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**Global Innovators:
International Case Studies on
Smart Cities**

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The views expressed in this report are the authors' and do not necessarily reflect those of the Department for Business, Innovation and Skills.

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The Department for Business
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Executive Summary

Context

In the past decade, the evolution and rapid uptake of information technology, sensing, big data and information-based products and services has shifted the way in which people live in cities. Smart phones make anytime anywhere access to information, services and communication a baseline expectation of many citizens, who have adapted almost seamlessly to this new way of living. Meanwhile technology vendors are espousing that ‘smart city technologies’ of increased sensing, information management and control could significantly improve the efficiency, quality and cost of providing city services. At the same time, while city governments make this transition to online service provision, they must ensure that those who do not have access to this technology are not left behind.

The public sector faces particular challenges when responding to the opportunities that the ‘smart city’ and private sector innovators might bring. They struggle to quantify the impact of novel, disruptive technologies, which can make investment challenging. The organisational structure and culture of City Councils can block cross-departmental long-term strategic thinking about ICT, and the required organisational changes can be difficult to implement.

While all cities are unique, they also have common objectives and face common challenges. Our study of six cities focused on how these cities are addressing their challenges, and how they are adapting their organisations to deliver new digital services to their citizens.

Findings

This study has highlighted common themes in cities adopting smart approaches to city management.

- Leadership models. A strong political mandate for action supported by a clear vision of the role of smart in the city supports strategic alignment and investment in technology across departments. This should be inclusive of grass-roots activities (such as individual department pilots, or local SME innovation) to ensure the longevity and sustainability of the programme.
- Mechanisms for managing risk and introducing innovation. Cities can manage the risk associated with innovation through both organisational structure and funding models. Organisationally, they can create a function whose role is to act entrepreneurially, collaborate, and pilot new ideas. This function may be supported by capital that is not drawn from the tax payer (e.g. through private grants from foundations etc.), allowing funds to be used more flexibly for innovative projects where the outcomes are less certain.
- In order to support cross departmental working for smart cities, many cities are choosing to place the smart city vision in a department that already works horizontally across city siloes (such as the Mayor’s Office). Alternatively they are adding in new groups to their organisational structure that are able to act as umbrellas for a host of existing activities. The aim of this is to ensure that all departments are working together towards an aligned vision.
- Procurement policy often makes working with SMEs challenging for local governments, which can act against smart city aspirations. This can be combated by placing a threshold on the size of

projects that need to go through formal procurement, or supporting small companies through the procurement process.

- Smart cities no longer place city governments as the top-down drivers of development in the city, but instead they act as one player in an ecosystem. In response to this, smart city strategies should represent the needs and capabilities of a variety of city stakeholders. In particular, relationships with community groups, the private sector and universities are core to developing well-rounded and sustainable initiatives.
- Data analytics can be leveraged to plan and deliver local services better.
- While smart city services and the move to e-government approaches offers significant advantages for citizens, special attention must be paid to ensure that the opportunities are equally accessible by all. Providing vulnerable citizens with access to internet, devices and training around the use of digital services as well as ensuring the transparency of and access to government data is essential in ensuring that certain citizen groups are not marginalised by the move to smart city approaches.

1 Introduction

The international smart cities debate has accelerated an understanding of the impact of smart city technologies on city operations, service provision, quality of life, and local economic development. But the reality of investing in and implementing these technologies still offers significant challenges to local governments. In order to understand the common challenges and solutions that cities face, this study analyses six global cities that are paving the way in smart city investment.

Cities were shortlisted for this study based on desk research on the investments made by cities to date. The final six were then selected according to geographic and cultural spread, spread of investment types, priorities and approaches, and the availability of and access to information. They are:

1. Chicago
2. Rio de Janeiro
3. Stockholm
4. Boston
5. Barcelona
6. Hong Kong

Core areas of interest during this research included governance and leadership models, the role of open data, smart city projects underway, investment and business models, barriers to implementation and future investment priorities.

Data was collected using a mixed approach of desk research and semi-structured interviews with core city stakeholders (see acknowledgements for list of interviewees).

Definition of the Smart City

There are many competing definitions of what a smart city, or a smart technology, constitutes. While this report does not offer a comprehensive definition, it adopts the following core principles about smart city projects:

- Smart city technologies leverage data in a way that either improves or redefines how a city service is delivered.
- Smart city investments contribute to a strategic vision for the use of ICT in the city.
- Smart city investments can include ‘soft’ measures to facilitate interest in and the sustainability of the marketplace.
- Smart cities do not include all new technologies regardless of their use of data.

2 Chicago

Summary

Chicago has been active in the smart city space since the election of Mayor Emanuel in 2011. Despite this relatively short period, strong political leadership and well aligned governance structures have allowed the City to take significant steps in achieving their goals. Investment in open superfast broadband infrastructure, community engagement and inclusion projects, as well as projects specifically aimed at fostering technology innovation, are all part of the City's aspiration to create the 'City-as-a-Platform' where products and services can be built on city owned resources.



Aerial view of Chicago: Source: Arup

With a population of 2.7 million, Chicago is the third most populous city in the US. Its challenges include economic development, education, crime and transport. In the last decade, the economy has been performing poorly. Between 2000 and 2010, the Chicago region lost 7.1% of its jobs, the worst performance of any of the top ten largest metropolitan areas in the US¹. Furthermore, the budget deficit stands at approximately \$600 million².

Chicago is a national transport hub and has many transport-related challenges. It hosts two large airports, is the hub of the freight rail network, and also has a well-used bicycle network. "Chicago is first in the nation for regional traffic congestion; bottlenecks disrupt and delay freight and passenger rail services; roadway crashes cost time, money, and lives"³.

¹ http://www.city-journal.org/2012/22_2_chicago.html

² <http://www.theatlantic.com/politics/archive/2011/05/the-top-challenges-facing-chicago-mayor-rahm-emanuel/238911/>

³ www.cityofchicago.org/dam/city/depts/cdot/Admin/ChicagoForwardCDOTActionAgenda.pdf

Schools have their own \$720 million deficit and the high school dropout rate is about 50 per cent. The city has been operating with as many as 2,000 vacant police positions in a city with a high homicide rate.

2.1 Introduction

The smart city agenda in Chicago was catalysed in May 2011 when Mayor Emanuel was elected, taking over from Mayor Daley, who had been in office for 22 years. Mayor Emanuel had previously been President Obama's Chief of Staff, and had created two federal technology positions in 2009 - a Federal CTO and a Federal CIO. He had been instrumental in creating data.gov which instigated the open data movement in the US. On arrival in Chicago, Mayor Emanuel had a very clear understanding of the role of technology and data in transforming a city and set out the digital agenda very clearly from the beginning.

John Tolva (Chicago's CTO) explains:

“At that point (Mayor Emanuel's election) we were a little behind our peer cities. The previous administration had no open data policy. There was a pent-up demand so that when Mayor Emanuel came along the floodgates opened. I believe there was more attention paid to it than if it had steadily built up over time like New York and Boston.”

The core drivers for the focus on smart city projects in Chicago include:

- 1) **Transparency** – President Obama laid out a clear agenda around Government transparency in his first term of office. This federal agenda for openness has trickled down into City openness, especially in Chicago. For example, the number one most trafficked part of Chicago's website every year has been the 'plough tracker' which shows where the snow ploughs are. Mr Tolva explains, “If you think about it pragmatically- you'd think it's not useful- it's not like a bus tracker or a train tracker. But it just speaks to the unquenched thirst to peer into how a government works.”
- 2) **Accountability** – the city is accountable for expenditure of public money, which drives investment into smarter procedures and better ways of operating.
- 3) **Analytics** – data offers new insights into how the city operates, which can be of huge value both operationally and strategically. Mr Tolva offers us an example: “we see that in this part of town when the alley lights go out the trash cans get stolen - that's a correlation that was previously unknown, and we can act on it.”
- 4) **Economic development** – new businesses and services based on access to new and reliable datasets.

Mayor Emanuel sees open data as a central part of solutions to each of these drivers, and as such holds open data policy at the core of smart city action in the City.

2.2 Organisation and Leadership

Chicago has created an organisational structure that combines strong leadership with a strong partnership with civil society.

2.2.1 Political/ civil leadership

Mayor Emanuel brought a strong mandate for smart city investment with him. His experience at the White House had also given him an understanding of how organisational structures can influence the success of smart cities programmes.

The data policy in Chicago is mandated as part of executive order, and as such is a long term Government commitment. Mr Tolva explains:

“A lot of the time these movements seem very bottom-up but in our case it was a bottom-up movement of third party developers that’s been paired with the official vision of the administration - which seems to have worked.”

2.2.2 Structure

Strategic ICT Roles in the Mayor’s Office

On his arrival, Mayor Emanuel appointed two new positions to focus especially on the role of technology and ICT in the city. The first was the Chief Technology Officer, a policy level position to advise the Mayor on strategic technology matters, which is currently held by John Tolva. Mr Tolva, who had previously worked for IBM, had an understanding of the philosophy behind how city optimisation can result in a more efficiently managed city.

The second position appointed was a new Chief Data Officer (CDO), held by Brett Goldstein, who had previously set up the predictive analytics group in the Chicago Police Department. As CDO, he is responsible for collating the city’s spatial data to help inform policy decisions. He also has the strategic role of creating the City’s open data policies, and is a prime liaison with the community. For Chicago, this community liaison role is particularly important as a significant proportion of the smart cities work in Chicago lies at the boundary between government, the community and private sector stakeholders.

Situating these positions in the Mayor’s Office has facilitated the process of working with different City departments. This is because they sit directly under the Mayor’s mandate, rather than within any single City silo.

Smart Chicago Collaborative

The Smart Chicago Collaborative is a partnership between the City, the MacArthur Foundation (one of America’s largest philanthropic foundations) and the Chicago Community Trust. It is a civic organization that focuses on using technology to improve quality of life in the city. The Collaborative “was born in the conversations of the early to mid-2000s around closing the digital

divide. As the Internet became an essential tool for citizenship, and a central place for people to gather, it became clear that uneven access to the internet was a problem to be solved.”⁴ Mr Tolva explains,

“The Smart Chicago Collaborative has been vital; it really helps us to be a lot more nimble than we could otherwise be. They give grants on our behalf and they really are the engine behind what is a pretty broad community of interested developers. They host meet-ups, and I know that sounds soft, but actually the social work that goes into a policy of smarter cities is really important. There is a momentum that sustains beyond the government. You can’t have the Mayor’s office constantly trying to drum up interest; it’s got to come from its own momentum. Smart Chicago is one of those ways of fostering that.

It would be very difficult to do the work we do without a function like that. This is an organisation that is specifically focused on digital literacy and government efficiency and it really is proof that this outside-in approach to smart cities works here in Chicago.”

2.3 Smart city projects in Chicago

The three main application areas for smart city and open data projects in Chicago are:

- Infrastructure investment
- Economic development
- Community engagement

2.3.1 Infrastructure Investment

Broadband project – The City is investing in a new open fibre optic ring to get gigabit speed over an open network. By investing in an open infrastructure the City hopes to facilitate a more dynamic and competitive marketplace. The City hopes the high-speed broadband combined with a competitive price point will be an incentive for digital technology companies to locate or re-locate in Chicago.⁵

Pilots with the Federal Communications Commission on Spectrum – Chicago City has run out of unlicensed radio spectrum. It is currently working with the Federal Communications Commission on Spectrum on dynamically sharing spectrum that has been allocated for public safety, so that when it’s not in use it can be used for small cells or cell phones etc.

Sustainable Broadband Adoption –The Smart Chicago Sustainable Broadband Adoption programme intends to “spur economic development in five disadvantaged neighbourhoods in Chicago”⁶. The broadband awareness and adoption programme provides computers and training opportunities to more than 11,000 residents and 500 small businesses and not-for-profits.

⁴ <http://www.smartchicagocollaborative.org/sample-page/history/>

⁵ www.cityofchicago.org/broadband

⁶ <http://www.smartchicagocollaborative.org/projects/sustainable-broadband-adoption/>

2.3.2 Economic development

Chicago sees an economic development rationale for opening up data, owing to the fact that businesses and applications get built on their open data platforms. Mr Tolva describes this new information-based marketplace:

“Where the innovation is taking place is really with third parties - developers, designers and interested parties working outside of government to make things better. Much of what we’ve done is to turn the equation around and think of the city itself as a platform that we can provide the raw materials for, but that applications are built on top of.”

Facilitating a market of interested parties and aligning industry, community and public sector needs is a key priority in Chicago. To this end, the Mayor convened a Technology Diversity Council of experts to develop policy recommendations to support the diversity of the technology industry workforce in Chicago. Some recommendations may require collaboration with other departments. For example, one solution might involve the education pipeline through the promotion of studying engineering, as well as collaborating with the private sector on investment priorities.

Other investments in facilitating this marketplace include:

Chicago Health Atlas – A website for displaying aggregate health-related information on a map.

Windy Grid – A real-time open data infrastructure investment programme and platform. User engagement has helped the City to understand the requirements, marketing and delivery of information and services.

Illinois Open Technology Challenge – A collaboration with the Illinois Science and Technology Challenge to bring Government, developers and communities together to use public data and create digital tools that will serve today's civic needs and promote economic development.

Hosted Web Space – Supports people/organisations that want to create services on the government open data by hosting web space for them.

2.3.3 Community Engagement

Much of the community engagement work in Chicago is carried out by the Smart Chicago Collaborative. Initiatives include:

The City that Networks – a key positioning report on what the Smart Chicago Collaborative would do around digital inclusion.

Digital Skills Initiative – A central hub for coordinating technology training across the departments and delegate agencies that have received federal funding.

Connect Chicago – A loose network of more than 250 places in the city where internet and computer access, digital skills training, and online learning resources are available for free⁷.

Smart Health Centres – places that have trained health information specialists in low-income clinics to assist patients in connecting to their own medical records and find reliable information about their own conditions.

2.4 Implementing smart city projects

2.4.1 Role of Pilots/ Demonstrators

For ICT investment in Chicago, pilots are seen as a useful way to learn and test how to roll out a project at scale. Some projects carry too many unknowns to roll out immediately at scale. The WindyGrid project was a pilot that is now being scaled up. Pilots exist partly because the resources are not available to roll projects out at scale, but also to test the concept, as well as the business case for investment.

In Chicago there is a drive to encourage the creation of new ideas for ICT pilots in the city. Every week, the city hosts an open.gov hack night. Each of these events has specific themes (e.g. transport or public health) and a variety of stakeholders are invited to work together to develop potential solutions.

2.4.2 Procurement

The city is keen to work with a variety of companies on their smart city projects, not just the big players. They see this as important because open data is creating a wealth of expertise across the city that has not previously been possible. For example, the Ethics Database publishes their lobbyist data (i.e. who lobbies whom for what). Some companies have been set up around this data, and have approached the City about bidding on their official ‘behind the firewall’ ethics database. In this case there is benefit to the City in regards to delivering a better service as well as for the local economy and the creation of jobs. Mr Tolva explains “we are creating a new class of expertise; we just don’t as yet have the perfect mechanisms for engagement.”

The city has taken some initial action on this, and following the example of the White House has made two key changes:

- 1) Set a threshold of \$100,000 for the instigation of the official procurement process, this means that procurement for smaller projects can be a little more flexible.
- 2) Created a translator for legal boilerplates. The city often has the problem that they don’t speak the same language as the small companies they are trying to work with. This boilerplate translation tool supports those companies by reducing the overhead associated with procurement.

⁷ <http://weconnectchicago.org/about/>

2.4.3 Funding

Funding for ICT projects in the city is drawn from a variety of sources.

Grant Funding

The City of Chicago Department of Innovation and Technology received grants under the Broadband Technology Opportunities Program of ARRA for Sustainable Broadband Adoption and the support of Public Computer Centres. The Smart Chicago Collaborative helps the City administer all of the projects under this funding.⁸

Partnerships

Chicago has a corporate partnership with IBM to do some basic research. The Smart Chicago Collaborative has McArthur Foundation support, which helps to fund some of the City's projects.

Existing City Funding

Many of the longer term roles in the City are funded through the City's budget. Similarly, having re-skilled the ICT department to be more creative and strategic, existing positions evolved to fit the new strategy. This meant that the funding for these positions came out of the existing department budget.

Mr Tolva explains that if funding for this work is to be maintained long-term, then there needs to be a strong cultural shift in the City so that each department can capitalise on the opportunities of Smart. He says;

“The open data strategy is now part of individual department budgets. They have had to budget for what is now required of them. So it's not that I am worried about the sustainability of external funding, the question becomes ‘has this become institutionalised in a way that is the standard operating procedures for departments?’”

2.4.4 Measuring Impact

Measuring the impact of Chicago's investment in smart cities has taken a mixed-method approach.

A key metric for the City is based around cost savings. For example, the City saved \$400,000 by moving to cloud-based productivity tools. Similarly the WindyGrid application is intended to save money by enabling insight into how the city operates to enable more efficient city operations and inform longer term policy decision making.

But quantifying this is a core challenge for Chicago. Tolva explains:

“Right now, we have to take a common-sense approach to this, because the system isn't fully built out. There is more work that needs to be done, and once it is I think we will be

⁸ <http://www.smartchicagocollaborative.org/sample-page/history/>

quantifying it - we're going to have to put numbers to it. I'm not worried about that, because if there is one thing that we have now more than ever it's data, and that's a good thing. For example, we know what the baseline is for expenditure in various classes."

The city also plans to work with universities to help understand the impact of their work. The 'City that Networks' report outlines that the city plans to work with universities to "undertake statistically valid baseline surveys and track progress."⁹

2.5 Key Barriers

Financial Capital

The city had to be creative about how it found funding to undertake projects, which was a key initial challenge.

Human Capital

A key challenge was in re-tooling the IT department in the city to be able to respond to these new challenges. Previously the IT department contracted development work, but now the city has a development and design resource, and a director of data analytics.

2.6 Future plans

Gigabit Broadband

The broadband work in the city is seen as a transformative project. The speeds and the price points that they are aiming to hit are intended to be disruptive. They believe that will be key in fostering innovative and creative responses to the city's challenges.

City as a Platform

Chicago has many networked devices (e.g. trash cans, bike sharing schemes). There is an opportunity to get these better connected in a similar way to the open data portal. Tolva explains:

"I think there is an opportunity to create another platform for development- to be able to interrogate these networked public objects for the creation of apps, internal efficiency etc."

Dispersed Digital Literacy

Digital literacy and digital access in 2013 is much more dispersed than it has ever been, and we are moving away from the era of the PC. Although there are public computer centres in Chicago, the next challenge will be bringing these resources out into the street.

⁹ http://www.cityofchicago.org/dam/city/depts/doit/supp_info/DEI/CityThatNetworks.pdf

Ensuring Sustainability

The real sustainability for this work in Chicago comes from its adoption by the community. Mr Tolva explains:

“When we released ten years of crime data, which is more than any other city in North America, I got calls from journalists saying thank you very much, we’ve been asking this for years. What we are now seeing is a number of front page news stories that use the data portal, so it’s a recognition that journalism in the 21st Century has an element of data literacy to it. That’s part of the sustainability, that you have a bunch of people that are using it and doing good stuff with it.”

3 Rio De Janeiro

Summary

The upcoming Olympics and World Cup are bringing the world's attention to Rio, and is a strong catalyst for investment in the city. Rio is making use of Public Private Partnerships (PPP) to help fund infrastructure projects as well as stimulate private sector growth. One example of a successful smart city PPP is the Centre of Operations, which was initially created to support the City in responding to natural disasters, but is now facilitating significant cross-disciplinary working. The City is now investigating how the centre of operations might continue to support smart city investments.



Aerial view of Rio De Janeiro Source: See footnote ¹⁰

Natural disasters are a significant challenge for the city. In the 2010 landslide 25 people were killed in the city, 800 in the state, and 15,000 people were left homeless. The population of Rio is approximately 6.3 million, with around 20% of residents living in the 1000 favelas across the city. Rio is the most violent city in Brazil, with 37 murders per 100,000 per year. There is a lack of public transit. Currently the bus system is the main public transport service in Rio. Healthcare demands are changing, including a growing prevalence of chronic diseases.

The upcoming Olympics and World Cup are focusing global attention on Rio, and redevelopment and investment in city services is underway.

¹⁰ <http://www.flickr.com/photos/fran001/4590359214/>

3.1 Introduction

When the current city government came into administration in 2009, Rio faced significant challenges. The city was one of the most violent in Brazil, and there were significant political and economic challenges. Rio also had the lowest health and primary care capability in the country. Rodrigo Rosa, Special Advisor to the Mayor of *Rio de Janeiro*, explains that with the new administration,

“The city itself started to find its way, and the public sector played a role in this. We stopped blaming others for our problems and started to take ownership over them. We designed a plan to address these challenges in a sustainable way. That started with the municipal administration in 2009.”

The new administration made a very strong fiscal re-alignment in the first two years of government. The previous budget was not seen as sustainable and the city was unable to meet its operational needs. The first fiscal action was to cut all spending in the city by 20%, and to re-negotiate all City contracts. Mr Rosa claims that this re-focusing was a key enabler for developing new, more effective ways of operating the city, and incorporating new smart city technologies.

The upcoming Olympics and World Cup is bringing a global focus of attention onto Rio. This has injected a new vigour into updating the city systems, and has enabled the city to leverage new support and investment which has kick-started some of their regeneration projects, including around smart city technology. Mr Rosa describes this as a “significant physical and cultural shift.”

Smart city investment in Rio was also accelerated by natural disasters, specifically landslides due to flooding, which killed tens of people a year. Mayor Paes believed that a more coordinated response was required by the city, and that a control room would be instrumental in facilitating this. As such, the city partnered with IBM and Oracle to create a ‘state of the art situation room’. This has been the city’s primary investment in smart technology, and is being used as a basis for their continued investment.

3.2 Organisation and Leadership

3.2.1 Vision/ Strategy

When the new administration came in in 2009 there was a strong vision for data in playing a key part in addressing the city’s challenges. Mayor Paes’ approach is to balance his own experience with data and statistics.

Rio views the social challenges in the city as one of the most important they have. One of their strategic views is to urbanise all the favelas by 2020, and are working with public finance on this, focusing on the key risk areas (e.g. natural disasters). The developments are focused around their poor communities, and all investments are focused on the bottom of the social scale.

3.2.2 Organisation

The new Centre of Operations (see 3.3.1) houses representatives from over 30 different departments at any one time. This has taken huge organisational change from the previously segregated and siloed city departments. The technology has helped with the coordination of this, but as Mr Rosa explains,

“This is more than just the screens in the situation room; it’s a significant organisational shift and a degree of professionalism for us. It’s actually a whole change of mind-set in terms of how you plan, and how you deal with public management in general.”

The Centre of Operations is a manifestation of a huge cultural change for the city as an organisation, which was used to working towards individual siloed aims, rather than towards a strategic, coordinated vision. In that sense, the Centre of Operations is as much about supporting strategic organisational change as it is about the ability to optimise the city’s disaster response.

3.3 Smart City projects in Rio

3.3.1 Centre of Operations

The Centre of Operations was created to respond to natural disasters. In 2010, the second year of the current administration, a big landslide killed fifty people. The centre of operations was originally in the Olympic plan for 2016, but the Mayor decided that it was required immediately. It was built from scratch in eight months in partnership with IBM and Oracle, and is used by decision makers in the city to operate general city services, but especially to coordinate emergency response.

Over time, the administration has begun to develop routine operational uses for the Centre of Operations. For example the garbage trucks are coordinated through GPS, so in an emergency the trucks can be re-purposed for other tasks. This helps the city manage resources and improve efficiency of response.

3.3.2 Open Data

One of the core principles of the centre of operations was that it was to be transparent. Mr Rosa explains that “if you want to manage a city, one of the best ways to do it is to circulate information - to facilitate the flow of information.” For example, all of the media companies, TV and radio stations have a seat inside the Centre of Operations. There is a press room and they have access to the information. This helps ensure that the information is spread out to society through the traditional mechanisms of media, and also through the internet.

Rio has made a significant amount of their data freely available to the public. Largely these datasets fall into two categories:

- 1) The data portal data – which provides in-depth city information, such as crime rates, mortality rates etc.

- 2) Centre of Operations data – which holds information for everyday management - e.g. congestion, weather etc.

3.4 Implementing smart city projects

3.4.1 Facilitating the market

As an emerging economy, Rio is focused on attracting new businesses and facilitating the economy. As such, they have created an agency called Rio Business (inspired by Think London, now ‘London and Partners’¹¹), which was created to focus on providing the private sector with information about the city and supports companies that want to do business in the city. It explains the bureaucratic process, public sector nuances etc. This agency communicates with investors to produce information to businesses to promote investment.

3.4.2 Funding

Rio is trying to tackle its funding constraints by importing innovative ideas and management styles from the private sector, and keeping on top of innovations that come out of the private sector. Performance - related pay is an example of this.

35% of the investment managed by the municipal government is from private investors. Public Private Partnerships (PPPs) are being newly exploited in Rio to manage these investments. In the past, PPPs had been extremely difficult to execute due to bureaucratic barriers, but regulation has since been changed to facilitate public-private relationships.

Rio now has the three largest PPPs in Brazil, including the port renovation area, a \$4 billion PPP. Previously legislation had prevented private investment in the area, so policy mechanisms and urban regulations have been introduced to ensure that private investment could support local development. Rio sees PPPs as being able to deliver virtuous schemes where the contractors are paying extra for the construction rights, and contributing to regenerating the area.

The Olympic Park will also be built using private money. The contractors will be building the Olympic buildings, which they will own and sell to the market. The city has therefore been able to concentrate public money on the public spaces, infrastructure, and facilities like transportation.

The Centre of Operations was a PPP with IBM who invested a significant proportion of the finance as a demonstrator of the concept. The city now has a service contract with them to support the system.

3.4.3 Measuring Impact

In the first year of government the new administration created a strategic plan, and a Public Management Office (PMO) to ensure they were making tangible steps to achieving their goals. This group monitors activities and has two main purposes:

¹¹ <http://www.londonandpartners.com/business/>

- 1) To monitor project progress (time and cost). The Mayor himself spends a few hours every Monday ensuring that core projects are running to plan.
- 2) To ensure that these projects have the impact and citizen value that they wanted to achieve. The PMO office investigates the real impact of investment on people's lives, rather than simply the physical outputs.

One of the challenges in creating smart city investment metrics is that it takes time to create a system that is easy to use, transparent, and understandable. Rio employs 15,000 public sector staff, and a core challenge is to align all stakeholders in the same direction. This takes clear leadership, cultural change, and time.

City workers have performance-related pay, meaning that if the departments reach their targets (say, over mortality rates reduction, etc.) they get a bonus. This incentive scheme runs across the whole public sector from the front-line staff such as teachers and doctors, to back end roles in the city administration.

3.5 Future Plans

The main focus for the coming years is the legacy of the Olympics and World Cup. They want to create a virtuous cycle of development that will focus on urban generation. Mr Rosa explains

“This is triggering a sustainable social and economic virtuosity that is going beyond the scope of the public sector. It is bringing innovation to the city.”

Rio is becoming the hub for digital start-ups in the country; the level of investment in terms of construction is higher than any other city in Brazil. The city's main focus here is on growing their creative economy, which is a key strategic goal. In the coming years, Mr Rosa sees “an opportunity for us to create a more integrated, more equal city.”

4 Stockholm

Summary

Stockholm's approach to smart city investment is citizen centric, and emerged from their work creating e-government services. The city has funded a large fibre-optic broadband network through Stokab, a city-owned company, and sees itself as a test-bed for new technology. Kista Science City in Stockholm acts as a focal point for technology innovation and economic development around smart city technologies.

A €70 million investment in smart city technology projects across all city departments acted as funding to support individual departments in undertaking novel and untested technology projects.



Stockholm Source: See footnote 12

Stockholm is the financial centre of Scandinavia. With a population of 870,000 it has the highest growth and gross regional product, GRP, in Scandinavia.¹² Stockholm's focus on research and innovation is supported by one of the world's largest ICT clusters.

In Stockholm, emissions of greenhouse gases from transport and energy consumption amount to 43.6 tonnes of carbon dioxide equivalents per resident and year. This is significantly lower than comparable metropolitan regions in the world – and nearly half of the average for the rest of the country.¹³

¹² <http://international.stockholm.se/Press-and-media/Stockholm-facts/Stockholm--A-vibrant-economic-centre/>

¹³ Energy future of the Stockholm region 2010-2050 The way to reduce climate impact, p13

4.1 Introduction

The telecoms industry has been a strong presence in Stockholm for the last hundred years, particularly driven by Ericsson, communications technology is part of the city's legacy. The beginning of the 'smart journey' in Stockholm started in the 90s when Stokab was created. Stokab is a 100% city owned company, which laid down a vast fibre network in the city (the total length being about 25 laps around the world). The aim was to provide local businesses with access to great communication at competitive prices. Currently there are about 50 service providers using this fibre, which is accessible to about 80% of households.

Stockholm sees itself as a good test-market for new technology, and was the first city in the world to roll out 4G, the new standard for mobile telecoms. In 2006/7, the city began investing in e-government. They set aside €70 million to set up e-government services and make them appropriate, customisable and accessible to all citizens.

4.2 Organisation and Leadership

Since 2007 the opportunities from the ICT sector has been a driver for developing the city's services.

4.2.1 Vision/ Strategy

The city of Stockholm adopted a vision in 2007 that detailed the core priorities to achieve by 2030. One of the cornerstones of this strategy was to become a more citizen-focused city, and they developed the e-service programme as a response to this long-term goal.

Staffan Ingvarsson, Vice CEO of Stockholm, explained the importance of a vision for smart cities:

“Driving the vision around smart is at least as important as delivering the infrastructure, because if we are very clear that we want to create this (and we have been able to be very clear since 2007 and the long term vision) that helps a lot, because the other stakeholders then adapt to that. If the political statement is clear and firm, then it will work.”

4.2.2 Political/ civil leadership

Strong and consistent leadership in this area has been essential to the success of the project. Mr Ingvarsson led the e-governance work for five years, and during this time was able to ensure that they delivered to the appropriate standard. He explains;

“I spent a huge amount of time travelling around the city talking about this and trying to make people understand within our own organisation how we should work with this. You have to do that. One part of leadership in these issues is to explain to people why digitalisation of the process is good. You can see that there might be something bad because, jobs might be lost. But at the same time, it's good for the citizen. Having that in focus, and the strong political vision behind it, was really nice.”

4.2.3 Structure

The structure and model of how to invest was a strategic decision by the city, and they devised and funded a programme in the Chief Executive Office to roll out e-government projects. After that, the management level of the organisation was able to work on it. The strategic mandate gave other departments in the city the flexibility and freedom to act, without needing to take all the decisions up to the political level. They simply had to report on their progress against the vision and goals in the integrated management system in the yearly budget.

A key pre-requisite for getting money from the programme budget was that it would create greater value for the citizen, which was a very strong political vision in the background. Mr Ingvarsson explains:

“That was a way for us at the executive office to make it happen across the organisation, without doing everything ourselves. We set up a framework and we put the money into it to make it happen.”

4.3 Smart City Projects in Stockholm

4.3.1 E-government

A huge part of the smart agenda in Stockholm has been to invest in high quality, accessible e-government services. With an investment of €70 million since 2007 they have created over 50 digital services, which has cut management costs. Mr Ingvarsson also claims

“We can see that Stockholmers approve and like the opportunity to choose, and to do business with the city 24 hours a day.”

4.3.2 Stokab Fibre Network

Stokab is a publicly owned company that was established in 1994 to create a “competition-neutral (fibre-optic) infrastructure able to meet future communications needs, stimulate competition, promote diversity, offer freedom of choice and minimise the need for excavating.”¹⁴ The company is now also responsible for managing the use of that infrastructure, and leasing connections to the network. Their purpose is not only to provide access to fibre-optic telecoms, but to create an environment that favours IT development, and by extension positive development for the Stockholm region.

4.3.3 Kista Science City

Another aspect of smart city investment in Stockholm is the Kista Science City, which is:

*“A creative melting pot in Stockholm where companies, researchers and students collaborate in order to develop and grow. The foremost sector in Kista is ICT... **Ericsson, Microsoft and IBM** are just some of the major ICT companies to have established a*

¹⁴ <http://www.rohab.co.uk/index.php/case-studies>

presence in Kista Science City. There are also over a thousand other ICT companies of all sizes. 6,800 students are currently studying ICT courses at Stockholm University and the Royal Institute of Technology in Kista Science City.”¹⁵

4.3.4 Royal Seaport

The Royal Seaport is a vast new development area in Stockholm. “On completion Stockholm Royal Seaport will house 12,000 new dwellings and 35,000 new office spaces – from the port and its associated trade to media and finance companies. The ambition is to offer one of Europe’s most modern and attractive living environments.”¹⁶ The goal is to be CO2 neutral by 2030. One the mechanisms to achieve that are to use ICT and smart grid to make it possible for different houses to provide electricity at different times of day, and to be very energy efficient.

4.3.5 Transport and Energy Efficiency

The city is working in cooperation with various private entities investigating the use of data in the layer between the connected devices and with the big data scheme to optimise procedures (such as traffic monitoring).

The city also operates a congestion charge zone which supports data collection through the processing of vehicles. The system currently helps the city to monitor traffic, and they are investigating how this can be better exploited¹⁷.

4.3.6 Green ICT

“Green IT – a strategy for the City of Stockholm”¹⁸ applies to the city’s administration and Stockholm’s Stadshus AB (the parent company for the activities that Stockholm City has chosen to operate as a limited company). The strategy has been adopted by the City Council and is administered by the Executive Office. The Green IT Strategy for the city of Stockholm explains:

“Green IT is a collective name for the measures designed to reduce our environmental impact with the aid of IT. It involves both using information technology to reduce our environmental impact, and reducing the energy consumption and environmental impact of the IT sector as a whole.

Green IT is a strategic and management issue, which is why it is important that environmental issues are considered from an operational viewpoint. Doing so clarifies the ways in which the municipality can reduce its environmental impact across the board.”¹⁹

¹⁵ <http://en.kista.com/>

¹⁶ <http://stockholmroyalseaport.com/about/>

¹⁷ <http://www.roadtraffic-technology.com/projects/stockholm-congestion/>

¹⁸ <http://international.stockholm.se/Politics-and-organisation/e-Governance/A-green-IT-strategy/>

¹⁹ http://www.greendigitalcharter.eu/wp-content/uploads/2012/05/GrnIT-strategi_eng1.pdf

4.3.7 Open Data

Stockholm sees open data as a fundamental principle for the future, and they are keen to make access to data more pervasive and straightforward. It is seen as huge opportunity for the city, especially for creating new innovative products and services and delivering economic development in the city.

However, Mr Ingvarsson explains that there is more to the story.

“We deal with data that is restricted by law, which is personal data about citizens so you have to draw a line somewhere. That will be a development where that line will be drawn, and we don’t own that all ourselves. That’s a conversation that is going on at a European level concerning who owns the data. But, I see a future for open data concerning information and those issues.”

Therefore in Stockholm, there are two key drivers around big data. The first driver is in getting the data out to the public and empowering them to make better, more educated choices. The second is about spending public money in creating the back end system, to really drive change and efficiency within the City as an organisation.

Competition – In order to promote and facilitate the use of open data in the city, they launched a competition, the ‘Open Stockholm Award’²⁰. This competition encouraged companies and individuals to use data innovatively to create new products or services. As part of this, the City published environment data, demographic statistics, etc. - datasets that were feasible both legally and practically. The competition received approximately 200 different ideas for new e-services, and created about 60 developed solutions. It was hailed as a huge success in terms of participation and output.

4.4 Implementing smart city projects

4.4.1 Facilitating the market

Stockholm City operates through structured dialogue with citizens and private companies. Citizens are asked what services they would like the city to provide, and private companies are also given space to interact with the council.

For the smart cities market, the city finds good two-way communication with private stakeholders especially important. Mr Ingvarsson hosted a conference for all the ICT deliverers in the city to present about who they are, their product and service offerings. This was also an opportunity for the city to present their priorities and strategic direction. Mr Ingvarsson explains,

“The aim was to create some common ground, to tell people this is where we are, this is where we are going, and to get all the good knowledge from the private companies, many of whom have their own R&D departments. Having that dialogue all the time is very important.”

²⁰ <http://international.stockholm.se/-/News-from-the-City-of-Stockholm/News/Open-Stockholm-Award---compete-with-your-app/>

Another key role that the city plays in facilitating the market is to act as a mediator between the universities and industry. The City is able to create a space or platform where they can meet and test new ideas.

4.4.2 Demonstrators

Demonstrators are seen as an important approach to smart city investment in Stockholm. Demonstrators allow investors to understand what the impact might be, how best to manage it, and what to do differently. Particularly, demonstrators offer the opportunity to test concepts at scale. For example, the Royal Seaport will have up to 20,000 residents, and 50,000 people working there. In this way, it won't be a 'test area' in the traditional sense. Mr Ingvarsson believes that this is "important because it means that you have to do it very very well."

The city owns a majority of the land and has legislative control regarding land use in the city, which means it can create requirements and targets around carbon emissions, technology use, service provision, etc. As well as creating great places for people to live, this approach drives new technology, and makes it possible for new ideas and companies to enter the market.

A key challenge is that real-estate developers are often conservative in their approach, and tend to want to implement proven solutions. The City Council understands that involving universities and SMEs in the process to create novel solutions might be really powerful, but that they might not work because they have not been fully tested. In response to this challenge, the council has created various test beds where very new unproven technology can be trialled.

One example of this full-scale test-bed is 'Kista Science City' where many ICT companies are trying to find a way to work with real estate owners to allow new technology to be used to foster new innovations.

4.4.3 Procurement

When it comes to developing e-services, the city is required by Swedish and European law to undertake standard procurement procedures. However, they believe that by having a good dialogue with the community of providers, they really understand what kinds of projects and programmes they can tender for and get a good response from.

The city has launched Sweden's first pre-commercial procurement with the Swedish Transport Authority concerning new smart traffic solutions. Instead of procuring a solution, they have advertised the problem, with the aim of getting different companies and organisations to formulate solutions. This is an open competition, and encourages innovative and creative approaches to problem solving.

4.4.4 Funding

"The key success to this is that we didn't have to use the regular budget, we got money on the side so that we can really drive the innovation."

The €70 million investment was used as an upfront financier for technology that the city needed. The money for this large investment came from the previous year's budget surplus (2006). In 2012

they had a further surplus of about €208 million. A significant proportion of this will be spent on infrastructure investment, but part will be allocated for future IT investment.

The city established guidelines and rules for optimising and using data, and would fund appropriate projects across all departments. This meant that any department had a proposal, a cost-benefit analysis would be undertaken to identify added value for the citizens of Stockholm, and could be funded by this central pot. This took the pressure off tight budgets in individual departments. This investment is then recouped by cost reduction due to the digitalisation of the process. This may be over a longer period of time, depending on the investment, and the estimated efficiency the project is creating.

4.4.5 Measuring Impact

Every year the citizens of Stockholm are asked 10 questions concerning the quality, efficiency, choice etc. of public services. These are monitored over time and are presented to the Council alongside the yearly revenues as a part of the integrated management system.

Monitoring and evaluation are integrated into the Council's management systems. They require that the departments that have used funds from the e-services programme report how they have cut costs on a yearly basis. Mr Ingvarsson claims that "this gives them the credibility to keep doing what they are doing."

4.5 Key Barriers

4.5.1 Funding

Funding is of tremendous importance for the smart cities work in Stockholm. It is the key mechanism that gives time and resources for vital development and progress in this area. Funding for smart city work will continue to be a challenge, as Ingvarsson explains;

"Looking forward I see a continuous need to have money available for up front financing - to look at this as an investment. We have to find a way of financing ICT investments over time, not taking the money from daily expenditure of the different departments and then risk the debate that we are taking it from the teachers' salaries."

4.5.2 Driving Change

Driving change in a large public sector organisation is a key challenge. Mr Ingvarsson describes this challenge;

"When you are trying to make a change, to do something differently, you are going to come up against resistance within society and the organisation. You really have to focus on communications around it. And of course, my employers are up for election every four years, so it's even more important for them to show that this is good. It might cost something... but it will make us a better organisation, it will make the city a better place for the citizens. Our Mayor has been extremely clear on the importance of Stockholm being smart."

4.6 Future Plans

Potential areas for investigation in the future include working with traffic management and smart grid with Sweden as a whole. The city sees the 'internet of things' and connected devices as an interesting way forward for the city in terms of economic and physical development.

Working with people who do not have access to the internet is also a priority for the future. Currently 90% of communication with the City is via email or the internet. At the same time there are people who are not included, are not comfortable with technology, which is a socio-economic dimension. The City is keen to understand this challenge and make it possible for all citizens to be a part of the digital society.

5 Boston

Summary

The Mayor's Office of New Urban Mechanics in Boston, set up by Mayor Menino is an essential mechanism for Boston's innovation in smart city investments. MONUM encourages and enables collaboration with innovative companies and SMEs, pilot projects, and supports other city departments through offering expertise and funding. It adopts a top-down and bottom-up model for innovation, and pays particular attention to good communications both internally and with other cities.



Boston Source: See footnote 21

The population of Boston is 625,087 (2011) and is growing, with young people moving to Boston and “older Bostonians returning”²¹. This has fuelled one of the largest increases in population in the US between 2000-2010 at 4.8%²².

Mobility is a significant challenge in Boston: with over 300,000 commuting into the city daily, congestion and parking is an issue. "Due to rush-hour traffic and the lack of a distinct grid roadway system, Boston was ranked the fifth most traffic delay-prone city in the nation, according to a recent study."²³

Waste management in the city is also a challenge. The city spends over \$40 million each year on residential waste and recyclables, and no issue generates more requests or complaints from citizens. Investment in education and crime are key priorities articulated by Mayor Menino in his ‘State of the City Address’

²¹ http://www.cityofboston.gov/Images_Documents/SOTC%202013_tcm3-35774.pdf

²² <http://www.bostonredevelopmentauthority.org/PDF/ResearchPublications/RappaportInstituteAdvBrd.pdf>

²³ <http://dailyfreepress.com/2013/02/11/boston-ranked-fifth-most-traffic-prone-city-in-nation/>

5.1 Introduction

Boston's Mayor's Office of New Urban Mechanics (MONUM) "pilots experiments that offer the potential to improve radically the quality of city services"²⁴. It was set up by Mayor Menino in response to the challenge of being able to innovate within the public sector.

The Office of New Urban Mechanics in Boston is entirely focused on working to deliver value to citizens, and focuses its attention at the interface between government and the public. Nigel Jacob, Co-Chair, Mayor's Office of New Urban Mechanics explains:

"We developed an approach that is about active experimentation in what we call the 'civic engagement space', how people are able to get involved in civic life generally and with their government."

Three principal areas of research include:

1. Clicks and Bricks
2. 21st Century Learning
3. Participatory Urbanism

5.2 Organisation and Leadership

5.2.1 Structure

There are broadly two types of project that MONUM engages in:

1. Innovation projects in their most general sense; this is generally incubation and Research and development projects.
2. Fostering relationships with city departments.

In order to be able to work effectively across all the city departments, MONUM invests a lot of time building up relationships and trust with them. Mr Jacob explains;

"In order for us to be able to work effectively with the operational side of the organisation, they need to understand that we are here to help them and to support them, and that we are not going to expose them or make them look bad. We do that by building trust. That can be anything from writing grant proposals to doing more technical analysis; we have relationships with the local universities so we are able to bring in very sophisticated people to lend a hand with some of these more technical issues that departments are grappling with."

²⁴ <http://www.newurbanmechanics.org/boston/%20%E2%80%8E>

5.2.2 Political/ civil leadership

Mayor Menino's emphasis is citizen-centric. His focus is on the quality of service delivery to the residents of Boston, the sense of safety that people have in their communities, or the sense of trust people have in their school system, as opposed to focus on the business objective. That is a very clear message set out by the Mayor, and it drives the decisions made at MONUM

The structure and organisational culture set out by the Mayor and MONUM encourages and facilitates entrepreneurial actions both inside and outside government. They achieve this by focusing on what they call the 'civic innovators' who are people that are trying to tackle issues within their communities. Mr Jacob explains "we are increasingly finding that there are people who are interested in finding solutions themselves, and operating as social entrepreneurs, and Boston has a thriving social entrepreneurial community. More and more of those people are realising that government needs to be part of the solution". In this way, the city leaders in Boston are focused on facilitating a group of entrepreneurs from inside and outside government to work together to achieve their goals.

5.3 Smart City Projects in Boston

Smart city projects in MONUM are carried out under three core programmes: 'Participatory Urbanism', 'Clicks and Bricks', and '21st Century Learning'.

5.3.1 Participatory Urbanism

MONUM believes that smart technologies are fostering a new wave of citizen participation in the community. Projects driven under 'Participatory Urbanism' are intended to support the creation of new, citizen-centric products and services.

Citizens Connect – This application for smart phones helps constituents make their neighbourhoods better by giving them an easy tool to report service problems. They are piloting an SMS version called 'citizens connect txt'.

Community PlanIt – A platform to explore how online platforms can complement in-person community meetings, as well as reach an audience that might not attend a community meeting.

Innovation District: Welcome home challenge – A competition focused on attracting and growing businesses in Boston's Innovation District.

Participatory Chinatown – Participatory Chinatown is a video game-like platform to engage a broader range of constituents in informative and deliberative planning and development conversations.

5.3.2 Clicks and Bricks

The 'Clicks and Bricks' programme of projects investigates how new technologies are linking how the city is built to how it is managed and experienced. Particularly, these focus on how to link "the

interests and talents of both designers and technologists outside of City Hall with leaders and staff from the city's Public Works and Transportation departments."²⁵

Redesigning the Trash System - The city is partnering with IDEO to look at this challenge through the lens of human centred design.

Street Bump – Street Bump is a mobile app that helps residents to improve their streets. As they drive, the mobile app collects data about the smoothness of the ride; that data can provide the city with real-time information it uses to fix problems and plan long term investments.

City Worker – To help city staff better manage its infrastructure and respond to constituent requests, the city has developed a smart phone application to be used by city workers. This allows workers to easily manage their daily work list and access and record information about the condition of city infrastructure such as street lights, trees and roads.

Adopt-A-Hydrant – A pilot project that encourages Boston residents to shovel out snowed-in hydrants during the winter. Through the app, residents can claim hydrants they intend to shovel out after storms.

Complete Streets – A project led by the Boston Transportation Department, Complete Streets is an effort to improve the flow of people and goods through Boston by making the city's transportation infrastructure greener, smarter and even more multi-modal.

5.3.3 21st Century Learning

The 21st Century Learning programme aims to deliver convenient, integrated and life-long learning to the citizens of Boston. It aims to facilitate relationships between educators, students and parents to improve both the in-school and out of school educational experiences.

Boston One Card – As part of the city's effort to have its schools, community centres and libraries provide a seamless system of educational opportunities for young people, the city is piloting a single card that provides access to all these resources for Boston Public School students.

Discover BPS – This web app helps parents navigate the options of public schools available to their children.

Where My School Bus – **This app** is allows parents to sign up to see on a computer or smart phone the real-time location of their child's school bus.

Autism App/ Assistive Technologies – The city is working with two local companies and an international robotics company to develop new applications to help children with autism learn.

Classtalk – Classtalk is designed to help teachers send text message reminders to students about homework and tests.

5.3.4 Open Data

Open data is seen as a core element of the smart cities work in Boston, and as a mechanism for fostering innovation in the city. Mr Jacob argues

²⁵ <http://www.newurbanmechanics.org/projects/>

“Open data is one of the legs of the stool; we do open innovation, and more effective use and generation of data is a part of that. However, the data that we need around behaviour change is not yet available; we need a much stronger focus on more sensitive datasets.”

One of these more sensitive datasets includes working on opening up schools and education data. They are interested in data such as the in-school behaviour of students, tests, grades, disciplinary records, curriculum data etc. By opening up this data, MONUM believes that there is a great potential for a new wave of innovation to create value-added services for children.

There are certain datasets that schools keep that would be useful in improving school performance, and tracking efficacy of out-of-school programmes. There are many organisations that would want to understand whether they can improve in-school performance, and at the moment they have very limited ways of doing that.

However, there are a range of legislative limitations to how this data can be used. MONUM is engaging in a research project with Harvard looking at what is possible and safe around using this data.

5.3.5 Other Investments

Better Traffic Management

This plan will help the Boston Transportation Department be able to spot traffic problems faster, allowing them to spend more time fixing problems and less time looking for them.

A Healthier Environment

This plan will help the city to understand how their bike, parking and traffic management policies are impacting vehicle usage in the city; with this intelligence, the city will be able to see how it can meet its aggressive climate action goals by 2020.

Transparency

As part of its commitment to transparency, the city has performance metrics, service request data, meeting notices, and broadcast their meetings via City Council TV.

5.4 Implementing smart city projects

5.4.1 Facilitating the market

Mr Jacob explains that “The Office of New Urban Mechanics is essentially a civic innovation incubator and R&D lab”. It is an incubator that focuses on enabling connections between government, citizens and social entrepreneurs to innovate around service delivery in the city, and enabling partnerships between people inside and outside of government to tackle city challenges.

MONUM plays a variety of roles in facilitating the market. Firstly they support private companies in making new connections, applying for funding and finding new business opportunities.

They also often have a more hands-on approach to supporting organisations that want to tackle issues at play in their communities. This might involve providing seed capital, or helping them to develop the technical elements of their proposal. Mr Jacob explains “When they find us they

typically have a basic pitch in mind that they need support and a resource to get that project off the ground. We are able to help them do that.”

5.4.2 Pilots

The majority of the projects that MONUM undertakes don't stay with them long term. They run the experiment and then if it's successful they work actively to scale it up by whatever means makes sense. They devise a scaling model for projects on an individual basis. For example, a company might need more customers or make the city a customer, and sometimes the city connects them to more conventional venture capitalists, or to other philanthropic foundations that are interested in exploring this kind of work.

Scaling up might also mean scaling to another city. There is another branch of work at MONUM that is about connecting with other cities. This involves building the bridges so that where there are innovators in one city they can create a network of innovators to other cities, so that they don't need to re-invent the wheel. The idea is that the city can both scale things up and out of Boston as well as into Boston from other cities.

In some cases, projects get scaled up to a specific city department because they are solving a specific need that the city has. The city then becomes a paying customer to the provider, and is willing to pay for the solution and sign a maintenance contract over a period of time.

5.4.3 Test-bed

Positioning the city as a test-bed for new technology is a model that Boston has used repeatedly. In these cases the city's value-add is to give the innovator deep access to how the city works, access to back-end systems etc. and they also get high-quality feedback as to how systems are working.

Citizens connect

In 2008/09 there was a need to improve channels of communication for citizens to report to government, and at the time there was no off the shelf solution that the city could buy. MONUM approached a local start-up (Connected Bits) and proposed the opportunity to provide lightweight tools for governments to collaborate better with citizens. If they were willing to do the technology development for below market costs, the city offered to be a test bed for the technology.

They were able to develop the first version of the app for \$25,000. Based on the success of the deployment in Boston, the company scaled it up and out to at least two-dozen American cities who are all paying customers to Connected Bits.

5.4.4 Funding

Funding for smart city projects in Boston comes from various sources. Project level funding often comes from grants and private donations. On top of this, the City funds the personnel salaries. Some positions in the team are also grant funded.

Innovation-capital

MONUM is trying to instil a culture of innovation within the city, and promote civic innovators within government. Mr Jacob explains that there is a culture of risk-aversion in the city, and that MONUM de-risks projects by taking them out of the responsibility of the specific department, giving them ‘permission to fail’.

MONUM has attracted a lot of grant funding from private organisations which effectively acts as what Mr Jacob describes as ‘a pool of risk-capital’ that can fund projects that are deemed too risky to spend public money on.

5.4.5 Measuring Impact

Project metrics

When starting any project, a lot of time is spent on establishing the success criteria, to ensure that the project will deliver value for the citizen. At the same time, the city wants to allow for outcomes that are entirely new, or perhaps unexpected, which means there has to be a degree of flexibility and an open minded approach.

Because of their role as the social interface of government, metrics for MONUM projects are generally focused on the level of citizen engagement. This might include, for example, the number of people that have downloaded, and are reporting requests for services, or numbers of people engaging in the programme or project.

Higher Level Outcomes

When evaluating projects MONUM also attempts to understand the broader impacts. A key challenge here is in understanding longer term implications, because it is still a fairly young field. Also, the interconnected and complex nature of city investment means that causation is difficult to identify.

The city has developed a collaboration with a local university (Emmerson College), called the Design for Actions Research in Government (DARG). The aim is to begin to understand this iterative model of innovation, how the city can learn from these experiments, and how they can rigorously understand their broader impact or their work.

5.5 Key Barriers

5.5.1 Funding

For the first six months, MONUM operated with no grants, which was the initial challenge. At that time they spent a lot of time trying to work out how to leverage in-kind resources etc. That was mitigated over time with the private funding grants.

5.5.2 Procurement Legislation

There are tight laws on procurement of products and services. This legislation is not able to cope with the 21st century use of cloud services etc. Procurement practices are a continuing challenge for smart cities work on Boston.

5.5.3 Human Capital

Having the right people who can drive this type of work is essential. Mr Jacob argues;

“The kind of work that we engage in requires people that can operate in this entrepreneurial mode. In a lot of ways it’s a mind-set to empower your workforce to become entrepreneurial and to resource them that way. A lot of our work is trying to promote these cultures of innovation. We need people that are willing to be creative and take some risks with our support.”

5.6 Future Plans

The city hopes that the MONUM concept will become a movement across cities both nationally and internationally. Last year, Philadelphia became the first official city outside Boston to set up an office of MONUM. The two MONMUM offices communicate almost daily, to share resources and experiences. There are other cities such as New Mexico, which are beginning to take an interest in this approach.

Within Boston, the city has plans to continue to grow their smart cities work, drawing on extra resources, building the team (currently eight people), to be able to tackle more issues. They intend to tackle harder problems. They believe that these types of innovation centres can tackle the hardest problems that cities face; Mr Jacob explains “it’s a case of ratcheting up and starting small and building confidence, and then moving onto these tougher waters.”

6 Barcelona

Summary

Barcelona has many smart city projects dispersed in various departments across the city. They are currently collating these projects, and devising a global vision to unite them under a single strategy. The 22@ Barcelona region is a focal point for economic development and innovation, and is being used by SMEs as a test-bed to trial new technologies.

Barcelona understands the importance and role of vertical and horizontal working, and has reflected that in both their organisational structure and the projects that are undertaken. Collaboration with other cities is a significant priority for the development of ideas and networks, which they are facilitating through their City Protocol project.



Barcelona Source: See footnote 26

The population of Barcelona is 1.6 million, and in 2011 had an unemployment rate of 17.2%. “Economically, Barcelona remains far ahead of other Spanish cities and some of the major economic hubs around the world. This is demonstrated in its GDP statistics where the city ranks 4th in the EU and 35th globally.”²⁶ The level of entrepreneurship in Barcelona is the highest in Spain.

Barcelona is an extremely compact city, which offers an advantage for sustainability. However, it leads to serious challenges of noise, traffic congestion and pollution.²⁷ Tourism is one of the core industries in Barcelona, alongside knowledge-based and information services, media and fashion. Education is one of the key pillars of Mayor Xavier Trias’ vision for Barcelona.

²⁶ <http://investinbarcelona.com/economy>

²⁷ <http://geographyfieldwork.com/barcelona.htm>

6.1 Introduction

The smart cities movement in Barcelona is growing rapidly, and has evolved from previous movements such as ‘digital cities’ of ten years ago. Julia Lopez Ventura, Strategic Director of TIC iSmart City in Barcelona City Council, explains that the smart city movement is a useful new step for them:

“From our point of view this is a good opportunity to say what we are doing thanks to ICT by creating a global strategy, rather than siloed strategies in different departments. In the past we, like many other cities, used ICT to increase welfare and to foster economic progress- this is not something new. But the smart city movement has a particularity that not only cities are working towards this vision, but also companies and academia. For us it’s important because there are many things happening at the same time and maybe because technology is mature enough to help cities now, where it wasn’t in the past.”

Another key change is that the smart city movement is a mechanism to use ICT strategically as an enabler for cities to achieve their goals. For Barcelona, the smart city is a means rather than an end in itself. Ms Lopez Ventura explains “that’s the main change from the previous movements, that technology is an enabler for projects.” This philosophy is clearly reflected in their strategy, where technology is seen as an enabler for:

- Efficient and sustainable urban mobility
- Environmental sustainability
- Business-friendliness and attracting capital
- Integration and social cohesion
- Communication and proximity with people
- Knowledge, creativity and innovation
- Transparency and democratic culture
- Universal access to culture, education and health.

In Barcelona, the smart city movement started in energy, but now is spreading across all sectors. The city believes that this investment will create a sustainable city, and also work towards fostering citizen participation, mobility, and other fields. The city describes this as a ‘transversal approach’.

City leaders in Barcelona understand the city as something dynamic and changing; a network of networks, as illustrated in their conceptual model of the smart city in Barcelona, which is broken down into three layers: People/ Information/ City Structure.

6.2 Organisation and Leadership

6.2.1 Vision/ Strategy

The city is currently in the process of developing a formal smart city strategy for Barcelona. The smart city movement has grown so rapidly in Barcelona that no formal strategy was created early on; the projects came first. The vision outlined in the strategy is as:

“A self-sufficient city, made of productive neighbourhoods at human speed, inside hyper connected metropolis, of high speed and zero emissions”

This is a long-term view for the city, and incorporates the cultural identity of Barcelona as a Mediterranean compact city.

6.2.2 Political/ civil leadership

When the new Mayor was elected in 2011, one of the earliest commitments was in investment in digital innovation and entrepreneurship through investment in smart cities, as outlined by Mayor Xavier Trias:

“We should not waste the opportunity we have to apply these new technologies to improving people's quality of life, by generating a new "economy of urban innovation" based around smart cities. This is another of our future commitments.”²⁸

One of the first organisational changes was the creation of a new group called Urban Habitats which works as an umbrella to facilitate departments that used to work in isolation to come together. Underneath this Urban Habitat structure sits water, energy, human services and environment. Housing and urban planning are also grouped together.

6.2.3 Structure

The city has created a Smart City PMO (Personal Management Office) in which the projects belong, which coordinates all the projects in the city that are classified under the smart city tag. This has meant transitioning from siloed work to “transversal” work. The city has produced an early strategy document which attempts to set up the basis of the smart city strategy in the city. Ms Lopez Ventura claims:

“I think that this change to get all departments working towards the same strategy is quite new.”

Actions developed under the Barcelona Smart City strategy lie on three axes: international promotion, international collaboration and local projects.

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http://w110.bcn.cat/portal/site/Alcalde/menuitem.324915bcba5b5254bc12bc12a2ef8a0c/?vgnextoid=001dd4eba298a310VgnVCM10000072fea8c0RCRD&vgnnextchannel=bcfdc83bb398b310VgnVCM10000072fea8c0RCRD&vgnnextfmt=formatDetail&lang=en_GB



Figure 1: Three axis of Barcelona Smart City

6.3 Smart City Projects in Barcelona

There are over one hundred projects considered to be part of the smart cities work in Barcelona, and this number is growing. However, there are currently thirteen projects that the City currently sees as a key part of the Smart City PMO.

Transversal Projects:

New Telecommunications Network – Integration of different fibre optic networks, boosting Wi-Fi network, reduced operating and maintenance costs, new business models.

Urban Platform – Barcelona sensor platform, city operating system, and apps and services.

Intelligent data – Open data, measurement of city indicators, and a central situation room for decision making and control.

Vertical Projects:

Lighting Directorate Plan – A strategic plan for lighting in Barcelona.

Self-sufficient islands – Creating energy self-sufficient island, to improve practices related to consumption and production of energy.

Electric Vehicles – Development of electro-mobility in the coming years, short-term (two years) and medium term (five years) in Barcelona.

Telemanagement of Irrigation – Remote management system for centralized control of the automated irrigation infrastructure in order to control the duration and frequency of irrigation in each area.

Orthogonal Bus Network or Directorate Mobility Plan – Orthogonal design of the bus network in Barcelona to improve urban mobility.

Urban Transformation – Within the frame of the remodelling of the main streets of Barcelona will develop a series of smart cities and telecommunications projects.

Citizen compromise to sustainability 2012-2022 – a roadmap for achieving a more equitable, prosperous and self-sufficient Barcelona.

O-Government – Implementation of Open Government, strategy and a roadmap, to develop tools and web sites in specific areas of transparency, open data and civic participation.

Smart parking – Network of sensors and displays of parking availability across the city.

Barcelona in your pocket – Barcelona contactless and mobile apps.

City Protocol

It is important to Barcelona to share their experiences in developing smart city projects with other cities across the world, academia, and industry. They see dialogue as central in spreading learning and maximising the benefit and value of their work. The City Protocol is a discussion space to talk about cities across sectors.

They have started to discuss the taxonomy of the city. The idea behind this is that cities might be different, they might have their own cultures and context, but they have something in common. Ms Lopez Ventura explains,

“We (cities) all have to have solutions for mobility, for nature, for energy, for water; we have something in common. The idea of the City Protocol is to study common problems.”

Vicente Guallart, the Chief Architect of the city of Barcelona City Council and Director of the new Department of Urban Habitat adds to this, saying:

*“In the 21st century, our common ground is that people will be the cities in which we live and work, in which the real economy is produced. The City Protocol will therefore be a global, open platform, comprehensive and progressive, where cities will share knowledge, projects and policies, define indicators and common evaluation systems, and promote the transformation of our cities on the basis of ecological principles and collective progress.”*²⁹

6.3.1 Open Data

Barcelona has an open data portal, OpenData BCN³⁰, which opens up city data to the public and has three clear aims:

²⁹ <http://spain-lab.net/architect/guallart/>

³⁰ <http://w20.bcn.cat/opendata/>

1. To increase the transparency of the City Council
2. To universalise data access
3. To promote innovation and the economic fabric

6.4 Implementing smart city projects

6.4.1 Partnerships

Working with a variety of partners is central to Barcelona's smart city approach. Partnerships fall under three categories: private sector collaboration, research centres, and other cities.

Private Sector Collaboration

Telefónica, Abertis – Telefónica and Abertis respectively signed agreements with the City Council, working together to define pilots, with the main objective being to collaborate in the process of integration of municipal networks as well as the development of a sensing platform (BSP). In addition, Telefónica is working with the project TAP & GO

Indra – Indra is working with the City Council to establish a collaborative agreement to develop a project in the Arrowhead framework of the European ARTEMIS "Pilot Innovation" 2012, in the areas of energy and mobility, for currently unspecified projects pilots.

IBM – The City signed an MOU with IBM for research and development of a City Operating System and its future application in other cities around the world.

Endesa – Presented an FP7 European project smart cities and smart grid, in collaboration with Turin, Italy. This was an energy efficiency project divided into three axes:

- Expansion of the smart grid network for electricity distribution.
- Network expansion of heating and cooling in the city.
- Rehabilitation of buildings to improve their energy efficiency.

Ros Roca – Jointly applied for a European project on intelligent automated urban waste collection.

Collaboration with Catalan Research Centres

Collaboration with the Catalan research centres for RDI projects in Europe to promote, together with the "Generalitat" of Catalonia, the creation of a cluster of smart cities to incorporate companies in Barcelona / Catalonia. These include:

- Bdigital (CITCLOPS, Wat ERP)

- IREC (microgrids and electric vehicles, lighting, Building (NZEB) and industry)
- Barcelona Design Innovation Cluster/ Barcelona Centre de Disseny (Initiative DIPOLIS)
- I2cat – (SENSORDROID/ Urbiotic transfer)

Collaboration with other City Councils and Institutions

Collaborations with other cities include:

- Dublin City Council
- Seoul Metropolitan Government
- Ajuntament de SantCugat

6.4.2 Demonstrators

Barcelona is fast becoming a world leader in creating an environment in which companies can try new ideas and technologies within the urban realm. Mayor Xavier Trias explains:

“Barcelona is becoming a real Urban Laboratory where it is possible to develop, try out and apply the most advanced solutions in electric mobility, intelligent urban development and energy self-sufficiency, for example. Inventing a new way to plan the city of the future, which can be applied to many other cities all over the world, with the “Brand Barcelona” stamp.”³¹

As part of this, the city has been investing in 22@Barcelona, an urban regeneration project offering modern spaces for the strategic concentration of intensive knowledge-based activities. “This initiative is a new model for city development, providing a response to the challenges posed by the knowledge-based society”³².

Some technologies and projects being implemented at 22@ Barcelona include:

- **System of underground service galleries:** Interconnecting the blocks and enabling service networks to be repaired or improved without the need for excavation in the streets.
- **New fibre-optic telecommunications networks, with a dark fibre network:** Allows companies to contract any service providers and create direct links between different parts of the district.

³¹

http://w110.bcn.cat/portal/site/Alcalde/menuitem.324915bcba5b5254bc12bc12a2ef8a0c/?vgnextoid=001dd4eba298a310VgnVCM10000072fea8c0RCRD&vgnnextchannel=bcfdc83bb398b310VgnVCM10000072fea8c0RCRD&vgnnextfmt=formatDetail&lang=en_GB

³² <http://www.22barcelona.com/content/blogcategory/49/280/lang/en/>

- **New System of centralized public climate control:** Involves savings at both the economic level and in the emission of CO₂
- **Selective pneumatic waste-collection network:** Differentiates between organic and inorganic waste and paper.
- **New electricity network:** Guarantees a quality of electrical supply, more efficient gas and water-service supplies.
- **22@ Urban Lab:** The goals of the Urban Lab are to use the city as a laboratory to test new solutions and services, facilitating market access and promoting competitiveness.
- **The pilot projects on behalf of the project 22@Urban Lab:** Improve resource management and efficiency and the urban quality of the neighbourhood.

Barcelona also created the Smart City Campus³³, located in the 22@ innovation district. In order to further strengthen the strategy of the city and urban innovation, Barcelona wants to offer the city a test-bed and ‘storefront’ for companies to develop and test pilots.

The Smart City Campus will develop a cluster of ‘smart city’ companies, and the Council hopes this will foster connections between diverse sectors like ICT, energy and mobility, for the creation of an ecosystem that integrates not only companies (multinationals and SMEs), but also to institutions, research centres, technology transfer centres, and universities.

6.5 Future Plans

Barcelona City recently published their smart city strategy, which recognises and incorporates existing successful projects, as well as setting an agenda for the future. This will help Barcelona to build upon their existing investment and success, whilst aligning action across the city to a common purpose.

In the coming years, the city believes that effective dialogue with the private sector, research institutes and other cities will be core to their success. As such, they see the City Protocol, participation in international events and sharing their learning openly as key next steps. They believe that this will help them to raise their profile as a global smart city, secure investment, and support other cities in achieving their goals.

³³ <http://barcelonacatalonia.cat/b/?p=3716&lang=en>

7 Hong Kong

Summary

Hong Kong has made significant organisational and strategic investment in ICT, and has a clear strategy for ICT investment, as articulated in their 'Digital 21' strategy. They have a specific function for ICT strategy, housed in the Office of the Government Chief Information Officer, which employs over 700 staff. They have a particular focus on economic development through facilitating the digital economy, and aim to create world-class e-governance services as well as prioritising digital inclusion.



Hong Kong Source: Arup

With a population of 7 million, Hong Kong is one of the most densely populated places in the world. This places particular strain on the housing stock and transport systems. Traffic congestion is a particular challenge. Environmental challenges are also significant in Hong Kong, specifically concerning air, solid waste and water pollution³⁴.

Under "One country, two systems" Hong Kong has its own economic and political system, distinct from the rest of China. Hong Kong is one of the world's leading financial centres, and the four key industries include financial services, trading and logistics, tourism and professional services.

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<http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CDMQFjAA&url=http%3A%2F%2Facad.wyk.edu.hk%2F~pyng%2F7SS%25202008-09%2FLau%2520Chor%2520Hang%2520Urban%2520Problems.ppt&ei=J0Z-UfjCEciI0AWG64CYDw&usg=AFQjCNHGQ4O-SZs1y6Rma4j-YrDG0d3Jvw&sig2=EcOgLvYBIfvFP8Q9jcIfNg&bvm=bv.45645796,d.d2k>

7.1 Introduction

In 1998, Hong Kong identified that ICT investment had the potential to have a positive economic impact. However, they were also aware that driving change in this area would bring about new challenges. In response to this they developed the Digital 21 Strategy as the blueprint for Hong Kong's ICT development.³⁵ Since then it has been "updated on a regular basis to take into account technological and socio-economic changes."³⁶ The current strategy contains five key action areas:

- Facilitating a digital economy
- Promoting advanced technology and innovation
- Developing Hong Kong as a hub for technological cooperation and trade
- Enabling the next generation of public services
- Building an inclusive, knowledge-based society.

The Office of the Government Chief Information Officer (OGCIO) was established in 2004. The intention was to streamline government structure and leadership for delivering the ICT functions within the Government and to enable the Government to take a proactive, leading role in championing ICT.³⁷

There are three main roles of the OGCIO, in line with the Digital 21 strategy. The biggest role, which takes most of the resource, is delivering the government's ICT programmes and having oversight of that across the whole of government, being in charge of the ICT professionals within the government, and setting the technical standards. Jeremy Godfrey, CIO of the OGCIO explains:

"Whereas ten years ago government ICT was decentralised, and each department had its own ICT-shop, now it is much more sensible to have shared systems and shared data. So OGCIO has a role in understanding what it makes sense to do centrally and what it makes sense to do in a distributed manner. It is then up to us to deliver the central systems"

The second role is to facilitate the digital economy in Hong Kong. There is a particular focus on facilitating the ICT industry; giving government support to the growth of that industry and to enable it to play a global and regional role. Mr Godfrey describes this opportunity:

"We see a very substantial (market) opportunity because of the size and the growth of the mainland ICT market and the possibility of the Hong Kong ICT sector playing a role as China's digital entrepôt... This is about Hong Kong businesses playing a leading role in ICT innovation and trade, whilst leveraging the relationship with the mainland - that is the relationship that makes Hong Kong special."

³⁵ www.digital21.gov.hk

³⁶ <http://www.digital21.gov.hk/eng/strategy/2008/foreword.htm>

³⁷ http://www.ogcio.gov.hk/en/facts/doc/Fact_Sheet-OGCIO-EN.pdf

The third role is digital inclusion, ensuring that all citizens can benefit from smart technology investments. Mr Godfrey explains:

“The use of ICT needs to be widespread. We can’t afford to have groups excluded from that. We see ICT as a mechanism to narrow social exclusion. In a way digital inclusion is ICT-enabled social inclusion.”

7.2 Organisation and Leadership

7.2.1 Vision/ Strategy

The Digital 21 Strategy brought together a pan-governmental ICT strategy for the first time. The core vision associated with this is to "sustain Hong Kong's position as Asia's leading digital city". As Mr Godfrey explains,

“The Digital 21 Strategy has at its core the desire that Hong Kong should maintain its position as a leading digital city. Over time, our notion of what that means has changed and our notion of what it is the government needs to do to facilitate that has changed.”

As such, the strategy is regularly reviewed, updated and consulted on.

7.2.2 Structure

Headed by the Government Chief Information Officer (GCIO), OGCIO provides a single focal point with responsibility for ICT policies, strategies, programmes and measures under the Digital 21 Strategy. In addition to providing information technology (IT) services and support within the Government GCIO is deputised by two Deputy Government Chief Information Officers (DGCIOs) who are responsible for two major areas of responsibilities: Policy & Customer Service and Consulting & Operations.

The two DGCIOs are underpinned by five Assistant Government Chief Information Officers and two Chief Systems Managers who head seven Divisions, namely Digital Economy Facilitation Division, E-government Service Delivery Division, Digital Inclusion Division, IT Strategy Division, Business Transformation Division, IT Operations Division, and IT Professional Development Division.

The OGCIO has around 700 civil service staff and is responsible for the career development of around 1,300 government IT professionals working in different government bureaux and departments. These government IT professionals are responsible for assuring the quality of government IT activities, particularly in developing and aligning IT strategy with business and policy objectives and in designing and delivering IT-enabled business change projects that enable timely delivery of policy goals. In addition, around 2,500 contracted IT staff are engaged to supplement the government IT workforce.

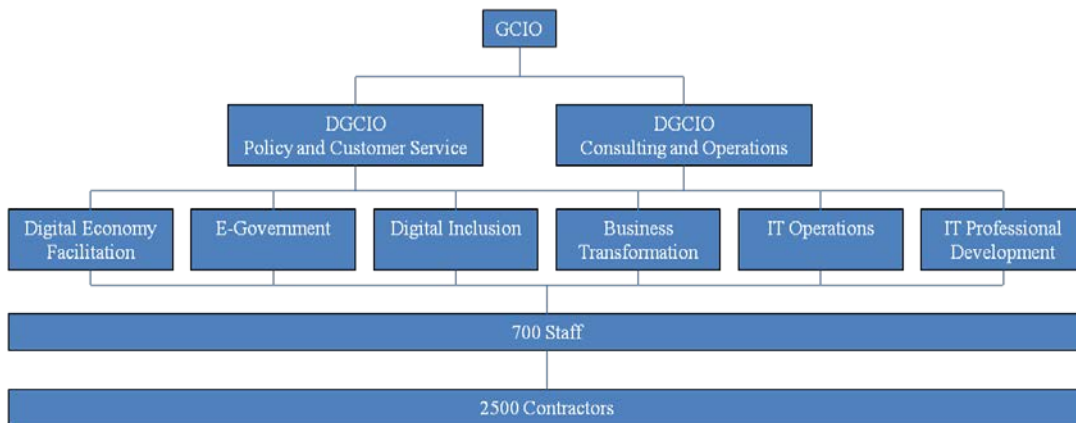


Figure 2: Organisational Structure of OGCIO

7.2.3 ICT for Public Engagement

New communications technology is fundamentally changing how citizens expect to interact with the government. They expect communication to be two-way, efficient and social. Mr Godfrey sees this both as a key challenge and an opportunity for better policy:

“The communication challenges are growing quite rapidly. If you engage with the public effectively, you get better policy, and you get better buy-in to policy. So it’s fundamental... social media allows government to demonstrate sincerity in listening to the public and come across as more human, and that can help the government’s image as well as come up with better policies that will have better impact and command wider support.”

The OGCIO has identified that ICT is driving change not only in how the government communicates with citizens, but in its fundamental role in contributing to debate about the city. Mr Godfrey argues:

“What we are seeing now, particularly with social media, is that government is becoming one voice in the debate, that there is a debate going on within the community that the government can learn from.”

7.3 Smart City Projects in Hong Kong

7.3.1 Electronic Information Management

Electronic Information Management (EIM), was central to the 2008 Digital 21 Strategy, and covers three central themes:

- 1) Content Management
- 2) Records Management
- 3) Knowledge Management.

“EIM aims to take a strategic approach to achieving effective information management through wider use of information technology (IT) and associated culture change so that information can be created, stored, used, disseminated, retrieved and archived in a well-managed manner and be readily available for day-to-day operational use, proper record keeping, knowledge sharing and decision support.”³⁸

7.3.2 E-government

The OGCIO is responsible for running the city’s main website. They aim to meet 80% of citizen needs for dealing with the government on that website, through e-government services. Mr Godfrey explains that:

“The vision is that our clients should find the government service as convenient, as efficient, as pleasurable to use as the best services they get from the private sector.”

“As of December 2012, there are 49 government mobile applications and 38 government mobile websites. OGCIO facilitates the implementation of mobile e-government services through providing support to Government departments and developing mobile applications commonly used by them for public services.”³⁹

7.3.3 GovWiFi

Government Wi-Fi Programme (*GovWiFi*) aims to transition Hong Kong into a wireless city, providing free wireless internet services to all citizens. The programme places Wi-Fi facilities at designated government premises, and aims to ensure that:

- “Citizens can surf the web freely for business, study, leisure or accessing government services whenever they visit the designated Government premises.
- Business organisations can extend their services to a wireless platform to reach and connect with their clients.
- ICT industry players can make use of this new wireless platform to develop and provide more Wi-Fi applications, products and supporting services to their clients, and open up more new business opportunities.”⁴⁰

7.3.4 Open Data

The Government holds a significant amount of data that could be of significant value to the public. These datasets include, for example demographic, economic, geographical and meteorological data, historical documents and archives. However this information has not historically been in a format to facilitate value-added re-use by third parties.

³⁸ <http://www.ogcio.gov.hk/en/strategies/initiatives/eim/>

³⁹ http://www.ogcio.gov.hk/en/facts/doc/Fact_Sheet-OGCIO-EN.pdf

⁴⁰ <http://www.gov.hk/en/theme/wifi/program/index.htm>

In order to combat this, the government launched a data portal entitled Data One (Data.One.gov.hk). This 18 month pilot scheme made geo-referenced public facilities data and real-time traffic data available for free. They held a competition for the best applications of this data, for which they received 41 entries. The winner was an app that located the nearest doctor, and tracked appointments. Following the success of this trial, and support from citizens and industry, the government plans to continue with the portal, and gradually add more datasets. The OGCIO claims:

“The vision is that with more types of PSI being made available, there will be more creative and value-added applications re-using PSI (public sector information). This will not only add convenience to citizens' daily lives, but also create new business opportunities, encourage entrepreneurship and promote innovation in a knowledge-based society.”⁴¹

7.4 Future Plans

Hong Kong will continue to work towards the vision articulated in the Digital 21 strategy, and will update it as new challenges and opportunities are identified. Mr Godfrey explains that achieving the city's aim around ICT is a continual process of improvement, rather than an end-goal:

“Although we have articulated our vision, I don't think we will ever be able to say we've done it. Because even when you get there, ICT changes so fast that you are going to have to keep running to achieve the vision.”

He also identifies that shifting to cloud-based ICT operations in the city will be a core upcoming challenge:

“We see the biggest change in the next few years being how we make use of cloud computing in government, which will affect both the applications and the infrastructure.”

⁴¹ http://www.ogcio.gov.hk/en/strategies/initiatives/info_pilot_scheme/

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