

Chapter 2

The Conceptual Idea of Smart City: University, Industry, and Government Vision

2.1 Introduction

During the latest twenty years, urbanization has been accelerating all over the world. People move from country to cities to find better opportunities for living, working, studying, developing their entrepreneurial ideas. However, urbanization produces also several diseases such as pollution, traffic, congestion, waste and social exclusion [1, 2].

The smart city movement was born just from these opposite circumstances: the pivotal role of cities and the urban problems deriving from urbanization. A smart city is conceived like an urban strategy using high technology and especially ICT for supporting a participated social and economic development of the urban area, preventing pollution and reducing the environmental footprint.

Until now, smart cities have been implemented especially applying a spontaneous, bottom-up process; municipalities, companies, not-for-profit organizations and the citizens themselves pursue the smartness of their city suggesting or directly implementing smart projects, initiatives, solutions. The final aim of this trend is to improve the citizens' quality of life and the environmental preservation.

Universities all over the world have been the first actor interested in studying and experimenting smart city pilots, starting this wave now interesting a very large set of heterogeneous stakeholders. As technology is the core component of a smart city, solution vendors are also first movers in designing and suggesting smart city solutions. Municipalities are involved as both players and coordinators of smart city plans interesting the city as a whole.

The involvement of universities, industries and (local) governments in the smart city implementation responds to the triple helix idea [3, 4]; where citizens or their representatives are involved too, it becomes a quadruple helix. A smart city emerges therefore like an innovation ecosystem, exploiting social and economic

development thanks to the hybridization of elements from university, industry and government to generate a creative renewal in the knowledge economy and society.

However, to produce benefits the smart city triple helix should be based on the same idea of smart city shared by all the key actors aiming at the same smart goals. As a sound definition of smart city lacks so far, it is not possible to refer to a shared theoretical concept, but a common smart city idea is the necessary conceptual basis to support a long term, synergic, successful implementation of innovative smart cities thanks to the cooperation of all the involved actors and stakeholders.

This work aims at verifying the conceptual idea of smart city belonging to these different key players: university, industry and government. For pursuing this aim, the author carries out a deep analysis of a large set of documents issued by all these players: the set includes scientific papers, institutional reports and industry surveys focused on the smart city topic and issued by the most representative actors in the international panorama. The content analysis permits to compare not only several smart city definitions, but also aims, components and instruments included in the smart city vision defined by each category of actors. It helps to understand if and how much these visions are similar or different to each other. Implications are derived, regarding public policies and private strategies for a better integration between university, industry and local government in smart city implementation.

2.2 Literature Review

During the latest five years, the smart city topic has been increasing its weight in research activities of universities all over the world. Papers and reports issued about this theme have been exponentially increasing after 2010 so far. Figure 2.1 shows the trend regarding the number of scientific papers about smart city indexed by Scopus and published from 1997 to 2015. The survey includes all the papers with the keywords “smart city” or “smart cities” in title, abstract and keywords. The graphs clearly show that one or few papers have been published from 1997 to 2008. In 2009, papers are 17, in 2011 are 119, in 2014 they reach the number of 731.

An analysis regarding the papers clustered by country or territory shows that all the continents are included: Europe is represented by several countries such as Italy (at the first place), Spain, Germany, France; China and USA are respectively at the second and third place, representing Asia and America. It emerges that smart city is really a global topic.

Clustering papers by subject areas, it emerges like a multidisciplinary field of study; 1443 papers out of 2260 regard Computer science, followed by 773 regarding Engineering; it outlines the technological aspect of a smart city. However, 336 documents are classified in the Social science subject area, remembering that a smart city is not only a technological affair, but also a human and social initiative.

This vibrant topic is until now immature and in progress; indeed, a shared and sound definition of smart city has not been recognized by the scientific community yet. However, some most cited definitions are able to depict the main contents and

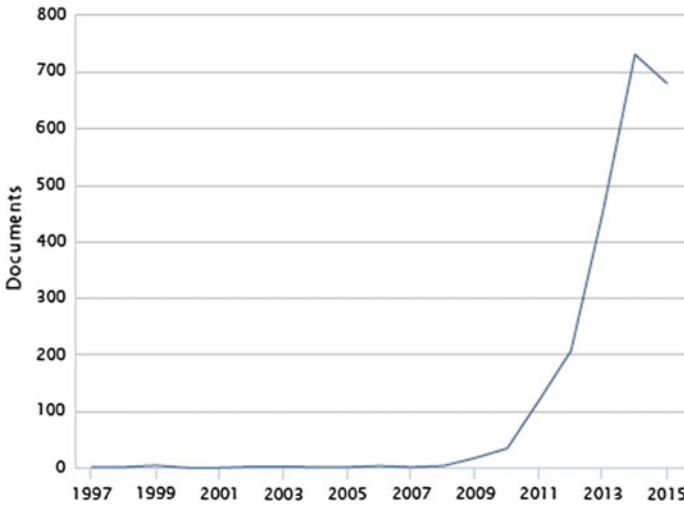


Fig. 2.1 Number of scientific documents indexed by scopus regarding Smart city (years 1997–2015)

aspects characterizing this new urban trend. Table 2.1 contains the definitions issued by researchers, public bodies and solution vendors, to compare their different points of view.

Hall [5] defines a smart city like a place where infrastructures—both traditional and ICT—are the core of an urban system; management, innovation and preservation of these infrastructures are crucial activities to grant to citizens a good quality of life. This pioneer and still immature definition already outlines the role of technology in smart city and the citizens as final addressees of the smart policies.

Also Caragliu et al. [6] define smart city depending on infrastructures and technologies, but they add also two more crucial components: environmental preservation and participation to city governance. The smart city emerges as an integrate subject of both technological and political solutions with a high degree of innovation not only in the physical layer of the city, but also in the human and knowledge component of it.

Similarly, Washburn et al. [7] refer to critical infrastructures, however, they include into the smart city concept also non infrastructural components, that is services, better defined such as city administration, safety, education, healthcare... and more generally all the aspects of a good quality of life when living in city.

Nam and Pardo [8] explicitly include technology, institutions and people in their smart city definition. In their vision, city policies are the core aspect of transforming a city in a smart city, applying technologies and people behaviours to all the aspects of their daily life. Moreover, they outline the importance of creating relationships and participation to enhance the urban smart strategies.

Moving from academic definitions to institutional definitions, we can find sometimes the same contents, some others different points of view. For example,

Table 2.1 Most cited definition of smart city

Definition	Author	Year
A city that monitors and integrates conditions of all of its critical infrastructures, including roads, bridges, tunnels, rails, subways, airports, seaports, communications, water, power, even major buildings, can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens	Hall	2000
A city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance	Caragliu, Del Bo, and Nijkamp	2009
The Smart city is the use of Smart Computing technologies to make the critical infrastructure components and services of a city—which include city administration, education, healthcare, public safety, real estate, transportation, and utilities—more intelligent, interconnected, and efficient	Washburn et al.	2009
[Smart Cities are about] leveraging interoperability within and across policy domains of the city (e.g. transportation, public safety, energy, education, healthcare and development). Smart City strategies require innovative ways of interacting with stakeholders, managing resources and providing services	Nam and Pardo	2011
Smart City is a city in which it can combine technologies as diverse as water recycling, advanced energy grids and mobile communications in order to reduce environmental impact and to offer its citizens better lives	EU-SETIS	2012
A smart City is a city where social and technological infrastructures and solutions facilitate and accelerate sustainable economic growth. This improves the quality of life in the city for everyone	Amsterdam Smart City	2015
In a smart City, networks are linked together, supporting and positively feeding off each other, so that the technology and data gathering should: be able to constantly gather, analyze and distribute data about the city to optimize efficiency and effectiveness in the pursuit of competitiveness and sustainability; be able to communicate and share such data and information around the city using common definitions and standards so it can be easily reused; be able to act multi-functionally, which means they should provide solutions to multiple problems from a holistic city perspective	Copenhagen Cleantech Cluster	2012
Smart city is defined by IBM as the use of information and communication technology to sense, analyze and integrate the key information of core systems in running cities	IBM	2010

the European Commission [9] in its program SETIS defines a smart city especially in order to harmonize technological innovation and economic development with environmental preservation. The environmental component has in the EU vision a central role and EU smart policies are explicitly addressed to use innovative

technologies for reducing the environmental footprint of smart cities. However, in 2014 a more recent smart city definition emerging appears to be more focused on ICT than on environmental issues [10].

Also, Municipalities implementing smart strategies issue their own definition. Amsterdam, generally considered the first smart city in the world, defines a smart city considering both infrastructures and people, and especially the quality of life for every citizen [11]. Copenhagen defines a smart city especially in terms of networks, data and information, ICT and digital services [12].

Also companies working in the smart city sector issue their own definitions, but they try to orient the smart city vision towards the use of their own products and services. IBM focuses on ICT and on facilities needed to use data and information for governing a city in a smarter way. Siemens defines a smart city as an energy efficient and CO₂-neutral city, therefore focusing on environmental aspects. Ericsson especially speaks about a smart connected city; Intel suggests to base a smarter city on ICT and especially on Internet of Things; and the list could continue. Figure 2.2 nicely summarizes the multidimensional aspects of the smart city definition.

Dameri [13] summarizes these and many other definitions putting together both the technological and the institutional aspects, and introduces some other elements, such as: the role of good city governance, the territorial component and the social and inclusive aims of a smart city.

All these definitions outline the innovative role of a smart city; as a city is necessarily a territorial system, a smart city emerges like an innovation ecosystem, that is “the network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies” [14]. However, the condition to realize such an ecosystem is that all players would act in synergy each other.

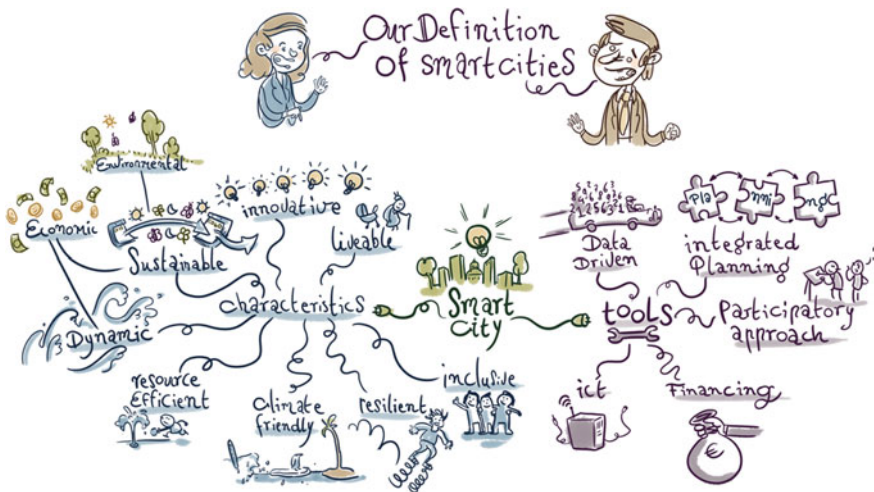


Fig. 2.2 Smart city definition: a multidimensional approach!

Several papers analyze the smart city like an ecosystem, based on the triple helix model joining all the players and stakeholders involved in the smart city implementation, i.e. local governments, universities and private corporations.

Leydesdorff and Deakin [15] in their paper try to demonstrate how the triple-helix model enables the study of a smart city like an innovation system. Lombardi et al. [16] suggest a modified model of a triple helix focusing on the production of knowledge by universities and government and the production of innovations that are patented by industry and universities as an index of intellectual capital in smart cities.

Figure 2.3 depicts the triple helix mechanism in smart cities. Three actors are included into the model: university, industry and government. University is more involved in the first steps, especially addressing the definition of fundamental aspects of the smart city and their embedding in intellectual capital, to be further used to support smart projects. Industry has a pivotal role, supporting the codesign of smart technologies and infrastructures. Firms are mainly involved in the second phase: they collect the academic outcome transforming them into products and services. Their aim is especially to create value, but in the meantime they produce also public wealth for citizens. Government plays a fundamental role in the third phase, when smart city enters its maturity. After the pioneering steps, government should define standards and issue rules. Moreover, the government role regards also the monitoring and evaluation of value and benefits created and delivered by other subjects and by the smart city program itself. Government support and implement also the smart government, an evolution of participated governance aiming at social, cultural and environmental outcomes.

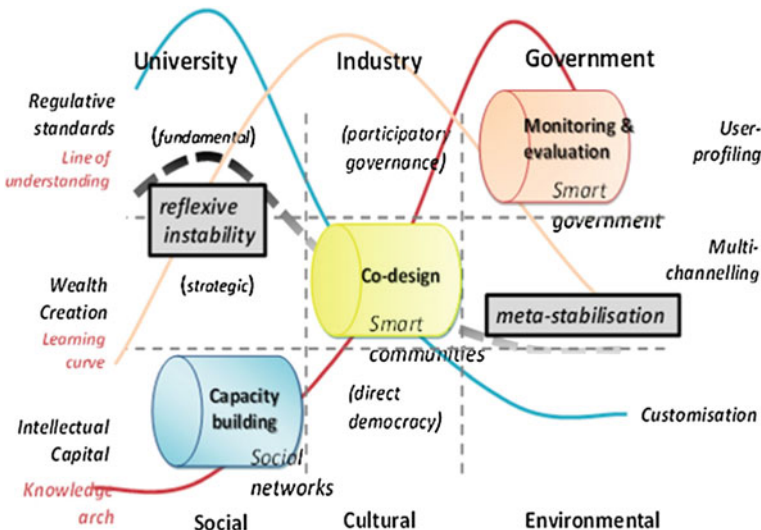


Fig. 2.3 Triple helix in smart city. Source Leydesdorff and Deakin [15]

Zygiaris [17] studies the role of smart city notion to transform the urban areas into green, interconnected, instrumented, open, integrated, intelligent and innovative cities. His *Smart City Reference Model* tries to generalize the different shapes and sizes of smart cities all over the world, focusing on addressing global sustainability challenges at local level. This reference model especially addresses the city conceived as a multilayer innovation ecosystem, where different actors play their own role in an integrated way to pursue shared goals.

The city's ability to raise innovation is especially based on knowledgeable and creative human capital [18, 19]; therefore, the terms smart city and knowledge city or intelligent city are often considered as synonymous, even if they not ever are [20].

In all these cases, the smart city emerges like a complex system, where both heterogeneous actors play a pivotal role and several components are strictly interrelated to each other. To give a framework to this complexity, some authors design a smart city model suggesting a framework to explore all the smart city components and their relations.

Giffinger et al. [21] design six smart dimensions that are nowadays the most used to define the smart city components. They are: Smart economy, Smart mobility, Smart environment, Smart governance, Smart people and Smart living. Chourabi et al. [22] define a smart city model built on two levels: in the internal level, Technology, Organization and Policy directly influence the smart city initiative; in the external level, People Infrastructure, Environment, Technology and Governance put their direct influence on the internal components. Nam and Pardo [8] suggest a smart city model like a complex system deriving from the interactions of three dimensions: Technology, People and Institutions.

All these models are useful to understand what a smart city is and how much different subjects involved in the smart city implementation converge or diverge in their own smart city vision. A shared smart city vision is indeed the premises for successful and synergic smart city programs involving all the triple helix subjects and to transform a smart city in a veritable innovation ecosystem.

2.3 Research Method

This paper aims at understanding and comparing the smart city vision of the three key actors—university, industry and government—composing the triple helix, whose activities support the smart city implementation. The research method is based on a deep content analysis conducted on a selected subset of both scientific and nonscientific documents published during the latest twenty years. This choice derives from the observation that the smart city concept evolves along with two different paths, not ever coordinated each other: scientific research and empirical implementation [23]. Therefore, scientific papers furnish the proof of theoretical evolution of the smart city concept and nonscientific papers collect the case studies of implemented smart projects all over the world.

The paper collection has been made differently for scientific and nonscientific documents:

- (a) scientific documents have been searched on Scopus database between April and May 2015 requesting to the system to search the keywords “*Smart City*” in the title and in the abstract of contribution. Thereby, the scientific documents found were 264 and they included only English academic papers published within 1995–2015 range. Afterwards, the author analyzed the paper containing the most cited smart city definitions;
- (b) nonscientific documents have been searched on Google in November 2014 requesting to the system to search on the web the keywords “*Report*” AND “*Smart City*”. The result of this research showed many reports concerning smart city, the author selected the most important industrial and institutional reports issued by the following institutions: Between [56], Ericsson [26], Forrester [34], IBM [42], IDC [23], Gartner [29], Mc Kinsey [43], Boston Consulting Group [27], Cassa Depositi e Prestiti [30], European Commission [28]), EU-Setis [9], California Institute [24], UK Government [44], Anci Cittalia-Forum PA [54].

Collected documents have been classified depending on the nature of their issuer: public body, university or private company. The content is further analyzed applying the Nam and Pardo Smart city model (see Fig. 2.4), chosen because it designs the smart city model on three dimensions, Technology, Institutions and People, well representing the multilayer architecture of a smart city and the interests

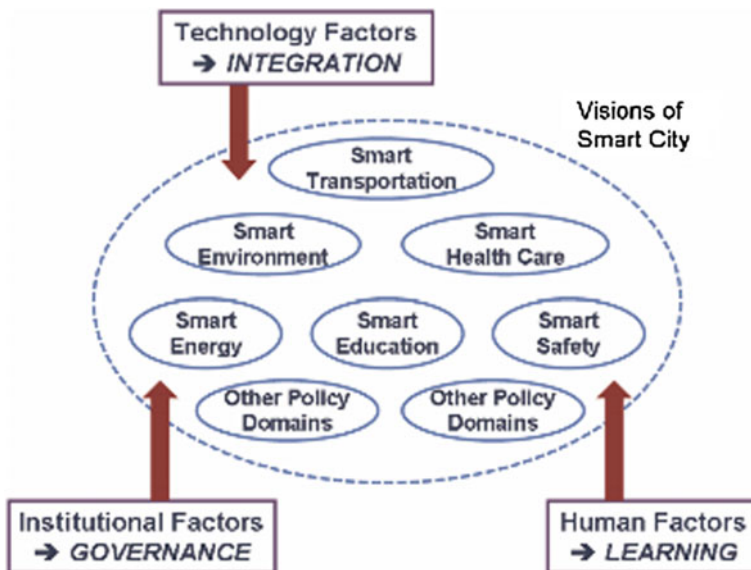
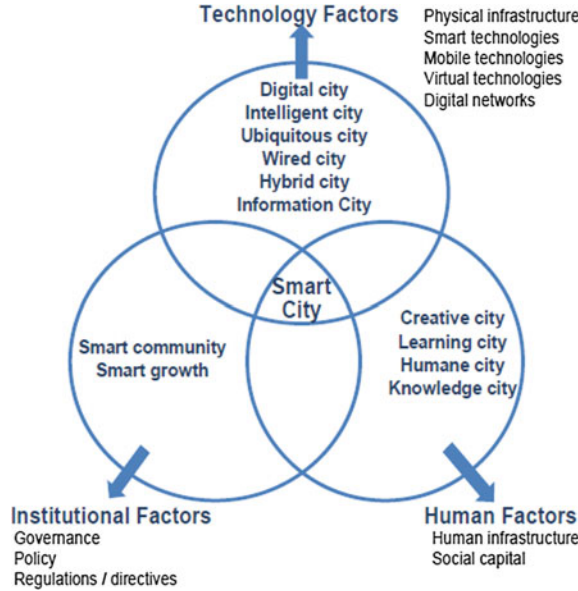


Fig. 2.4 The Nam and Pardo smart city model [8]

Fig. 2.5 Smart city core components [8]



of the three key actors—public bodies, universities and research centres, and private companies [8].

The analysis is then executed using manual coding and applying the keywords representing the Nam and Pardo dimensions. Finally, contents are compared respect to these three dimensions to understand if and how much the key actors share or not the same smart city vision.

In the following paragraphs, the results of this survey are shown analyzing and comparing the contents of the selected documents.

Box 1. The Nam and Pardo’s Smart City Model

This theoretical model tries to understand when it is possible to consider a city a smart one, considering a set of multidimensional components. Indeed, several cities affirm to be smart, defining themselves with this label. However, the lack of a scientific and shared smart city definition prevents to clearly state what a smart city is; to be smart is considered virtuous by city councils and it multiplies the use of the smart city label, not ever in a justified way; and cities all over the world are starting to implement smart initiatives, following their own smart city vision and specificity, generating a various and jeopardized smart panorama.

After examining the most cited smart city definitions and a long list of smart city implementations, the Nam and Pardo smart city model has been chosen as it pinpoints the core components of a smart city and the strategic directions for realizing the better smart city implementation.

The authors identify three smart city core components (Fig. 2.5)

- Technology factors, including all the facilities supporting the physical smartness of a city, both physical infrastructure and ICT;
- Institutional factors, represented by the capacity and instruments for well governing the city;
- Human factors, regarding the citizens and their capability to innovate, learn and form the city's human capital.

Each factor is derived from a subset of smart city definitions and conceptual relatives of smart city.

To successfully implement a smart city, it is necessary to pursue three strategic directions concurrently (see also Fig. 2.4)

- to integrate technologies: a smart city goes beyond technology, the crucial role of technology in smarter city could produce its effect only when integrated into infrastructures, services and human behaviours;
- to govern the institutional factors: the support of local political bodies is imperative to design and realize a smart city effective initiative, also involving and coordinating diverse players and stakeholders, and establishing an administrative environment;
- to learn: even if sometimes the role of technology appears to be the pivotal aspect of a smart city, citizens are the real core component, not only because they should be the real addresser of each smart city program to improve their quality of life, but also because they should participate and cooperate to improve the smartness of their city thanks to creativity, social learning and education.

2.4 The Comparison of Smart City Vision Among University, Industry and Government

At a glance, it seems that all the aforementioned actors share the same vision of the smart city: a new way to understand the city of the future [5, 11, 15, 16] to realize economic sustainability and social inclusion, preserving the environment [17–20] with the aim to improve the quality of life of citizens [6, 9, 21, 22].

However, each category of actors has different aims and these aims influence their smart city vision. The content analysis permits to compare not only several smart city definitions, but also aims, components and instruments included in the smart city vision defined by each category of actors and to understand if and how much these visions are similar or different each other. In the following, smart city ideas are compared respect to the three core factors: technology, institution and people.

2.4.1 Technology Factors

Technology is one of the most important enabling factors to implement a smart city. Authors especially consider ICT like the main enabler of a smart city [12, 14]. Thanks to high technologies such as Smart Computing [23, 24], it is possible to support traditional hardware and software interaction [25], to collect data from the urban sensors and to deliver real-time information to support better decisions [26]. These technologies need an adequate ICT infrastructure, including broadband, optic fibre, Wi-Fi networks, wireless hotspots [27, 28]. Technology and infrastructures are therefore the premises to create a smart city [14, 29].

With respect to technology, the examined three key actors have different ideas.

Universities and Research centres develop and experiment the use of innovative technologies in urban areas and study their delivering cost and benefits. Researchers aim to finally transfer their technological knowledge to solution vendors for their concrete application [4]. Research activities regard both positive and negative impacts of such technologies on citizens' quality of life. On the one hand, technology is examined as a positive factor able to support and improve the quality of life [3]. On the other hand, doubts arise as regard as the real capability of technology to positively change the daily life of all citizens, especially thinking at digital divide [30, 31]. Sometimes implementing ICT in smart cities could generate several problems, such as a reduction in ICT security and data privacy, high cost of implementation and low returns [32, 33]. Universities generally study the most innovative technological solutions, but not ever these solutions are suitable to the smart city and especially to a large number of heterogeneous users; instead they are niche solutions useful for few recipients.

Private companies play the role of technology enablers [26, 34]. They project and implement the smart city technological infrastructure; obviously each of them is especially focused on its own technological products and solutions, i.e. smart transport, smart energy systems, ICT systems, healthcare solutions, efficient building and so on [23, 27]. Overall, they try to implement the most profitable solutions, conditioning the prioritization expressed by local governments and better suitable with the citizens' needs.

Advisors and consultancy officers are involved in studying the better technological solutions for the smart city implementation; they are the link between the innovative solutions suggested by universities and the vendors able to produce technical facilities [26, 35, 36]. They offer their knowledge and competencies to support local governments in smart city strategic planning, economic evaluation and estimate, technological prioritization about the best smart solutions to be implemented for the first [23].

Local governments are involved in planning and implementing the smart city; they generally play the director role, coordinating all the other players in their own territory [37]. A local government establishes relationships with private companies charged to implement technical infrastructure and smart technologies; the most applied instruments for supporting these relationships are public-private

partnerships (PPP) [7]. Municipalities and also the central governments are required to rule all the new topics emerging from the smart technologies implementation, such as the security and privacy requirements for cloud computing, the open data rules and so on [32, 38].

This survey shows that the three smart city key actors are playing an interconnected role in implementing smart cities, sharing some basic concepts but pursuing their own goals. The analysis of a large set of smart projects in some champions smart city [39] and the direct involving of the author in a Municipal government reveal that the key actors are sometimes in synergy, sometimes in conflict each other. With respect to the Technology factor, their ideas regarding the smart city—emerging from both the examined documents and the empirical observation—are quite different and confrontational for the following reasons:

- universities and research centres consider smart city like an innovative place where to implement their pilots and experimental solutions, sometimes neglecting the digital divide, the difficulties in funding innovative facilities and the lack of competences in Municipalities to manage the highest innovation;
- private companies try to force Municipalities to prioritize their own technical solutions, without paying enough attention to the real needs of citizens and offering standard systems, instead of projecting ad hoc solutions for a specific urban area;
- Municipalities are trying to transform cities in smart cities, but both political bodies and public managers and officers often are not capable nor to define strategic planning for the smart city implementation, nor to manage the change program; the topic is too much immature and new, and public bodies need official education and support from the central state to face such a complex topic.

From this survey, it emerges also that all the actors are not enough considering the role of knowledge and human capabilities in using smart technologies. For this reason, two situations occur:

1. solution vendors mainly suggest the implementation of technologies not requiring the citizens participation (such as smart public lighting, reducing energy consumption but impacting remotely on the citizens' quality of life) [10];
2. innovative technological solutions are implemented, but scarcely used; in this case, the impact on the citizens' daily life is minimum, because the rate of use is very low [25].

Box 2. IBM for Smarter Cities

IBM is a global player offering ICT solutions and strategies to large companies, governments and institutional bodies all over the world. From 2009, IBM has been working for designing its own smart city vision, connected with its products and services portfolio. A smart city is conceived like an

integrated urban strategy capitalizing on new technologies and insights to transform its systems, operations and service delivery.

Cities are seen like competitors to engage and attract new residents, businesses and visitors, requiring constant attention to providing a high quality of life and vibrant economic climate. Forward-thinking leaders recognize that although tight budgets, scarce resources and legacy systems frequently challenge their goals, new and innovative technologies can help turn challenges into opportunities.

At the core of a smart city strategy, IBM puts some most innovative ICT technologies such as: transformative possibilities in using big data and analytics for deeper insights; cloud for collaboration among disparate agencies; mobile to gather data and address problems directly at the source; social technologies for better engagement with citizens.

All these aspects are connected into an integrated framework including all the aspects of the daily life in city. The framework recalls the Nam and Pardo's smart city model, as it considers not only the important role of technologies, but also the imperative participation by people and institutions.

Figure 2.6 shows the IBM Smart city vision: it revolves around three core aspects, that are, planning and management, infrastructure and people. Depending on IBM, no Smart city can success without the capacity to plan and manage projects and facilities. Therefore, IBM offers instruments for supporting city planning, local administration and more specific management tools applied to public buildings or safety. Infrastructures are the physical layer of a smart city, and IBM addresses both natural resources such as water, and human artefacts such as energy plants or transportation. Finally, people are the final stakeholders of the Smart city initiative: human aspects are synthesized through education, health and social inclusion.

IBM do not only supply technological applications: it offers integration and strategic partnership. In 2014 Frost & Sullivan awarded IBM the Global Best-in-Class smart city Integrator. It recognizes the winning IBM's vision of a Smarter Planet driven by the 3 'I's':

- Instrumentation;
- Interconnectedness;
- Intelligence.

2.4.2 Human Factors

Human factors regard the role of people in smart city. Smart citizens and communities play a pivotal role, both because they are the main addressees of smart initiatives, and because their involvement and participation is often required for the

Fig. 2.6 IBM Smart city framework [42]



complete success of a smart project [11, 14, 40]. The Human factor is considered not only with regard to the citizen participation, but also regarding the human and social capital existing in a city and knowledge, culture and values characterizing a community [6].

With respect to this factor, key actors have some shared basic ideas and different points of view.

Universities and research centres recognize the role of a smart city program in supporting the human factor development, by attracting talented people [41], developing work and entrepreneurship [11, 17], settling excellent schools and universities [21]. Universities coined the phrase “Smart people” just to outline the role of citizens in the smart city implementation success [18].

Private companies consider people like the addressees of their technological solutions. Therefore, companies and advisory officers often have been settled where the local community is more interested in smart projects, offering their technological solutions or consulting. For example, in China large companies such as IBM are finding fertile ground for their business, in cities strongly oriented towards smartness. To have success, companies need to invest in smart employees, educating their work force to the smart city vision [42]. Private companies represent therefore an enabler factor for smarter people, attracting talented workers, educating employees and inducing the settling of better schools and universities [10, 18, 33, 43].

Public bodies should create the better conditions for implementing a smart city for all, reducing digital divide and promoting smart social inclusiveness. A key role for these aims has been played in Europe by the European Commission with acts such as the European Digital Agenda [44–46].

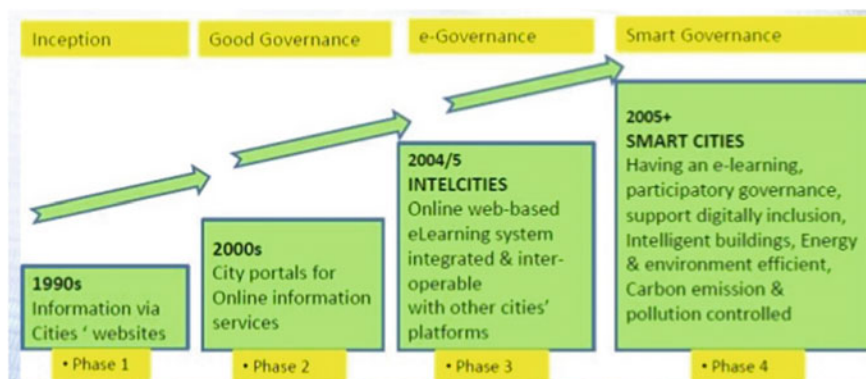


Fig. 2.7 The human role evolution in smart city governance

However, the smart city has been developing especially like a bottom-up phenomenon [47], where the citizens themselves have been the main characters in the smart city implementation [48]. People are moving independently from the governments, cooperating and implementing their own smart solutions; governments should enforce their role, promoting the citizens' involvement and participation in smart city planning, coordinating all the initiatives to gain higher synergies [49].

Box 3. The Role of Human Capital in Smart City Development

The smart city innovative strategy is a global trend, somewhere pursued by each city for itself, elsewhere pursued by the central government and for supporting cities in implementing a national-style smartness. For example, the Government of India launched in 2015 a big national program called Smart Cities Mission [www.smartcitiesindia.com]. This program aims to develop 100 cities all over the country making them citizen-friendly and sustainable. Smart cities are projected to be equipped with basic infrastructures and will offer a good quality of life through smart solutions. Assured water and power supply, sanitation and solid waste management, efficient urban mobility and public transport, robust IT connectivity, e-governance and citizen participation along with safety are some of the likely attributes of these smart cities.

The human role is played at the core of this urban strategy (see Fig. 2.7). It is based on three levels:

- Social capital, developed thanks to infrastructure and connectivity for shared data and information;
- Human capital, based on community intelligence and knowledge, aiming at creating a competitive environment for business-led urban development;
- Participatory governance: inclusive approach towards social and environmental sustainable city.

The human role in city governance has been evolving from 1990s to nowadays, thanks to ICT. Until 2005, citizens have been involved thanks to city portals, websites and only recently through interactive platforms. The new trend considers the citizens' involvement based not only on technological platforms, but especially on learning, participation, information and knowledge sharing, inclusion.

2.4.3 *Institutional Factors*

With the phrase “Institutional factors” Nam and Pardo [8] mean the set of actions forming the smart city governance; they individuate the following smart actions: collaboration, cooperation, partnership, citizen engagement, participation. Institutional factors therefore enable the multi-stakeholders smart city, supporting interactions and communication amongst all the players. Also in this case, the three key actors have different visions about this component.

Universities and research centres coined the phrase “smart governance” to outline the pivotal role played by governance in realizing a successful smart city [6, 21, 37]. During the latest years, academic papers suggest the importance of a comprehensive governance by both local and central governments, aiming at designing an urban smart strategy [51, 52]. This vision suggests a top-down path for implementing the smart city, where the government plays a central, directive role.

Private companies suggest a mix solution between top-down and bottom-up approach [50]. Indeed, the top-down approach does not consider enough the citizens' needs and preferences, the bottom-up approach lacks of coordination and often is not efficient nor effective [53, 54]. A mix solution could balance strengths and weaknesses of both the approaches.

Public bodies are often driven by financial constraints instead of by smart city vision; local governments are influenced by funding policies by national or supranational bodies and sometimes lack of their own smart city plan. In Europe, for example, the European Commission defines the guidelines to pursue and implement a smart city, sustaining its own priorities with large financial amounts and influencing the local choices. However, the EU does not define common goals for the smart city and for this reason results are heterogeneous and lack of synergies [2, 10, 46]. Also private companies adhere to this trend, as EU funds can support the purchase of smart solutions from technology vendors [9, 33, 42]. This situation reduces the importance of governance aspects, such as citizen engagement and participation [15]. A crucial role in supporting the citizen's role in smart city is played by the so-called civil society, for example association, foundations, observatories and so on. They are playing a central role in sharing and communicating the smart city idea suggesting more participated and people-centred smart city models [53].

Box 4. The Role of Institutions in Promoting Smart City Excellence

The recent trend of “smartization” regarding cities all over the world has generally produced a plethora of smart solutions not harmonized each other neither at country level nor at city level. However, as several authors claim, the institutional direction is necessary to create a smart environment able to sustain the effective implementation of smart city strategies. Central or local government should create administrative processes and a governance framework for really develop smarter cities and obtain social and economic returns from smart investments.

The pivotal role of institutions in supporting smart city development has been well understood by the UK Department for Business, Innovation and Skills (BIS) for bringing together all UK smart cities and creates positive synergies from their individual experiences and best practices.

The project is based on two main pillars:

- The definition of standards for all the UK’s smart cities, to support their understanding of smart strategies and orienting their decisions in a better way;
- The link between smart city programs leaded by local government and smart city initiatives lead by private companies, to accelerate urban ideas to market, to grow the economy and make cities better.

The project is developed thanks to the joint venture settled by the BSI—British Standard Institute, and the Future Cities Catapult, an accelerator provide world-class facilities and expertise to support the development of new products and services, as well as opportunities to collaborate with others, test ideas and develop business models in the urban field of study.

The output of the project is a set of standards covering all the phases of the smart city development path, from the understanding of what a smart city is, to the evaluation and performance measurement of obtained results.

At present a subset of standards has already been published. It covers the smart city concept and Vocabulary, the Decision-making framework supporting the strategic definition and the Process framework for implementing smart projects; the Performance assessment method has been published only partial.

Further steps regard the publishing of other standards for smart cities, about technical specification (Collaboration procurement, IoT, Open data and so on), Business case and Model for funding (Fig. 2.8).

The final aim of the project is to bring together cities, key industry leaders and innovators to cooperate in identifying the challenges facing cities, providing solutions to common problems and defining the future of smart city standards.

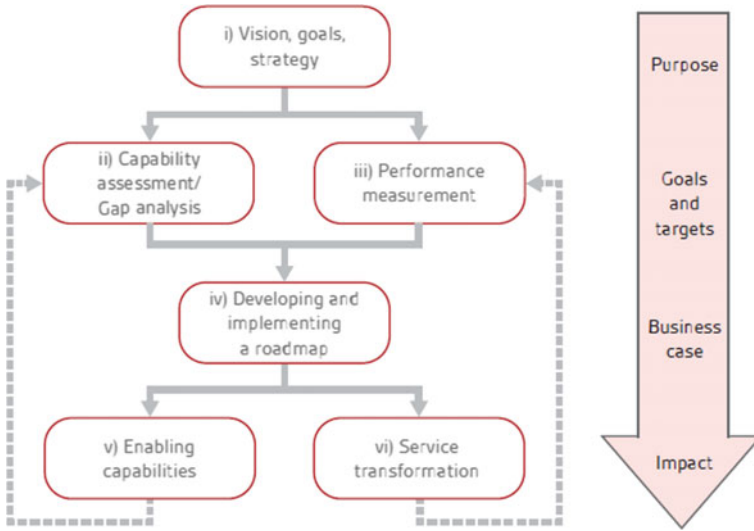


Fig. 2.8 The smart city standards [58]

2.5 Conclusions

Our survey permits to discover the different orientation that three key players have towards the smart city concept. Both scientific papers and practitioner reports reveal the presence of a triple helix, as theoretical defined by Lombardi et al. [16] or Deakin and Leydesdorff [15], even if each key player has different aims: research and knowledge spreading for universities, business and profit for private companies, local well-being and political consensus for public bodies.

Different aims synergetic linked together should drive the smart city towards its veritable final aim, that is, the quality of life for citizens. However, our survey shows that people not ever are at the core of the smart city efforts and key actors are more interested in pursuing their own objectives than to reach the common good.

Several institutional reports or empirical survey outlines that people are few aware about the smart city projects occurring in their city [54, 55]; it generally depends on the lack of local initiatives by the key actors to inform and support the use of smart devices and services [56, 57].

The comparison amongst all the papers and reports included in our survey reveals that the first stage of smart city implementation is not more suitable for the future. If in the pioneer phase a spontaneous, bottom-up wave has been useful to stimulate innovative and original initiatives, now the smart city needs comprehensive, integrated strategies to support long term, profitable and effective smart projects. The analysis of reports collecting smart projects in Italy or Europe [6, 10, 21, 54] outlines that until now smart initiatives are heterogeneous, unfocused, less effective, regarding few people, poorly funded. Without a central direction,

coordinating the interests of all the key actors with the stakeholders' expectations and needs, the smart city will remain an interesting innovative laboratory, but failing in creating public and private value for everybody in the long term. An effective strategic planning, based on a shared smart city definition collected by the participation of both key actors and stakeholders would be the right basis for a long lasting well-being in smarter cities.

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