacy systems

Some operators have expressed concerns about G.hn interfering with legacy powerline systems. While there is an installed base of such systems, this is quite small when compared to the number of homes that will need high speed networking in the future. Further, as G.hn is not just limited to powerline, there is always the possibility of using one of the other G.hn wire types to sidestep this issue.

The home network of the future will be a hybrid. Wi-Fi is the connectivity of choice for all portable devices. However there are several, large fixed device types in the home (ranging from TVs to white goods) which would benefit from being networked, but there is no advantage in this being done wirelessly. Indeed, not having such devices on the wireless network means there is greater capacity for those which really need it. As mentioned above, multiple wireless access points will become increasingly common to improve wireless coverage and performance. These will need a robust, high performance backbone which G.hn provides.

A secure network

In a truly connected world, security is more critical than ever. It is not only data and equipment that need to be protected against hacking and theft, this now extends to content, personal information and credentials. Wireless has made great strides to enhance its security, but wireless signals can always be intercepted and the end-user may well, knowingly or unknowingly, disable their wireless security. G.hn is inherently secure, it can even utilize different encryption keys for each link in the network. While the user should take care to setup their wireless network securely, once traffic enters the G.hn domain, they do not have to worry about this part of the network.

G.hn, the backbone of the home

One of the main roles of G.hn will be to extend Wi-Fi coverage and performance throughout the home, a true hybrid network. However it will also play an increasing role in interconnecting large, fixed devices which have no need of wireless, and providing a different sort of backbone to interconnect disparate Smart Home technologies. It will also play a role in Smart Homes and Smart Cities. G.hn started out in the service provider domain, and many of its features benefit from that heritage. However it is now moving into the retail space, and end users will start to realize what a valuable and easy to use networking technology it really is.

How Cloud and Big Data platforms are making it easier to turn vision into reality

by Saif Ahmad, President and Neeraj Sabharwal, Director Cloud and Big Data, Xavient Information Systems

Smart Cities, which use information and communication technologies in a smart and secure manner, are one of the primary visions of future urban development. At Xavient, we envision a focus on smart ecosystems, which are created through the implementation of a smart infrastructure underlying power grids, roads, cars, homes, schools and hospitals, in combination with smart technologies that allow for analysis and insight.

Saif Ahmad, co-founder and President of Xavient Information Systems (www.xavient.com), has more than 15 years of leadership experience in the IT industry. Ahmad built Xavient's key customer base and delivery competencies, and directs all facets of Xavient's global operations and growth strategy. He is the chief architect of Xavient's operational excellence, profitability model and extremely successful customer engagements. He runs the international operations of Xavient's United States and India offices. Saif has also been instrumental in driving sales and customer acquisition efforts for Xavient in the high tech and telco domains.

Neeraj Sabharwal, Director Cloud and Big Data in Xavient Inforamtion System, has more than 15 years of experience in Data, Cloud and Big Data technologies. Neeraj has worked on hundreds of cloud and big data implementations to help customers to get more value out of their data.

The Internet of Anything (IoAT) has shown the ability to connect people, cities, and even planets with missions to Mars and Jupiter sending back scientific information to NASA. And as IoAT has blossomed out of the Internet of Things, the number of devices connected to each other has increased exponentially. The technology has quickly gone beyond connecting a smart phone to a homeowner's security, lighting and heating systems. Connected devices can be in or on anything, such as buildings, roads, cars, vending machines, fitness wearables, and even space rovers, with the ability to transmit information in near real time.

Smart homes are a reality. Now sights have been set on Smart Cities. The technology is here; it's really just a matter of city planners defining how connected they want to their Smart Cities to be, and what they want to accomplish. As a provider of technology infrastructure services to cable companies and telecommunications firms designing Smart Home services, Xavient Information Systems views Smart Cities as basically Smart Homes on a grander scale. While people invest in Smart Homes to be more secure or to use energy more efficiently, among other reasons, the goals of a Smart City can be infinitely more complex. Goals can include the more efficient running of the city, better communications with residents, or enhanced safety and lower crime rates.

Smart Cities, which use information and communication technologies in a smart and secure manner, are one of the primary visions of future urban development. At Xavient, we envision a focus on smart ecosystems, which are created through the implementation of a smart infrastructure underlying power grids, roads, cars, homes, schools and hospitals, in combination with smart technologies that allow for analysis and insight.

Ultimately, the goal would be to have all the Smart Ecosystems within a city connect with each other so as to create an integrated city that connects utilities,

schools, transportation departments and healthcare facilities as needed.

This vision is fast becoming a reality, and much of the credit goes to Big Data, a technology popularized by information technology professionals in corporate business settings. Big Data technology – the collection of structured and unstructured data -- allows Smart City architects to analyze structured information generated by utilities and government entities alongside unstructured data, such as social media postings, in order to generate better insight. One of the reasons that Big Data is now able to be leveraged are new technologies that make it practical to store and process all the new data types getting generated from smart phones, other networked devices and wireless sensors. This data would be accessible to city managers, data scientists and civil engineers from anywhere because of another technology – "The Cloud" -- which allows for data to be stored and shared easily.

So let's take a look at a small cross section of a Smart City, to illustrate the how and why it works.

It starts with a resident who has created a Smart Home that connects with her no matter where she is, as well as connects with her office. She can access the home's primary functions – lights, heat, security, and even the dishwasher she forgot to turn on before leaving – all from a smart device such as a phone, tablet or laptop. Beyond the home, our resident receives information – customized to her needs – regarding school schedules that allows her security system to know that the children will be home early because of a half day. It also alerts her that traffic is jammed on the interstate, and automatically communicates to the kids, "Dinner will be late! Get that homework finished!"

We're talking about a Smart Home connected to a growing number of parts of the Smart City. And vice versa.

Schools and Transportation Departments can work together: Sensors indicate larger than normal amounts of pedestrian traffic, and school zone signals help control the speed of cars no matter how much pressure is applied to the gas.

A City's Chamber of Commerce and Tourism departments share information so that residents can access steals and deals and other promotions in real time. And businesses can be alerted to road work that may hinder or even help with planned promotions. A person's smart device becomes akin to road signs on the street displaying real-time information on events and even wait list information of popular restaurants.

A City's Parking Authority can be plugged in. Finding parking spots in a city can be a nightmare. You drive to parking spot and find it full. How about getting this information before you even start driving? Connected cars and smartphones send information in real time and become part of the pool of information in a span of milliseconds to provide available parking information. Besides saving time, this results in less traffic and reduces carbon dioxide emission.

School Systems can be part of the ecosystem. All the schools are connected together through a redundant centralized system to track school activities, student attendance, bus routes, activities in buses and bus drivers' driving patterns.

The monitoring of waste management can be connected and managed more effectively, especially considering that the transportation and storage of refuse is a major environmental concern. Smart Cities connect garbage trucks, disposal centers and landfills to monitor for efficiency, levels of toxins and other pollutants.

Smart hospitals can be involved in public safety in our Smart City. Police and public health officials can receive information in aggregate from various regional hospitals to identify trends in the types of cases being handled. Is there a spike in bed bug cases, calling for public health's involvement? More gun shot or marital abuse victims? A growing number of Zika-related patients? Such analysis could lead to informed, near-time decision making.

So how do cities make this happen?

Cities are realizing that digital transformations which have revitalized companies and entire industries, can be created within the government sector. As municipal governments have invested in web sites, software systems and databases to keep up with the times, they now understand that the data collected can be a powerful asset; an asset that can be leveraged to make better, quicker decisions and even save money.

Cities – and many of them are now hiring or appointing chief information officers – need to invest further in infrastructure and technologies such as Big Data and the Cloud in order to better collect, store and analyze data while it's in motion allows for the creation of "perishable insights," which is defined as "insights that provides incredible value while an event is happening because value expires once the moment is gone." They may also need to invest in smart devices and/or wireless sensors that transmit additional types of information into a city's Big Data platform.

Xavient is involved in these kinds of projects, albeit on a smaller scale. For instance, it is implementing a Big Data, "perishable insight" analysis for one of its wireless telecommunications customers, to better predict and avoid dropped calls created by network strength and environmental factors. It also has implemented cloud solutions alongside Big Data technologies as an efficient way to scale resources to store and process data.

As Smart Cities expand and connect the number of Smart Ecosystems they have in place, the amount of data collected, stores and analyze will increase exponentially, calling for a highly scalable platform that the Cloud can provide.

Co-creating Singapore's Smart Nation

by Khoong Hock Yun, Assistant Chief Executive (Development) & Chief Data Officer, Infocomm Development Authority of Singapore (IDA)

The deployment of the Nationwide Broadband Network (NBN), which began in August 2009, has taken Singapore a huge step forward in its plans to become a connected nation. Today, we have achieved nationwide fibre coverage with more than 75% of households subscribed to NBN services that delivers 1Gbps for less than S$50 per month. Complementing the wired network is the proliferation of free WiFi hotspots across Singapore under the Wireless@SG programme. Reaching its ten-year milestone this year, Wireless@SG has more than two million users per month. We have made various enhancements over the years, and these included the increase of Wi-Fi hotspots and the introduction of the SIM-login method for automated authenticated login in. Usage hours have also increased to ten million hours every month.

Mr. Khoong Hock Yun is the Assistant Chief Executive (Development) and Chief Data Officer of the Infocomm Development Authority of Singapore (IDA).
Mr Khoong joined IDA's senior management team in 2000 around the time of its founding. He is responsible for the 'Build' agenda for IDA, to generate economic growth for Singapore. This includes developing and building the infocomm industry, infocomm manpower and critical national infocomm infrastructure, such as the Nationwide Broadband Network (NBN). Mr Khoong also oversees IDA's strategic and corporate planning, enablement of industry sectors with infocomm, as well as the mandate to develop the Smart Nation Platform (SNP).
Other transformational initiatives led by Mr Khoong include Wireless@SG, National Authentication Framework, National Cloud Computing Office, Singapore Internet Exchange, an upcoming Data Centre Park and Singapore's first cloud-based infrastructure implementation for the inaugural Youth Olympic Games in 2010.
Mr Khoong previously served at the Ministry of Defence as Programme Director, developing simulation systems, as well as command, control and communications systems. He brings with him deep industry experience having spent more than 11 years at Mentor Graphics Corporation, where he was Strategic Business Group Director responsible for areas such as R&D, Product Engineering, Consulting Services, and the management of product development organisations in Singapore, Europe and the USA.
A Harvard Business School alumnus, Mr Khoong has Master Degrees in both Engineering and Business Administration. He enjoys playing golf for leisure.

Rapid developments in technology has and will continue to have a profound impact on the way we live, work, interact and play. As Singapore moves towards being the world's first Smart Nation – a vision we laid in 2014 – we will be harnessing the power of technology to build upon the collective efforts of people, businesses and Government to improve the quality of life; power our economy; and continue in our journey to build up Singapore, in a highly sustainable manner, as a world leading nation.

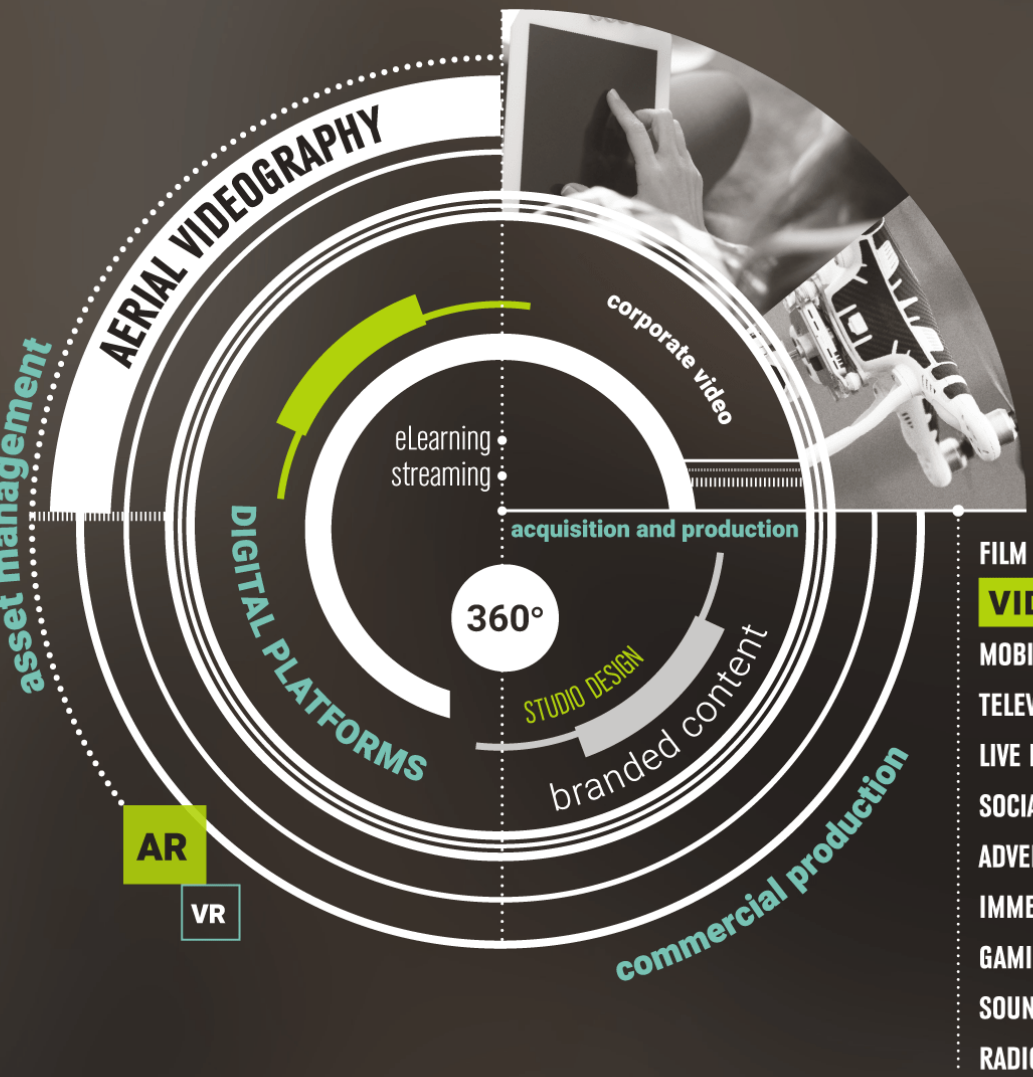
Why is 'Smart Nation' important to us?

Singapore celebrated our 50th birthday last year. Born with few natural resources, Singapore has grown beyond expectations in both economic and social terms – we built a comfortable home, a safe place for our families, and worked hard to be value-adding partner in the world. The world in the next 50 years will be very different, compounded by key trends such as a rapidly ageing population and growing urbanisation. We have to do things "smarter", to think of ways in which we can effectively deploy our limited resources to achieve the most important outcomes, in the best optimal way. We have to be receptive even to disruptive changes that has the potential to improve our society, to have an experimental mind-set in leveraging emerging technology such as data, IoT and sensors to transform our lifestyles, our business, and the economy for the better.

Building the foundation – communications infrastructure

Connectivity is a key piece in Singapore's journey as a Smart Nation.

The deployment of the Nationwide Broadband Network (NBN), which began in August 2009, has taken Singapore a huge step forward in its plans to become a connected nation. Today, we have achieved nationwide fibre coverage with more than 75% of households subscribed to NBN services that delivers 1Gbps for less than S$50 per month. Complementing the wired network is the



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proliferation of free WiFi hotspots across Singapore under the Wireless@SG programme. Reaching its ten-year milestone this year, Wireless@SG has more than two million users per month. We have made various enhancements over the years, and these included the increase of Wi-Fi hotspots and the introduction of the SIM-login method for automated authenticated login in. Usage hours have also increased to ten million hours every month.

With strong communications foundation laid, the next phase of infrastructure building includes technology development and innovation in wireless networks, starting with Heterogeneous Networks (HetNet). By harnessing all available networks across different parts of the wireless spectrum, HetNet can potentially increase Singapore's overall wireless capacity and hence data speeds. This will not only improve user experience, but also meet the growing demand for mobile connectivity and usage of bandwidth intensive applications. We received very positive results from the Trials which ended in June 2016. Out of 1,100 participants who were surveyed, 86% were satisfied with the improvements in network performance due to HetNet. Speed tests conducted also showed a significant 66% improvement in average download speeds and 21% improvement in upload speeds.

Supporting tech innovation and value creation

The Government also seeks to articulate key problems/challenges for our technology ecosystem to work on, and work with them to deliver innovative solutions that improves our lives and/or helps our companies be more competitive. For example, our Urban Logistics initiative helps to significantly reduce the delivery turnaround time of goods to our retail malls, improving the effectiveness and efficiency of our logistic players - increasing the number of deliveries per day that they can make, while reducing congestion at the loading/unloading bays, and reducing the need for more delivery vehicles and drivers. Such an initiative reorganises the delivery process, introduces new innovation and technology developments, new business models, review of existing regulations, and collaborative participation of SMEs (from retailers to logistic players).

Another example would be in Fintech, where we have jointly developed a pioneering use of Block Chain technology in trade finance. For example, recently a prototype solution, implemented with the Bank of America Merrill Lynch and HSBC, mirrors a paper-intensive Letter of Credit transaction by sharing information between exporters, importers and their respective banks on a private distributed ledger. This enables them to execute a trade deal automatically through a series of digital smart contracts. This work shows potential in streamlining the manual processing of import/export documentation, improve security by reducing errors, increase convenience for all parties through mobile interaction and make companies' working capital more predictable.

The education sector is also another key innovation space for many trials and experimentation to take place. The PlayMaker programme was launched in the beginning of 2016 to introduce a suite of technology-enabled toys to pre-schoolers. Through the process of facilitated learning through play with the toys (such as tech-enabled building blocks), children developed skills such as logical thinking, reasoning, sequencing, estimation, inventive thinking, and teamwork. The toys encouraged small group collaboration which develops social and communication skills – all these without requiring screen time from PCs, tablets or smartphones. This programme piloted with 160 centres as a start.

Nurturing talent and skills development for the future

It is essential that our people – both budding and experienced professionals – are able to leverage new and disruptive technologies to co-create solutions for the betterment of citizens, communities and society. We need to expose our children to programming and find ways to encourage students and the general public to get involved in technology.

Since 2014, the Code@SG movement has reached out to over 90,000 students through initiatives including Code for Fun Enrichment Programme, Code for Charity and the National Infocomm Competition. In addition, we have the IDA Lab on Wheels, roving buses to schools that house engaging and experiential technologies. Lab on Wheels helps students better appreciate the possibilities that can be created with various technologies through fun activities such as coding a game and programming robots, such that coding and computing thinking will be a national capability of our future generation.

It is also critical to accelerate professional development and enable continuous skills upgrading. We have this April, announced that we have set aside S$120 million for manpower development. To this end, we have also launched Tech Skills Accelerator (TeSA), which aims to help fresh and mid-career ICT professionals to develop core and sector-specific ICT skills. We will bring together key employers and industry partners to enhance employability, by identifying in-demand skills and through structured programmes delivered by training partners.

One example of TeSA is when IDA collaborated with the Cyber Security Agency of Singapore to launch the Cyber Security Associates and Technologists (CSAT) Programme. The aim of CSAT is to enable ICT professionals to acquire industry experience and practical skills to take on Cyber Security job roles with major employers. In addition, companies can also leverage on CSAT to deepen the capabilities of Cyber Security professionals in highly specialised domains such as threat intelligence and digital forensics through exposures via overseas attachments with leading technology providers.

Conclusion

Smart Nation is a journey, co-created by different parts of the ecosystem – from individuals to government to industry. We will have to come together, work hand in hand to build our future together. By working together, Singapore can bring this vision to fruition, and harness the disruptive power of technology to transform businesses, enhance the lives of our citizens, and create new technologies, systems and processes that can also help address similar challenges in many cities around the world.

Future Cape Town, South Africa

by Rashiq Fataar, Director, Future Cape Town

Future Cape Town (FCT) was formed to reach out to young people and stimulate debate, inspire ideas and awareness about the future development of the city. FCT leveraged the rise of social media in the city and country to start to engage more openly and on a more non-partisan platform about what the city could become, and in the process hope to inspire more citizens to become active.

Rashiq Fataar is the Director of Future Cape Town, a leading think-tank promoting discourse and thought leadership on the future of African cities. In addition to its research, events and advocacy work, the organisation has over 90,000 social media followers and 120,000 website readers annually. The network also includes Future Lagos and Future Johannesburg.

As an independent urbanist he helps develop strategies to expand public participation in urbanism, with a focus on public spaces, urban regeneration and young urbanists.

Mr. Fataar has previously served on the board of Cape Town Tourism and holds an Actuarial Science degree from the University of Cape.

Introduction.

Rashiq Fataar is the founder of Our Future Cities, a non-profit organisation that creates platforms to inspire dialogue about the urban development of Cape Town and other cities. As an independent consultant, speaker and writer, Rashiq works at the intersection of urbanism, new media and economics.

"When you have the 3rd highest income inequality in the world, combined with the historical legacy of separation and segregation, and the increasing pressures of urbanisation, a volatile local and global economy and limited resources, there is almost no choice but to turn to innovation when looking to move towards more equitable and sustainable development" says Fataar.

Despite these challenges, Cape Town does have plans in place to improve infrastructure in a number of areas and particularly in the area of transport. This, along with an increasingly galvanised youth audience, and the increasing global interest in the city from a tourism, business and investment perspective; offers the opportunity to make a smarter Cape Town a more achievable reality.

"At the time of the 2010 FIFA World Cup, the pressure to deliver infrastructure, including transport, stadia, and other city improvements was the top priority, with little room to really capture the imagination of the public in the process, and strengthen democratic and open participation in shaping the city," says Rashiq.

Considering the prediction that within the next 35 years Africa will need to accommodate almost 900 million new urban dwellers this is equivalent to what Europe, USA and Japan combined have managed over the last 265 years1. We also know that:

- 80% of South Africa's population is expected to be urban by 2050,
- 66% of youth in South Africa live in urban areas3, and
- According to the National Development Plan of South Africa4, South African cities

have “entrenched spatial patterns across all geographic scales that exacerbate social inequality and economic inefficiency, compounded by a population that is disengaged with spatial and urban issues”,

All meaning that the creation of inclusive and sustainable South African cities will require a scale of resources and effort never seen before.

Considering the notable absence of dialogue that appeals to young people around the urban planning and development of the city post 2010 World Cup, where few plans were open for widespread discussion in a city and country based on decades of top-down planning; a person or organisation was needed to step in to bridge this gap from young people to the more senior leadership.

Future Cape Town was perfectly positioned to meet this need, and has been aiming to do so since its inception through the various projects they consult on, and using, but not restricted to, the focus areas discussed further in this article.

Focus 1: Smart use of social media, FCT growth, dialogue, real time conversation.

Challenge: Future Cape Town (FCT) was formed to reach out to young people and stimulate debate, inspire ideas and awareness about the future development of the city. FCT leveraged the rise of social media in the city and country to start to engage more openly and on a more non-partisan platform about what the city could become, and in the process hope to inspire more citizens to become active.

Case study: Starting from a microblog on Tumblr, and a few hundred Twitter followers in 2010, FCT has since published over 350 blog articles and grown their social media following to over 90,000 followers and 100,000 website readers per year (70% from South Africa), with a demographic largely in the 18 to 35 age range.

In addition to the strong owned content that generated interest and engagement, the platform’s method of choosing to work in collaboration was largely instrumental in driving this growth. Collaborative intitiatives included hosting social media conversations on Twitter with other organisations or blogs in other cities, and using social media to amplify ideas for the city covering a wide array of topics; from cycling infrastructure, to urban design to the role of business and technology. Through this it has worked with government, companies, and civil society organisations, lending its reach and audience to the wider effort of sustainable cities.

Outcome: Cape Town as a city is more than a technical project for which infrastructure solutions could be development and implemented, but the opportunity identified in our work showed the amount of work required in the development of people, their awareness, and ultimately activating/mobilising democratic values of the city and country.

Focus 2: Future Cape Town’s limitations, and the opportunity for collaboration.

Having seen significant and rapid interest in the online and ideation space, Rashiq and Future Cape Town realised that this success may also be contributing to the limitations that they were experiencing of working only in the ideas space or in facilitating online and in person dialogues. This presented an opportunity to think of and evaluate the organisation's role in moving from dialogue to action and working with strategic partners in delivering physical projects that speak to the vision of citizens and the organisation's ambition for a more equitable and progressive city.

Challenge: It became apparent that in order to create projects a multi-sector effort would b required in a city where resources were limited. It was important to embrace the energy and culture of the city, and most of all the younger and more progressive partners wanting to take an active role in change, especially given that the FCT team was largely comprised of younger people, ranging from tertiary students to young professionals. In forming and catalysing new partnerships was the awareness that in a complex city like Cape Town, we needed to challenge the notion and perceptions of who should be involved, responsible, and active in improving parts of our city and in particular its public spaces and the broader public realm.

Case study: One such local urban development company, Blok, passionate about the potential for urban innovation and wanting to go beyond their key business focus of developing apartments, approached Future Cape Town with a number of ideas to co-invest in innovation around public spaces in the neighbourhoods in which they worked

One of these ideas was for a Parklet - a public space that temporarily occupies on-street parking bays - on Regent Road, a vibrant and busy high street in the neighbourhood of Sea Point in Cape Town, where the brand owns and develops off-plan urban homes.

The reason for the Parklet project is very specifically to try to understand how to define public space in an existing urban environment, and encourage people to think of the street as a space that they can use for purposes other than driving and walking between shops. Through these moments and opportunities, chances to engage, socialise and interact would be expanded – thus strengthening the social fabric of the diverse community.

The parklet was also considered to be a means of softening a busy, fast part of this important arterial road, and providing respite for pedestrians throughout the year. Regent Road has very few places to rest or access the Internet without paying to enjoy a coffee or meal at a restaurant - and given our socio-economic demographic the seating, bicycle parking and free Wi-Fi was a small opportunity to give meaning to a more inclusive city.

Outcome: One of the partners in this project is the City of Cape Town, and since only draft guidelines were in existence, and previous parklets were delivered in a pilot period some years ago, the parklet on Regent Road presented a chance for all involved to test these guidelines and provide input on how these could be improved in future.

The input, it is hoped, could overcome the issue where the application process might prohibit the general public from applying for parklets in their neighbourhoods or communities.

• The advances in applications and platforms for monitoring this and other public spaces has allowed us to build a more serious case for more of these spaces including:
o Passersby using the free Wi-Fi to share their engagement with the space on social media,
o Monitoring the internet usage and logins at the parklet to quantify its daily use,
o And even considering more sophistical tools like a “placemeter” which monitors pedestrian, cycling and car traffic around a space.

• We have already noted that there is a surprisingly diverse audience using the space - including children on their own, the

local car-parking attendants, older members of the public resting between running errands, mothers with children, young professionals looking for spaces to work and park their bicycle, and more.

• It is also the normal everyday-use as a public space very early in the morning and very late in the evenings, almost unlike what is traditional in Cape Town cognisant of the safety and security challenges of the city, which proves success.

• Another highlight is how accepted the space has become across the racial divide that often persists – and this presents some hugely positive ideals of what the city could be in all its spaces if this culture was encouraged through similar initiatives.

Conclusion: Smarter ways of working in African cities, next opportunities and a call to action.

In 2013, through a former team member from Nigeria, the opportunity arose to form a similar movement or action in Africa's largest and one of the fastest growing business economies. Future Lagos was initiated to start dialogue and research in a city where most of the complexities of developing smarter cities are played out.

Some of our key achievements here have been in bringing more global awareness to the urban issues facing Lagos, including its challenges with planning around water, transportation, energy and efforts to reduce pollution. More recently we managed a Future Lagos collaboration with the British Council and technology firm Watershed UK and their Playable City project, conducting public engagement using video interviews in streets and public spaces across the city to raise the concerns and ideas from the public on how to improve public spaces, and as a result recommended three locations as opportunities for investments in artistic interventions.

While our work started in Cape Town, the challenges facing cities across the developing and developed world, means that our larger network, 'Our Future Cities', could take a more global position to become a conduit between government, forward thinking businesses and citizens, in cities wanting to use innovation to address challenges and move towards a smarter future. We welcome any and all collaboration from around the world from similarly interested parties that share our vision of smarter, more connected cities.

Smart cities need smarter politics

by Mark Prisk, MP for Hertford & Stortford, Member of the Communities & Local Government Select Committee,& Chairman of the All Party Parliamentary Smart Cities Group

Around the world, cities and other urban communities are facing significant challenges.

The credit crunch and resulting indebtedness, means the public sector has to do more, with less, a lot less. Indeed, in the US and elsewhere, some cities have actually gone bust.

At same time, the population is not only growing in many countries, it's also ageing fast. This has immense implications for all public services, not least health care and social services.

Mark Prisk is the MP for Hertford & Stortford. A member of the Communities & Local Government Select Committee, Mark takes a close interest in housing & planning, infrastructure and cities. He is Chairman of the All Party Parliamentary Smart Cities Group.

Mark is a former Minister of State for Business & Enterprise (2010 – 2012) and for Housing & Local Growth (2012 – 2013). Mark is a Fellow of the Royal Institution of Chartered Surveyors. In March 2014 he was appointed by the Prime Minister as Investment Envoy for the Nordic and Baltic Nations. In 2016 he was additionally appointed as the Prime Minister's Trade & Investment Envoy to Brazil.

Before going into politics Mark ran his own business for 10 years. He lives with his wife Lesley in Much Hadham and he is a rugby fan, Chairman of the Parliament Choir and a keen hiker. He is a Strategic Adviser to Essential Living plc and a non-executive director of Edward Stanford ltd.

The smart cities debate is often led by technologists or businesses focussed on specific sectors. For my part, I'd like to focus on the broader civic framework and set out the key challenges to making our local politics and governance smarter.

As chairman of the All Party Parliamentary Group (APPG) for smart cities it is an aspect which strikes me as vital. The APPG is a unique national forum, one which embraces parliamentarians from across the parties and from both the House of Commons and the Lords.

But our reach extends far beyond Westminster. We have 20 city and urban council associate members, with more joining. And we have forty businesses, large and small, from many different sectors.

Our aim is not to duplicate roles which either government or industry can provide. Rather it is to be the forum in which we establish what people want in our cities, (now and in the future) and what local government needs, in order to create smarter cities across the UK. You can find us at: http://www.smartcitiesappg.com/

What is a smart city?

So what do we mean by a smart city? It's a term which has become somewhat nebulous. The British Standards Institute, for example, defines it as

"the effective integration of physical, digital and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens."

It's a pretty all-encompassing definition.

Personally, I prefer the ideas behind the definition used by the Manchester Digital Development Agency, namely that: "a smart city means smart citizens – where they have all the information they need to make informed choices about their lifestyle, work and travel options."

What does that mean in practice?

First it means starting from understanding what the citizen needs, not what the technology could do.

Second, it means rethinking how city government works. Not just in terms of being more efficient – however pressing that may be. Local governance needs to become more holistic, delivering public services in the round, not piecemeal.

Third, it also means rethinking how cities work, in the widest sense. Moving away from arbitrary distinctions between city hall and its citizens, towards a more collaborative, networked approach to representative democracy.

Put simply, smarter cities will need smarter politics, or smarter civics, as the Americans might put it.

The challenge within city halls

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At same time, the population is not only growing in many countries, it's also ageing fast. This has immense implications for all public services, not least health care and social services.

So 'business as usual' isn't an option for city halls. Local government is going to have to completely rethink both what it does and how it delivers its services.

So what to do?

Whilst every city will have distinct local circumstances, some common themes are emerging.

First, creating a smart city plan isn't a policy end in itself. It should be seen as a means to achieving a much wider range of policy ambitions.

Similarly, don't create a new, separate team to deliver the change. This is about changing mindsets, changing the culture of existing management. Everyone needs to see this as their responsibility, or nothing will change at all.

Second, be practical and focus on visible outcomes. Once people can understand and see the benefits, the willingness to embrace change will rise.

It's why I think that initiatives around public transport have progressed more, than those in energy or waste management.

Busy people understand the benefits to them of a smarter transport system, especially in saving time. If more people then use public transport, it benefits everyone - from cutting congestion, to lowering pollution and so carbon emissions.

Third, work with residents and businesses, from the start. This doesn't mean occasional consultation, it means creating real partnerships, which truly reflect the wider views and concerns of the community, not the 'agenda' of city hall. That means seeing community or local business groups as partners, not as supplicants.

The challenge beyond

This leads me onto the wider challenge for elected representatives, locally and nationally.

We need to rethink what we mean by representative democracy. People want more than being occasionally consulted about who their representative should be. They want to be able to participate directly in key changes to their neighbourhood and their community.

The huge appetite for Neighbourhood Plans is one obvious example of this interest.

So we shall need to find different points in the system - and different ways - to enable people to participate, and not assume that voting for a councillor is enough.

And there's another social reason why we need to engage with the widest range of people in creating our future cities.

Just 60% of adults in the UK has a smartphone. And for those over 55 years, only 20% have a smartphone.

So we need to be very careful about not just engaging the 'connected elite'. Especially as many of the public services we are discussing are principally used by those very people without either an internet connection or a smartphone.

So I believe we need to think as carefully about the civic framework for future cities, as we do about the technological opportunities.

What impact will Smart Cities have on the future of mobile commerce?

by Hiroyuki Sato, CEO, DOCOMO Digital

The increase of mobile commerce in Smart Cities will almost certainly have a dramatic impact on mobile operators. A 2016 report by Ovum Research stated that if operators, vendors and regulators don't work together to overcome the barriers currently facing carrier-driven payments, the total share of mobile commerce spend processed by operators will drop from 4.1% in 2014 to 0.8% in 2020. Mobile is an essential piece of the Smart City puzzle but if operators can only profit through selling data packages then they will lose out on a considerable slice of the pie.

Hiroyuki Sato, is Chief Executive Officer of DOCOMO Digital which is a newly unveiled initiative 5-years in the making from NTT DOCOMO, Japan's largest mobile operator.

A 25-year NTT Group and NTT DOCOMO veteran, with over seven years of global business management and M&A experience, Sato-san leads DOCOMO Digital with his ambitious vision to enable next-generation mobile-centric digital commerce in the global market as a way to drive universal financial inclusion for banked and unbanked citizens globally.

Sato-san graduated in 1990 from the University of Tokyo with a bachelor's degree in economics; and received in 1999 a Master in Business Administration degree from New York University's Stern Business School with an emphasis in finance and accounting.

Smart Cities will inevitably change the way people shop. Digital and physical goods are already being paid for using mobile devices and this will increase as cities become evermore connected. I believe the biggest impact that Smart Cities will have on the payments industry will be for smaller transactions, things like transport, groceries or eating out, or what is becoming known as the consumer's daily life transactions. The technology to introduce a universal payment gateway for these services already exists so it is now up to merchants, mobile operators and regulators to work together to create an ecosystem where frictionless mobile commerce solutions can be built.

To create a truly frictionless payment experience for end users you need to be able to instantly authenticate and process transactions at the point of sale. The input, whether that's a microchip, smartphone or contactless card, as well as the authentication, through retina, fingerprint or pin code, are already used daily by millions of people so we know the technology exists. The bulk of the work to make daily life transactions instant, safe and convenient for consumers in a Smart City is by converging existing mobile commerce technology into universal payment gateways.

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A 2016 report by Ovum Research stated that if operators, vendors and regulators don't work together to overcome the barriers currently facing carrier-driven payments, the total share of mobile commerce spend processed by operators will drop from 4.1% in 2014 to 0.8% in 2020. Mobile is an essential piece of the Smart City puzzle but if operators can only profit through selling data packages then they will lose out on a considerable slice of the pie.

Another consideration for mobile commerce stakeholders in the future of smart cities is how to overcome the current obstacles preventing operators, merchants and regulators being able to easily work together to create brilliant end

user experiences. The growth of smart cities is reliant on an ability to trade and communicate openly as a connected community. Currently, there are many technological, regulatory and behavioural issues preventing mobile commerce from completely disrupting the payments industries and for these to be solved, everybody has to work together.

The need for collaboration between all stakeholders in the mobile payments industry, particularly when it comes to trends like Smart Cities, goes much further than creating open payment gateways. Actively working with each other to solve problems and create new solutions to tired methods of processing and verifying payments is the key to creating a Smart City that doesn't have a transaction bottleneck.

The mobile commerce puzzle

It's not all doom and gloom for carriers, however. If operators do manage to work with stakeholders, especially each other, to create ways around regulatory issues, consumer education and merchant integration, they will be the primary outlet for processing payments and communicating in Smart Cities. The potential is huge but only if the global players work together to create convenient and safe payment solutions for merchants and end users.

Merchants are set to really benefit from mobile commerce in Smart Cities. Today you can pay for travel, groceries and coffee using your mobile phone, through systems like Apple Pay. While this is great for end-users, merchants aren't yet seeing any real changes from card and cash payments as the transaction still has to go through a bank account, which charges merchants each time it is used. But it doesn't always have to be this way.

Instead of a mobile payment linking to a credit or debit card, it is possible to link this directly to a consumer's phone bill. The merchant can negotiate transaction terms directly with the operator, which can improve merchant margin and operator cash flow. But this is just one option, there are many others that could conceivably happen in Smart Cities. One of the great things about a completely connected ecosystem is that it opens so many doors that would otherwise be closed. If you have an enclosed ecosystem there's no reason why a cryptocurrency like BitCoin couldn't be used to exchange digital and physical goods and services. Whatever happens and whichever mobile commerce payment method is used, it's essential that it's fair to merchants and safe for consumers.

Regulators and banks are another key part of the the mobile commerce puzzle. For many good reasons, verifying a transaction is a multi-layered process. When this is about a multi-million sale of a business or transfer of commodities, it's completely understandable. But when it comes to a 35p packet of crisps, some of the stages
probably are a bit overkill!

For Smart Cities to really become frictionless, it's important for banks and regulators to see and categorise daily life transactions differently to savings and investments. If the multi-stage verification by banks is replaced by mobile operators, mobile payments will become the easiest, safest and most convenient in Smart Cities.

Often when mobile commerce is discussed, the stakeholder that people talk about least is the end-user. I have seen some truly innovative mobile commerce solutions completely fail because people didn't know how to use or trust it. Educating the end-user on any new system is vital and without it, mobile commerce in Smart Cities won't be used. Without reassuring and showing people how to transact effectively through their mobile devices will lead to unprepared people fumbling for their smartphones when trying to pay for coffee or trying to jam £1 into an NFC-only cinema ticket dispenser.

When it does work correctly and consumers know how and where to pay for goods and services, it will be a major step towards the future of Smart Cities. Payment shouldn't be stressful, you should be more worried about whether the smoothie you're buying contains your 5five-a-day than whether the local shop accepts NFC payments. Frictionless, safe and universal payment methods are what the people want and Smart Cities need, we just have to work together to make it happen.

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