Digital Urban Renewal

Retro-fitting existing cities with smart solutions is the urban challenge of the 21st century

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SUMMARY

In a nutshell

New tools created by the ICT industry have the potential to help city governments address the growing range of challenges that they are facing. However, the tools themselves are not a "silver bullet" that will solve urban problems in one stroke. Deploying them will require a new discipline of digital urban renewal and a philosophy that incorporates both political leadership and open collaboration.

Ovum view

In both mature and emerging markets, city authorities are facing a number of significant challenges. Resources are limited and often diminishing, old problems such as traffic congestion remain, and new ones such as reducing carbon emissions continue to arise. Building new, green cities from scratch is a great way to showcase potential solutions, but most people will never live in this kind of development. Instead, retro-fitting existing cities with "smart" solutions is required, but achieving this represents an extremely complex task for city authorities.

The ICT industry is able to provide some new and effective tools to help deal with some of these problems. These are not limited to the e-government initiatives and applications of the early 2000s that were largely dominated by the Web 1.0 publishing and form-completion paradigm. There are now new and powerful connectivity technologies, including high-speed fixed and mobile broadband, and there is a new kind of software that better supports co-production, collaborative consumption, and participation. There is also a philosophy of openness and collaborative

development, which is derived from Web 2.0 and open source software. In addition, there is a “vanguard” of advanced users that have been educated by online gaming and social networks, giving them the skills to make use of the tools that cities can offer.

However, the new fully connected city is not ready to be built as there are still significant institutional and organizational barriers that make it difficult for cities to exploit the potential of the new technologies in a comprehensive way. The new tools are components rather than solutions, and while they are considerably more powerful together than they are individually, integrating them to derive maximum value is difficult.

There is a tendency to deploy isolated point solutions or treat the application of technological solutions to urban issues as a problem that must be solved all at once. However, these methods can lead to paralysis and inaction.

A new discipline is required that enables "digital urban planners" to find a balance between fragmentation and a one-off vertically integrated and inflexible master plan. This discipline would be able to work with the different environments that characterize individual cities while enabling the benefits of experience and scale to be realized.

While it is premature to define exactly what form this discipline will take, it is likely to include:

- tools for developing a digital master plan, including case studies and templates
- tools for the creation of business cases and for ongoing evaluation
- a guide for individual solutions and applications, and a library of reusable widgets and drivers from which these can be built
- an annotated logbook to facilitate the sharing of experiences between developers and their urban clients.

TABLE OF CONTENTS

TABLE OF TABLES

SMART CITIES, CONNECTED COMMUNITIES

The smart city and the smart/connected community is a collection of initiatives rather than a tightly defined discipline

The idea of the smart city or community has a center but no clearly defined boundary. There is not even a general agreed terminology, with "smart city", "intelligent city", "wired city", "senseable city," and "smart and connected community" all used to describe similar concepts. While no one owns any of these terms, some tend to be associated with particular vendors or linked to particular approaches. For example, Cisco prefers the term "smart and connected communities" to "smart cities", and tends to use this term to indicate an orientation towards behavior-centric implementations. To encompass the different facets and approaches to the concept of a "smart city" we have used the phrase "digital urban renewal", which has the benefits of neutrality and novelty.

Currently, The Climate Group is conducting a three-year project to create a "smart cities standard framework and value case." We hope that this report will help provide a framework for discussions on this type of project.

At the heart of all of the different approaches is a series of programs or concepts that are aimed at making life in cities better through the use of ICT. These programs and concepts are typically a combination of:

- environmental sustainability
- economic performance
- community cohesion
- efficiency of operations and/or cost reduction.

Digital master plans and bottom-up initiatives

Most of these projects apply at the level of the individual city. In some cases, the municipal authority is the principal actor. Others are premised on the creation of a special agency similar to an urban development corporation. This agency is formally and institutionally separate from the municipal authority and has special powers and a different form of accountability. A common trend is the need to complement existing disciplines of physical urban planning with a new discipline of digital planning so that cities will have their own digital master plans.

Some projects, particularly those aimed at promoting community cohesion, are "civil society" initiatives that are entirely separate from the institutions of local government. Examples of these projects include the "collaborative consumption" initiatives StreetBank and Ecomodo, and the political engagement projects FixMyStreet.com and TheyWorkForYou.com. A few projects are oriented towards a particular neighborhood or locality, such as the Harringay Online community in the UK.

Greenfield vs. retro-fit

There are some clear regional differences in the orientation of projects. In Asia-Pacific and the Middle East, there are a number of greenfield "smart city" projects, with Songdo in South Korea and Masdar in the UAE the best known examples. Both of these projects are new-build cities that make extensive use of ICT, innovative planning, and architectural design to achieve environmental, social, and economic objectives. In these developments, the deployment of the ICT infrastructure is planned into the city's construction from the beginning. The fact that conventional services and facilities can have "smartness" built in from the beginning makes for a top-down approach that can be both radical and thorough. It also makes it possible for systems to be integrated and to make use of common elements.

Projects in Europe and North America tend to be focused on "retro-fitting", which is the use of ICT as an overlay for existing infrastructure. In these regions, it is more challenging to deploy an integrated approach as existing cities already have systems in place to discharge their functions. In addition, most cities have grown on a piecemeal basis as a result of individual initiatives and projects. For example, London's bus and underground networks use a smart card as a rechargeable electronic wallet for fare payment, but its recently introduced cycle hire scheme uses a different card format and back-office system (although there are some links between the two). Another example is the various on-demand car club schemes that exist in London, which are supported by the same transport authority. These schemes all use different proprietary smart cards, and none of them can be used to access any other facilities or services throughout the city. While this is the case in most European and North American cities, there are some notable exceptions such as the proposed PlanIT Valley greenfield smart city in northern Portugal.

Top-down vs. bottom-up

Another tension that runs through the various initiatives is the differences between the top-down and bottom-up approaches to digital urban renewal. At its most extreme, the respective distinction between the top-down and bottom-up models is a "tight" approach, which involves monitoring, instrumentation, and centralized control, and a "loose" approach, which focuses on enablement, community involvement, and behavioral change.

The paradigm for a top-down approach is a tightly managed enterprise resource planning system for the entire city, including its distributed physical assets. The paradigm for a bottom-up model is an open source platform that supports instead of prescribes the creation of modular and diverse applications and extensions by third parties. Singapore's water management system is an example of a top-down approach, where the authority has deployed a large number of connected sensors that are designed to reduce water loss through undetected leaks. An example of a bottom-up approach is Amsterdam's urban EcoMap, which collates data from a number of different sensors and sources, and makes it available for the development of mashups and applications that are designed to drive behavioral change.

The debate surrounding top-down and bottom-up approaches in ICT is not a new one, and there are a number of examples of projects using a combination of the two. In both instances, a technology roadmap can help to give external parties some visibility as to what functionality and interfaces are planned in elements that they do not control. Numerous city projects draw on both approaches to some extent.

A series of EU-funded and coordinated programs are increasingly focusing on the enablement and community involvement components of smart city projects. For example, the SMARTiP (Smart Metropolitan Areas Realised Through Innovation & People) project, which is coordinated by the Manchester Digital Development Agency, focuses "on the challenge of transforming public services by empowering ‘smart citizens’ who are able to use and co-produce innovative Internet-enabled services within emerging ‘smart’ cities." The project aims to "take the experience developed by a wide range of existing user-driven, open innovation initiatives in Europe" to develop "a dynamic co-production process resulting in more inclusive, higher quality and efficient public services which can then be made replicable and scalable for cross-border deployment on a larger scale."

Living laboratories vs. "digital Haussmanns"

In the ICT sector, greenfield projects can achieve much in a short period. They can be powerful demonstrations of what is possible with available technology, and can inspire wider deployments of the technology in other regions. However, the practical implications of these projects are limited as they will always have a far smaller scale than existing cities. For example, Masdar in the UAE is expected to have 50,000 residents and a further 40,000 commuters, while Cairo has a population of approximately 8 million.

Opportunities for complete retro-fits are also limited. While in the 1850s and 1860s, Haussmann could drive great boulevards through Paris's inner-city districts to fix the city's perceived circulation

and political security problems, there are unlikely to be many "digital Haussmanns" as it is simply not possible to replace existing urban systems because too much relies on them.

Therefore, urban projects increasingly make use of a "living laboratory" methodology. This methodology explicitly recognizes that new systems must be deployed in a real life context, with the experimental subjects drawn from the population of future service users. This approach is supported by several EU initiatives, including the 2009 APOLLON (Advanced Pilots of Living Labs Operating in Networks) program and the 2010 FIREBALL (Future Internet Research and Experimentation By Adopting Living Labs) project.

THE URBAN CONTEXT

Cities are the primary location for the main problems of the 21st century

For the first time in history, the majority of the population live in cities

Demographers estimate that some time between 2007 and 2008 the majority of the global population lived in urban areas for the first time in history. According to UN-Habitat, the UN agency for human settlements, the trend towards urbanization is set to continue, with 60% of the global population expected to live in urban areas within the next 20 years. Almost all of the growth in urban-dwelling populations will occur in emerging markets, and by 2050, UN-Habitat predicts that there will be 5.3 billion people in the cities of the developing world. In 2050, 63% of the world's urban population is expected to live in Asia-Pacific, while 25% will live in Africa.

In terms of their economic and environmental impact, cities consume and produce a disproportionate amount of the world's resources and waste. It is estimated that cities consume 75% of the world's resources and produce a similar proportion of its waste.

Many of the problems facing cities and their inhabitants are old, and are a function of the trade-offs inherent in urban living. The ancient Greek poets wrote about poor air quality in cities as a result of the concentrated burning of wood fires, while the Romans grappled with managing the circulation of goods and of people in an inherently constricted environment. However, cities are also facing a number of new problems. For example, if the human contribution to climate change is to be reversed, it will need to take place in cities. Cities are also uniquely vulnerable to the consequences of climate change as many of the world's largest cities are ports. In addition, 60% of the world's population is estimated to be at risk from rising sea levels.

While cities are a major part of the problem of sustainability, they also have the potential to be a part of the solution. Urban citizens, particularly in developed economies, have lower carbon footprints than rural and suburban citizens as it is easier to deliver services in cities than to people living in lower density population areas. It has also been calculated that the carbon emissions of cities have been overestimated, and may actually account for only 30–40% of global emissions rather than the 60–80% that has been previously estimated (Satterthwaite, 2008). A 2009 study by the International Institute for Environment and Development calculated that the carbon footprint of the average London resident was approximately half of the average Briton's, and that a Sao Paolo resident produced just 18% of the average Brazilian's carbon emission. Other studies, including by the Washington-based Brookings Institute, have produced similar findings.

In emerging economies, cities are grappling with the problems of success

According to UN-Habitat, cities in developing countries add 5 million people to their population each month. Rural to urban migration continues to be a major demographic trend, as does the higher population growth rate in cities, which is driven by declining death rates and high birth rates. Currently, cities in emerging economies are growing much faster than the infrastructure that they require can be planned or built.

This creates obvious pain points for municipalities and city-dwellers. High levels of traffic congestion, a lack of public transport, poor air quality, inadequate provisions for waste disposal and sewerage, and minimal law enforcement are apparent to visitors and residents alike. The observation that many established cities endured similar problems at a comparable stage in their development is of small comfort and ignores the much greater scale involved in these emerging economy mega-cities.

The response to these problems has been to allow informal processes to shape cities. There have been highly local solutions to planning, housing, and transport, which have often been provided by the inhabitants themselves. In the case of housing, this has occurred through the construction of shanty and squatter districts, while local micro-entrepreneurs have sometimes stepped in to serve transport and law enforcement needs.

In mature economies, cities are grappling with problems of intermingled growth and decline

In mature economies, some cities have grown to an enormous size and are expected to continue growing until 2025. These cities will face some of the same problems that emerging economy cities have encountered, although they are more likely to have the resources, infrastructure, and skills to deal with the problems as they arise.

Other cities have encountered the opposite problem, experiencing marked declines in their populations and economic bases as a result of shifts in industrial production and other globalization-related factors. Even in the absence of inner-city decline, imbalance between labor and housing markets can result in simultaneous gentrification and suburbanization, which increases commute distances and traffic volumes. This indicates that it is possible for cities to experience the problems of growth (crowding, absence of affordable housing, increased congestion, and pressure on transport systems) and decline (degeneration of housing stock and infrastructure, and a loss of population, tax base, and economic activity) at the same time.

As well as traditional urban problems, cities in mature economies must also deal with new problems such as the need to reduce carbon emissions from their own operations and from the areas that they govern. Alongside enterprises, cities are increasingly expected to shoulder the burden of emissions reduction demanded by national climate change strategies.

These issues are all taking place against a backdrop of tightening public sector finances, which has increased the pressure to "do more with less" and use unfamiliar governance models and instruments such as public–private partnerships.

DRIVERS AND BARRIERS

Demand- and supply-side drivers

Demand-side drivers

Considering the urban context, it is not hard to identify the demand-side drivers for digital urban renewal projects in mature markets.

- An increasing focus on sustainability and emissions reduction, which is driven by genuine concern among city administrators, politicians, citizen pressure, and national and supra-national policy frameworks such as the European Union Emissions Trading Scheme.
- Increasing pressures on citizen services due to demographic shifts, including the ageing of the population and the increasing diversity of urban populations as a result of sustained inward migration.
- The current financial climate, which reinforces the need to "do more with less" to alleviate the pressure on public sector finances.
- Continued pressure on urban transport infrastructure, exacerbated by population growth, continued suburbanization and sprawl, increased car ownership, and longer commute times and distances.
- Regional economic development programs that are aimed at securing or maintaining local competitiveness with other urban centers and increasing the focus on creative and digital industries.
- The continuing responsibility for law and order, networks for water delivery and sewers, road maintenance, waste management, transport, social services, and interactions with citizens.

The balance between these elements shifts over time and between different geographies. There is some sense that the "green" agenda has slipped in importance in the wake of the financial crisis that has affected many mature market economies since 2008.

Supply-side drivers

Technologies

On the supply side, a number of technology developments and new kinds of commercial and organizational arrangements have helped to make digital urban renewal initiatives easier to realize. These include:

- the ongoing evolution of IP and the Internet as an underlying framework for services
- telepresence and videoconferencing
- mashups and open application programming interfaces (APIs)
- new connectivity technologies, including high-speed fixed and mobile broadband
- smartphones
- positioning technologies such as GPS
- cameras and image processing
- machine-to-machine and sensor networks
- radio-frequency identification (RFID) and near-field communications
- augmented reality on mobile devices.

While some of these technologies are not new, many of them have reached a new cost point or degree of miniaturization. For example, RFID was first deployed during the Second World War, and the augmented reality browsers now available on smartphones are direct descendants of the heads-up displays used by fighter pilots and more recently tested for use by combat infantry. Positioning technologies such as GPS became widely available in the mid-1990s.

The availability of cheap smartphones that include in-built cameras, GPS receivers, and enough processing power to combine these and other inputs on a handheld display has the potential to create a network of end points. These could be used to gather information (for example, in a crowd sourcing framework such as FixMyStreet) and distribute it to influence behavior. For example, this type of information could be used as part of a personal travel assistant that delivers realtime traffic and/or public transport updates. More widely available Wi-Fi and higher bandwidth/lower latency mobile networks have made these types of applications possible.

While connected digital cameras that can be used for videoconferencing or CCTV applications are not new, more available connectivity has removed a barrier to widespread deployment. In addition, higher bandwidth networks have resulted in reduced delays and higher resolution video, which has

gone a long way towards making telepresence an acceptable substitute for face to face presence. More sophisticated image processing software also makes it possible to use cameras in a wider range of applications, such as for automatic number plate recognition as used in London's road pricing scheme.

While on their own these are all useful technologies, when used in combination with other innovations they have a much greater potential for impact. A similar trend has been identified by historians of the first industrial revolution, who used the term "invention queue" to describe the way in which some innovations only became useful when other complementary inventions were made available.

Business and application models

As well as technology developments, there have been developments in governance frameworks and business and application models that have helped drive advances in digital urban renewal.

- The evolution of cloud and software-as-a-service (SaaS) models has made it more common for organizations to use hardware and software that they don't own or maintain.
- The mashups model enables data owners to make their data available for innovative development by third parties.
- The crowd-sourcing and open source methodologies make it possible for users to contribute to the development of content and software.
- The development of a wide range of institutional frameworks in the municipal arena, such as public–private partnerships and financing arrangements or development authorities and corporations make it possible to bypass political, procedural, and bureaucratic impediments.

Barriers to digital urban renewal

Despite the widespread enthusiasm for digital urban renewal and the availability of technologies, there has been relatively little progress. The most fundamental obstacle to digital urban renewal is the limitations of municipal government. Many city governments are neither empowered nor sufficiently resourced to carry out wide-scale digital urban renewal projects. The budgets, authority, geographical boundaries, and organizational structures of many municipal authorities belong to an earlier era, and unlike comparably sized businesses, city governments are under political constraints that prevent them from conducting comprehensive restructuring programs. In addition, many are already struggling with the magnitude and complexity of the day-to-day

problems that they face. Multiple and contradictory objectives and lines of accountability to central government authorities and citizens make this even more difficult.

Although a digital master plan might help city governments to solve these problems, many don't have the expertise or perspective to make this type of transition. However, this varies according to geography or the range of activities that municipalities are responsible for. For instance, in France, Spain, and the US, cities are responsible for some of the policing within their boundaries, while in the UK municipal authorities have little direct involvement. Municipally-owned social housing is still important in some countries, but is absent or insignificant in others. In some countries, city politicians are important national powerbrokers, while in others they have very little influence.

Of comparable importance is the issue of governance. Often, digital urban renewal does not fit neatly into anyone's job description. Typically, the strategy department, CEO, or mayor's office doesn't think about technology, while the IT department is focused on supporting existing systems and managing costs.

Even where there is a powerful and articulate advocate for digital urban renewal, the benefits of the program and the efforts of implementation are unevenly distributed across organizational units. Outsourcing and privatization of municipal functions have exacerbated this issue. For example, a city may try to reduce its CO2 emissions by encouraging citizens to walk or cycle, but the transit authority or the franchised transport operator is rewarded according to passenger numbers. Similarly, municipalities may attempt to reduce emissions from energy consumption while utility companies are trying to make money from selling energy.

Other barriers to the introduction of digital urban renewal programs can be attributed to a fear of change. Staff may be frightened that the introduction of new technologies will be used to cut jobs, and citizens may be concerned that new mechanisms for service delivery will negatively impact the quality of the services that they receive. In countries where an agenda of "reform" and "efficiency savings" in the public sector has translated into job losses and the slashing of services, these suspicions are unsurprising and often justified. Elected politicians are less resistant to the idea of change and may try to associate themselves with it, but they are also fearful of failure or of appearing to fail. With many municipalities subject to a short electoral cycle, politicians are more likely to pursue short-term wins rather than long-term strategic goals.

Digital urban renewal also raises concerns about privacy and civil liberties. As digital urban renewal projects often involve the use of ICT to monitor and control physical assets or gather and distribute location-aware information, they tend to provoke suspicions surrounding the privacy of data. This is a bigger issue in some countries, with English-speaking societies particularly concerned about allowing the state or the municipality to create or have access to data about their

whereabouts or activities. Typically, discussions surrounding road pricing or traffic flow monitoring cannot be sustained without someone mentioning "Big Brother." There has also been vocal opposition from lobby groups to CCTV cameras, while transport payment cards, which can be used to track an individual user's movements, have also been criticized by privacy advocates.

Toy box vs. tool kit

Currently, there is no common framework or architecture for the multiplicity of urban applications. While the "Internet of things" is a concept and a slogan, it is not yet a family of standards or architecture. There are many useful technologies, but deploying them as part of an integrated solution is an enormous customized and labor-intensive task.

Despite the advent of mashups and API models, applications that involve interfaces to physical objects can rarely make use of standardized abstraction layers. Instead, there is a need to develop each component of the overall solution from scratch. Several companies such as Jasper Wireless and Pachube have taken steps towards solving this problem, but there is still a long way to go before it is as easy to develop a sensor network application as it is to create a web interface and then transfer it to another context.

A TYPOLOGY OF DIGITAL URBAN INITIATIVES

Defining digital urban renewal

Digital urban renewal is a very broad concept, and there are many different kinds of initiatives. In an effort to define the concept, we have categorized some of the initiatives and provided illustrative examples. This is not an exhaustive list of categories, and the categories themselves are not exclusive. For example, behavior change initiatives are often aimed at promoting more sustainable energy and resource use.

Table 1: Digital urban renewal initiative categories

Category	Description	Example
Citizen services	Using ICT to make existing processes involving interaction between the municipality and citizens better, cheaper, or both.	Guldborgsund's video-enabled satellite offices
Regional/economic development	ICT-oriented economic development or regeneration. Aimed at attracting digital industries or residents that make real estate decisions based on the availability of broadband.	Barcelona's 22@ district
Community	Using ICT and crowd-sourcing to increase community cohesion, or influence and improve the political system. Typically started by civil sector organizations or social enterprises.	Harringay Online, Ecomodo, StreetBank, EveryBlock, Tyze.com
Law enforcement	Using ICT to improve law enforcement and/or crime prevention through surveillance or improved communications for operatives.	Drancy's CCTV network Birmingham's Shotspotter gunshot location system
Resource management	The use of ICT to improve the functioning of citywide systems to use energy and other resources more efficiently.	Adaptive traffic lights Singapore's water distribution system Amsterdam's EcoMap
Behavioral change	Using ICT to facilitate behavioral change by providing information or tools that make the desired behavior easier or more attractive.	The Digital Environment Home Energy Management System (DEHEMS) liftshare, walkit, WhipCar, Seoul Personal Travel Assistant
Health	The use of ICT to promote or deliver healthcare, and control illness or disease.	HealthMap Global Disease Alert Map

Source: Ovum

USING ICT TO SOLVE URBAN PROBLEMS: WHAT IS TO BE DONE?

There is no set path to digital urban renewal

The cities that we have studied for this report demonstrate that there is no “one-size-fits-all” solution to digital urban renewal, and that a number of different approaches are capable of working well.

There is no single institutional or organizational framework that is required. Some cities have had success with custom ventures designed especially for the task of delivering digital urban renewal, while others have made use of existing municipal structures, especially where they have had the resources and the delegated authority to do so.

Building citizen engagement into the project from the beginning has worked well in some contexts, but it is not a prerequisite that needs to be fulfilled before anything can be done.

There is no single technology architecture that will fit all projects. Visionaries are often fond of mandating all-encompassing solutions, but there are examples of projects that have begun with a single “anchor” application (similar to an “anchor tenant” in a building project) and then leveraged that infrastructure to develop others. Examples of this type of development include the citizen services implementation in Guldborgsund, and Drancy’s CCTV crime prevention project. Equally, an approach that seeks to create a common platform on which others can build multiple applications is being piloted in Barcelona and has already achieved a degree of success.

Defining digital urban renewal as a problem that requires a complete, overarching solution that must be introduced all at once is an approach that will lead to complications. The complexity and interrelatedness of digital systems that address urban problems means that it is inevitable that some parts of the solution will be suboptimal at certain points in the process. The planning philosophy needs to reflect this from the beginning, and needs to make experimentation and revision an integral part of the design.

Some strategies are generally applicable

Whichever kind of implementation is chosen, it is good practice to assume that there will be some degree of collaboration and participation by third parties, including developers, data users, and citizens. It is important for municipal authorities to plan for open interfaces that can be used by developers and “mashers.” However, cities should not expect these third parties to pay for the data

that they are adding value to as they are creating services for the benefit of the city and funding the activity from raw materials that the city itself is unable to monetize.

While connectivity will be critical to any implementation, a telecoms operator does not necessarily have to be at the center of the project. Relaxed regulations, more affordable and accessible technologies, and new wholesale business models make it possible for municipalities to own and operate their own fixed telecoms infrastructure. In addition, it allows them to lease surplus capacity on this infrastructure to third parties, which could even include telecoms operators. All of the cities that we studied for this report had adopted some aspect of this business model. In the mobile sector, the new smartphone operating systems make it easier and cheaper to treat mobile operators as bit pipes, and Wi-Fi provides a useful alternative in many urban contexts.

Software will also be a crucial component of any project, and whatever gets developed will be called a “platform.” However, this term is applied to many different models. Having a platform does not necessarily mean customized development, the need for a single monolithic piece of software, or having to run it on internally owned and operated hardware. Even within the overall framework of cloud services there are many different models, and these will be explored in Ovum's forthcoming series of reports on cloud services in the public sector.

Sponsors of projects should choose the overall architect carefully, considering their own interests when shaping the solution. Outsourcing strategy will prove expensive in the long run, while putting a systems integrator in charge of the overall project may result in a complex architecture that has a lot of customized development. Putting a connectivity provider in charge may result in standardized solutions in the networking elements of the project but not on the software side.

Towards a new discipline of digital urban planning

That there are so many initiatives, networks, and conflicting terminologies is to be expected as cities are vastly different from one another. While cities can learn much from other organizations, they are not enterprises. Businesses have simple and focused objectives, while cities have conflicting pressures and lines of accountability that must be negotiated.

However, treating each city case as completely unique will lead to expensive, one-off, and inflexible developments.

What is needed is a new discipline that enables “digital urban planners” to find the right balance between fragmentation and a one-off vertically integrated and inflexible master plan. Such a discipline would be able to work with the different environments that characterize individual cities while enabling the benefits of experience and scale to be realized.

While it is premature to define what form this discipline will take, it is likely to include:

- tools for developing a digital master plan, including case studies and templates
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CASE STUDIES

Guldborgsund

Guldborgsund is a new and large local authority in Denmark that was formed from the merger of six smaller city governments and one district government. With a population of 64,000 citizens, it is the tenth largest local authority in Denmark.

Guldborgsund has introduced video conferencing to enable citizens to access the municipality's services through "digital booths" in three local centers. High-quality interactive video allows residents to interact with back-office staff based in the town hall offices. The project is managed by the city's central administration function, which is run by the CEO who is the top civil servant within the municipality.

The primary motivation for the project was economic. Following the merger, there was a need to deliver efficiency savings rather than keep the same number of staff in all the offices that had been merged into the new entity.

The system is owned and operated by the city's administration, and operates on its own equipment. There is no technical or facilities outsourcing, cloud-based architecture, or any new legal or functional entity to operate the services. The IT department is responsible for managing the data from the project (including security and privacy requirements) and ensuring the compatibility of all the necessary interfaces with central government departments.

Citizen satisfaction with the project has been high, and the number of citizen visits has fallen by 10%. The municipality is now trying to determine whether this is because some citizens are now making a longer journey to the remaining fully staffed offices, or whether visitors who had no specific requirement and were "just dropping in for a chat" have stopped coming.

The project is expected to deliver an equivalent head count reduction of 2.25 in 2011, rising to 4.5 in future years. Cost savings are expected to be DKK550,000 in the first year, and DKK1.1m in future years. Given the initial investment of DKK2.7m, the payback period of the project is less than three years.

Drancy

Drancy is a commune in the north-eastern suburbs of Paris with a population of approximately 65,000. The municipality has a budget of €120m and staff of 1,600. The IT department has a budget of €2m and 12 employees.

Drancy's anchor project involved the deployment of 300 CCTV cameras for law enforcement and crime prevention, which is the largest deployment of CCTV anywhere in France. The fiber network that the CCTV system operates on is also used for other projects, including connectivity to 80 municipal buildings, 200 businesses, and 6,000 homes, and it supports IP telephony for the municipality. In addition, Wi-Fi is available in all city buildings. The municipality also rents capacity on its fiber backbone network to SFR, which uses it to provide FTTH services to citizens for €30 per month.

The municipality also has a telepresence suite in one of its offices, which it uses to provide a bureau service for local businesses, the municipality's own internal business (including meetings with other local authorities), and to support local schools' overseas exchange programs.

The project is managed by the city's CIO and operated by its IT department. There has been no special entity created.

In 2002, Drancy's population was declining, which was partly a result of the city's reputation as being unsafe. In a crime survey conducted by the French police, Drancy was ranked 27th out of 30 cities in terms of safety. Drancy's CCTV project was a response to its poor performance in this survey, and since the system has been deployed, the city has moved from being the 27th safest city to the 2nd.

Drancy's CCTV camera application is run by the municipal police, while the project is managed by the city's IT department. The city acted as its own integrator and Cisco provided the network. Hymatom, a specialist integrator, provided the cameras, control center, and provides ongoing support and maintenance for the system. The overall budget for the CCTV network was €5m, which was separate from the city's overall IT budget of €2m.

Drancy's IT department uses Amazon EC2 as its cloud provider. Currently, some servers are physical while others are in the cloud, but the aspiration is that within five years the city will no longer operate its own data centers.

The police have been enthusiastic supporters of the project from the beginning, and the ability to provide the CCTV feeds to the national police as well as to the municipal police has helped the two forces to collaborate.

Since the introduction of Drancy's CCTV system, the reported crime rate has fallen by 30%, and there has been a 30% increase in the clear-up rate. The population of Drancy has increased by 10%, rising from 60,000 in 2002 to 66,000 in 2010. So far, the city has not experienced any regulatory or civil liberties concerns with the cameras, problems with integrating legacy systems, or

issues with jobs or employment practices. The CCTV system has actually created a number of jobs in the police force.

The increased safety in the city has led to more businesses moving in, which has created more employment opportunities for residents. The availability of FTTH has also helped to make the municipality a more attractive place to live.

Rivas-Vaciamadrid

Rivas-Vaciamadrid is a municipality in Spain that has a population of 72,000. Approximately 70% of the municipality's 6,400 hectares is protected national park.

Rivas-Vaciamadrid's "ecopolis" project is an umbrella framework for a number of applications, including smart grid and building energy management, access control and security, air quality monitoring, traffic management, IPTV (the city televises council meetings and important events such as the housing allocation process), CCTV, IP telephony, a terrestrial trunked radio network, and public address system. The project is managed by the municipal public works and ICT department.

The primary driver for the city's project was a vision of a community that is socially, economically, and environmentally sustainable. One of its major objectives is the reduction of carbon emissions. The city aims to reduce its emissions by 50% from its 1995 levels by 2020 and to be carbon neutral by 2030. Rivas-Vaciamadrid claims to be one of only two cities in Europe with such an aggressive carbon reduction agenda (the other city is Copenhagen). A secondary aim of the project is to encourage the municipality and its citizens to use ICT.

All the initiatives in the "ecopolis" project are publicly funded, with no public–private partnership dimension. The municipality manages the investment case and owns all of the assets associated with the project. On occasions, private companies that want to showcase their own technologies make small contributions, but the project is primarily focused on the city's own assets and services.

The project has resulted in energy savings of 35%, and a 50% reduction in ICT spending. In addition, the city rents excess capacity on its fiber and Wi-Fi networks to service providers.

The technology has also allowed the city to maintain and extend services that would otherwise have had to be cut. The overall municipal spend of the city remains at 2005 levels, despite the creation of new services and jobs.

Amsterdam

Amsterdam has a population of 1.2 million (2.1 million in the greater metropolitan area), making it the largest city in the Netherlands.

Amsterdam's Smart City project has taken the approach of not introducing one single project, but instead establishing a platform on which many applications and services can be built. Amsterdam's EcoMap is a highly prominent service that provides visualization and development interfaces for aggregated data sources. The EcoMap is also used as a development platform for behavioral change initiatives and "dashboard" management tools. In addition, the city has introduced many pilot programs, including domestic energy management systems, sustainable public spaces, optimized logistics systems, smart grids, and electric car charging.

Amsterdam Smart City is a joint venture that involves the Amsterdam Innovation Motor (AIM) and Liander. AIM is an independent foundation established by the city of Amsterdam with participation from other local government entities, the University of Amsterdam, and local banks. Liander operates the city's utility grids.

The primary driver for Amsterdam's digital urban renewal project was climate change, with the city targeting a 40% reduction in its carbon emissions from its 1990 levels by 2025. Other areas of focus have since been added, most notably economic stimulation and the desire to establish the city as a center of innovation.

The Smart City project is a lean, near-virtual organization that is supported by staff and contributions from partners. It has a multilayered set of pilots with different but overlapping participants. The 15 pilots are divided into four areas (Living, Working, Mobility, and Public Spaces), and all focus on energy saving. Each pilot is based on a specific coalition, for example the smart home pilot brings together home owners, IT companies, energy companies, installers, and application providers. One partner is a community organization in a less wealthy area, where 500 households are trialing ways to reduce energy consumption. Other partners include Philips, IBM, and Cisco, which all work on separate pilots.

The city also operates a parallel FTTH initiative that is separate from the Smart City project and the city administration. It is privately financed, and plays the role of a "grid company", providing basic connectivity for others to provide services and applications, which are paid for on a commercial basis. So far, 50,000 houses are connected through this initiative, and plans are under way to roll the service out to the whole city.

Results from Amsterdam's Smart City project are not expected until April 2011 as most of the pilots are "proof of concept" demonstrations rather than commercial services. However, AIM is

reflecting on its findings to date, including who is interested, what is needed, and what the business case might look like.

The successful pilots will be scaled up in May 2011, and the intention is to integrate the "smart" elements with the normal investment cycle, for example the refurbishment cycle for landlord-owned homes. At this point, AIM will also consider integration and synergies between the various pilot concepts.

Barcelona

Barcelona is the largest city in Catalonia and the second largest in Spain. It has a population of 1.6 million in the city itself and 5 million in the Barcelona metropolitan area.

The city has introduced a number of projects, including:

- an open data initiative that is designed to offer all of the city's data (or at least of all of it that can be provided legally) to anyone that can use it to make a product or service
- multiple e-government projects, including one to facilitate citizen participation in planning
- 22@, a project to use ICT to transform an economically depressed neighborhood in the city center.

The owner of the project is the Municipal Institute for Informatics (IMI), which is a department of the city. The city has ten districts, and a similar number of service departments. IMI is a part of the central administration, and its services are available to all the districts and service departments. The IMI owns Barcelona's citywide fiber network, which includes 500 wireless access points and the city's servers.

There are a number of drivers for Barcelona's digital urban renewal program. The district and service department managers are driven by efficiency and cost-savings. Early estimates have suggested that the city has saved 20–30% on telecoms opex and capex, while savings of up to 25% have been made on the cost of introducing new city services.

The open data project is designed to support cross-accounting between different functions within the city. The need for this is reinforced by the fact that the city is run by a coalition of political parties. As the politicians need to know how much services cost, there is a need to have a common platform rather than let each party build its own.

Transportation problems are also a key issue in Barcelona. The city is trying to control traffic congestion and pollution by reducing the use of private cars. To do this, it has introduced a network of CCTV cameras and sensors, and has connected them through its own network. This has proved to be far cheaper than connecting through a public provider.

Barcelona has its own fiber and Wi-Fi network. Initially, the Wi-Fi network was only designed to provide access to city workers as it was far cheaper than using 3G. However, the city is now considering making its Wi-Fi network available to citizens.

Currently, each service department has its own platform, but there are plans for a common platform to be rolled out across the whole city. As yet, it is still undecided whether the platform will be owned by the municipality or a SaaS provider. The model for the platform has been based on Apple's App Store, and the city will provide software development kits so that developers can create their own apps for the platform. There have already been some trials with private companies. For example, logistics companies have been given access to parking meter data (both realtime and historical), which has enabled them to plan their routes better.

The platform will include the city's mechanical sensors and actuators (remote controls), which already exist in public escalators, moveable bollards, and air quality and traffic monitors. The platform will manage and control all of these functions, allowing the city to automate some of its processes such as cycling down the local power station on days when air quality and local weather conditions demand it.

So far, the initiative has been received very positively, but a rigorous breakdown of the individual infrastructure projects has not yet been conducted. However, some analysis of the cost savings that have resulted from the project has been undertaken. There has also been some analysis of the benefits of services aimed at tourists, but none has been conducted in regards to the overall social benefits of the projects.

APPENDIX

Methodology

Research for this report was conducted between late 2010 and early 2011. It included interviews with the city administrations of Drancy in France, Barcelona and Rivas-Vaciamadrid in Spain, and Guldborgsund in Denmark. Interviews were also conducted with the Amsterdam Innovation Motor, Manchester's Digital Development Agency, and Professor Caroline Moser of the Global Urban Research Centre at the University of Manchester. Telstra and Cisco also provided significant input into this report.

Bibliography

Satterthwaite D (2008) Cities' contribution to global warming: notes on the allocation of greenhouse gas emissions. *Environment and Urbanization,* 20, 539–550.

Further reading

IBM Claims Green Space (OVUM051259, July 2009)

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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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