Significance of Smart Cities in 21st Century: An International Business Perspective

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ABSTRACT

The accelerating growth of cities and their disproportionate consumption of physical and social resources are unsustainable, as are the traditional systems cities rely upon to deliver resources. For cities to become both smart and sustainable – more environmentally sound, economically prosperous and socially just – they must integrate the use of big data and ICT both into daily processes and in the pursuit of their pressing goals. Smart cities, as they are presently conceived and understood have enormous potential to open-up in the international business arena through multilateral trading systems as are provisioned under the WTO. This paper explores and discusses the significance and new opportunities of smart cities in international businesses to face the challenges of the 21st Century.

Keywords: Smart cities, Internet and Communication Technology, Infrastructure, Economic development.

1.0 Introduction

By 2050, the global population is expected to grow to over nine billion, and 80 percent of that population will reside in cities. Today, cities are home to just over half of the global population of seven billion. Meanwhile, cities comprise just 2 percent of the Earth’s land mass and are responsible for the consumption of 80 percent of the Earth’s resources. The accelerating growth of cities and their disproportionate consumption of physical and social resources are unsustainable, as are the traditional systems cities rely upon to deliver resources. While urbanisation continues to contribute to increased carbon emissions globally, local action is critical for achieving a low carbon future. In the absence of binding international climate action as well as limited leadership in many state governments, cities are now taking the lead and developing strategies to address climate change impacts.

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In many respects, cities are our best hope for tackling climate change (World Urbanization Problem, United Nations, 2014). By 2030, 70% of people will be in our global cities, the hubs of innovation and economy that today provide about 80% of global GDP (World Bank). How these cities look, around the world, will impact our environment, and hence it is crucial that we proactively understand what we want for our future cities, and put in place systems now that support those future needs in a sustainable and integrated way.

Cities have always been complex in character. For cities to become both smart and sustainable – more environmentally sound, economically prosperous and socially just – they must integrate the use of big data and information and communication technology (ICT) both into daily processes and in the pursuit of their pressing goals. Moving quickly into the 21st Century, it becomes apparent that a city’s overall liveability will have to enter a new dimension and horizon in order to keep pace with the growing population and finite resources. Technological innovation, coupled with smart connectivity that leverages the growing Internet of Things, can solve the actual pressure points related to traffic congestion, waste/pollution management and energy efficiency that will take the city liveability to new levels. Smart cities are always a ‘work in progress; but cities across the world would have a better chance at earning the most liveable accolade when smart city initiatives are implemented with real business outcomes and the end-users unique needs in mind. As such, smart cities, as they are presently conceived and understood have enormous potential to open-up in the international business arena through multilateral trading systems as are provisioned under the WTO.

The discourse of future cities is becoming more multi-disciplinary, more evidence-led and more conceptually watertight, but descriptions and imaginations of the future city will also reflect the competitive dynamics between cities and the firms and institutions that seek to serve them. The future form, functionality, appearance and ambience of cities will have a direct impact on most people’s lives, whether they live in a city or not. The future city will not only impact on society, but will also influence wider global environments and economies. In terms of economics, the largest city markets have already grown bigger than those of many nations. Bearing in mind the above vision of smart city, this paper discusses the significance and new opportunities of smart cities in international businesses to face the challenges of the 21st Century.

2.0 Important Elements of a Smart City

When looking at a city, several dimensions can be identified with some aspects being given and others needing to be designed. The dimensions are:
Environment – landscape, buildings, parks, lakes, rivers.
Infrastructure – public transport.
Collaboration System - Open Data, innovation, synergy, collaboration, creativity.
Living – work, recovery, playing.

2.1 Structures of a Smart City

The biggest opportunity to create value in a Smart City is at the interfaces between the various disciplines. And when talking about Smart Cities it is also important to mention services that are enabled by technology. In this context people and their needs are often neglected. The significance of the Value of people in a Smart City is graphically illustrated in Figure 1.

Figure 1: Significance of the Value for People in a Smart City

Source: Vth Smart Guide - Edition II: Smart Cities Committee Report:

It should be remembered that a Smart City is not created for its own sake but for the people. Disciplines and sectors which historically did not strongly interact with each other now need to be interlinked in a value-creating manner. Often Smart City projects are approached in a purely technological manner. However, it is important to address several other aspects which are not technological, such as the culture of the society,
organizational conditions and the culture of the city management departments (viz. municipalities, corporations, district councils etc.).

2.2 Making Business in a Smart City

A Smart City is not an end in itself, nor some neutral, self-sufficient benefit. On the one hand, decreasing environmental impact will improve the quality of life for residents and staff whilst on the other hand, a Smart City is a place where businesses and innovation are supported. This support takes the form of various services such as: e-Government, which makes it easier for enterprises to interact with the relevant authorities; optimized transportation brings the employee to work quickly and safely; performance and price of telecommunications media are a competitive factor for companies operating internationally; local cloud services can build trust with respect to data security; and, a reliable power supply is an important foundation for business continuity. Cheap energy is not least a competitive factor. Innovation today is often realized in the development of software. The raw material for new applications is information. If the city provides data in a machine-readable form for free disposal, the software developer will have the opportunity to combine this information into new applications. This accessibility in cities is called Open Data. The goals of the Open Data movement are similar to those of other "Open" movements, such as open source, open hardware, open content and open access.

2.3 Smart City Business Model

Business model innovation is more profitable than product or process innovation. Over 50% of executives believe that innovative business models generate more advantage than innovations in products and services which are utilized by smart cities in expanding their potential as well as strategic business opportunities in the future endeavours (University of Sankt Gallen, Competence Centre for Business Models). The idea that digitalization drives new business models is recognised, though sometimes unwillingly, by most industries nowadays. We should be convinced that discussing business models is at least as important as talking about projects and business cases; the latter being the first area of importance when considering smart city development. A smart city business model turns the existing city business model upside down like an Innovative Triangle.

2.4 Defining the Smart City from Business Perspective

Though the smart city has recently emerged as a widely discussed urban planning model both in the policy and theoretical spheres, there is a remarkable lack of consensus
on the term’s definition. In general, the smart city is characterised by the extensive use of internet and communications technology (ICT) infrastructure to drive urban growth through the improved delivery of city services, environmentally sustainable development, and growth of social capital. Much of the literature on smart cities comes from one perspective, however, concentrating heavily on either the technological, environmental, or social element; little attention is paid to the governance component, and it is only recently that more holistic definitions have emerged. The six characteristics mentioned by Hin and Subramaniam (2012)—people, living, economy, mobility, environment, and governance—were developed by Giffinger et al. (2007) to rank the “smartness” of medium-sized cities across Europe. Townsend’s similarly holistic model shows the smart city more generally as the intersection of urbanization and ubiquitous digital technology, with four main “intelligent” drivers: the commons, markets, design and planning, and governance (Institute for the Future, 2010). Rather than break the city down into sections—the model of six characteristics recalls the legacy of department-led city governance—this understanding of the smart city identifies the scales at which ICT can impact urban human interactions. The smart city distinguishes itself from its predecessors in its emphasis on the specific instrumentation that will enable urban problem solving, specifically embedded systems—sensor technology, mobile phones, smart meters, etc.—and big data—large and complex datasets used to analyse urban life (Schaffers et al., 2011). The most important ICTs that contribute to the physical smart city are widespread broadband connectivity, smart personal devices, open data infrastructures, public interfaces, and cloud computing (Institute for the Future, 2010).

2.5 Economic Projections for the Smart City

The economic dimension of the smart city argues that the model is a means to achieve urban economic growth. In particular, the smart city is expected to “sustain the innovation economy and wealth of cities, maintain employment and fight against poverty through employment generation” (Schaffers et al. 2011). There is extensive literature on regional competitive advantage and what characteristics, beyond technological capacity, make areas like Silicon Valley more resistant to failure, including collective innovation and a culture of openness between firms and a region’s institutions (Saxenian, 1994). A positive correlation exists between urban wealth and the “presence of a creative class, the quality of and dedicated attention to the urban environment, the level of education, multimodal accessibility, and the use of ICTs for public administration” (Caragliu et al., 2011). These elements are seen as the basis for a new strategic agenda for European cities and align with the six-part conceptualization of the smart city—smart people, living (lifestyle), economy, mobility, environment, and governance.
2.6 ‘Smart Cities’ are the next phase in the 21st century surveillance grid

As the Internet of Things (IoT) continues to expand in size and scope producing even more data, demand for companies such as ‘Recorded Future’ by intelligence agencies and corporations will continue to increase. Techopedia defines the IoT as a “computing concept that describes a future where everyday physical objects will be connected to the Internet and be able to identify themselves to other devices.” The number of devices connected to the internet has exploded in recent years, a trend that Cisco details in a 2011 report: “In 2003, there were approximately 6.3 billion people living on the planet and 500 million devices connected to the Internet… Explosive growth of smart-phones and tablet PCs brought the number of devices connected to the Internet to 12.5 billion in 2010. Cisco IBSG predicts there will be 25 billion devices connected to the Internet by 2015 and 50 billion by 2020.” Today, more than half the world’s population lives in urban areas – a trend that is set to accelerate into the future – meaning the smart city concept is going to affect the lives of billions of people around the world. India is at the forefront of this push as it plans to build 100 smart cities in the coming years, with Singapore set to become the world’s first smart nation. Smart cities are not just confined to Asia however, as Glasgow, Rio de Janeiro, New Orleans and Cape Town are just a handful of cities involved in IBM’s “smarter cities challenge”.

3.0 Case Studies of Smart Cities for International Businesses

3.1 Smart city projects in Chicago

The three main application areas for smart city and open data projects in Chicago are: infrastructure investment, economic development and community engagement.

**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.

*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”. 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.

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. 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.

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 free: http://weconnectchicago.org/about/
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.

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 Windy-Grid 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. 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.”

3.2 Smart city projects in Rio De Janeiro

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.

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 recently held Olympics and World Cup have focused global attention on Rio, and redevelopment and investment in city services is underway.

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.

**Implementing Smart City Projects**

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’, 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. 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.

**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:

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. 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.”

3.3 Smart city projects in Stockholm

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 is the financial centre of Scandinavia. With a population of 870,000 it has the highest growth and gross regional product, GRP, in Scandinavia. 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 (Energy future of the Stockholm region 2010-2050: The way to reduce Climate impact).

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.”

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.”

**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 (http://www.rohab.co.uk/index.php/case-studies).” 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.

**Green ICT**

“Green IT—a strategy for the City of Stockholm” 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.”

**Measuring Impact and Future Plan**

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. 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.

3.4 Smart city projects in Boston

The Mayor’s Office of New Urban Mechanics (MONUM) 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.

The population of Boston is 625,087 (2011) and is growing, with young people moving to Boston and “older Bostonians returning”. This has fuelled one of the largest increases in population in the US between 2000-2010 at 4.8%. 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 (http://dailyfreepress.com/2013/02/11/boston-ranked-fifth-most-traffic-prone-city-in-nation/)." 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. Smart city projects in MONUM are carried out under three core programmes: ‘Participatory Urbanism’, ‘Clicks and Bricks’, and ‘21st Century Learning’.

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 Plant – 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.
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 (http://www.newurbanmechanics.org/projects/).”

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.

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.

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 MONUM 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.

3.5 Barcelona

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. 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.

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.” 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. 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. The smart cities movement in Barcelona is growing rapidly, and has evolved from previous movements such as ‘digital cities’ of ten years ago. 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.

Organisational 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, consisting of ‘three axis of Barcelona Smart City’ which attempts to set up the basis of the smart city strategy in the city.

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.

Tele-management 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.

Implementing Smart City Projects: 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.
Significance of Smart Cities in 21st Century: An International Business Perspective

- Rehabilitation of buildings to improve their energy efficiency.

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

Barcelona also created the Smart City Campus, 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.

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.

3.6 Hong Kong

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. 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 pollution. 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.
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 (www.digital21.gov.hk). Since then it has been “updated on a regular basis to take into account technological and socio-economic changes.” 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 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.”

**Organisation and Leadership**

**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.

**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 bureau 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.

**Smart City Projects in Hong Kong**

*Electronic Information Management: The E. Bricks Matrix:* 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.

*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.”

*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.”

**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.”

3.7 Singapore as a Smart Business and Knowledge City Hub

From transportation and public housing, to energy management and water treatment, Singapore has developed and adopted some of the world’s most advanced urban solutions. Backed by a progressive leadership and firm commitment to sustainable development, the city has managed to turn the challenges of urban development into rewarding economic opportunities. Some of those solutions have been replicated and implemented successfully in other cities. Even though Singapore can already be regarded as a ‘smart’ city, the government is actively exploring ways to make the city even smarter. Key elements in this approach are the integration of policies, the intelligent use of ICT, and the focus on ‘liveability’; i.e. creating a city in which people are happy to live. Singapore is a highly developed country which relies on good economic policies by the government, a highly skilled workforce, high productivity and cutting edge technology. Just like the Netherlands, its focus lies on innovation as an engine for growth. It therefore invests heavily in R&D. Singapore’s growth in the last few decades is based on attracting Foreign Direct Investment. The Economic Development Board, responsible for FDI, has incentive programmes to attract companies in specific sectors. The EDB is mainly interested in companies with high productivity, cutting edge technology and large investments in R&D. Singapore is also very interested in foreign architecture and design. Singapore is always on the lookout for talent. It has special programmes to attract talented students and scholars from the region and beyond.

Dutch collaboration in Singapore Smart City

Singapore is a dynamic city which is constantly changing. The Singapore society is embracing innovative technological solutions, whether it is for personal use or to be applied on broader scale. New buildings are being built, the newest technologies are being applied and top rated universities educate the highly skilled workforce of the future. The country has a pro-business mentality, and offers business opportunities on many fronts. In the construction sector, there are opportunities for architects, designers, companies working in construction industry and companies specialized in green buildings and energy efficiency. Implementation of ICT solutions in all sectors brings many opportunities. The Dutch water sector is renowned in Singapore and actively offers solutions for Singapore’s challenges in this field. The maritime sector offers opportunities in LNG, green shipping and port construction. Singapore is very interested
in European design. In line with its desire to be a ‘liveable’ city, new products should not only be functional, but also attractive. In the health sector, there is interest in technological tele-health solutions and other medical devices, and for creative solutions to prevent development of chronic illnesses, e.g. serious gaming. In this small country without natural sources of energy, there is a need for new methods of energy collection and storage. Smart grids are test-bedded and universities develop methods for energy storage. The fact that Singapore likes to see itself as a “Living Laboratory” also offers opportunities. The city is open to test new concepts, develop and commercialise cutting-edge urban solutions, capitalising on Singapore’s experience in systems level integration. It invites companies to partner government agencies, local companies and research institutes for a diversity of R&D activities, leveraging the excellent public infrastructure for test bedding activities.

**Investment and development plans of Singapore government.**

The Singapore Government pursues a pro-business, pro-foreign investment, export-oriented economic policy framework. Overall economic policy has been laid out in the Economic Strategy Committee Report 2010. This report proposed a shift towards productivity-driven growth, which would require major new investments in skills, expertise and innovative capabilities of people and businesses. The strategy was summarized as “High-skilled People, Innovative Economy, Distinctive Global City”. This approach filters through every aspect of government policy. For each sector, plans are being developed that have a long planning horizon. This leads to consistent and integrated city planning. Over the last decades, this has resulted in a city with excellent infrastructure, business climate and services. Efforts are underway to turn Singapore into an even smarter city. The Infocom Development Authority (IDA) has set up a ‘smart city programme office’, to study the phenomenon and decide what needs to be done before Singapore can really call itself a smart city. Key elements will be a whole of government approach, integration of policies and intelligent and multi-purpose use of existing data.

**Smart City Planning**

One of the key features of Singapore is its intelligent and integrated city planning. The Urban Redevelopment Authority (URA) develops land use plans that guide Singapore's development for the next 40 to 50 years. The last Concept Plan dates from 2001 and is currently being reviewed. The concept plan is translated into a Master Plan which guides Singapore's development in the medium term over the next 10 to 15 years. It is reviewed every five years and translates the broad long-term strategies of the Concept Plan into detailed plans to guide development. The Master Plan shows the permissible land use and density for every parcel of land in Singapore (www.ura.gov.sg). The Housing Development Board is responsible for the development of public housing
projects. The organization aims to develop these projects in a sustainable manner. A good example is the Punggol Eco-Town (more information below). The HDB is also involved in the land reclamation projects of Singapore, for which the Netherlands offers its expertise. Singapore emphasises the need for a city not only to be business friendly, but also ‘an endearing place to live’. In 2008, an Inter-Ministerial Committee on Sustainable Development developed a “Sustainable Development Blueprint”, outlining that Singapore should be efficient, clean and green (preserving greenery). The Committee also set up the Centre for Liveable Cities, which organizes events and trainings on the topic. The main event is the two-yearly World Cities Summit, which last took place in July 2012 (www.clc.org.sg).

**Smart ways to save energy and protect the environment.**

Since Singapore has no natural energy resources, it depends on imported fossil fuels to meet its energy demand. Its energy policy is therefore based on diversifying its energy sources and reducing the demand for energy. There are limited opportunities for alternative energy sources due to Singapore’s size and location. Possible sources that are being explored are waste-to-energy, biofuels, solar energy and possibly nuclear energy. Singapore also focuses on the R&D of renewable energy options and presents itself as an R&D center and ‘living lab’ for new energy technologies in Asia. In March 2010, a bill was adopted aimed at reducing the energy intensity of the country by 35% in 2030 compared to 2005. The electricity consumption in buildings in Singapore can be attributed to the use of air conditioning (40-50 percent) and ventilation (20 percent). The government is working on comprehensive legislation for energy efficiency in buildings, such as giving energy labels. Singapore is very interested in smart grid technology. In 2011 one of the largest experimental test facilities for electricity networks in the world opened in Singapore: the Experimental Power Grid Centre (EPGC). Energy Market Authority (www.ema.gov.sg). The National Climate Change Secretariat (NCCS) was set up to coordinate Singapore's domestic and international policies on climate change. In June 2012, the Deputy Prime Minister launched the National Climate Change Strategy 2012. The NCCS-2012 describes the projections for carbon emissions up to the year 2020 and the plans to reduce emissions to meet Singapore’s target of 7% to 11%. It also outlines the direction post-2020 as studies are undertaken into how to stabilise Singapore’s long-term emissions (www.nccs.gov.sg.).

**Smart and green buildings**

The plans and initiatives outlined above culminate in a series of efforts to make Singapore’s buildings greener and smarter. The Building Energy Efficiency Master Plan (BEEMMP), contains programmes and measures that span the whole life cycle of a building. It begins with a set of energy efficiency standards to ensure buildings are
designed right from the start and continues with a programme of energy management to ensure their operating efficiency is maintained throughout their life span. There are business opportunities for Dutch companies in energy efficient building systems, such as smart building management systems. The “Sustainable Singapore Blueprint” led to the Green Buildings Master Plan. It contains, inter alia, a Green Mark Incentive Scheme to encourage building owners to undertake improvements in energy efficiency. This system gives points on items such as energy efficiency, water efficiency and indoor environmental quality. Singapore set a target for 80% of existing build stock to achieve at least a Green Mark certified rating by 2030. As the Building Construction Authority’s flagship R&D project under its Green Building Master plan, an existing building at the BCA Academy was retrofitted into a Zero-Energy Building (ZEB). It houses green classrooms and offices, and also function as a test-bedding center for Green Building Technologies (www.bca.gov.sg).

4.0 Smart Cities: Evolution of the Concept from International Business Perspective

Smart cities concept evolved during last periods, on the basis of a process started in 2000 with the definition of the “digital city”, consisting of a city in which the focus is on “hardware” features, in particular like ICT. Sometimes the notion of digital city was also used to depict the representation of a city through digital tools (Anthopoulos and Fitsilis, 2014) and even the management of some services in a city thanks to ICT. Some years later the “socially inclusive city” took the place of the previous concept with a new focus on “software” elements as pillar. In detail the participation of different actors and the leverage on people competencies represented the most prominent parts of this new idea. Then the new concept, namely “city with a higher quality of life”, finally emerged, even if it had already been used in literature and in public projects too. The definition is based both on “hardware” and “software” features, arising from the two previous definition, and even on the linkages between them. Most of the conceptualizations about smart city arose from 2010, but some literati used it even before, defining smart city as a context in which all critical infrastructures are monitored and coordinated to optimize resources usage and to maximize services to citizens (Hall, 2000). The word smart emerged even in a slightly different way, when it represented the way to combine endowments and activities of citizens to achieve forward-looking performances (Giffinger et al, 2007). Then in 2009 the term smart was coupled with the aim of sustainability to depict the theme shared by the range of aims to be achieved thanks to smart cities projects. In the following year gave a definition of smart city to highlight the
need to use in a more aware way ICT to give services to the city (Caragliu et al, 2009; Bélissent, 2010).

4.1 Smart cities and innovation

Scanning contributions in literature about smart cities, innovation emerged as an important and frequent concept to be considered in defining models, actions and roles. First of all Toppeta (2010) underlined the importance of innovative solutions to manage complex projects like the ones leading to smart cities. Innovation is strongly highlighted by Nam and Pardo (2011a & b) in their definition of smart city, as he wrote about the importance of “a contextualized interplay among technological

4.2 Business management, consulting, sales

One more focus on innovation is provided by Schaffers (2011), when focusing on the open innovation (Schaffers et al, 2011) as the way to offer internet-enabled services to perform experiments and validations of the activities. Finally the whole range of subjects involved in smart cities management shape an ecosystem, considered as an urban laboratory, and in a more detailed way an urban innovation ecosystem (FIREBALL, 2012). When considering innovation, it is important to understand which are the subjects linked to this concept, as stated in the last two definitions we considered above. Innovation is crucial in defining the way in which stakeholders can support smart cities projects and even in defining the content of their contributions. As stated by Roy (2005) internet is a means to facilitate a broader conversation among all stakeholders and some of them are starting to be considered as relevant compared to what happened in the past.

ICT instruments can impact on defining the extent of the range of stakeholders and the opportunities to interact can change, as it can happen to the nature of communication and to the allocation of power among different actors. Innovation is pivotal in smart cities development and can act as the way to connect different stakeholders. This approach has been supported by several researchers as they developed the so-called helix models. The first one to be proposed is the triple-helix model focused on the contemporary contributions of university, industry and government to favour innovation (Etzkowitz, 2008). The same model has been reviewed some years later with the proposal of the revised triple-helix (Lombardi, et al, 2011) in which the three helices of the previous model were integrated together with the innovation itself and the knowledge. This update of the model was considered as necessary because lots of contributions in literature had underlined the importance of the innovation and of the knowledge, with the necessity to give them some more space to accomplish a good level
of analysis. Finally this last model has been further reviewed in 2012 (Carayannis, 2012) and referred to as Quintuple helix, composed by 5 different systems packing actors and resources. These systems are: education system, economic system, natural system, media-based and culture-based public, political system.

4.3 Stakeholders: Roles and participation

As a consequence of what we stated before about innovation and actors, it is important to depict the whole range of stakeholders, as strategies to manage cities in a smart approach have to define challenges and to take into account all the needs to be considered and satisfied. Stakeholders are very relevant in smart cities projects and generally in cities contexts, especially by considering the description of cities as “system of systems, system of stakeholders” (Bélissent, 2010). They are considered both in theoretical and in operative models. Some of the most interesting theoretical models were set up by research centre (like the Centre of Regional Science at the Vienna University of Technology – in Austria – or the University of Oulu – in Finland), by industry players (the most used and cited models by industry players are the ones created by IBM, Microsoft and Accenture) or by central agencies, like European Union or National Agencies. All of the most used models in smart cities projects take into account the social participation as one of the crucial features to involve stakeholders and to enable their actions in supporting the urban governance process. Stakeholders are considered in models in lots of different ways, as they can be seen as performance evaluators, holders of useful resources, addressees of information, decision makers, beneficiaries of services, and co-creators of new services. Furthermore stakeholders have to be considered as carriers of different – and sometimes contrasting – needs too, and at the same time as people with different and complementary resources to be integrated, leading to a potential increase in problem solving capacity for the actors performing governance activities (Komninos, 2008, 2011; Nalbandian, 1999). Stakeholders can be engaged in smart cities activities as they can have a direct impact on the improvement of the decision processes and they can favour an efficient usage of the available resources (Wolfram, 2012).

4.4 Business modeling

Business model concerns quite a recent concept and although it is broadly discussed, a common definition is missing (FIReBALL, 2012). A business model describes the rationale of how an organization creates, delivers, and captures value (economic, social, cultural, or other forms of value). One of the most widely accepted definitions come from, according which a business model concerns “an architecture of the products, services and information flows. This definition recognizes actors, roles,
potential business value and the source of revenue. A business model framework or “canvas” contains four components and places in the center the value proposition (Etzkowitz,, 2008; Giffinger, et al, 2007). Although there could be various value propositions, business models can be classified in five patterns according to Roy (2005):

- Unbundling business models, which can be utilized by firms that perform all the three fundamentally different types of businesses: customer relationship; product innovation; and infrastructure businesses (i.e., private banking).
- The long tail business model according which a firm tries to sell less for more. This model can be addressed by the offering of a large range of niche products, each of which sells relatively infrequently (i.e., LEGO).
- Multi-sided platforms, which bring together two or more distinct but interdependent groups of customers (i.e., game console production vendors).
- Free business model continues to benefit at least one substantial customer segment from a free-of-charge offer (i.e., cell phone operators).

The Smart City Context

Before proceeding to the identification of existing smart city business models, it is important for the smart city components to be mentioned. Almost all well managed and large-scale smart cities follow the multi-tier architecture in their attempt to integrate the physical with the ICT environment. However, another interesting approach appears to be adopted by smart cities and concerns the Internet-of-Things (IoT), meaning that many smart cities could utilize data from sensors, buildings and users as sensors with their applications, without necessarily install networks from scratch or other large-scale infrastructure. Potential business models could refer to any or all the smart city components. For instance, smart city vendors develop and deploy facilities; operators earn from facility utilization or service provision; service providers earn from their service delivery etc. To this end, various contemporary business models can be utilized in a smart city.

Domain Study: Existing Smart City Business Models

Smart city stakeholders are too many and exceed city stakeholders: local and central governments; utility providers; ICT companies; Non-Governmental Organizations (NGOs); international organizations; chambers and industry organizations; academia; companies; and citizens. Thus, each stakeholder (or in groups) could develop value proposals for local customers. As such, each smart city service or product can be concerned that it follows or should follow a contemporary or innovative business model. Contemporary business models exist even in web-based cases and the city operates as a direct content and service provider to its habitants and enterprises. On the other hand, reported various smart city business models. Although business models
Significance of Smart Cities in 21st Century: An International Business Perspective

are not supposed to be observed in public organization cases (i.e., Masdar, Gdansk etc.),
even in these forms smart city is utilized by the Municipality to attract visitors, habitants
and investments. Moreover, some of the investigated cases concern novel business
models, such as the South Korean “city-in-a-box”, which is replicated in other Asian
cases; the Dubai/Malta/Kochi Smart City captures value from the private investments of
the located companies at the business parks; and Taipei eco-city concerns a sustainable
growth business model. These studies assigned representatives from two contemporary
business model classes: 1. E-Service business model (Etzkowitz, 2008), and 2. Openness
of the Commercial Enterprise and ICT network ownership (Chourabi et al., 2012)
business model. In the e-service business model, each service group was considered to
be offered by an individual provider (or groups of stakeholders). The assignment of a
pattern considered the network to be the key-resource for value proposition. To this end,
network owner delivers value to individuals and enterprises. An important outcome of
this assignment process concerns the appointment of business model patterns to cases
where network-relative business models were not applicable. The unbundling pattern
appears most in the examined cases and more specifically in all cases where key
resources exist and are utilised by the smart city: broadband, smart, digital, ubiquitous
and eco-cities. This is a reasonable outcome, since all these city forms require different
types of facilities for their service provision (networks, grids, sensors, etc.). Even in case
that these facilities are rent for service provision, the unbundling pattern still exists.
Things change when the IoT is utilized as the key-resource, which results to the
corresponding IoT business models. However, cities in the above examined cases have
not capitalized the IoT yet, which leaves an open space for start-ups and other vendors to
develop their customers’ value.

Today, smart cities appear as the solution to manage urbanisation, waste,
emissions and resource in cities. However, these values do not clearly appear when the
question goes to business model. More specifically, all the examined business models
appear to return value to smart city owners, in terms of internal efficiency (web-based
models); money (network providers); city attractiveness (e-commerce models); or
standardization (value integrators). Finally, although IoT is being discussed extensively
and corresponding innovative products and services are being developed, it is still under
development in the smart city context and it has not been utilised yet. These outcomes
are of extreme interest to both the smart city industry and the local governments. Today,
despite the increasing smart city development, argument appears about the
corresponding technology push which is enforced by vendors (Bannister & Connolly,
2012). To this end, this case study demonstrates how the proposed values will be
delivered to smart city stakeholders and the means, which would involve vendors in smart city privatization.

References


Smart Chicago Collaborative helps the City administer: http://www.smartchicagocollaborative.org/sample-page/history/.
