

GETTING SMART ABOUT SMART CITIES

UNDERSTANDING THE MARKET OPPORTUNITY IN THE CITIES OF TOMORROW

EXECUTIVE SUMMARY

Telecommunications service providers are not playing a primary role in smart city projects, even though they have strengths and assets that can be leveraged to create the information and communications technology (ICT) infrastructure that enables smart city environments. Telecom networks are, in many cases, essential to realize the objectives of the other industries driving the development of a smart city, and machine-to-machine (M2M) and machine-to-machine-to-human (M2M2H) communications technologies (also known as the Internet of Things) are basic requirements for an effective smart city.

But service providers tend to take a reactive, back seat role in the smart city development process. Their involvement remains limited, which means they run the risk of having to compete with utilities, cable companies, and other types of service providers, to provide ICT services. By leveraging their assets in a proactive way and partnering with the key players in a smart city project, service providers can change their role from that of facilitators of other industry objectives, to that of strategic partners of the key industries and governments involved in each project.

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INSIGHTS AT A GLANCE

- Although ICT plays a major role in the development of a smart city project, the value propositions of most smart city initiatives do not position ICT as the key to the project's value.
- Because ICT is not a driving force in smart city projects, the implementation of the necessary layers related to ICT services (the communication infrastructure layer, the IT layer and the applications layer) is usually determined by the motivations behind the project and those who initiate it.
- Along with the many stakeholders involved in a smart city development, each project is also driven by a variety of motivations, of which the major ones are:
 - The need to construct or invent a new economic model (the economic motivator)
 - The need or wish to reduce energy consumption (the eco-sustainability motivator)
 - The need to improve the quality of life in a city environment (the social motivator)
- The three key motivations are not exclusive of each other and they can all be found playing a role in the initiation of a project.
- Despite the many factors that must be taken into consideration, smart cities present a viable business opportunity to service providers.
- Some opportunities are better for service providers to target on their own, while others will need cooperation and partnership with other players in the smart city ecosystem:
 - IT Box projects are the best fit with a service provider's product and service offerings
 - Dream Box projects can only be pursued in cooperation or partnership with the key companies in the industry that is driving the project
 - Black Box projects can only be successfully approached if and when a service provider is invited to participate
 - Fragmented Box projects require a case-by-case evaluation, and even a project-by-project evaluation within each smart city, to better understand the covered functional areas and develop an appropriate strategy (go it alone, or enter into a partnership)

UNDERSTANDING THE SMART CITY LANDSCAPE

To better understand the dynamics of smart city development projects and the opportunities available to service providers, the Alcatel-Lucent Market and Consumer Insight team conducted an in-depth, three-part analysis of 52 smart cities in 2011 (Table 1).

Table 1. Smart city projects researched

Cities	
1. Amsterdam (The Netherlands)	27. Malmö (Sweden)
2. Ballarat (Australia)	28. Masdar (UAE)
3. Besançon (France)	29. Moncton (Canada)
4. Birmingham (U.K.)	30. Ottawa (Canada)
5. Bottrop (Germany)	31. Paredes (PlanIT Valley, Portugal)
6. Bristol (U.S.A.)	32. Pedra Branca (Brazil)
7. Cape Town (South Africa)	33. Porto Alegre (Brazil)
8. Chattanooga (U.S.A.)	34. Quebec City (Canada)
9. Cleveland (U.S.A.)	35. Recife (Brazil)
10. Copenhagen (Denmark)	36. Riverside (U.S.A.)
11. Curitiba (Brazil)	37. Rotterdam (The Netherlands)
12. Dakota County (U.S.A.)	38. Shanghai (China)
13. Dongtan (China)	39. Shenyang (China)
14. Dublin (Ireland)	40. Songdo (South Korea)
15. Dublin (U.S.A.)	41. Sopron (Hungary)
16. Eindhoven (The Netherlands)	42. Suwon (South Korea)
17. Gdansk (Poland)	43. Tallinn (Estonia)
18. Gold Coast City (Australia)	44. Taoyuan (Taiwan)
19. Gujarat international financial tech-city (GIFT, India)	45. Tianjin Binhai (China)
20. Ipswich (Australia)	46. Toronto (Canada)
21. Issy-les-Moulineaux	47. Trikala (Greece)
22. Jubail (Saudi Arabia)	48. Trondheim (Norway)
23. Kalundborg (Denmark)	49. Urumqi (China)
24. Lavasa (India)	50. Windsor-Essex (Canada)
25. Lyon (France)	51. Winnipeg (Canada)
26. Malaga (Spain)	52. Wuxi (China)

The first phase of the study focused on developing an overview of the smart city landscape based on a review of secondary sources. The research looked at smart cities from two angles. First, it focused on key stakeholders and their contribution to the conceptualization and realization of the ideal. Second, to better understand how the stakeholders influenced development, the research focused on a thorough review of 18 ongoing smart city projects.

The second phase of the study, which was conducted in association with the EDHEC Business School of Nice, was designed to supplement the initial outside-in view of smart cities provided by third party sources with an insider's view of smart city projects. This insider's view was built on interviews and discussions with smart city analysts, key representatives of five of the original 18 smart cities studied, and representatives from additional projects in India and Brazil.

Finally, the third phase of the study, which was conducted in association with the Presidio Graduate School (San Francisco, U.S.A.), rounded out the initial findings through a close examination of an additional 25 smart cities. This final analysis enabled the team to develop a more detailed view of smart city categories and all the factors that influence ICT decisions.

THE ROLE OF ICT

The research revealed that how and where ICT is used to create smart cities varies from project to project (Table 2). However, it is usually applied to improve a mix of public and private services:

- **City administration**, to streamline management and deliver new services in an efficient way
- **Education**, to increase access, improve quality, and reduce costs
- **Healthcare**, to increase availability, provide more rapid, accurate diagnosis, provide wellness and preventive care, and become more cost-effective
- **Public safety**, to use real-time information to anticipate and respond rapidly to emergencies and threats
- **Real estate**, to reduce operating costs, use energy more efficiently, increase value, and improve occupancy rates
- **Transportation**, to reduce traffic congestion while encouraging the use of public transportation by improving the customer experience and making travel more efficient, secure, and safe
- **Utilities**, to manage outages, control costs, and deliver only as much energy or water as is required while reducing waste

Table 2. Examples of main areas in which the smart city concept has been adopted in selected smart cities

Area of Adoption	Example
Energy	• Energy networks, such as smart grids, smart meters, smart buildings (Amsterdam, Chattanooga, Dublin, Malaga, Masdar) • Renewable energy sources in a smart grid (Malaga) • Electric vehicles (Amsterdam, Malaga) • Power quality monitoring (Lavasa) • Energy conservation monitoring (Shenyang)
Telecom network	• Broadband development (Chattanooga, Dakota County) • Home automation (Lavasa, Malaga, and Masdar) • Internet access in public libraries (Cape Town) • ICT sector support and ICT training (Cape Town)
Transport	• City transport systems (Dublin, Lavasa, Shenyang, Trondheim, Dakota county) • Consolidated parking management technology (Lavasa) • Geographic Information System (GIS) (Lavasa)
Business support	• Library business corners for starting and running small businesses (Cape Town) • Digital business centers with telephones, faxes, scanners, photocopiers, etc. (Cape Town) • Retail (Masdar) • Business incubation center (Suwon) • Climate street (Amsterdam) • Electronic trade office (Suwon)
Intelligent community framework	• Guide for planning (Dakota County) • Education (Gdansk) • Recreation (Gdansk, Chattanooga, Dakota County) • Integrated security command center (Lavasa) • Automated messaging/mass Short Message Service (SMS) from a citizen call center (Lavasa) • Consolidated billing (Lavasa) • Residential (Masdar, Trondheim) • City administration center (Suwon)
Public utilities	• Water and sewage (Gdansk, Shenyang) • Streets (Gdansk) • Waste management (PlanIT Valley) • Food supply (Shenyang)
Industry sectors	• Petrochemical (Jubail)
Eco-sustainability	• Integrated environmental measures (Lavasa) • Smart building (PlanIT Valley, Masdar) • Environment management (Shenyang)
Technology development and innovation (academic based)	• Technology and innovation centers (Masdar and MIT)

ICT BUILDING BLOCK REQUIREMENTS

To achieve these objectives, smart cities require common open platforms and an underlying ubiquitous ICT infrastructure, which includes high-speed Internet access, wired infrastructure and wireless networks. They also need an ICT application and service enablement suite, which includes smart media service enablers and citywide open access to sensors and actuators.

For telecommunications service providers and alternative operators, this means that each smart city infrastructure must have:

- **An all-IP core network**, which creates a converged infrastructure for buildings and ICT systems, and seamlessly integrates wireless and wireline technologies
- **A broadband access network**, which can support the integration of numerous components via wireless, wireline, copper, fiber, and other access nodes to make a city “smart” by enabling advanced services and applications, such as telecommunication coordination, urban traffic management, building automation, lighting and energy management, access and security networks

At first glance, the ICT building block requirements imply that smart cities offer a major market opportunity that can be easily exploited by telecommunications service providers and their telecom equipment partners. However, although the opportunity exists, capitalizing on it is not as straightforward as it seems.

A VARIETY OF PLAYERS AND OBJECTIVES

Although ICT plays a major role in the development of a smart city project, the value propositions of most smart city initiatives do not position ICT as the key to the project’s value. On the contrary, value propositions are typically more aligned with the respective motivations for the initiation of each project, while ICT is considered an enabler of the ultimate objective.

In addition, the Alcatel-Lucent analysis revealed a variety of ecosystem players involved in the realization of smart city projects. These players span many government levels and multiple disciplines, and those from the business world range from small private firms to large multinationals. Interestingly, there is no single definitive way in which all players behave and work together. Roles vary based on the nature of each player’s business and the smart city’s goals.

Typically, governments initiate a smart city project. Sometimes this happens in cooperation with other partners. However, private companies can also initiate development efforts. When this does happen, the initiative still needs government backing (Table 3).

Table 3. Key initiation models for smart city projects

Initiator	Explanation
Government	The government alone takes the initiative with the key objective to rationalize infrastructure (existing or to be deployed). Examples: • Masdar City, where a presidential law created a special economic zone • Cape Town, where the local government issued a decree transforming the way local government services are delivered • Suwon city, where the Korean Ministry of Information and Communication, in collaboration with the Ministry of Construction and Transportation, created a task force to cope with issues related to Ubiquitous City (U-city) environments that will be realized mainly in newly created communities
Government with partners	Governments work closely with private companies or other partners to improve existing processes and reach pre-defined targets. Examples: • Amsterdam, where the city government (Amsterdam Innovative Motor) in cooperation with an electric grid operator (Liander) started a project to reduce energy consumption and tackle related ecological challenges • Birmingham, where the city council worked with partners from the business, public, and local communities to stimulate economic growth and inward investment • Dublin, where the city government cooperated with an energy agency (Codema) to reduce energy consumption and CO₂ emissions
Private companies	Private companies take the initiative, backed by the government, to realize well-defined development projects. Examples: • Jubail, where Bechtel started the project to make better use of natural gas resources and to develop related industries with the active support of the government • Lavasa, where the Lavasa Corporation in partnership with Wipro (MyCity Technology, Ltd.) plans, builds and manages ICT services • Malaga, where the Spanish energy company Endesa took the lead managing over 50 partners for a project to reduce energy consumption and CO₂ emissions • Songdo city, where Gale International, a U.S. real estate firm, and Posco, a Korean steelmaker, were the main backers of a project to build a new city on a 1500 acre man-made island off the coast of Incheon

Government and top government officials are also usually drivers — key influencers and decision makers — of most smart city projects. Birmingham, Dublin, Gdansk, and Shenyang offer very good examples of projects where government and government officials play this role.

In some areas, laws and regulations sometimes impose this role on local governments. In these cases, governments often form project or development teams, which include leads from governments, academia, and industries, to direct independent yet coordinated sets of programs.

But governments are not the only ones initiating smart city projects. In some cases, private companies take the initiative. This is the situation in Lavasa, where a subsidiary of the HGC Group started the development. Songdo smart city was backed by Gale, Morgan Stanley and Korean steelmaker Posco, while the Trondheim project was initiated by Bellona in cooperation with Siemens.

MANY COMPLICATED RELATIONSHIPS

In all cities, a variety of relationships have developed between primes, main contractors and sub-contractors. However, it is unclear how these relationships are created. The most obvious example of this is in Chattanooga, where the Electrical Power Board became an electric utility as well as a communications company, providing communications services for local businesses using its fiber optic infrastructure. Meanwhile, in Shenyang, Northeastern University is working closely with IBM, and in Songdo architects Kohn Pedersen Fox Associates co-operated with ARUP.

Likewise, it is not clear how the relationships between the main contractors are created and what determines the level of engagement among these players. It is also not clear how relationships are established between sub-contractors. In addition, there is no evidence to suggest whether or not contractual agreements are created to guide and monitor engagement, as well as manage and minimize competitive behavior among ecosystem partners and sub-contractors. And it is unclear how the relationships between the many suppliers involved in a typical project are created and maintained.

A VARIETY OF MOTIVATIONS

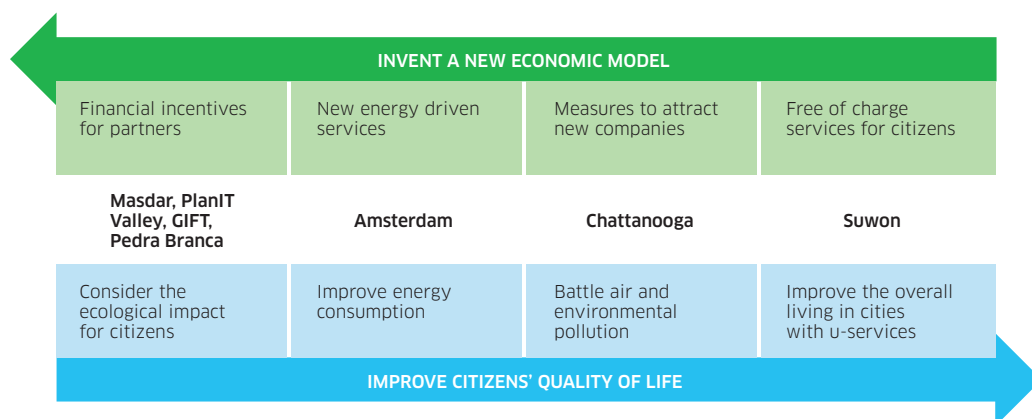
Along with the many stakeholders involved in a smart city development, each project is also driven by a variety of motivations. The Alcatel-Lucent analysis revealed three major motivating thoughts behind a smart city project:

- **The need to construct or invent a new economic model (the economic motivator):**
This was clearly the case in Masdar, where the driving idea was to change the oil-based business model of Abu Dhabi Emirates to one based on renewable and alternative energy sources.
- **The need or wish to reduce energy consumption (the eco-sustainability motivator):**
The best example of this is the Amsterdam smart city project, where reducing energy consumption and more efficient energy usage were the key motivations for the project.
- **The need to improve the quality of life in a city environment (the social motivator):**
This is best exemplified by the Suwon smart city project where the initial goal was to improve the lives and education of citizens, and improve government services.

These three motivators are not exclusive of each other. They are all major reasons behind the establishment of smart cities, and they can all be found playing a role in the initiation of a project. They do not exclude that in a specific smart city context another motivator may be present, but considered less important. In fact, the Alcatel-Lucent analysis revealed aspects of different motivators in each smart city project.

However, what is different is how each city rates the importance of each motivator in the initiation of the project. For example, Figure 1 provides a visual picture of how the “Invent a new economic model” and “Improve citizen’s quality of life” scored in seven of the smart city projects analyzed.

Figure 1. Scoring of two key motivators in seven smart cities



CATEGORIZING SMART CITY OPPORTUNITIES

Despite the many factors that must be taken into consideration, smart cities present a viable business opportunity to service providers. But given that the market is still in the early stages of development and the broad range of smart city projects being initiated across the globe, service providers run the risk of over-committing resources without any clear payback. Therefore, a successful engagement model is one that is carefully tied to a smart city strategy. And that strategy must be based on a clear understanding of the ICT opportunities in each smart city.

To that end, every smart city has characteristics that make it easy to categorize it as a specific type of project (Table 4).

Table 4. Categories of smart cities based on stakeholder vision and objectives

Category	Explanation
IT box	This type of smart city is characterized by the fact that an IT company initiates the smart city project and manages it, with the focus, of course, on IT excellence. Moreover, the business model is based on private companies providing funding for the project.
Dream box	Dream box projects present themselves as turnkey smart cities in which many dimensions are covered in a very ambitious and wide-ranging plan created at the very beginning of the project. The business model for this type of initiative involves a public-private partnership, which is crucial for funding, with an important contribution provided by governments or government agencies.
Fragmented box	In this type of smart city there are many projects defined, which cover various aspects of the smart city, but these projects are treated as independent and separate, with little or no integration or link to a global smart city plan.
Black box	A black box smart city project is usually led and managed by a government or government-affiliated agencies. A closed ecosystem exists that only includes “invited” companies, which are, in most cases, government-affiliated companies. It is very difficult to get a clear view of what happens inside this ecosystem. Moreover, it is very difficult for private companies to enter.

Obviously, some opportunities are better for service providers to target on their own, while others will need cooperation and partnership with other players in the smart city ecosystem:

- IT Box projects are the best fit with a service provider’s product and service offerings
- Dream Box projects can only be pursued in cooperation or partnership with the key companies in the industry that is driving the project
- Black Box projects can only be successfully approached if and when a service provider is invited to participate
- Fragmented Box projects require a case-by-case evaluation, and even a project-by-project evaluation within each smart city, to better understand the covered functional areas and develop an appropriate strategy (go it alone, or enter into a partnership)

POSITIONING FOR MARKET SUCCESS

Service providers have many assets that they can use to build a foundation for an integrated smart city strategy, and to position themselves as the key ICT providers in smart city value chains, including:

- A trusted brand, valued for high availability, quality of service (QoS), privacy, security
- Sophisticated authentication and billing capabilities, potentially integrated across multiple bearer networks (fixed, mobile, Wi-Fi®)
- Mass-market customer care and self-service capabilities
- Consumer and commercial distribution and marketing channels
- Real-time customer insights (presence, location, usage)
- Data center scale
- Technology expertise in networking, telecom, and IT

Most importantly, service providers offer the ability to manage and ensure delivery of large amounts of data over protected, secure, and reliable network infrastructures that are required to enable all of the different visions of an ideal smart city. By leveraging these assets, service providers can change their role in each smart city ecosystem. They can enable the seamless integration of the unique sub-systems that must be created to support each city's services over a single telecommunications infrastructure. They can better deliver solution and service offerings that fit the specific objectives, needs and priorities of each project and its stakeholders. And they can establish strategic partnerships with the specific vendors and application developers that will support unique service and application development efforts for each city.

A strategy built in this way will make service providers prime players in smart city development efforts. It will change their role from that of facilitators of other industry objectives, to that of strategic partners of the key industries and governments involved. Most importantly, it will allow service providers to make the transition from that of providers of basic M2M and M2M2H carrier services to that of key enablers of the smart city vision.

MARKET KNOWLEDGE SHARPENS YOUR BUSINESS EDGE

Market and Consumer Insight (MCI) investigates links between consumer behavior, market and technological trends to help Alcatel-Lucent and its clients, communication service providers, make more informed and impactful business decisions.

MCI experts dig deeper and reach farther to provide information that helps communication service providers formulate new thinking, including:

- Global and regional, urban and rural, insights
- Research on consumer, market and technological trends

For more information related to planning, strategizing and executing adeptly to position for success in the smart cities market, please contact the Alcatel-Lucent Market and Consumer Insight team at mcinsight@alcatel-lucent.com.