ANALYST INSIGHT

# Is Your City Smart Enough?

## Digitally enabled cities and societies will enhance economic, social, and environmental sustainability in the urban century

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## SUMMARY

### Catalyst

Population growth, urbanization, and global warming are fueling an increasing focus on the challenges facing the world's cities. As the global population heads towards 7 billion we are discovering that more people want the benefits of urbanization than our economies, societies, and the environment can necessarily sustain. Accommodating the future billions will require cities that make smarter use of resources to deliver more with less.

Information technology is an important enabler of a more sustainable approach to designing, building, and operating cities. New greenfield cities and major urban renewal projects provide the focus and investment needed to reengineer the way cities work.

### Ovum view

Population pressures are driving an unprecedented explosion in city building. United Nations projections suggest that the world's cities will need to accommodate an additional 2.9 billion people by the middle of what is being called "the urban century." Existing cities will grow and hundreds of cities will be built and expanded to accommodate migration and growth.

Building good cities is expensive and we will see a rise in competition between cities to secure investment and to attract and retain the businesses and people needed for economic success. The limits of economic, social, and environmental sustainability will be tested by this competition.

The terms "smart" and "intelligent" have become part of the language of urbanization policy, referring to the clever use of IT to improve the productivity of a city's essential infrastructure and services and to reduce energy inputs and CO2 outputs in response to global climate change. However, some "smart" and "intelligent" initiatives will no doubt turn out to be neither. Ovum prefers to use the more value-neutral term "digital."

We see two broad streams of digital enablers in cities. The first, digital-city strategies, are the formal/inside-out projects which provide new ways for public authorities and developers to architect and build more efficient infrastructure and services. Digital-city strategies include such things as IP network infrastructure, e-government/gov2.0 services, and the digitization of processes and systems in urban planning, transport, healthcare, education, utilities, and buildings.

The second, digital-society initiatives, are more emergent/outside-in. They stimulate self-help and co-production behaviors in the community, strengthen social capital, and engender digital inclusion. These complement public services, but also hold them to account. Digital-society initiatives include such things as: urban action forums (www.greatcities.org), service interfaces (www.fixmystreet.com), hyper-local websites (www.everyblock.com), support networks (www.tyze.com), volunteering networks (www.volunteerhq.org), collective action forums (www.pledgebank.com), carpooling networks (www.zimride.com), social innovation incubators (www.mysociety.org), digital divide programs (www.digitaldivide.org), and the use of social network platforms, such as Facebook, to form communities and mobilize local action.

Together, formal digital-city and emergent digital-society initiatives offer the prospect of making cities more livable and sustainable even as they become more densely populated.

Greenfield city projects are at the forefront of digital-city innovation, with Songdo in South Korea being one of the most advanced (www.songdo.com). Songdo, which by 2015 is planned to accommodate 300,000 workers and 60,000 residents, is an interesting laboratory for the city of the future. The developer, Gale International, is partnering with Cisco to make Songdo a digital-city exemplar. Cisco's Smart+Connected Communities program aims to implement leading-edge IP networks and IT systems in all aspects of the city's infrastructure and operations, including its utilities, transport, hospital, school, offices, and homes. Every Songdo home, for example, will have a TelePresence unit provided as part of its infrastructure – with over 20,000 units so far confirmed. The city will feature an integrated control center for all of its essential services.

IBM and HP, along with other global technology vendors, have similar programs dedicated to developing and providing technology building blocks and solutions for digital-city strategies.

Digital-city strategies can offer a breath of fresh air to stale e-government programs that have reached a plateau. Online services benefits may have been realized, but deeper IT-enabled, citizen-centric reform has often become stymied by political volatility, structural complexity, conflicting agendas, and scale. The locus of innovation will shift to cities in the urban century because urbanization trends compel cities to innovate and to bring new energy and focus to e-government. Cities are decisive, commercially focused, citizen-centric, and action oriented. Urbanization trends and competitive pressures will only make them more so in the future.

As well, the technology building blocks of digital-city strategies are becoming increasingly globalized, and available to any city on equal terms. These building blocks include: ubiquitous connectivity, anytime/anyplace devices, collaboration platforms, cloud computing, SOA, geospatial platforms, Internet of Things, advanced analytics, open access to public data, digitally controlled devices, and Web 2.0/social networking. These are combining to enable the network to (at last) actually become the computer. Cloud computing is creating the means for cities to use shared global technology and solution platforms, rather than each city building and owning fixed assets and dedicated solutions. Solutions developed in places like Songdo and deployed in the cloud will provide the tools for other cities to accelerate their digital-city visions. Indeed, this approach may be just the competitive advantage an ambitious city is seeking.

The advancement of digital cities requires four critical ingredients:

- leaders who inspire the pursuits of economic, social, and environmental sustainability
- governments, industry, cities, and citizens who collaborate
- cities that leverage proven ideas and solutions to build more city for less
- cities that consciously nurture a vibrant digital society to strengthen social capital and engender digital inclusion.

## Key messages

- Population growth and accelerating urbanization mean that we must develop more economically, socially, and environmentally sustainable cities.
- ICT can transform cities by enabling new digital-city platforms and solutions. This, however, needs to be complemented by the evolution of a vibrant digital society.
- Leadership is required to define a vision of a more sustainable future and to inspire collaboration between government, industry, cities, and citizens to share ideas and to leverage proven platforms and solutions.

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## Bigger and more cities

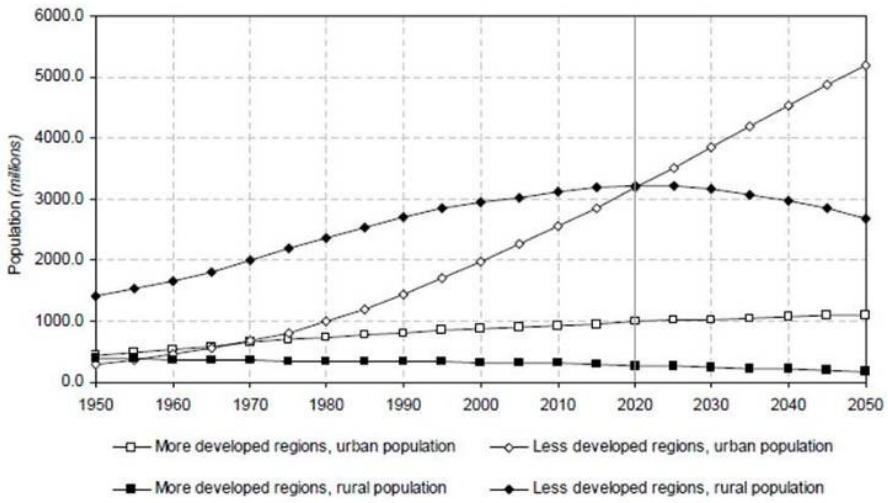
### The urban century

Most people who will read this report will live in cities. The United Nations, in the 2009 revision of its *World Urbanization Prospects* report, noted that 2009 was the year that the world's population crossed the line of being more than 50% urban – with 3.42 billion living in urban areas versus 3.41 billion in rural areas. Ban Ki-moon, Secretary-General of the United Nations, has stated that we are now living in the "the urban century."

This urbanization trend is expected to intensify as the world's population grows. The UN report projected a growth in world population of 2.3 billion between 2009 and 2050, from 6.8 billion to 9.1 billion, with all of this growth focused in urban areas. A further 0.6 billion are expected to flock to cities from rural areas, creating a net growth in urban population of 2.9 billion (84%) over the next four decades.

Urbanization trends, however, vary significantly by region. Figure 1 summarizes the population projections made by the United Nations.

**Figure 1: Urban and rural populations by development group, 1950–2050**




Source: World Urbanization Prospects Report - 2009 Revision, UN, 2010

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The bulk of the projected growth in urban population is expected to occur in the less developed regions – with the urban population of Asia projected to increase by 1.7 billion and Africa by 0.8 billion. China and India together are projected to account for around a third of the increase in the world's urban population to 2050.

The urban population of more developed regions, in contrast, is expected to experience modest growth, and in some cases to decline due to the effects of aging and falling birth rates on the overall population.

### Projected growth in the size and number of cities

Accommodating an additional 2.9 billion urban dwellers will – it goes without saying – require bigger cities, and new cities. How big and how many?

The biggest cities, the megacities, are agglomerations of cities and towns with populations in excess of 10 million. According to the United Nations, there were just 3 megacities in 1975 (Tokyo, New York-Newark, and Mexico City, housing urban populations totaling 53 million). By 2009, there were 21 megacities housing 320 million. The largest megacities are currently Tokyo (36.5 million) and Delhi (21.7 million). By 2050, an additional eight cities are expected to have grown to megacity status, with 29 megacities accommodating urban populations of around 470 million in total. Tokyo and Delhi are still expected to be the largest megacities in 2050.

Beyond the megacities, the UN expects the number of cities with populations of 5–10 million to grow by 14, from 32 in 2009 to 46 in 2050. The number of cities with populations in the range of 1–5 million is expected to grow by 132, from 374 to 506. The number with populations in the 0.5–1 million range is expected to grow by 168, from 509 to 677.

While the megacities attract a global profile, the reality is that growth is distributed across thousands of towns and cities, suburb by suburb, slum by slum. Much of the projected population growth will be achieved by increasing both the density and urban footprints of existing towns and cities – at a population growth rate of around 1–2% per year. This will be combined with many hundreds of major urban development and greenfield city projects, some of which will involve the building of entirely new cities.

Not all cities, however, are growing. Growth in city populations is also a product of intra-city migration. Some cities are experiencing declining populations as overall birth rates decline and/or their citizens decide that greater opportunities and a better life can be found elsewhere.

## Competition between cities

### The fight for investment

The engine of urbanization is the competitive advantages of cities versus rural areas, and of bigger cities and agglomerations versus smaller cities. Cities deliver many obvious economy-of-scale benefits to their citizens, including greater employment opportunities; access to public services such as healthcare, education, transport, and public safety; and the lifestyle benefits of access to resources, culture, and the arts. There is a clear relationship between rising rates of urbanization and rising per-capita GDP. The best performing cities have the highest productivity, create the most wealth, and attract the most capable and creative citizens, and often grow to become megacities and participate in mega-regions as success breeds success.

Building good cities, however, is expensive. Cities are increasingly in overt competition with one another to attract business income and development investment from national and regional governments and from global corporations. This point was noted in the United Nations' State of the World's Cities report in 2008: "The growth of cities through local initiatives reflects a rising trend towards greater urban entrepreneurialism and more intense city competition."

### The urban divide

Not all cities or parts of cities, however, have the economic and administrative wherewithal to out-compete their peers, nor all citizens the ability or desire to migrate to a "better" city. Urban divides are emerging as a major threat to the economic, environmental, and social sustainability of cities. Economically strong cities are weakened by urban divides that distribute urbanization dividends unfairly – creating persistent regions of disadvantage and social unrest. Economically weak cities fall further behind as growing populations overwhelm the city's ability to deliver public infrastructure and services. Concentrations of economic disadvantage in urban areas tend to exacerbate environmental degradation and social unrest.

Sustainable growth, in the long run, requires the recognition that all of a city's residents have a "right to the city" – sufficient economic, social, political, and cultural inclusion to access the city's urbanization benefits. This can only be achieved if we find ways to deliver "more city" more quickly, at lower cost, and in less environmentally damaging ways.

### Build it and they will come?

That even brand-new cities need to reflect the realities of economic and social inclusion is bizarrely illustrated by the phenomenon of empty cities. One often cited example is the Kangbashi New District outside the city of Ordos in Inner Mongolia. Kangbashi is a brand-new city built over 5

years to accommodate 1 million residents by 2010. It is located 15km from the 1.5 million residents of Ordos, and despite the fact that investors flocked to buy the new homes, apartments, and commercial buildings, few residents have chosen to, or can afford to, live in Kangbashi.

No doubt Kangbashi will be populated in due course; this example really just equates to a minor glitch in the balancing of supply and demand created by central planning, economic stimulus activity, and local resource wealth. It is, however, a stark example of why there is a lot more to creating a vibrant and successful city than building offices and houses to a project plan. New cities also need to be economically and socially attractive for their residents.

## Growing pains

Population growth and city building on the scale suggested by the UN's population projections creates many challenges. Cities have historically developed in a largely incremental and ad hoc manner as the cumulative product of individual decisions made by countless administrators, traders, and citizens over hundreds of years. Much of the character of some of the world's most famous cities stems from the serendipitous nature of their evolution.

The rate of population growth, however, has now reached the point where there is universal concern among policy makers about the consequences of unplanned, or poorly planned, urban environments. Most cities, even the most successful, have areas where poor planning has created economic and social disadvantage and environmental degradation. It is becoming clear that our approaches to urban planning and city building need to change if cities are to accommodate an additional 2.9 billion people in reasonable harmony before the middle of the century.

Critical growing pains of cities include such things as air and water pollution, congestion, noise, urban sprawl, overburdened infrastructure, inadequate public services, and the social consequences of unaffordable housing, under-employment, crime, and under-privilege. Rising concerns about global climate change over the past decade have also elevated energy consumption and CO2 emissions to the top of the list of urbanization challenges.

## New cities, new possibilities

More positively, as city administrators contemplate more new cities and major urban redevelopments, excitement is growing around the possibility of fresh thinking and new designs. With a fresh approach, cities can be designed to both minimize the traditional growing pains and to genuinely take advantage of the latest thinking in planning, infrastructure, and technology to succeed on all levels – economically, socially, and environmentally. Smarter cities can become the lifestyle destinations of the future.

## Competitive collaboration among peer cities

While cities can be said to be in competition they also have many challenges and issues in common. There are more than 900 cities in the world with over 0.5 million people, with a further 300 expected by 2050. The number and diversity of cities creates considerable scope for the creation of networks and peer groups of cities facing similar challenges. A range of global forums exist to stimulate collaboration and knowledge sharing between cities, for example www.citymayors.com, www.metropolis.org, and www.cityforward.org, as well as more ICT-centric forums such as www.intelligentcommunity.org and the World Technopolis Association, www.wtanet.org.

These forums reinforce the benefits of joint problem solving and collaboration between cities as peers, but their intellectual leadership, awards, and scorecards also stimulate the intra-city competition that drives innovation. Some cities are literally in competition, but many others are both competing and collaborating with rival cities in equal measure to create and implement their visions for economic, social, and environmental sustainability.

# SMARTER THAN THE AVERAGE CITY

## Digital cities and digital society

### What is in a label?

The terms "smart," "digital," and "intelligent" are used by a wide range of public and private sector organizations in the context of cities and communities, for example: Cisco's Smart+Connected Communities www.cisco.com/go/smartconnectedcommunities; the Digital Communities media site www.digitalcommunities.com; IBM's Smarter Planet www.ibm.com/smarterplanet; Intelligent Community Forum www.intelligentcommunity.org; the SmartCities collaboration project (www.smartcities.info); and Smart+Connected Communities Institute www.smartconnectedcommunities.org.

The "smart" term has also come to be associated with responding to global climate change. The Climate Group's Smart2020 report claimed that global CO2 emissions could be cut by 15% by 2020 through smarter use of ICT in electricity grids, buildings, logistics and transportation, dematerialization, and in the ICT industry itself. (For more information, see www.smart2020.org.)

Some cities are currently implementing urban development or sustainability projects using the "smart" label, for example Amsterdam www.amsterdamsmartcity.com, Kochi in India www.yoursmartcity.com, and Malta www.malta.smartcity.ae.

These "smart" strategies seek to leverage ICT to pursue economic, social, and environmental sustainability to enhance the competitiveness of individual cities and their communities. Ovum, however, prefers to use the more neutrally descriptive labels "digital" or "digitally enabled" in this report. (Some of the "smart" and "intelligent" initiatives will no doubt turn out in retrospect to be neither.) We also find it useful to distinguish between two streams of digitally enabled urbanization:

- **Digital-city strategies:** Inside-out/formal strategies and programs funded and administered by government agencies, metropolitan authorities, utilities, and industry.
- **Digital-society initiatives:** Outside-in/emergent initiatives created by individuals, community groups, NGOs, universities, and start-ups, often using low-cost and publicly available ICT platforms and solutions.

Digital-city strategies create the infrastructure and services that enable the city to function and also create an environment within which digital-society initiatives flourish.

## Digital-city strategies

Digital-city strategies provide new ways for governments, municipal authorities, and private sector companies to architect and build more efficient infrastructure and services. Examples of digital-city initiatives include:

- **Provision of networked infrastructure:** The provision of ubiquitous broadband infrastructure via wired and wireless networks creates a platform for fixed and mobile telecoms, Internet connectivity, and integrated systems in all spheres of a city's activity. This is often seen as an infrastructure prerequisite for a digitally enabled city. For example, the city of Danang in Vietnam is deploying a metropolitan area network with World Bank funding as a cornerstone of its smart city strategy. Developers and hotel operators we interviewed now regard it as essential for IP network infrastructure to be included from the outset to maximize the flexibility and long-term value of their assets.
- **Digitally enabled urban planning:** Online publication of city policy and planning information, online processing of development submissions, and online forums to promote citizen participation in urban planning discussions.
- **E-government:** Ensuring that all appropriate public services are available online, over the phone, or both to boost productivity and reduce unnecessary travel. The scope of e-government is wide, but South Korea is currently regarded as a world leader in e-government, ranking number one in the 2010 United Nations E-Government Survey, with Seoul also ranked as having the best municipal online services in the Rutgers Global E-Governance Survey in 2010.
- **Enabling regulation:** Creation of legislation and regulatory regimes that provide incentives and sanctions in support of environmentally sustainable behaviors by organizations and individuals (for example, carbon trading systems and changes to building regulations to encourage the installation of ICT infrastructure and energy-efficient technologies in new housing developments).
- **Digitally enabled transport:** To improve the efficiency, reliability, and safety of road, rail, bus, taxi, and parking services and to use price and other signals to shape and manage demand (for example, via toll and congestion charges, controlling traffic lights in response to realtime traffic flow data, and portals that help people plan journeys, find car parks, or decide to take public transport instead of driving).
- **Digitally enabled healthcare:** The use of integrated electronic health records/administration systems and networked technology to leverage medical

professionals' expertise (for example, via remote diagnosis, tele-health, in-home monitoring of medical conditions and online consultations via video).

- **Digitally enabled education:** The use of ICT to richen educational experiences, enable access to educational resources and educators, and improve collaboration between students, educators, and parents/guardians. Online education is becoming a global business, minimizing the need to travel for education.
- **Digitally enabled grids and utilities:** The use of realtime metering and control systems for smart grid electricity networks and gas and water utilities. These systems allow improved usage reporting, more cost-reflective pricing, and more efficient alignment of supply and demand to reduce overall resource consumption.
- **Digitally enabled construction:** Initiatives to reengineer the construction industry to minimize waste and emissions and to implement building-automation systems to reduce energy consumption and enable flexible use of spaces within buildings. Leading developers are well aware of the commercial benefits of both improving efficiency in the construction industry and reducing the materials and energy costs of buildings.
- **Open public sector data:** Open publishing of data sets held by public sector agencies to promote transparency and to stimulate the crowd sourcing of innovation and co-production of services.
- **ICT-led economic development:** Creation of technology-intensive business or R&D clusters, special economic zones, or technopolises to attract and stimulate the growth of hardware- and software-intensive industries. Early examples include Japan's Shinanogawa Technopolis, Malaysia's Cyberjaya, Bangalore's software and tech parks, and the Wuxi New District in China. More recent technopolis developments include India's Kochi Electronic Park and Chengdu's Tianfu Software Park, the largest software park in China.

### Digital-society initiatives

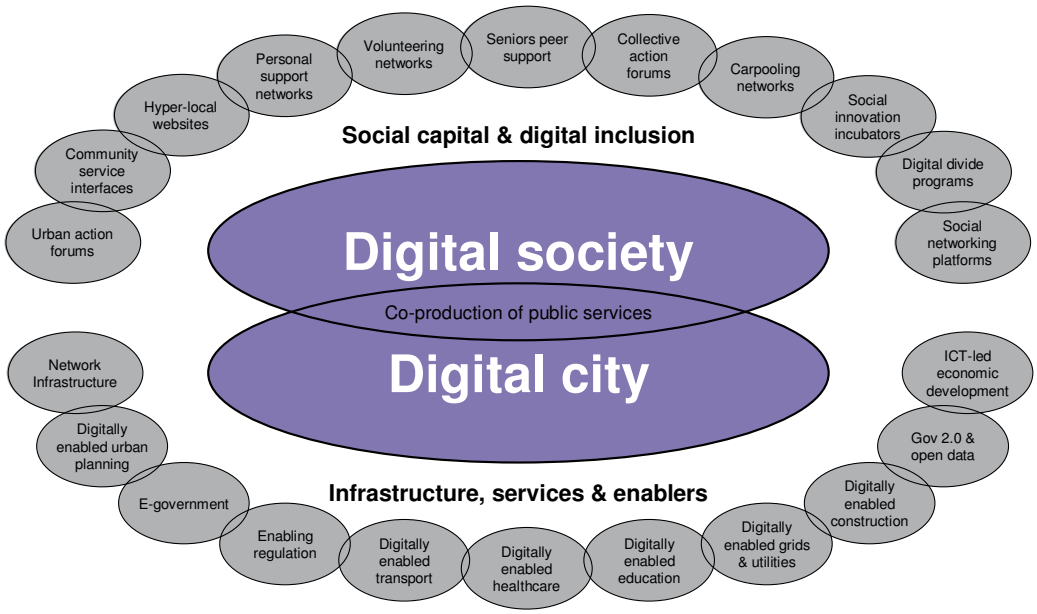
Digital-society initiatives are more emergent and can be regarded as part of broader social innovation and government 2.0 strategies. These initiatives aim to stimulate self-help and co-production behaviors in the community, strengthen social capital (the tendency of people to form voluntary associations), and engender digital inclusion. They help to make cities more livable even as they become more densely populated. Illustrative examples include:

- **Urban action forums:** e.g. www.greatcities.org, www.livableplaces.org and www.planningalerts.org.au – forums for discussion of urban-planning issues and strategies, and for mobilizing local action.
- **Community service interfaces:** e.g. www.fixmystreet.com and www.seeclickfix.com – websites that empower citizens to issue service requests to local government and hold them accountable for action.
- **Hyper-local websites:** e.g. www.everyblock.com – websites focused on individual neighborhoods and "meet the neighbors" websites such as www.streetparty.org.uk and www.groupsnearyou.com.
- **Personal support networks:** e.g. www.tyze.com – a platform for encouraging people to form support networks to care for the infirm, disabled, or elderly.
- **Volunteering networks:** e.g. www.govolunteer.com.au and www.volunteerhq.org – platforms for facilitating volunteering and matching volunteers with opportunities.
- **Seniors peer support:** e.g. www.eons.com and www.boomj.com – social networking sites for seniors.
- **Collective action forums:** e.g. www.pledgebank.com – a platform for enrolling people in local initiatives on the basis of "I'll do it, but only if you help."
- **Carpooling networks:** e.g. www.zimride.com and www.raspberryrideshare.com – websites that facilitate shared car journeys.
- **Social innovation incubators:** e.g. www.digitalpioneers.nl and www.mysociety.org – groups that promote the use of the Internet as a catalyst for social innovation.
- **Digital divide programs:** e.g. www.onelaptop.org and www.digitaldivide.org – groups that aim to distribute low-cost laptops and address digital divides in developing countries.
- **Social network platforms:** There is also widespread use of "generic" social networking platforms such as a Facebook, Blogger, Ning, YouTube, and Twitter as platforms for community collaboration and for mobilizing action on local issues and in natural disaster situations such as earthquakes, storms, and floods.

### Digital-city versus digital-society

We think it is useful to recognize these two streams as distinct, but synergistic, as summarized in Figure 2. While digital-city strategies occupy the mainstream of the formal ICT industry thinking around digitally enabled cities – providing the core infrastructure and services – we believe it is also important to consider the role of emergent digital-society initiatives in urban development.

**Figure 2: Digital-city strategies and digital-society initiatives**




Source: Ovum

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## Digitally enabled city exemplars

### Shining new cities

The UN's population growth projections make it clear that there is a growing demand for new cities – some of which will be designed and built as greenfield developments, particularly in Asia. Such cities provide an opportunity to design and build new forms of urban landscapes using the latest technologies with few of the constraints that limit smart strategies in established cities.

Masdar in the United Arab Emirates is one of the pioneers of digitally enabled, zero-emission cities. Masdar was created in 2006 as a living laboratory for sustainable urban technologies (see www.masdarcity.ae for more information). There are a handful of other such cities on the drawing boards, or having recently commenced construction, including King Abdullah Economic City in Saudi Arabia and Taihu New City in Wuxi China.

Two interesting examples illustrative of the leading edge of the trend of technology enabled cities trend are Songdo in South Korea and the PlanIT Valley in Portugal.

## New Songdo, South Korea

One of the clearest examples of a large new 21st century city nearing completion is Songdo International Business District in South Korea, depicted in Figure 3 (see www.songdo.com for more information).

**Figure 3: Songdo International Business District master plan**

Source: www.songdo.com

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Construction of a new city on 1,500 acres of reclaimed land in the Yellow Sea off Incheon commenced in 2003 and is scheduled for completion in 2015. The master plan for the city aims to be fully compliant with the US Green Building Council's internationally recognized Leadership in Energy & Environmental Design (LEED) ratings. The city will accommodate around 300,000 people during the day, with some 22,500 homes and 60,000 residents.

Design features include public and open spaces, integrated public transport supporting electric vehicles and bicycles, a state-of-the-art hospital and international school, aerotropolis, water- and energy-efficient construction and operations, a centralized pneumatic waste collection system, and extensive use of digital infrastructure and systems throughout the city.

### *Cisco in New Songdo*

Cisco was appointed as the technology partner for Songdo by the developer Gale International in 2009 and has used Songdo as a catalyst for the development of a comprehensive suite of smart ICT infrastructure and solutions under its Smart+Connected Communities program. This is part of a US$2bn program of investment by Cisco in South Korea.

The essence of Cisco's program is to assist urban planners and architects to design smart technology in from the outset, as part of a city master plan, and then to build it and provide it "out of the box" for the next new city. In Songdo, this translates into extensive digital plumbing and control systems designed in throughout the built environment, most tellingly evidenced by Cisco's intention that every home in Songdo will have a TelePresence unit provided as part of its infrastructure. Over 20,000 units have so far been confirmed. The TelePresence units will enable residents to access a wide range of city services from their homes via interactive high-definition video. Songdo's Chadwick International School was opened in 2010 with two TelePresence studios plus a screen in each classroom and prides itself on extensive use of digital technologies in its curriculum.

Cisco refers to these customer-facing applications as Community+Connect – the smart use of technology to transform the way people "live, work, play and learn." Cisco's Community+Connect program aims to create new ways for people to experience homes, offices, shopping, major sporting and public events, transport, healthcare, education, and interaction with government agencies.

The fact that all this is designed to a master plan means that all of the city's infrastructure and services can be connected to, and controlled by, a central integrated operations center running in a centralized data center complex. Cisco refers to this as a Community+Exchange – the back-office systems that enable integration of utilities, transport, emergency services, building automation systems, and government services. (For more information, see www.cisco.com/go/smartconnectedcommunities.)

Cisco demonstrated a range of Community+Connect and Community+Exchange solutions developed for Songdo in its pavilion at the 2010 World Expo in Shanghai. (More information is available at www.ciscocom/go/expo2010.)

### *Other Smart+Connected Communities initiatives*

Cisco's Smart+Connected Communities program is being used to accelerate smart-city planning projects in a range of other cities including: New Tianfu City, Chengdu, China (www.tianfusoftwarepark.com); Lavasa City, India (www.lavasa.com); "Technopolis Skolkovo," Russia (www.skolkowo.com/category/skolkovo-technopolis); and PlanIT Valley in Portugal (see below).

Cisco is also using its Smart+Connected Communities program to assist urban renewal projects in Bangkok in Thailand; Barcelona in Spain; Chongqing in China; Danang City in Vietnam; Jazan Economic City in Saudi Arabia; the cities of Holyoke, Massachusetts, and San Francisco, California, in the US; and Toronto and Vancouver in Canada.

## PlanIT Valley, Portugal

One of the more ambitious, and speculative, digital-city strategies under way is PlanIT Valley in Portugal. Living PlanIT is a company that aims to use the 4,000-acre PlanIT Valley project as an R&D "collaboratory" for the development of the technologies of the city of the future. Construction is scheduled to start in 2011. (For more information, see www.living-planit.com.)

Living PlanIT aims to pioneer three categories of new technologies. Its vision is to take a radical approach to reengineering all aspects of the construction and operation of cities. The planned technology innovations include:

- **Urban Operating System:** an integrated software environment for coordinating all of a city's systems and services.
- **Xtreme Construction Platform:** reengineering the construction process using techniques that are already well established in (for example) the automotive and aviation industries. The plan is to create platforms based on modular designs, automation, advanced materials, extensive use of sensors, logistics optimization, etc.
- **Sensor Network Technologies:** development of technologies for placing sensors throughout the city and its systems to monitor and feed data to the Urban Operating System and enable automated and remote control.

One of the core concepts behind PlanIT Valley is to comprehensively reengineer the processes and systems involved in planning, building, and living in a city. The aim is to reduce the resources required by cities and to increase the flexibility and adaptability of the built environment, enabling it to evolve as the city evolves without the wasteful construction processes and cycles of building, demolition, and rebuilding that occur in traditional cities.

It is not clear whether or not Living PlanIT will gain traction with its plans for PlanIT Valley, but the venture is an interesting, if extreme, example of the momentum that is growing behind attempts to bring a fresh ICT-centric/process-reengineering perspective to the business and technology of building cities.

### Smart21 award-winning cities

At a more practical level, an excellent resource for highlighting digital-city exemplars in established cities is the Intelligent Community Forum (www.intelligentcommunity.org). This forum has run an annual Smart21 Communities award program since 2006 to identify and celebrate leading examples of digitally enabled cities. The awards program has accumulated over 100 case studies which provide many examples of the digital-city initiatives noted earlier.

### Other smart-city surveys

Other useful surveys of leading practices for digitally enabled cities include:

- Digital Cities Survey from e.Republic's Center for Digital Government and its Digital Communities Program, with 10 years of surveys of leading cities in the US (www.digitalcommunities.com/survey/cities).
- The European Digital-City Rankings produced in 2007 by the Vienna University of Technology. This ranking covers 70 medium-sized cities across Europe ranked on the dimensions of a smart-city model, including economy, mobility, environment, people, living, and governance (www.smart-cities.eu).
- The Rutgers Global E-Governance Survey carried out by Rutgers, The State University of New Jersey, in the US, which identifies the leading municipal websites globally. The city of Seoul in South Korea was the top municipal website in 2010 (www.rutgers.edu).

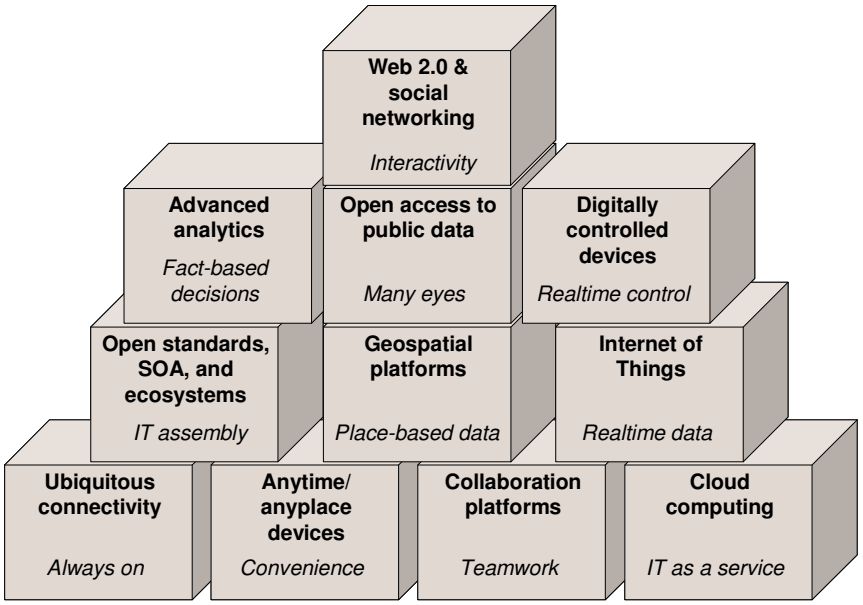
# ICT IN THE CITY

## City-building technologies

### IT building blocks for digitally enabled cities

Figure 4 summarizes Ovum's view of the IT building blocks of digitally enabled cities.

**Figure 4: IT building blocks of digitally enabled cities**




Source: Ovum

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### Ubiquitous connectivity – always on

Ubiquitous connectivity is the essential infrastructure of the 21st century – the contemporary equivalent of the rail and road infrastructure which fueled economic development through much of the 20th century. Access to high-bandwidth, competitively priced Internet and mobile network connectivity anytime/anyplace is viewed by most governments as an essential platform for a modern economy.

A wide range of different types of projects have been implemented at national, regional, municipal, and community levels around the world to fund and implement Internet connectivity. One of the most ambitious national broadband investments currently under way is the Australian government's A$40bn+ National Broadband Network (NBN). The fiber-to-the-home open access network seeks to provide 93% of Australia's homes with 1Gbps connectivity and the remainder with 12Mbps connectivity using satellite and wireless technologies. The rollout of the NBN commenced in 2010 and is expected to take 8 years.

### Anytime/anyplace devices – convenience

The mobile phone revolutionized the way people lived and worked in the late 1990s and we are seeing the next phase of this revolution in mobility play out with the latest generations of smartphones, tablets, and laptops.

The Apple iPad in particular has reshaped people's perception of a device that is primarily designed for accessing services from the cloud via a Wi-Fi or 3G network. Other tablets and netbooks are blurring the boundaries of the "phone" and the "computer." The iPhone and Android smartphones with their app stores have also transformed the way people think about buying and using applications. Combined with other forms of interface devices such as surface computing, kiosks, and point-of-sale devices, we are rapidly reaching the point where increasingly useful and relevant online services are available anytime/anyplace.

### Collaboration platforms – teamwork

Unified communications and collaboration platforms are maturing to bring together previously discrete technologies such as voice, SMS and email messaging, calendars, office automation tools, online meetings, and video conferencing. These platforms can significantly increase the productivity of teams, enable remote working, and minimize the need for travel for meetings. The latest generation of online meetings and high-resolution video conference systems, such as Cisco's WebEx and TelePresence, offer a genuine alternative to face-to-face team meetings.

### Cloud computing – IT as a service

Cloud computing refers to the provision of computer processing, storage, and applications as a service over the Internet or a secure private network on a pay-as-you-go basis. This makes computing services available from any broadband connection without the need to buy and own the back-end computer hardware and software.

Cloud computing will be a powerful enabler of both digital-city and digital-society initiatives because it makes massive computing and storage power and sophisticated applications available

to anyone, be they an individual, a small business, an NGO, a local authority, or a large metropolitan government. As cloud computing services become more mature and trusted, they will reduce the threshold of funding and technical knowledge required to implement a new application. This will drive a wave of ICT-enabled innovation throughout cities and society.

### Open standards, SOA, and ecosystems – IT assembly

One of the significant trends in the ICT industry in the past decade has been the recognition of the value of open standards, published interfaces, and ecosystems of vendors producing interoperable hardware and software systems within a service-oriented architecture (SOA). This allows a more emergent approach to the creation of applications, which can be assembled from preexisting system components and web services rather than having to be custom-built as monolithic projects.

### Geospatial platforms – place-based data

Free or low-cost online geospatial platforms such as Google Maps and Microsoft Bing Maps, combined with GPS and other location-sensing technologies in mobile phones, have made it a lot easier, faster, and cheaper to present and manipulate data on a map or aerial image. Interactive maps are a powerful way to visualize and locate assets, resources, and services in a local community or neighborhood, and are invaluable tools for engaging citizens in planning dialogues.

### Internet of Things – realtime data

As connectivity becomes more ubiquitously and reliably available and as the cost of devices falls, we are seeing increasing possibilities for connecting a wide range of sensors to the Internet via wired or wireless communications such as RFID, Wi-Fi, and 3G networks. Examples include still and video cameras; and sensors for temperature; humidity; light; vibration; spatial location and orientation; wind; electricity, gas, and water consumption; the mass and velocity of objects; the health status of people and devices; etc. Once sensors are connected, data can be recorded, analyzed, and stored for retrieval by any Internet device from any location. Practical uses already well established include remote security monitoring, monitoring of energy consumption, food traceability, and the remote status/health monitoring of devices, vehicles, and people.

The Internet of Things is one of the fastest growing frontiers of ICT innovation and is currently a major focus of Chinese technology investment. Chinese Premier Wen Jiabao made a speech in Wuxi in 2009 calling for the rapid development of Internet of Things technologies, famously declaring "Internet + Internet of Things = Wisdom of the Earth." Wuxi Tech Park has since become the center of Internet of Things developments in China (see www.en.wuxi.gov.cn/web2010/internetofthings for more information).

### Advanced analytics – fact-based decisions

As more and more data is available in the Internet of Things, and as analysis tools become more sophisticated, we will see a rapid growth in innovation associated with making fact-based decisions and controlling events based on realtime data. Advanced analytics and business intelligence systems will provide the means to detect patterns, generate alerts, predict trends, and visualize information in oceans of data. The rise of advanced analytics systems will be accelerated by synergy between the Internet of Things (more data) and cloud computing (scalable processing and storage capacity).

### Open access to public data – many eyes

The open standards trend has also extended to data as government agencies have recognized that "more eyes are better" when it comes to adding value to data. Many countries have followed the path initially set by the US government's data.gov website for publishing government datasets. The UK government's data.gov.uk website now provides access to over 5,600 datasets and has stimulated the creation of hundreds of apps which help citizens find information and make decisions.

### Digitally controlled devices – realtime control

There is a universal trend towards appliances and devices being digitally controlled to enable their integration into computerized home, building, and infrastructure control systems. For example, home automation technologies allow heating, cooling, lighting, window coverings, and security systems to be controlled from a central computerized controller – and even remotely via a mobile phone or laptop. Digitally controlled devices are a key enabler of smart buildings and smart transport systems.

A key issue here is that the devices and systems required for digital control need to be built in at the time of construction – they can be very expensive to retrofit. A sensor, for example, can often be retrofitted using wireless networks, but actually controlling an appliance or service will likely require motors and actuators. If these are not present in the installed equipment, it may not be economically feasible to retrofit them.

### Social networking – interactivity

Web 2.0 design patterns and software capabilities have had a big impact on the appeal and engaging quality of online services. The participation, interactivity, ease of use, and evolutionary nature of Web 2.0 applications are well suited to enabling and supporting community activity. Wikis

such as Ning and Wikia and blogging platforms such as Blogger or WordPress have made it a lot easier to publish and share information and to mobilize community action.

Social computing platforms such as Facebook, Twitter, LinkedIn, MySpace, and Orkut have proven to be popular platforms for creating and sustaining online communities of interest. Facebook in particular has matured from being used solely for social/informal networking to also being used for maintaining a wide range of more formal networks based on particular organizations, campaigns, cities, communities, and issues. Social networking platforms will become increasingly powerful tools for building social networks in cities.

## Smarter use of public goods

### "Big/small," "global/local" ICT

One of the powerful themes to have emerged from the combined effect of these technologies is a fundamental shift in the dynamics of scale. As ICT power becomes more ubiquitous – via broadband, anytime/anyplace devices, cloud computing, and open standards – the basic building blocks of compute, storage, web services, and data sources become more and more commoditized and utility-like. This makes it easier for individuals and businesses to use these utility-like services in ever more innovative ways – fueled by collaboration platforms, social networking, and unprecedented global flows of information and services.

A (small/local) start-up company using a (big/global) cloud computing platform like Amazon Web Services, Google App Engine, Microsoft Azure, Netsuite, or Salesforce can provide services to thousands or millions of customers worldwide with unprecedented ease and speed. A person or a community group can create a conversation on a (big/global) platform like YouTube, Facebook, or Wikia to mobilize interest in a (small/local) town-planning or social policy issue – for free.

### Twitter as a public good?

The Web 2.0 effect is that the greater the number of users and the richer the data in these services, the more useful they become as ubiquitous platforms for innovation at the local level. Australian economist Nicholas Gruen observed at the World E-Gov Forum in 2010 that services such as Google, Wikipedia, and Twitter are, in effect, public goods – economically and socially useful services available to all.

The paradox here is that big global investments in ICT infrastructure and platforms turn out to create powerful public goods that make small local innovations possible. These investments are now so big, and the economies of scale and scope so compelling, that it makes less and less

sense for individual cities and smaller governments to invest capital in duplicating these public goods via local computing infrastructure and applications.

### The shift from own to orchestrate

ICT in the 20th century, particularly in government agencies and city authorities, was very much a "build, customize, and own" affair. Each agency and city duplicated infrastructure and reinvented the wheel – often in areas that became more of a financial millstone and a constraint on innovation than a source of competitive advantage.

The problem with this model was that ICT became rationed by the ability of cities to raise capital and to build and own ICT infrastructure and applications. High population-growth scenarios create increasing challenges for the "build, customize, and own" model as cities struggle to fund the rising costs of their dedicated ICT operations.

ICT in the 21st century will be more of a "source and orchestrate" affair. Increasingly powerful and useful applications and services will be available over the Internet and delivered via cloud computing models – no up-front investment, pay-as-you-go. This, however, requires some changes in thinking about the need to own in-house ICT assets and the necessity of dedicated, customized solutions.

One early example of fresh thinking is the widespread trend now for universities to use cloud email and office productivity applications from global providers like Google, IBM/Lotus, and Microsoft. Universities have come to understand that there was no value in owning subscale, out-of-date, hardware and software when they could buy a better and less expensive solution as a service from the cloud.

Even large government agencies are now starting to use cloud services for core applications. In December 2010, the US government's Government Services Administration (GSA) agency selected Google Apps in a $6.7m, 5-year deal to replace Lotus Notes as the email and collaboration platform for its 17,000 users. Casey Coleman, the GSA's chief information officer, commented in a media release, "Cloud computing has a demonstrated track record of cost savings and efficiencies. With this award, GSA employees will have a modern, robust email and collaboration platform that better supports our mission and our mobile work force, and costs half as much."

The smarter way of accelerating digital-city strategies is to leverage proven, shared, commodity solutions and services which can be used anytime, anywhere and can scale rapidly.

# DIGITAL CITIES ARE REVITALIZING PUBLIC SECTOR REFORM

## Advancing beyond the e-government plateau

### E-government's identity crisis

E-government has for the past decade been the primary technology agenda of national and regional governments. Countries regarded e-government as a key driver of ICT-enabled modernization, and prided themselves on their ranking in the annual United Nations E-Government Survey.

For many governments, however, the e-government strategy agenda has lost momentum in recent years, and has reached a plateau in terms of its ability to effect real change. As we observed in our 2008 report titled "E-Government's Identity Crisis," the "e" in e-government has progressively lost its power as a universal agent of national modernization.

This is not to downplay the successes, of which there have been many. Services became easier to access and became more citizen-centric due to integration of systems at both the point of interaction and in the back-end processes and systems. Agencies became more efficient and better coordinated. Industry development programs accelerated e-commerce adoption and the development of export-earning ICT industries.

Many countries have now matured beyond this first phase of "big e-government strategies," and the "e" has lost its allure as an overarching catalyst of reform at the national or whole-of-government level. There are a number of reasons for this:

- The low hanging fruit of technology enabled modernization has largely been picked, e.g. putting services online, automating previously manual processes, and creating online portals to integrate services.
- Most of the straightforward cross-agency applications have been completed; the next phase requires deeper organizational and process reengineering, which is difficult because it challenges bureaucratic structures, multiple layers of government, and the entrenched interests of NGOs and private sector organizations.
- These more ambitious and difficult reform projects are big, high-risk projects and many have experienced disappointing outcomes, cost and time overruns, and even outright failure.

- ICT costs have risen as a percentage of agency operating costs and have themselves become the subject of efficiency strategies such as consolidation, rationalization, and shared services; the desire to cut ICT costs has been compounded by the effects of the global financial crisis.
- Stimulation of the digital economy has been successful, but globalization and competitive pressures are intensive, so it is not necessarily as clear as it once was how governments should seek to grow their ICT industry further.

### The "e" is mainstream, and no longer warrants special attention

The effect of this has been for the "e" to become once again viewed as just another of the complex mix of factors that governments need to manage – a cost to be minimized and a risk to be contained rather than a surefire driver of innovation.

In part this is due to the success of past e-government programs. The "e" has become fully embedded in all government and business activities to the point where it is the responsibility of every executive to use ICT to boost productivity and to drive innovation. The "e" has been mainstreamed, and so is no longer as amenable to visionary leadership; there are now many competing leaders and visions.

This effect is most noticeable in the larger democracies, such as the US, Canada, the UK, and Australia, with their many layers of national, state, and local governments and governing bodies. Complexities of scale and organizational structure too often defeat visionary intent.

Asian governments tend to still have visionary e-government strategies in mid-flight – in many cases reflecting their more authoritarian governance styles and the fact that some are still in the midst of rolling out their first generations of Internet infrastructure and online public services. In Asia, e-government strategies continue to benefit from the furious pace of growth.

The root of the challenge to "big e-government strategies" is the complexity of implementation. As ICT has become more pervasive throughout public and private sector organizations, it has become progressively more difficult, at a practical level, to use ICT as a lever for across-the-board change and modernization. Nationwide and region-wide e-government has become bogged down in complexity.

## Digital cities bring fresh action to e-government policy

### Competition and diversity stimulate innovation and action

Competitive collaboration between cities can bring a renewed sense of energy and focus to e-government agendas that have reached a plateau. Change programs can be more achievable at a city level, particularly when there is a politically strong and visionary leader. Cities have a range of benefits as drivers of ICT-enabled reform:

- **Citizen-centricity:** Cities are a fusion point for services from all levels of government, which obliges a practical approach to the delivery of "joined-up," citizen-centric government services. While it can be frustrating trying to assemble services that involve multiple agencies and layers of government, cities have a greater motivation to make this work than national or regional government agencies do individually.
- **Focus:** A city has a more focused set of problems to solve and a more immediate set of imperatives to act upon than do national and state-level bureaucracies. This focus can lead to a more practical and action-oriented approach, particularly in the context of a major new city or urban redevelopment project. Urban development authorities have proven to be a good way to further accentuate this local focus.
- **Commercial orientation:** Cities are usually more commercially oriented, and can be less bound by complex procurement constraints than national or regional governments. Cities are in the business of development, are experienced with managing large contracts, and tend to be more comfortable with public-private partnerships.
- **Leadership stability:** Cities can be less affected by national and regional government political cycles and tend to have longer periods of leadership continuity (if the mayor and municipal authority are perceived as effective).
- **Among peers:** Cities have many peers around the world – other cities with similar characteristics that can provide opportunities for sharing insights, ideas, and solutions. It can be easier for a city to openly share information and experiences than it is for a regional or national government. The more direct nature of peer-to-peer relationships between cities can accelerate the propagation of urban innovation.

Cities, of course, also have limitations of scale and access to capital and operational funding – particularly for large-scale infrastructure developments – and so need to develop skills in partnering and attracting investment.

## Digital-city implementation challenges

### Another "silver bullet"?

Many policy executives remain somewhat skeptical of the idea that ICT will be any more of a "silver bullet" for cities than it proved to be for previous generations of ICT enabled policy programs. Utopian visions of digital cities – with their "integrated operations centers" and "urban operating systems" – are intriguing and thought provoking, but they can look like expensive and high-risk solutions seeking problems. Mayors and executives who bear the scars of visionary ICT projects that have failed or encountered significant cost and time overruns will be naturally cautious about large digital-city projects.

### Alignment with existing policy agendas

One of the challenges for digital-city initiatives is aligning them with the complex web of policy and strategy initiatives already running in any government. National and regional governments, and even large municipal authorities, will have a range of demand-side and supply-side policy initiatives under way to stimulate the growth of the digital economy, strengthen communities, and improve e-government. A digital-city strategy will need to align with, and draw from these existing policy agendas. For example, digital-city initiatives may align, or clash, with existing national, regional, or municipal policy programs in the areas of:

- ICT industry vision and leadership
- digital economy and ICT promotion
- e-government, Gov2.0, and open public data
- competition policy and regulation reform
- centers of innovation and tech clusters
- business development and support
- infrastructure development
- digital inclusion and ICT literacy/skills
- export support and promotion
- securing inward investment in the ICT sector
- research and development
- awards, incentives, and showcasing.

Digital-city strategies will be most effective if they are part of a master plan that aligns with policy programs in other levels of government – and that also draws in resources and funding from these programs. It can be challenging, however, to align initiatives across layers of government. The coordination can add costs and risks of its own. Cities will need to assess the trade-off between the benefits of local policy autonomy versus the benefits of being part of broader regional or national policy programs.

### Balancing public and private sector interests

Large corporations have long played a crucial role in urban development projects; architects, developers, engineers, and technology companies are integral with all stages of the lifecycle of project from concept through to implementation. Public-private partnerships are a well established and proven way of blending the roles of government agencies, municipal administrations, and private sector corporations.

The trend towards more digitally enabled cities, however, creates new challenges for these partnerships because of the interdependence of digital-city and digital-society initiatives and their pervasive impact on people's lives. The model of corporations owning and operating physical assets such as a city's utilities, buildings, and roads has a long history and is well understood. A future, however, where corporations comprehensively own and control a city's core digital infrastructure, applications, and data is new territory.

Some of the tensions likely to arise are discussed in the Institute for the Future's report titled "The Future of Cities, Information, and Inclusion" (www.iftf.org/inclusion). Digital-city systems will progressively streamline and automate all aspects of the way citizens live. How will access to the systems and their data be governed and controlled? How will municipal authorities avoid widening digital divides when the digital fabric of the city is run by corporations, for the benefit of their shareholders?

Careful thought will need to be given to the longer-term social policy implications of public-private partnerships as digital-city strategies become more pervasive. We see digital-society initiatives as playing an important role in creating balance between public and private sector interests.

## Key behaviors for advancing digital cities

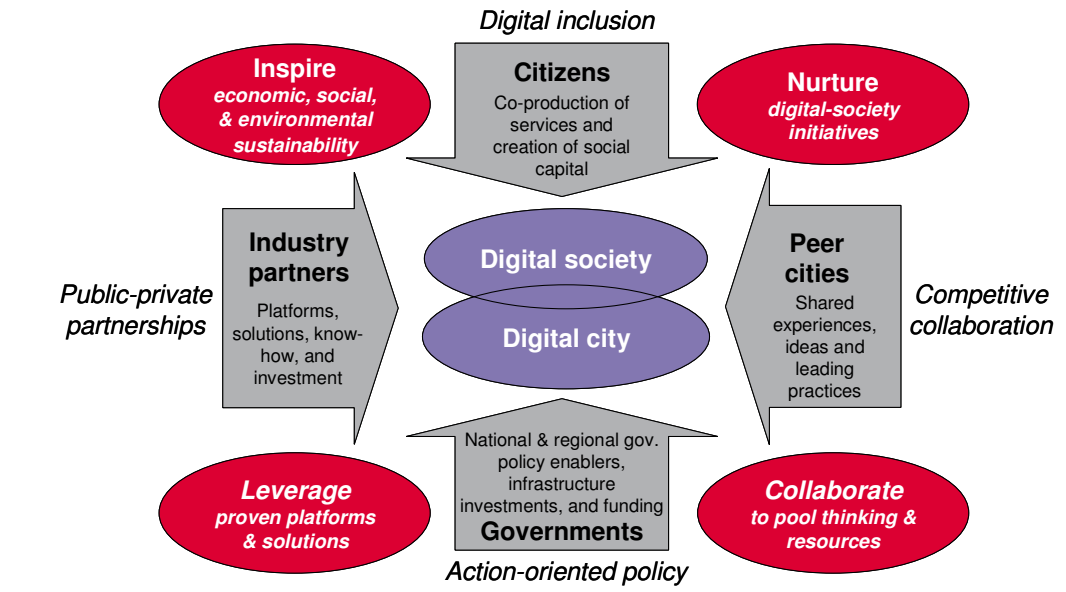
### Inspire, collaborate, leverage, nurture

Our research has shown that the advancement of digital cities requires four critical behaviors from the parties involved:

- leaders who inspire the pursuits of economic, social, and environmental sustainability
- governments, industry, cities, and citizens who collaborate to pool thinking and resources
- cities that leverage proven ideas and solutions to build more city for less
- cities that consciously nurture a vibrant digital society to strengthen social capital and engender digital inclusion.

These behaviors and their actors are summarized in Figure 5.

**Figure 5: Key behaviors and actors for digital-city strategies**




Source: Ovum

### Inspire – economic, social, and environmental sustainability

Leadership is a critical success factor in any competitive or collaborative effort; team leaders and coaches make the difference between winning and losing, between achieving goals and simply surviving. If we believe in the idea that cities will compete to attract investment and to attract and retain the best businesses and citizens then the quality of leaders is paramount.

It almost goes without saying that digital-city strategies require inspirational leaders to paint a vision of the future of the city, to explain why ICT is a key part of achieving the vision, and to **inspire** a team of people to pursue the vision over a sustained period of time.

### Collaborate – to pool thinking and resources

A city is the focal point at which a wide range of people, services, products, and technologies converge to create a place to live, work, play, and learn. A key behavior is to **collaborate**. Success is very much a product of collaboration between a wide range of public and private sector organizations and individuals as both producers and consumers of services.

Cities will need to collaborate with:

- **National and regional governments and NGOs –** to participate in policy programs and to obtain investment and support for infrastructure and locally specific projects.
- **Peer cities** – as part of megacities, regional alliances, or growth corridors and as members of global associations and forums.
- **Industry partners** – to attract investment and to partner with a wide range of organizations including architects, developers, technology and services providers, chambers of commerce, trade and industry groups, universities, and policy think tanks.
- **Citizens** – to engage them in the future of their city, seek their input and participation in the development of policies and plans and to stimulate digital-society initiatives.

Urban development authorities can be an effective approach to coordinating activity and promoting collaboration – providing focus for both the public and the private sector.

### Leverage – proven ideas and solutions

A city is one of hundreds, or even thousands, of similar cities or communities around the world. This means that there is considerable scope to share and **leverage** ideas, strategies, and solutions from elsewhere. Cities that share and leverage will move faster. The rise of global

Internet platforms and cloud computing is lowering the barriers to discovering and leveraging ICT enabled services and solutions. As the pace of growth accelerates, cities that can access trusted and scalable services will move faster than those that build and own dedicated assets.

### Nurture - digital-society initiatives

Effective digitally enabled cities create environments where a vibrant digital society flourishes. A key behavior is to **nurture** purposeful social networking though digital-society initiatives that are aimed at stimulating the co-production of public services, building social capital, and engendering digital inclusion. Social networking is a powerful global force. All that is required is to harness this force to the city's vision of economic, social, and environmental sustainability.

# RECOMMENDATIONS

## Recommendations for city leaders

City leaders are urged to consider that two synergistic streams of activity are required: digital-city strategies and digital-society initiatives. Digital-city strategies will be familiar territory, being extensions of long-running municipal ICT strategies and e-government–style projects. Digital-society initiatives, however, will likely be less familiar. While we have stated that digital-society initiatives often emerge from the community, we should not underestimate their power in shaping citizen behaviors nor the need for city leaders to put in place some critical enablers, most importantly ubiquitous connectivity and a supporting regulatory environment. The city should also consider proactive policy support for digital-society initiatives, for example via the sponsorship of social innovation incubators and digital divide programs.

City leaders are advised to consider how they demonstrate four key behaviors: inspire, collaborate, leverage, and nurture.

## Recommendations for industry partners

Digital-city initiatives present significant opportunities for organizations throughout industry. The market is substantial, with hundreds of cities likely to be seeking to plan and implement digitally enabled city strategies in the coming decades. We recommend that vendors develop the same behaviors as their city leader customers:

- **Inspire:** provide compelling and practical illustrations of how the cities of the future will work to make it easier to define and sell a digital-city vision.
- **Collaborate:** develop practical collaboration behaviors and demonstrate to city leaders how these behaviors can reduce the risk and cost of digital-city projects and accelerate their implementation.
- **Leverage:** create standardized platforms and solutions that are able to be leveraged as building blocks by many cities around the world.
- **Nurture:** proactively seek to raise awareness of urban development issues and possibilities, influence the debate on leading practices, and create demand for both formal digital-city solutions and for emergent digital-society initiatives.

# APPENDIX

## Further reading

Profiting from Smart Meter Communications Networks: Alternative Revenue Theories and Cisco's S+CC, January 2011, OI00034-005.

Mobile Applications in the UK Public Sector Post-CSR: Equipping Government's Field Forces for Efficient Working, January 2011, OI00020-003.

2011 Trends to Watch: Cloud Computing Technology: One of the Most Important IT Trends of the Decade Has Barely Started, January 2011, OI00001-011.

Planning for Cloud Computing: Understanding the Organizational, Governance, and Cost Implications, November 2010, OI00005-006.

2011 Trends to Watch: Healthcare Technology: Better Patient Outcomes and Cost-cutting Are Driving Technology, October 2010, OI00001-017.

2011 Trends to Watch: Utilities Technology: Improved Efficiency and Cost Control in an Era of Disruptive Technology, October 2010, OI00001-006.

Consumer Attitudes to Billing, Payment & Smart Metering in the Australian Residential Electricity & Gas Market, September 2010, BFEN0594.

BI and Analytics: Making the Smart Utility Intelligent: How Utilities Can Use Business Intelligence to Extract Value from Across the Enterprise, June 2010, DMTC2385.

A Healthcare Provider's Guide to Telehealth: Demystifying an Emerging Technology, June 2010, BFTC2591.

Will Cloud Computing Enable or Undermine Public Sector IT Climate Change?, May 2009, OVUM050757.

The Development of Smart Grids, February 2009, BFEN0372.

E-government's Identity Crisis, October 2008, OVUM049793.

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## Methodology

This research report was sponsored by Cisco Systems Inc., and was based on a wide-ranging set of inputs including analysis of 400 delegate feedback surveys from Cisco's Smart+Connect Life pavilion at the Shanghai Expo, interviews and discussions with selected Expo delegates, city leaders, and developers. Our research was complemented by extensive online research and Ovum's extensive prior research insights.

## Ovum Consulting

We hope that the analysis in this report will help you make informed and imaginative business decisions. If you have further requirements, Ovum's consulting team may be able to help you. For more information about Ovum's consulting capabilities, please contact us directly at consulting@ovum.com.

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